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Maschio Gaspardo S.p.A.	

Appeal number: **T0698/22-3.2.04**

Please find enclosed a copy

☑ of a letter of the patent proprietor dated 27.09.22

☐ of a letter of the opponent dated

☐

for your information.

All documents attached to party submissions, including patent and non-patent literature cited in party submissions as well as documents containing amendments, such as an amended set of claims are available for inspection via the European Patent Register at www.epo.org/register. They will be provided to you in paper form upon request only (see Notice of the President of the Boards of Appeal dated 1 May 2022 on informing the parties of submissions made by other parties to the proceedings and by third parties, OJ EPO 2022, A57).

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Annex(es):

Registered letter

EPO Form 3345 01/11

Precision Exhibit 1005

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Acknowledgement of receipt

We hereby acknowledge receipt of the following subsequently filed document(s):

Submission number	11343423
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Your reference	PBP11900-EP
Documents submitted	package-data.xml epf1038.pdf (2 p.) CLMS-CLEAN-R82-1.pdf\Amended claims 1st aux req clean.pdf (5 p.) CLMS-CLEAN-R82-2.pdf\Amended claims 2nd aux req clean.pdf (4 p.) CLMS-CLEAN-R82-3.pdf\Amended claims 3rd aux req clean.pdf (4 p.) CLMS-CLEAN-R82-4.pdf\Amended claims 4th aux req clean.pdf (5 p.) ep-sfd-request.xml DOBS3.pdf\Observations to grounds.pdf (4 p.) CLMS-HWA-1.pdf\Amended claims 1st aux req marked.pdf (5 p.) CLMS-HWA-2.pdf\Amended claims 2nd aux req marked.pdf (5 p.) CLMS-HWA-3.pdf\Amended claims 3rd aux req marked.pdf (5 p.) CLMS-HWA-4.pdf\Amended claims 4th aux req marked.pdf (5 p.)
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CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the

movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12), the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another, wherein the drive element (32) is self-centring relative to the drive shaft (20) and wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

~~2.~~ A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

~~3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).~~

~~4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.~~

~~5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).~~

~~6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).~~

2. -

~~7.~~3. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

~~8.~~4. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

~~9.~~5. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim ~~8~~ 4 are mounted.

~~10.~~6. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the kit comprises:

– the movable portion (12) pre-assembled with:

– a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element

(26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12), the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another, wherein the drive element (32) is self-centring relative to the drive shaft (20) and wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

~~11~~7. A kit according to Claim ~~10~~ 6 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to ~~7~~4.

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23), by means of a suction device mounted on a bearing structure (8) of the seed drill (3) and connected to the suction chamber (17) by means of pipes

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12), the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the

drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23), by means of a suction device mounted on a bearing structure (8) of the seed drill (3) and connected to the suction chamber (17) by means of pipes

characterized in that the kit comprises:

– the movable portion (12) pre-assembled with:

– a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12),

the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the

movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12), the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

~~3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).~~

~~4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.~~

~~5.~~3. ~~-~~A seed distribution element (1) according to Claim ~~4~~1, wherein the drive element (32) is self-centring relative to the drive shaft (20).

~~6.~~4. A seed distribution element (1) according to ~~Claim 4 or Claim 5~~any of the preceding claims, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

~~7.~~5. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

~~8.~~6. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

~~9.~~7. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim ~~8~~ 6 are mounted.

~~10.~~8. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the kit comprises:

– the movable portion (12) pre-assembled with:

– a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12), the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal

(24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

~~11~~9. A kit according to Claim ~~10~~ 8 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to ~~7~~6.

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the

movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12), the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another and wherein the drive element (32) is self-centring relative to the drive shaft (20).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

~~3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).~~

~~4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive~~

~~shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.~~

~~5.~~2. ~~A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).~~

~~6.~~3. A seed distribution element (1) according to ~~Claim 4 or Claim 5~~any of the preceding claims, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

~~7.~~4. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

~~8.~~5. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

~~9.~~6. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim ~~8~~ 5 are mounted.

~~10.~~7. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the kit comprises:

– the movable portion (12) pre-assembled with:

– a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings

(28) in a seat (29) of the movable portion (12), the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another and wherein the drive element (32) is self-centring relative to the drive shaft (20).

~~11~~8. A kit according to Claim ~~10~~ 7 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to ~~7~~5.

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23), by means of a suction device mounted on a bearing structure (8) of the seed drill (3) and connected to the suction chamber (17) by means of pipes

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12), the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the

drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23), by means of a suction device mounted on a bearing structure (8) of the seed drill (3) and connected to the suction chamber (17) by means of pipes

characterized in that the kit comprises:

– the movable portion (12) pre-assembled with:

– a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12),

the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the

movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12), the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1, wherein the drive element (32) is self-centring relative to the drive shaft (20).

4. A seed distribution element (1) according to any of the preceding claims, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

5. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

6. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

7. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 6 are mounted.

8. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is

capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the kit comprises:

– the movable portion (12) pre-assembled with:

– a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12), the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

9. A kit according to Claim 8 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 6.

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the

movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12), the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another and wherein the drive element (32) is self-centring relative to the drive shaft (20).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to any of the preceding claims, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

4. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

5. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

6. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 5 are mounted.

7. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the kit comprises:

– the movable portion (12) pre-assembled with:

– a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12), the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another and wherein the drive element (32) is self-centring relative to the drive shaft (20).

8. A kit according to Claim 7 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 5.

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the

movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12), the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another, wherein the drive element (32) is self-centring relative to the drive shaft (20) and wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

4. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

5. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 4 are mounted.

6. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the kit comprises:

– the movable portion (12) pre-assembled with:

– a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12), the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another, wherein the drive element (32) is self-centring relative to the drive shaft (20) and wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A kit according to Claim 6 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 4.

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Letter accompanying subsequently filed items

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The document(s) listed below is (are) subsequently filed documents pertaining to the following application:

Application number and/or Patent number	EP11779702.7 - EP2637492
Applicant's or representative's reference	PBP11900-EP
Name of represented party	Maschio Gaspardo S.p.A.

	Description of document	Original file name	Assigned file name
1	Reply to observations made by the patent proprietor(s)	Observations to grounds.pdf	DOBS3.pdf
2	Clean copy of amended claim(s)	Amended claims 1st aux req clean.pdf	CLMS-CLEAN-R82-1.pdf
3	Amended claims with annotations	Amended claims 1st aux req marked.pdf	CLMS-HWA-1.pdf
4	Clean copy of amended claim(s)	Amended claims 2nd aux req clean.pdf	CLMS-CLEAN-R82-2.pdf
5	Amended claims with annotations	Amended claims 2nd aux req marked.pdf	CLMS-HWA-2.pdf
6	Clean copy of amended claim(s)	Amended claims 3rd aux req clean.pdf	CLMS-CLEAN-R82-3.pdf
7	Amended claims with annotations	Amended claims 3rd aux req marked.pdf	CLMS-HWA-3.pdf
8	Clean copy of amended claim(s)	Amended claims 4th aux req clean.pdf	CLMS-CLEAN-R82-4.pdf
9	Amended claims with annotations	Amended claims 4th aux req marked.pdf	CLMS-HWA-4.pdf

Signatures

Place:	**PADOVA, ITALY**
Date:	**27 September 2022**
Signed by:	**/Davide LOCAS/**
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Capacity:	**Representative**
Function of person signing:	**Representative**

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Applicant:	**Maschio Gaspardo S.p.A.**
Our ref.:	**PBP11900-EP**
EP Application no.:	**11779702.7**
APPEAL No.:	**T0698/22-3.2.04**
Opponent:	**Precision Planting LLC**

OBSERVATIONS OF THE PROPRIETOR TO THE NOTICE OF APPEAL

Further to the Communication of the Boards of Appeal dated May 19, 2022 forwarding via EPO FORM 3344 the Grounds of Appeal filed by Precision Planting LLC against European Patent n. 2637492 (in the following "the Patent") the following observations are hereby submitted.

Requests

It is respectfully requested:

- as main request that the appeal by the opponent be dismissed and thus the patent be maintained in the amended form according to the decision of the Opposition Division taken at the oral proceedings dated 13.12.2021, and submitted to the party with registered letter of 07.01.2022;

- as auxiliary request that the patent is maintained according to the enclosed auxiliary requests.

Should the Boards of Appeal, at the end of the written proceedings, be intended to revoke the Patent or not to satisfy in full one of the aforementioned requests, oral proceedings under Art. 116 EPC are requested.

Inventive step

According to the Grounds of Appeal filed by the appellant, the subject matter of claims 1 and 10 would not involve an inventive step in view of document D10 and the common general knowledge of a person skilled in the art.

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According to decision of the Board of Appeal in the previous case T 0305/18, the subject matter would be novel over D10 at least because such document does not disclose the following features in the known knockout element:

a) that the shaft is rotatably mounted by bearings;
b) the shaft has flanging by means of which it is fixed to a thrust—bearing plate which can bear on the surface of the disc;
c) the surface on which the plate can bear faces the seal in a zone radially inside the ring of holes in order to withstand at least some of the axial load produced by the disc on the seal.

Considering now individually the above feature, the technical effect related to the use of a bearing can be identified as allowing proper rotation of the shaft. In particular, even if the arm of the knock-out device of D10 would be considered as a shaft - which, according to the Patent proprietor, is not the case - such arm would not be suitable for rotating together with the disk, while the shaft of the thrust bearing element of the Patent is suitable for this purpose.

With reference to feature b) the technical effect related thereto can be identified as providing a surface-to-surface contact between the disk and the thrust bearing plate. This makes it possible to provide a more stable contact between the disk and the thrust bearing plate. Such effect is also clearly synergic with the possibility of having a shaft supported by bearings, since it is possible to a proper simultaneous rotation of the disk together with the thrust bearing plate.

The technical effect of feature c) is again connected to the provision of a proper contact between the plate and the disk: as a matter of fact if the plate would cover any of the holes either the seeds of the passage of air would impair such contact.
It is therefore clear that the above features have a synergic effect in improving the capacity of the thrust bearing element in withstanding at least some of the axial load produced by the disc on the seal.

Accordingly, the objective technical problem solve by the invention with respect to D10 can be identified as providing a thrust bearing element which is more effective in withstanding the load and, accordingly, in limiting the wear of the seal.

As a first remark it should be noticed that a person skilled in the art would never consider a modification of knock-out device - such as the one disclosed in D10 - according to which it is not located on the ring of holes. The scope of the knock-out device is to remove seed from the holes and the person skilled in the art would never deprive such device from its main function without any specific hint.

The appellant fails to explain why the person skilled in the art would consider such modification. In the grounds of appeal the appellant merely states that *the "arrangement of the thrust bearing plate "in a zone radially inside the ring of holes" is also an obvious measure. The skilled person would choose the arrangement of the thrust bearing plate in such a way that the function of the sowing disc is not impaired".* Nevertheless it is not explained why the person skilled in the art would have deprived the knock-out device from its main function. Again this modification could be excluded without any specific incentive in doing so.

Also the provision of a bearing on the shaft of the knock-out device could not be considered obvious for a person skilled in the art. It should be always taken into account that the person

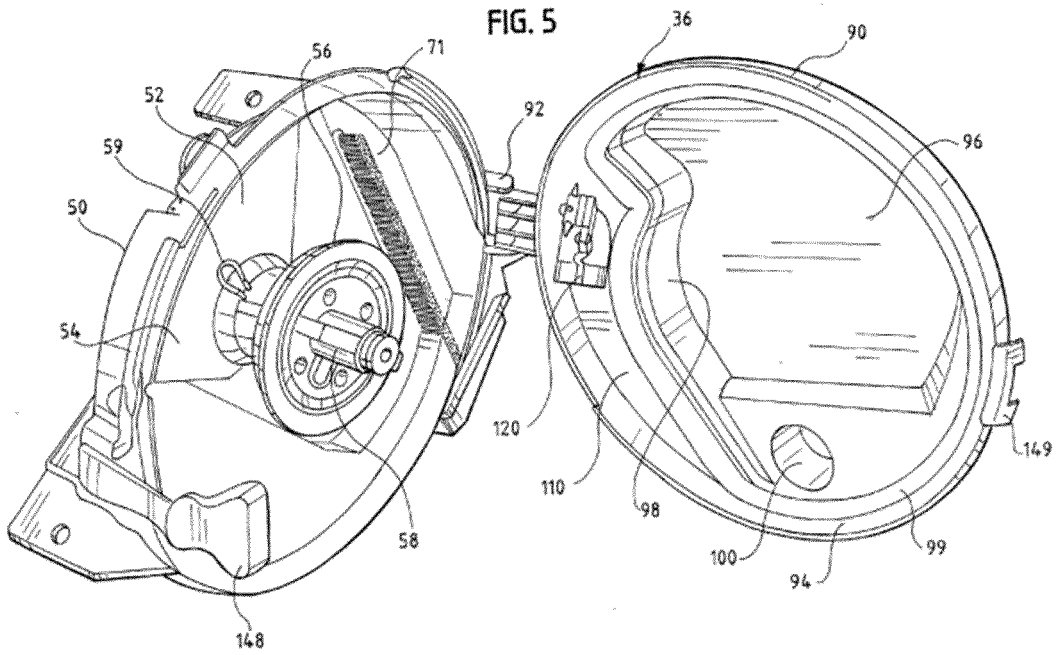
skilled in the art is not aware of the solution to the objective technical problem: he is only aware of the available prior art, in the present case D10 and its general technical knowledge.

Providing a bearing on the shaft of the knock-out element (if element 120 can be considered a shaft according to the invention) would not be an obvious choice for the person skilled in the art since it is not requested for the shaft to rotate, but merely to oscillate of a very little degree.

With reference to the thrust—bearing plate, according to the Appellant such feature would be derivable from the circular portion 58 around the handle in D10. According to the wording of claim 1 the shaft is rotatably mounted by bearings on a seat formed on the movable portion, and the shaft has flanging by means of which it is fixed to a thrust—bearing plate.

This means that the thrust—bearing plate should also be supported (by the shaft and the flanging) on the movable portion. Therefore, the circular portion 58 around the handle in D10 does not correspond to such definition. Even admitting that the person skilled in art considered such portion as a thrust—bearing plate, he should have in some manner fixed it on the knock-out device. As a matter of fact, the mere difficulties in combining the two elements are indicia of inventive step for the subject matter of claim 1.

FIG. 5



The Appellant also mention documents D1, D4, D5 as possible closest prior art. Nevertheless this can be excluded since no disclosure of the knock out element is provided in such documents and none of the discloses a thrust bearing element supported on a seat in the movable portion (even considering the handles as thrust bearing elements, they are clearly not supported on movable portion).

The subject-matter of claims 1 and 10 of the patent according to the present request therefore involves an inventive step (Article 56 EPC).

* * *

In case the Board of Appeal does not consider satisfactory the observations produced by the proprietor, the following auxiliary requests are respectfully submitted.

Auxiliary request 1

Auxiliary request 1 corresponds to the 11th auxiliary request previously filed by the Patentee. In particular claim 1 and 10 of such auxiliary request corresponds to the main request further amended by introducing the feature "by means of a suction device mounted on a bearing structure (8) of the seed drill (3) and connected to the suction chamber (17) by means of pipes".

Basis for this amendment can be found in page 4, lines 20-23 of the application as filed.

Auxiliary request 2-4

Auxiliary requests 2 to 4 correspond to the main request amended by introducing the subject matter of dependent claims 4 to 6 respectively.

Such auxiliary requests are filed in response to the new inventive step attach based on D10 and the common general knowledge submitted by the Appellant for the first time during the proceedings with the grounds of the present appeal.

* * *

For the reasons state above, maintaining of the patent in amended form according to the decision of the Opposition Division taken at the oral proceedings dated 13.12.2021 is requested and fully substantiated. Oral proceedings are requested in case the Board of Appeal does not intend to follow the request in written proceedings.

The representative
CANTALUPPI & PARTNER
Davide Locas

Europäisches Patentamt
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19.05.22

Zeichen/Reference/Référence	
PBP11900-EP	/ APPR
Anmeldung Nr./Application No./Demande n°//Patent Nr./Patent No./Brevet n°	11779702.7 / 2637492
Anmelder/Applicant/Demandeur//Patentinhaber/Proprietor/Titulaire	
Maschio Gaspardo S.p.A.	

Appeal number: T0698/22-3.2.04

Please find enclosed a copy of the statement setting out the grounds of Appeal.

Any reply must be filed within **4 months** of this notification.

The documents specified in this letter as patent documents and as non-patent literature are available for inspection via the European Patent Register at www.epo.org/register. They will be provided to you in paper form upon request only (see Notice of the President of the Boards of Appeal dated 31 October 2020 on introducing a consolidated list of documents submitted by parties during inter partes appeal proceedings and on discontinuing the forwarding of cited documents to the other parties, OJ EPO 2020, A131).

The Registry G. Magouliotis
Tel.: 089 / 2399 - 3241
Annex(es):

Registered letter

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Acknowledgement of receipt

We hereby acknowledge receipt of the following subsequently filed document(s):

Submission number	10947530	
Application number	EP11779702.7	
Date of receipt	16 May 2022	
Receiving Office	European Patent Office, The Hague	
Your reference	E 98381	
Applicant	All applicants as on file	
Documents submitted	package-data.xml epf1038.pdf (1 p.)	ep-sfd-request.xml APPEAL-GRDS-1.pdf\98381amt grounds of apppeal _16_05_2022_.pdf (12 p.)
Submitted by	CN=Albrecht von Menges 23641	
Method of submission	Online	
Date and time receipt generated	16 May 2022, 16:27 (CEST)	
Message Digest	DA:58:41:54:9C:89:C1:A7:03:A7:83:EF:44:FC:1E:4A:F6:E3:DC:00	

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Letter accompanying subsequently filed items

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The document(s) listed below is (are) subsequently filed documents pertaining to the following application:

Application number	11779702.7
Applicant's or representative's reference	E 98381

	Description of document	Original file name	Assigned file name
1	Statement of grounds of appeal	98381amt grounds of apppeal _16_05_2022_.pdf	APPEAL-GRDS-1.pdf

	Payment	
1	Method of payment	Not specified

Signatures

Place:	**Hamburg**
Date:	**16 May 2022**
Signed by:	**Albrecht von Menges 23641**
Association:	**Uexküll & Stolberg Partnerschaft von Patent- und Rechtsanwälten mbB**
Representative name:	**Menges**
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16. 5. 2022
E 98381 Me/MJ

Appeal No.: T0698/22-3.2.04

Patent No.: EP 2 637 492

Application No.: 11779702.7

Patentee: Maschio Gaspardo S.p.A.

In the name and on behalf of the Opponent, Precision Planting, 23207 Townline Road, Tremont, IL 61568 USA, the following

GROUNDS FOR APPEAL

are submitted herewith to substantiate the Notice of Appeal dated March 3, 2022.

I. Requests and Introduction

1. It is requested that the decision of the Opposition Division maintaining European patent 2 637 492 in amended form which decision was announced on December 13, 2021 and the written reasons of which were forwarded with EPO Form 2327 on January 7, 2022 be set aside and that European patent 2 637 492 be revoked in its entirety for all EPC member states.

The subject matter of the patent as maintained by the Opposition Division lacks an inventive step.

An oral hearing is requested in case the Appeal Board should not intend to comply with the previous request in the written proceedings.

2. The interlocutory decision of the Opposition Division (subsequently OD) contains legal and technical errors. In particular, the OD incorrectly concluded that the subject matter of claims 1 and 10 as maintained (Auxiliary Request 7) involves an inventive step when taking prior art document D10 or any of D1, D4 and D5 as closest prior art.

As will be shown below, the provision of a thrust bearing element comprising the features of claims 1 and 10 is obvious to the skilled person in order to support the respective seed disc against the axial forces caused in the movable portion by the negative pressure.

II. Lack of inventive step

1. Introductory remarks

The opposed patent generally relates to seed drills which, by means of a pressure differential generated in the area of a seed disc, separate and distribute seeds in a controlled manner. The operating principle of such seed drills is based on the fact that, as a result of the pressure differential between the opposed faces of the disc, a seed adheres to each hole and is then transported by the rotation of the sowing disc from the seed selection zone to the point at which the pressure differential ceases and the seed is released to drop through a sowing pipe into

the furrow or sowing track. In practice, on one of the faces of the disc a strong air suction is exerted which retains the seeds on the opposite face in the region of the respective holes. For the correct functioning of such distributors it is necessary to ensure an effective pneumatic seal between the face of the disc that is subjected to suction and a seal which delimits the pneumatic suction chamber. The suction effect itself effects a substantial compression of the disc against the seal. If on the one hand this ensures adequate adherence of the seal to the disc surface which is subjected to negative pressure, on the other hand it involves severe abrasion of the seal which limits the effective service life thereof (see opposed patent at [0004]).

The opposed patent explains at [0006] that prior art seed drills include a thrust bearing element to relieve the heavy load on the seal. These seed drills include that the sowing disc is installed together with the corresponding drive shaft in a fixed housing portion and that the thrust bearing element is also mounted on the fixed portion, i.e., the sowing disc and the thrust bearing element are both mounted in the same housing portion. This joint arrangement of sowing disc and thrust bearing element in the same housing portion is considered problematic by the opposed patent:

> *"In all cases, however, the thrust-bearing element, which must be rotated with the disc, is mounted on the fixed portion of the housing, that is to say, that portion which is fixed to the framework of the sowing elements. This means that the disc must be attached to the thrust-bearing element; therefore an attachment system must be provided which in the stage of replacement of the disc must be removed, conse-*

quently lengthening the operation." (opposed patent at [0006])

"However, positioning the thrust-bearing element on the fixed portion entails the pneumatic suction chamber being provided on the fixed portion, or on the same side at which the thrust-bearing element is placed, while the seed collection chamber must be provided in the movable portion. This is the source of numerous drawbacks […]." (opposed patent at [0007])

The opposed patent originates from this reference prior art and seeks to remedy the problems associated therewith by arranging the sowing disc and the thrust bearing element in different housing sections, i.e., by mounting the sowing disc with its drive shaft in the fixed housing portion and by mounting the thrust bearing element in the other, movable housing portion opposite to the sowing disc. Further, the opposed patent places the suction chamber in the movable housing portion, i.e., the suction forces pull on the sowing disc in the direction of the movable housing portion.

2. Lack of inventive step

2.1 The OD correctly assumed D10 as appropriate closest prior art.

With respect to the distinguishing features between D10 and claims 1 and 10, the OD felt bound by the earlier Board of Appeal decision T 0305/18 that held that D10 did not disclose the following feature of claim 1:

A shaft of the thrust-bearing element is rotatably mounted by bearings and has a flanging by means of which it is fixed to a thrust-bearing plate which can bear on the surface of the disc which faces the seal in a zone radially inside the ring of holes in order to withstand at least some of the axial load produced by the disc on the seal.

The technical effect related to this feature may be considered a limitation of wear on the seal.

The objective technical problem may be formulated as how to provide a solution to limit the wear on the seal.

2.2 The subject matter of claims 1 or 10 is rendered obvious by D10 and the common general knowledge of the person skilled in the art.

The OD based its decision in particular on the argument that a modification of the knockout assembly known from D10 into a thrust bearing element is not suggested. However, as will be shown in point (1.) below, apart from the knockout assembly, D10 includes an arrangement of sowing disc and suction chamber which strongly suggests the provision of a thrust bearing element in the movable portion. As will be further shown in point (2.) below, the particular features of the thrust bearing element as required by claim 1 are also obvious to the person skilled in the art.

(1.) Including a thrust bearing element in the movable portion of the seed distribution element in D10 is an obvious measure in view of the prior art known at the time the opposed patent was filed.

The reference prior art discussed in [0006] of the opposed patent already teaches that the sowing disc and the pneumatic suction chamber are both arranged in the fixed housing portion. Thus, for the reference prior art, the suction forces pull on the sowing disc in a direction toward the housing portion in which the sowing disc is mounted, i.e., away from the movable housing portion. The thrust bearing element is therefore also provided in the fixed housing portion.

Contrary to the reference prior art, claim 1 requires that the suction chamber is not defined in the same housing portion as the sowing disc (fixed portion), but in the other housing portion, i.e., the movable portion. Consequently, contrary to the reference prior art, the suction forces now pull on the sowing disc in the opposite direction, *that is*, in a direction away from the housing portion in which the sowing disc is mounted, i.e., toward the movable housing portion. Thus, to support the sowing disc in that direction, the opposed patent places the thrust bearing element on the movable housing portion.

In D10, the suction forces act in the same direction. D10 has an arrangement corresponding to claim 1, in which the sowing disc 60 is mounted in the fixed housing portion 50 and the suction chamber is provided in the movable housing portion 90. Thus, in D10 the suction forces pull on the sowing disc in a direction away from the housing portion in which the sowing disc is mounted, i.e., toward the movable housing portion, too.

Taking into account the fact that a thrust bearing element on the negative pressure side of the sowing disc has been disclosed in the prior art (opposed patent, paragraph [0006]), the person skilled in the art who is confronted

with the above technical problem of limiting the wear of the seal 99 in D10 would have provided a thrust bearing element precisely in the housing part where the suction forces are generated and in the direction of which the sowing disc is pulled by the suction forces. . Accordingly, in the case of D10, the skilled person would arrange the thrust bearing element in the movable portion, i.e. the housing portion where the suction chamber is defied. The provision of a thrust bearing element on the housing portion that defines the pneumatic suction chamber lies clearly within the knowledge of the person skilled in the art. This is shown in particular in paragraph [0006] of the opposed patent.

Consequently, taking into account the arrangement of the suction chamber and sowing disc in D10, providing a thrust bearing element in the movable portion is a measure that is clearly obvious to the skilled person in view of the above objective technical problem.

(2.) The embodiment specifically claimed, i.e., a shaft of the thrust-bearing element is rotatably mounted by bearings in a seat of the movable portion and has a flanging by means of which it is fixed to a thrust-bearing plate which can bear on the surface of the disc which faces the seal in a zone radially inside the ring of holes in order to withstand at least some of the axial load produced by the disc on the seal, is an obvious implementation of a thrust bearing element in the movable housing portion in order to support the sowing disc.

In detail: As the opposed patent explains in paragraph [0006] with regard to the reference prior art, a thrust bearing element must rotate together with the sowing disc. Consequently, with the arrangement of the thrust bearing

element in the movable housing portion it was obvious for the skilled person to support the thrust bearing element rotationally in the movable housing portion so that the thrust bearing element may rotate with the sowing disc during operation.

Further, the use of a bearing element with a planar section, e.g. a thrust bearing plate, designed to abut against the planar sowing disc in axial direction is an obvious implementation for a thrust bearing element. For example, a bearing element may be configured to extend circularly around the handle 58 in D10 while abutting against the sowing disc. Such a bearing element includes the characteristics and functions of a thrust bearing plate.

For the rotational mounting of the thrust bearing plate, using a shaft mounted in the movable portion by means of bearings and connecting the shaft to the thrust bearing plate by means of a flanging is also an obvious constructional measure to rotationally support a thrust bearing plate on an axis that runs perpendicular to the surface of the plate. In particular, the use of a flanging for connection to a shaft is well known to the skilled person.

The arrangement of the thrust bearing plate "in a zone radially inside the ring of holes" is also an obvious measure. The skilled person would choose the arrangement of the thrust bearing plate in such a way that the function of the sowing disc is not impaired.

Summarizing the above, it shows:

1. Rotatable thrust bearing elements to support the sowing disc in the direction of the suction chamber were

prior art at the time the opposed patent was filed (opposed patent, paragraph [0006]).

2. In accordance with claim 1, D10 provides for an arrangement of a sowing disc in the fixed housing portion and of a suction chamber in the movable housing portion. Considering point 1 above, (thrust bearing elements to support the sowing disc in the direction of the suction chamber are prior art), it was obvious for the skilled person to provide D10 with a thrust bearing element to support the sowing disc in the direction of the suction chamber, i.e. in the movable housing portion, when the skilled person seeks to reduce the wear of the seal.

3. The specific features of the thrust bearing element as required by claim 1 belong to an embodiment that is within the technical knowledge of the skilled person.

4. Faced with the objective technical problem to reduce the wear of the seal in D10, the person skilled in the art arrives at the subject matter of claim 1 by applying his technical expertise and technical knowledge of the prior art.

Consequently, the subject matter of claim 1 as maintained is not inventive in view of the prior art.

The above applies *mutatis mutandis* to the subject matter of claim 10, which is also not based on an inventive step.

2.3 The seed meters disclosed in D1, D4 and D5 have the same basic structure as the seed meter in D10 (see D1, FIG. 6; D4, FIG. 3; D5, FIG. 3.), including the arrangement of the sowing disc in the fixed housing portion, the definition of the suction chamber in the movable housing portion and the arrangement of the seal in movable housing portion.

The above arguments therefore apply analogously. Starting from any of D1, D4 and D5, it would have been obvious for the skilled person to provide an additional, rotatable thrust bearing element in the movable housing portion where the suction chamber is defined and in which direction the sowing disc is pulled by the suction forces. The specific features of the thrust bearing element are obvious for the skilled person as explained above.

2.4 Further, with regard to the contested decision, section 1.3, it is to be noted that the assessment of inventive step in view of D10, specifically under consideration of the knockout assembly, as taken by the OD is not correct.

The OD assumed that it was not obvious to the skilled person to modify the knockout assembly of D10 to comprise the specific features of the thrust bearing element as defined in claim 1 (see contested decision, section 1.3). This assessment is not correct for the following reasons.

The knockout assembly as shown in FIG. 13 of D10 generally exerts axial forces on the sowing disc via the spring 128 and the hexagonal wheel / prongs 132.

It is clear to the skilled person that the forces exerted by the knockout assembly support the sowing disc to a certain degree.

From the functioning of the knockout assembly, the skilled person learns that supporting the sowing disc in the movable portion has the effect of reducing, at least to a small degree, the force with which the sowing disc is pressed against the seal.

Confronted with the technical problem to reduce the wear of the seal, the skilled person would consider a modification of the knockout assembly in order to increase the support forces exerted by it. In this respect, the considerations from points (1.) and (2.) above apply analogously. In providing a thrust bearing element that provides a better supporting effect than the knockout assembly of D10, the skilled person will be guided by known thrust bearing elements and consider a design corresponding to the features of claim 1 as a potential solution. In doing so, he will in particular be guided by the considerations discussed in point (2.) above and consider a corresponding modification with thrust bearing plate, shaft, bearings and flanging.

Consequently, the OD's findings are not correct. A modification of the knockout assembly to the effect "a shaft of the thrust-bearing element is rotatably mounted by bearings and has a flanging by means of which it is fixed to a thrust-bearing plate which can bear on the surface of the disc which faces the seal in a zone radially inside the ring of holes in order to withstand at least some of the axial load produced by the disc on the seal" is an obvious measure for the person skilled in the art in view of the technical problem to reduce the wear of the seal.

Also for these reasons, claims 1 and 10 as maintained are not based on an inventive step.

For the sake of completeness, it is noted that the (modified) thrust bearing element of D10 is also applicable to the D1, D4 and D5 and its application is also directly suggested, since these seed meters have the same basic design as the seed meter of the D10.

For the reasons outlined above, revocation of the opposed patent in its entirety is fully substantiated.

- signed electronically -

Martin D. Jacob
(Association No. 1)

Albrecht v. Menges
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Datum/Date
22.03.22

Zeichen/Reference/Référence	
E 98381	/ OPPO01
Anmeldung Nr./Application No./Demande n°//Patent Nr./Patent No./Brevet n°	11779702.7 / 2637492
Anmelder/Applicant/Demandeur//Patentinhaber/Proprietor/Titulaire	
Maschio Gaspardo S.p.A.	

File number: **T0698/22-3.2.04**

Commencement of proceedings before the Board of Appeal

The letter dated 03.03.22 filed by the opponent
against the decision of the European Patent Office of 07.01.22
has been referred to Board of Appeal 3204.

The reference number is mentioned above.

Any further communications should be addressed to the Boards of Appeal of the European Patent Office and should quote this reference number.

The Registrar G. Magouliotis
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Annexe(s): copy of the notice of appeal for the other party(ies)
Practical instructions

Registered letter

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File number: **T0698/22-3.2.04**

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Your attention is further drawn to the provisions of the new Rules of Procedure of the Boards of Appeal (in force from 1 January 2020 - RPBA 2020, see OJ EPO 2019, A63), in particular Articles 12, 13, 15 and 16 RPBA 2020.

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Datum/Date
22.03.22

Zeichen/Reference/Référence	
PBP11900-EP	/ APPR
Anmeldung Nr./Application No./Demande n°//Patent Nr./Patent No./Brevet n°	11779702.7 / 2637492
Anmelder/Applicant/Demandeur//Patentinhaber/Proprietor/Titulaire	
Maschio Gaspardo S.p.A.	

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Acknowledgement of receipt

We hereby acknowledge receipt of the following subsequently filed document(s):

Submission number	10722930	
Application number	EP11779702.7	
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Receiving Office	European Patent Office, The Hague	
Your reference	E 98381	
Applicant	All applicants as on file	
Documents submitted	package-data.xml epf1038.pdf (2 p.)	ep-sfd-request.xml APPEAL.pdf\98381 AMT NoA 3.3.pdf (2 p.)
Submitted by	CN=Albrecht von Menges 23641	
Method of submission	Online	
Date and time receipt generated	03 March 2022, 18:00 (CET)	
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Letter accompanying subsequently filed items

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The document(s) listed below is (are) subsequently filed documents pertaining to the following application:

Application number	11779702.7
Applicant's or representative's reference	E 98381

	Description of document	Original file name	Assigned file name
1	Notice of appeal	98381 AMT NoA 3.3.pdf	APPEAL.pdf

	Fees	Factor applied	Fee schedule	Amount to be paid
15-1	011 Appeal fee for an appeal filed by an entity other than those referred to in Rule 6(4) and (5) EPC	1	2 705.00	2 705.00
	Total:		**EUR**	**2 705.00**

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	Account holder:	Uexküll & Stolberg
2	Refund/Reimburserment	
	Reimbursement (if any) to be made to EPO deposit account:	28000327
	Account holder:	Uexküll & Stolberg

Signatures

Place:	**Hamburg**
Date:	**03 March 2022**
Signed by:	**Albrecht von Menges 23641**
Association:	**Uexküll & Stolberg Partnerschaft von Patent- und Rechtsanwälten mbB**
Representative name:	**Menges**

Capacity: **(Representative)**

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PARTNERSCHAFT VON PATENT- UND RECHTSANWÄLTEN mbB

Europäisches Patentamt
80298 München

Patent No.: 2 637 492

Application No.: 11779702.7

Patentee: Maschio Gaspardo S.p.A.

3. 3. 2022
E 98381 Me/BB

In the name and on behalf of Precision Planting LLC, 23207 Townline Road, Tremont, IL 61568, U.S.A. a

Notice of Appeal

is filed herewith against the Decision of the Opposition Division announced on December 13, 2021, maintaining European patent 2 637 492 in amended form, the written reasons of which were forwarded with EPO Form 2327 on January 7, 2022.

It is requested that the above Decision be set aside and that the patent be revoked in its entirety.

Oral proceedings are requested in case the Appeal Board does not intend to revoke the patent in the written proceedings.

The fee for appeal is paid per enclosed voucher.

The grounds for appeal will be filed within the time limit of Article 108 EPC.

Albrecht v. Menges
(Association No. 1)

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Date
07.01.2022

Reference	Application No./Patent No.
PBP11900-EP	11779702.7 - 1004 / 2637492
Applicant/Proprietor	
Maschio Gaspardo S.p.A.	

EPA/EPO/OEB Formblatt/Form/Formulaire : 2327

Empfangsbescheinigung über den Zugang des vorstehend bezeichneten Schriftstücks
Acknowledgement of receipt of the document specified above
Récépissé du document spécifié ci-dessus

Unter Bezugnahme auf die Mitteilung im ABl EPA 7/2010, 377 wird gebeten, die Empfangsbescheinigung mit Empfangsdatum und Unterschrift zu versehen und **umgehend** an das EPA zurückzusenden:

With reference to the Notice in OJ EPO 7/2010, 377, you are requested to date and sign the acknowledgement of receipt and return it to the EPO **immediately**:

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Received at the EPO on Jan 18, 2022 09:48:42. Page 1 of 1
Duration: 01.18.2022 09:48:17 AM - 01.18.2022 09:48:42 AM. This page 1 of 1 was completed at 01.18.2022 09:48:42 AM.

Precision Exhibit 1005

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Acknowledgement of receipt

We hereby acknowledge receipt of the following subsequently filed document(s):

Submission number	10571158	
Application number	EP11779702.7	
Date of receipt	14 January 2022	
Receiving Office	European Patent Office, The Hague	
Your reference	E 98381	
Applicant	All applicants as on file	
Documents submitted	package-data.xml epf1038.pdf (1 p.)	ep-sfd-request.xml ADVOFDELIVRY-1.pdf\20220110102402094.pdf (1 p.)
Submitted by	CN=Albrecht von Menges 23641	
Method of submission	Online	
Date and time receipt generated	14 January 2022, 14:05 (CET)	
Message Digest	AC:00:9C:C8:AF:76:B7:F2:89:B6:D4:63:63:F4:44:AC:A3:93:B8:7A	

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INTELLECTUAL PROPERTY
Hamburg (sm)
07.01.2022

Date 07.01.2022

Reference		Application No./Patent No.
E 98381	OPPO 01	11779702.7 - 1004 / 2637492
Applicant/Proprietor		
Maschio Gaspardo S.p.A.		

EPA/EPO/OEB Formblatt/Form/Formulaire : 2327

Empfangsbescheinigung über den Zugang des vorstehend bezeichneten Schriftstücks
Acknowledgement of receipt of the document specified above
Récépissé du document spécifié ci-dessus

Unter Bezugnahme auf die Mitteilung im ABl EPA 7/2010, 377 wird gebeten, die Empfangsbescheinigung mit Empfangsdatum und Unterschrift zu versehen und **umgehend** an das EPA zurückzusenden:

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Letter accompanying subsequently filed items

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The document(s) listed below is (are) subsequently filed documents pertaining to the following application:

Application number	11779702.7
Applicant's or representative's reference	E 98381

	Description of document	Original file name	Assigned file name
1	Acknowledgement	20220110102402094.pdf	ADVOFDELIVRY-1.pdf

	Payment	
1	Method of payment	Not specified

Signatures

Place:	**Hamburg**
Date:	**14 January 2022**
Signed by:	**Albrecht von Menges 23641**
Association:	**Uexküll & Stolberg Partnerschaft von Patent- und Rechtsanwälten mbB**
Representative name:	**Menges**
Capacity:	**(Representative)**

Opening

The chairperson opened the proceedings (9:03).

The chairperson stated that recording is not allowed.

The parties confirmed to have received emails comprising addresses for providing/ receiving submissions and the phone number of the chairperson in case of disconnection.

Because the oral proceedings were held via Zoom, the chairperson ensured that all parties could follow the proceedings by frequently asking the representatives if their sound and image were of good quality.

The chairperson then asked the parties to confirm their request:

Patentee:

Main request: to maintain the patent in an amended form according to auxiliary request 7 filed on 27.03.2018.

Opponent:

Main request: to revoke the patent in its entirety.

Art. 56 EPC: Inventive step of the subject-matter of claims 1 and 10

The chairperson informed the parties that the opposition division is bound by the Board's ratio decidendi also with regard to the features distinguishing the subject-matter of claim 1 from the teaching of D10 which have been identified by the Board of Appeal. The chairperson asked the parties to consider this in their argumentation. The opponent repeated the arguments brought forward in writing in the letter of 11.10.2021 and referred to point 6.3 of the decision of the Board of Appeal (p. 15-16) as well as Fig. 13 in D10.

The patentee also referred to point 6.3 of the decision of the Board of Appeal and argued that the distinguishing features of claim 1 with respect to D10 have already been decided by the Board of Appeal.

Between 9:28 and 9:42, the oral proceedings were interrupted first due to a sound issue from Mr. Jacob and then due to a connection problem of Mr. Locas.

The patentee further argued that none of the documents cited by the opponent discloses the distinguishing features as defined by the Board of Appeal and that the skilled person would not modify the position of the knockout assembly without exercising an inventive activity.

After being asked by the chairperson, the opponent referred to the written submissions concerning the other lines of argumentation, i. e starting from D1, D4 or D5.

The patentee disagreed with the opponent's point of view and based his argumentation on Fig. 8 of D1.

The chairperson informed the parties that the opposition division would like to confer to deliberate about inventive step and informed the parties on the further procedural steps depending on the outcome of the deliberation.

After deliberation (9:59-10:24), the chairperson communicated to the parties that the opposition division has come to the conclusion that the subject-matter of claim 1 and the corresponding kit claim 10 of the auxiliary request 7 involves an inventive step (Art. 56 EPC).

Adaptation of the description

The chairperson communicated that the opposition division does not see a need for adaptation of the description.

After being asked by the chairperson, the opponent stated that he has no objections regarding the description.

Decision

The chairperson announced the decision that taking into account the amendments made during the opposition proceedings, the patent and the invention to which it relates meet the requirements for patentability of the EPC. The patent will be maintained in amended form under Article 101(3)(a) EPC on the basis of auxiliary request 7, provided that the requirements of Rule 82(2) EPC are fulfilled.

After being asked by the chairperson, the parties answered that the proceedings held by videoconference ran in a technically good manner.

The chairperson closed the oral proceedings (10:27).

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Tel: +49 89 2399 0
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Application No.: 11 779 702.7

Patent No.: EP-B-2 637 492

Direct decision:

☐ **yes** ☒ **no**

Interlocutory decision in opposition proceedings (Art. 101(3)(a) and 106(2) EPC)

The Opposition Division - at the oral proceedings dated 13.12.2021 - has decided:

Account being taken of the amendments made by the patent proprietor during the opposition proceedings, the patent EP-B-2 637 492 and the invention to which it relates are found to meet the requirements of the Convention.

The currently valid documents are:

Auxiliary Request 7

Description, Paragraphs

1-24 of the patent specification

Claims, Numbers

1-11 filed in electronic form on 27-03-2018

Drawings, Figures

1-3 of the patent specification

The Grounds for the decision (Form 2916) are enclosed.

16-12-2021

. . . . . .
Date

Chairman	1st Examiner	2nd Examiner	Legally qualified member
Schlichting, N	Holtermann, Timm	Leblanc, Romain	

Description

[0001] The subject of the present invention is a seed distribution element for precision pneumatic seed drills, a sowing element for such machines and a seed drill including a plurality of such sowing elements.

[0002] In precision pneumatic seed drills it is known to use sowing elements which are each equipped with a seed distribution element (hereinafter, in brief, distributor) for distributing one seed at a time in a controlled delivery while the sowing element moves along a sowing track.

[0003] It is equally known to use seed distributors which use an air pressure differential between opposed faces of a sowing disc (or selector) provided with one or more rings of through holes. The operating principle is based on the fact that, as a result of the pressure differential between the opposed faces of the disc, a seed adheres to each hole and is then transported by the rotation of the sowing disc from the seed selection zone to the point at which the pressure differential ceases and the seed is released to drop through a sowing pipe into the furrow or sowing track. In practice, on one of the faces of the disc a strong air suction is exerted which retains the seeds on the opposite face in the region of the respective holes. An example of such devices is disclosed in US 7 228 807.

[0004] For the correct functioning of such distributors it is necessary to ensure an effective pneumatic seal between the face of the disc that is subjected to suction and a seal which delimits the pneumatic suction chamber. The suction effect itself effects a substantial compression of the disc against the seal. If on the one hand this ensures adequate adherence of the seal to the disc surface which is subjected to negative pressure, on the other hand it involves severe abrasion of the seal which limits the effective service life thereof. It is therefore necessary periodically to replace the seal in order to prevent sowing errors arising from insufficient depressurization of the suction chamber.

[0005] On the other hand, even if replacing the seal is a simple operation, in each case it entails an unwanted machine stoppage, besides the cost of the spare part itself.

[0006] In order to remedy this drawback, seed drills have been developed which are equipped with a thrust-bearing element which relieves the heavy load on the seal. In all cases, however, the thrust-bearing element, which must be rotated with the disc, is mounted on the fixed portion of the housing, that is to say, that portion which is fixed to the framework of the sowing elements. This means that the disc must be attached to the thrust-bearing element; therefore an attachment system must be provided which in the stage of replacement of the disc must be removed, consequently lengthening the operation. This is inevitable in the known machines since it is obligatory to mount on the fixed portion the transmission which drives in rotation the motor-driven shaft which rotates the disc.

[0007] However, positioning the thrust-bearing element on the fixed portion entails the pneumatic suction chamber being provided on the fixed portion, or on the same side at which the thrust-bearing element is placed, while the seed collection chamber must be provided in the movable portion. This is the source of numerous drawbacks, including the fact that the opening of the housing necessarily involves the removal of the portion containing the seed collection chamber from the hopper type store located above, which must necessarily be fixed to the framework of the sowing element.

[0008] Furthermore, for the replacement of the sowing disc it is necessary to remove some parts of the distributor, such as the adjustable seed selector, and the seed ejector, where provided.

[0009] The problem underlying the present invention is that of providing a seed distribution element structurally and functionally designed to make it possible to remedy all the drawbacks mentioned with reference to the prior art cited.

[0010] This problem is solved by the invention by means of a seed distribution element produced in accordance with one or more of the attached claims. The features and advantages of the invention will become clearer from the following detailed description of a preferred exemplary embodiment thereof, illustrated by way of non-limiting example with reference to the appended drawings, in which:

- Fig. 1 is a perspective view of a seed distribution element produced according to the present invention;
- Fig. 2 is an exploded perspective view of a detail of the element of Fig. 1;
- Fig. 3 is a perspective view of a seed drill equipped with sowing elements with a seed distribution element according to the invention.

[0011] In the drawings the reference 1 indicates as a whole a seed distribution element intended for equipping a sowing element 2 of a precision pneumatic seed drill 3.

[0012] The distribution element 1 is the device intended to deposit one seed 4 at a time at a predetermined adjustable spacing in a sowing furrow opened by a coulter 5. The sowing element 2, besides the distribution element 1, comprises a frame 6 and a seed store or hopper 7, besides other devices which are known per se and not necessary for the understanding of the present invention. The seed drill 3 itself comprises a bearing structure 8 on which a plurality of sowing elements 2 are mounted, all connected to a pneumatic suction device 9.

[0013] The sowing element 1 itself comprises a housing 10 with a fixed portion 11 fixed in a stable manner on the frame 6 and a movable portion 12 hinged in the region of a hinge 12a on the fixed portion 11 by means of a removable hinge pin 13. The fixed portion includes a throat 14 by means of which it is connected below an

outflow mouth of the store or hopper 7 in such a way as to be fed directly by the latter.

[0014] From the throat 14 the seed flows through a gate 14a through which the seed flows into a seed collection chamber 15.

[0015] A sowing disc 16 separates the seed collection chamber 15 from a suction chamber 17 provided in the movable portion 12. A suction device 18 mounted on the bearing structure 8 is connected to the suction chamber 17 by means of pipes 19 for producing a pressure differential between the opposed surfaces 16a, 16b of the selector disc 16.

[0016] The sowing disc 16 is removably mounted on a motor-driven drive shaft 20, supported in the fixed portion 11 and driven in rotation at predetermined adjustable speeds by a transmission which is not shown. The presence of the transmission requires the shaft 20 to be mounted on the fixed portion 11 of the housing 10. The keying between the shaft 20 and the disc 16 is obtained by means of a polygonal profile 21 at the free end of the shaft 20 which protrudes beyond the disc 16 and preferably has chamfers 22 which serve to facilitate the functions explained hereinafter. At the periphery of the disc 16 is/are provided one (or several) ring(s) of holes 23 passing between the opposed faces of the sowing disc 16.

[0017] A seal 24 is fitted in the suction chamber 17 and is placed in sliding contact with the facing surface of the disc 16, when the movable portion 11 is closed on the fixed portion 12, to delimit a circumferential segment in which the holes 23 are subjected to the aforesaid pressure differential. The circumferential segment extends between the seed collection chamber 15 and a seed fall pipe 25 in which the seeds are released one at a time into the furrow formed by the coulter 5.

[0018] By reason of the pressure differential between the two opposed surfaces of the sowing disc, the seeds 4 are held, one to each hole 23, when the holes pass in the seed collection chamber 15, and are released in the region of the pipe 25 when the pneumatic effect of the pressure differential ceases or owing to the presence of a seed ejector (not shown). In order to limit the wear on the seal 24 resulting from sliding against the surface of the disc 16, a thrust-bearing element indicated as a whole by 26 is mounted on the movable portion.

[0019] The thrust-bearing element 26 comprises a shaft 27 rotatably mounted by means of bearings 28 in a seat 29 of the movable portion 12. The shaft 27 has flanging 30 by means of which it is fixed to a thrust-bearing plate 31 which can bear on that surface of the disc which faces the seal 24 in a zone radially inside the ring of holes 23 in order to withstand at least some of the axial load produced by the disc 16 on the seal 24.

[0020] The bearing between the thrust-bearing plate 31 and the disc 16 takes place in the region of a ring 31a in relief on the surface of the plate which faces the disc 16.

[0021] The thrust-bearing element 26 is driven in rotation with the sowing disc 16 when the fixed and movable portions 11, 12 are closed against one another by means of a drive element 32 which comprises a coupling device constrained for rotation with the thrust-bearing plate but with radial and/or circumferential clearance in such a way as to be self-centred in the rotational coupling with the drive shaft of the disc 16. For this purpose, in the present form of embodiment, the drive element 32 is coupled with limited radial and/or circumferential clearance to the element 26 by means of one (or more) appendage(s) 33 protruding radially towards the outside and fitted into corresponding seats 34 of the plate. The drive element 32 is coupled by means of an internal polygonal profile 35 (similar to that adopted for box-end wrenches) to the polygonal profile 21 of the free end of the shaft 20, the chamfers 22 of which serve to facilitate the centring of the two profiles and the respective engagement. The drive element 32 is thus self-centring relative to the drive shaft 20 by which it is driven. The positioning between seal 24 and plate 31 is such that the rotation of the latter will not be hindered by the presence of the seal 24 and, at the same time, both will be kept bearing against the disc 16.

[0022] Provision is also made for the thrust-bearing element 26 to be made idle and not driven in rotation by the shaft 20.

[0023] The whole of the movable portion 12 complete with thrust-bearing element 26 and seal 24 lends itself advantageously to the production of a kit for the retrofitting of existing seed drills. It is sufficient in this case to separate the old type of movable portion by removing the hinge pin 13 and replacing the old movable portion with the aforesaid kit. By reconnecting the pneumatic pipes previously disconnected, the seed drill becomes ready for use.

[0024] Among the principal advantages of the distribution element according to the invention is the fact that the wear on the seal resulting from the sliding contact with the seed selector disc is substantially reduced, if not eliminated; the thrust-bearing element is self-centring, thereby allowing easy opening and closing of the movable portion on the fixed portion of the housing; the system additionally lends itself to easy retrofitting, all without removing movable parts and/or operations of disconnecting the sowing disc.

Claims

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

   - a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
   - a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
   - a seed collection chamber (15) being defined

Amended claims - Seventh Auxiliary request clean

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

- a seed collection chamber (15) being defined in the fixed portion (11),

- a pneumatic suction chamber (17) being defined in the movable portion (12),

- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the

Amended claims - Seventh Auxiliary request clean

movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12), the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

Amended claims - Seventh Auxiliary request clean

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
- a seed collection chamber (15) being defined in the fixed portion (11),
- a pneumatic suction chamber (17) being defined in the movable portion (12),

Amended claims - Seventh Auxiliary request clean

- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the kit comprises:

- the movable portion (12) pre-assembled with:

- a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12), the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

Amended claims – Seventh Auxiliary request clean

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

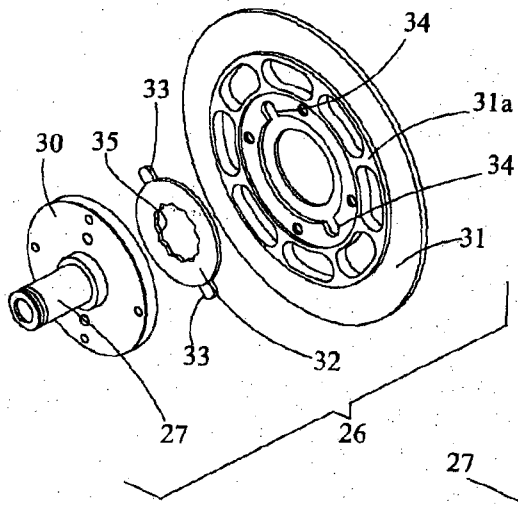

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fig. 2

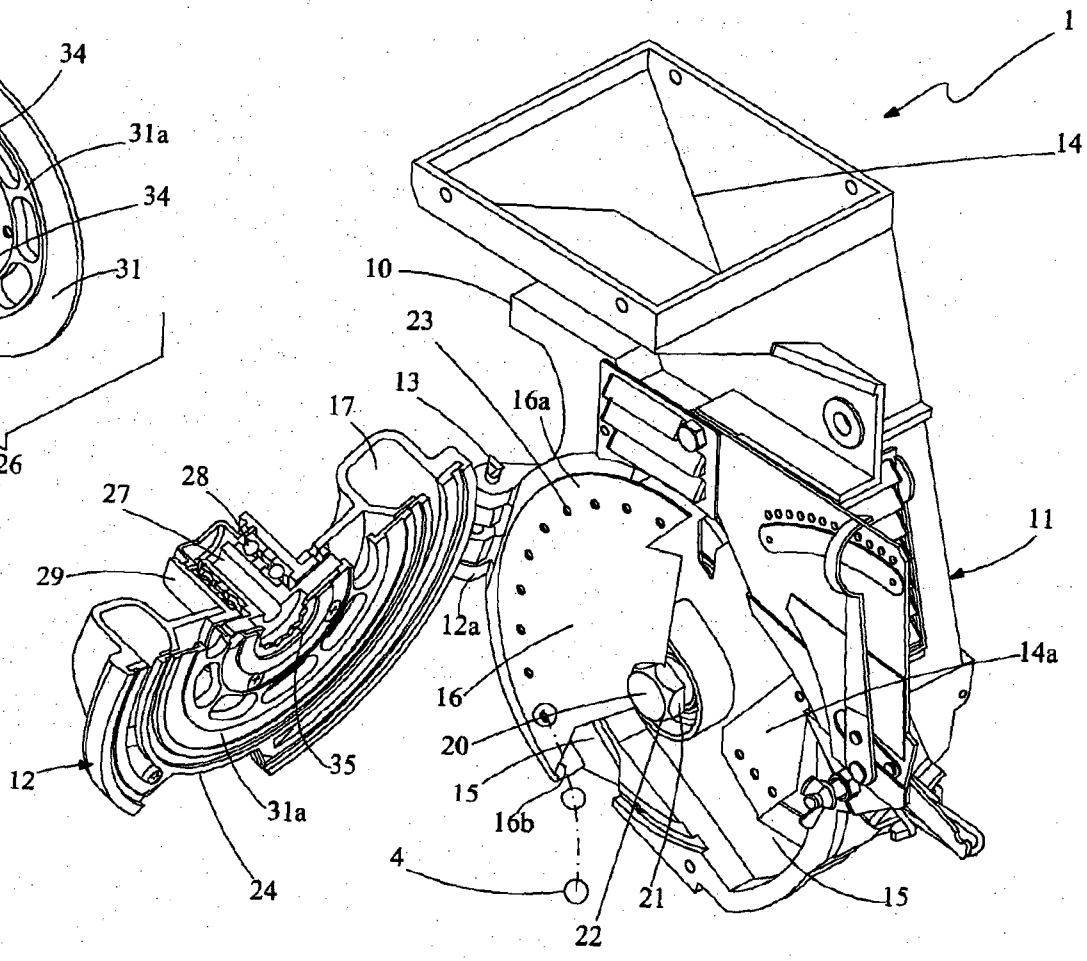

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fig. 1

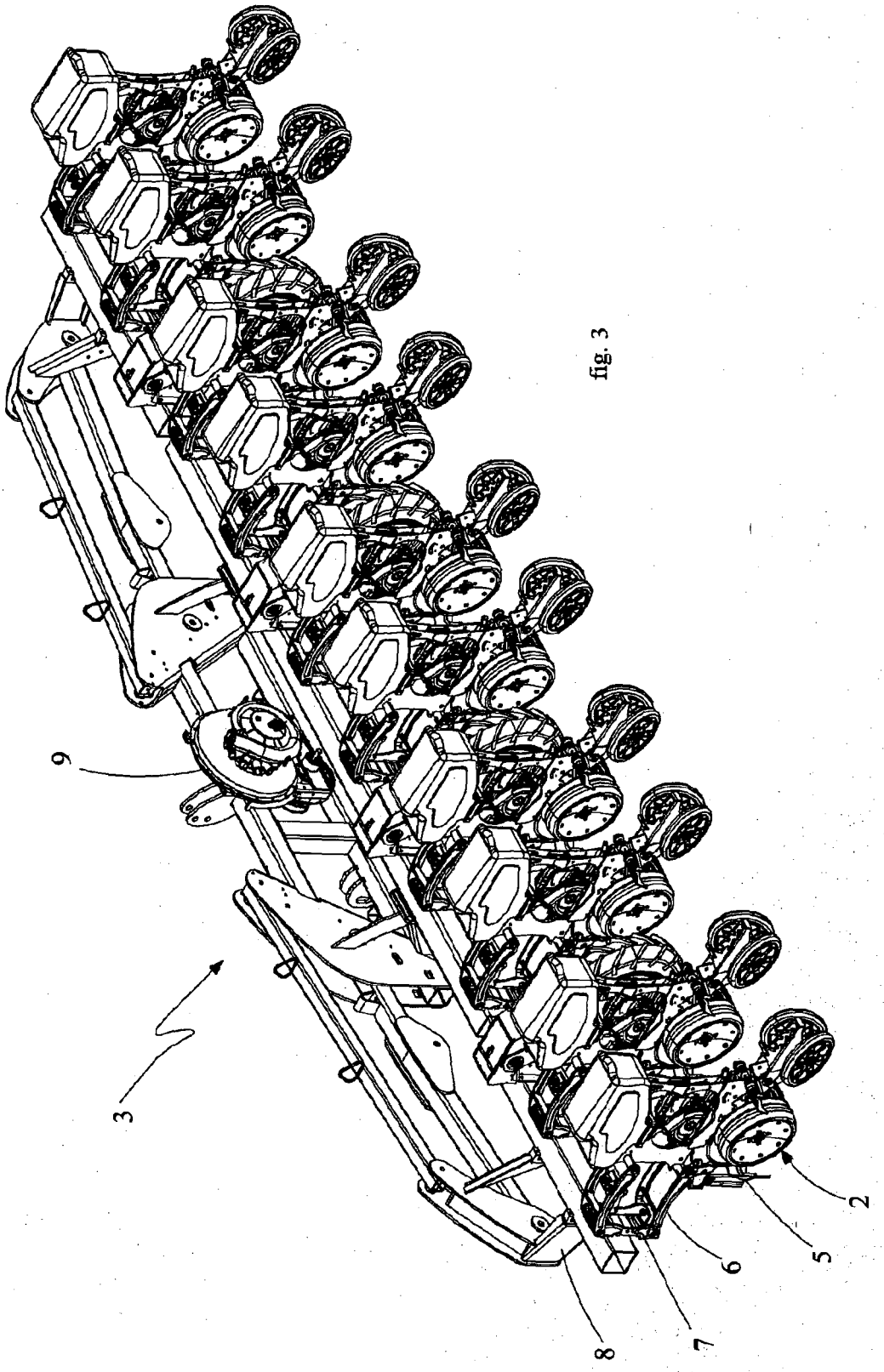


fig. 3

I. Summary of Facts and Submissions

1 European patent 2 637 492 having the title "SEED DISTRIBUTION ELEMENT FOR PRECISION SEED DRILLS, SEED DRILL INCLUDING SAID ELEMENT" is based upon European patent application No. 11779702.7 filed on 10-11-2011. The application claims priority from ITA PD 201 00338 filed on 12-11-2010.

The mention of the grant of the patent has been published in the European Patent Bulletin of 03-12-2014.

Proprietor of the patent is:

Maschio Gaspardo S.p.A.
Via Marcello 73
35011 Campodarsego (PD)
Italy,

hereinafter referred to as "the proprietor".

2 Notice of opposition has been filed on 03-09-2015 by

Precision Planting LLC
23207 Townline Road
Tremont, IL 61568
United States of America,

hereinafter referred to as "the opponent".

3 The following evidence has been submitted within the opposition period:

D1: US-B1-7 228 807
D2: EP-A1-0 536 543
D3: EP-A1-2 848 109
D4: US-A1-4 664 290
D5: EP-A1-140 699
D6: Betriebsanleitung Einzelkornsämaschine
ED 302, ED452, ED 452-K ,ED602-K, ED 902-K, Amazonen-Werke
D7: DE-T2-689 16 976
D8: WO-A1-96/02123
D9: Translation of the Italian priority document

4 A decision of the opposition division to revoke the patent (Art. 101(3)(b) EPC) was issued on 17-11-2017.

5 Notice of appeal was filed by the proprietor and received on 26-01-2018 (Art. 108 EPC). The statement of grounds of appeal was received on 27-03-2018. The proprietor requested to set aside the decision of the opposition division and to maintain the patent as granted (main request). With the statement of grounds of appeal, the proprietor filed new auxiliary requests 1 to 11.

6 The opponent's reply to the appeal was received on 14-08-2018. The opponent requested to dismiss the appeal.

7 With the reply to the appeal, the opponent submitted the following evidence:

D10: US 2003/0183647 A1
D11: US 2002/0043201 A1
D12: ES 2 013 539 and English language machine translation

8 The Board of Appeal issued a summons on 17-12-2019 to attend oral proceedings on 23-07-2020.

9 On 23-07-2020, oral proceedings were held before the Board of Appeal.

During the oral proceedings, the proprietor withdrew the main request as well as auxiliary requests 1-3 and 5 of 27-03-2018. Auxiliary request 4 of 27-03-2018 became the new main request followed by auxiliary requests 6 and 7 of 27-03-2018.

The Board of Appeal took the view that the new main request lacks novelty over D1.

The Board of Appeal decided to admit auxiliary requests 6 and 7 as well as document D10 into the proceedings.

The Board of Appeal took the view that claim 1 of auxiliary request 6 contained added subject-matter.

The claims of auxiliary request 7 were considered to comply with the requirements of both Art. 52(1) and 54 EPC as well as Art. 123(2) EPC.

10 The Board of Appeal set aside the decision under appeal and remitted the case to the opposition division in order to assess whether auxiliary request 7 meets the requirements of the EPC with regard to inventive step.

11 On 28-01-2021, the opposition division issued summons to oral proceedings to take place on 13-12-2021 (Art. 116(1) EPC).

12 By means of a notification, dated 06-10-2021, the parties were informed that the oral proceedings would be held as a videoconference.

13 In a letter, received on 12-10-2021, the opponent provided arguments as to why the subject-matter of claims 1 and 10 of auxiliary request 7 does not involve an inventive step.

14 On 13-12-2021, oral proceedings were held as a videoconference.

15 The decision is based on the following request:

Auxiliary Request 7

Description, Paragraphs

1-24	of the patent specification	

Claims, Numbers

1-11	filed in electronic form on	27-03-2018

Drawings, Figures

1-3	of the patent specification	

16 The claims under consideration are attached to this decision. As to the other documents, reference is made to the file.

II. Grounds for the decision

1 **Inventive step (Art. 52(1) and 56 EPC) - auxiliary request 7**

1.1 The opposition division comes to the conclusion that the subject-matter of claims 1 and 10 of auxiliary request 7 involves an inventive step.

D10 may be considered as the closest prior art in relation to claims 1 and 10 of auxiliary request 7, because it is from the same technical field (pneumatic seed drills) and is structurally close (knock-out assembly mounted on the movable portion of the housing and being arranged to bear some axial load).

D10 does at least not disclose the following features of claims 1 and 10 (see points 6.3 and 7 of the Decision of the Board of Appeal):

> A shaft of the thrust-bearing element is rotatably mounted by bearings and has flanging by means of which it is fixed to a thrust-bearing plate which can bear on the surface of the disc which faces the seal in a zone radially inside the ring of holes in order to withstand at least some of the axial load produced by the disc on the seal.

A technical effect related to these features is a limitation of wear on the seal (see para. 18 of the patent under dispute).

The objective technical problem may be formulated as how to provide a solution to limit wear on the seal.

The opposition division comes to the conclusion that the solution as defined by claims 1 and 10 involves an inventive step. In particular, none of the prior art documents in the procedure discloses the above-identified distinguishing features such that the skilled person could not arrive at the claimed subject-matter without applying inventive skill.

1.2 The opponent provides arguments as to why the subject-matter of claims 1 and 10 of auxiliary request 7 does not involve an inventive step.

<u>D10 as the closest prior art</u>

The opponent presents an attack departing from D10 as the closest prior art. The opponent takes the view that the only difference between the claimed subject-matter and the device of D10 is the provision of bearings to rotatably mount the shaft. It is argued that the provision of such a bearing is a straight-forward solution, which does not justify the presence of an inventive step.

As to the interpretation of D10, the opponent refers to fig. 13 of D10 and argues that the knockout assembly (120) of D10 constitutes a thrust-bearing element with a shaft (124) being rotatably mounted (at pin 126) and having a flanging (hexagonal wheel) by means of which it is fixed to a thrust-bearing plate (stepped portion of the wheel) which can bear on the surface of the disc (via prongs 132) which faces the seal in a zone radially inside the ring of holes in order to withstand at least some of the axial load produced by the disc on the seal.

D1, D4 or D5 as the closest prior art

Further attacks are presented departing from D1, D4 or D5, respectively, as the closest prior art.

Concerning D1, the opponent argues that D1 discloses the preambles of claims 1 and 10 of auxiliary request 7. Moreover, it is argued that D1 discloses a thrust-bearing element (handle 58) including a shaft (drive shaft 55) being rotatably mounted by means of bearings (see fig. 6: shaft supported by bearings) and a flanging (rotating retaining hub 56) being fixed to a thrust-bearing plate (left surface of handle 58).

The opponent argues that the subject matter of claims 1 and 10 of auxiliary request 7 differs from the disclosure of D1 in that the thrust-bearing element is mounted in the movable portion and not in the fixed portion.

The objective technical problem is seen in the provision of an alternative arrangement of the thrust-bearing element.

The opponent argues that the skilled person would know that arranging the thrust-bearing element in the movable portion makes it easier to access and/or replace parts of the seed distribution element. The arrangement of a disc supporting element in the movable portion is one of two alternatives for arranging a thrust-bearing element, which can either be arranged in the fixed or in the movable portion. The opponent concludes that the subject-matter of claims 1 and 10 of auxiliary request 7 is thereby rendered obvious.

The opponent states that similar considerations apply when departing from D4 or D5.

1.3 The opposition division comes to the conclusion that these arguments are not convincing.

D10 as the closest prior art

The opponent's attack based on D10 relies on a different interpretation of said document, which can, however, not be taken into account for the following reasons:

With regard to D10, point 6.3 of the Decision of the Board of Appeal states the following:

> *"Irrespective of whether the known arm 124 can be considered a shaft in the broad sense of the term, the board does not identify at least the following claimed features in the known knockout element: that the shaft is rotatably mounted by bearings and has flanging by means of which it is fixed to a thrust-bearing plate which can bear on the surface of the disc which faces the seal in a zone radially inside the ring of holes in order to withstand at least some of the axial load produced by the disc on the seal."*

The opposition division is bound by the Board's ratio decidendi in this regard such that the distinguishing features over D10 are the ones identified above under point 1.1. The opponent has not provided convincing arguments as to how this combination of features could be rendered obvious when departing from D10. Furthermore, in the light of the extent of technically necessary modifications in order to transform the knockout element of D10 into a thrust-bearing element according to claim 1 of the auxiliary request 7 under dispute, the opponent's argument, whereby the skilled person would simply provide bearings to rotatably mount the shaft, has to be considered as hindsight.

D1, D4 or D5 as the closest prior art

The opposition division acknowledges that D1 (see fig. 6: handle 58), D4 (see fig. 3: handle 32) and D5 (see fig. 3: handle 24) each disclose a handle, which may be considered as a thrust-bearing element having at least some sort of shaft and a flanging.

Nevertheless, the opposition division comes to the conclusion that the skilled person would face major difficulties when trying to arrange the respective thrust-bearing element on the movable portion of the housing, as suggested by the opponent. It rather seems that the elements in question are required to fix the sowing disc to the fixed portion of the housing. Hence, the skilled person would additionally need to identify a replacement for fixing the sowing disc to the fixed portion of the housing. However, such a replacement cannot be derived from

any of D1, D4, D5 or the common general knowledge. It is therefore concluded that the skilled person would not arrive at the claimed subject-matter without applying inventive skill.

2 Taking into consideration the amendments made by the proprietor of the European patent during the opposition proceedings, the patent and the invention to which it relates meet the requirements of the EPC.

In accordance with Art. 101(3)(a) EPC, the patent is maintained as amended, provided that the conditions laid down in R. 82 EPC are fulfilled.

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Office européen des brevets

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Cantaluppi & Partners S.r.l.
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Application No. / Patent No.	Ref.	Date
11 779 702.7 - 1004 / 2 637 492 /	PBP11900-EP	07.01.2022
Proprietor Maschio Gaspardo S.p.A.		

Interlocutory decision in Opposition proceedings (Art. 101(3)(a) and 106(2) EPC)

The Opposition Division - at the oral proceedings dated 13.12.2021 - has decided:

Account being taken of the amendments made by the patent proprietor during the opposition proceedings, the patent and the invention to which it relates are found to meet the requirements of the Convention.

The reasons for the decision are enclosed.

Documents for the maintenance of the patent as amended:

Auxiliary Request 7

Description, Paragraphs

1-24 of the patent specification

Claims, Numbers

1-11 filed in electronic form on 27-03-2018

Drawings, Figures

1-3 of the patent specification

Possibility of appeal
This decision is open to appeal according to Article 106(2) EPC. Attention is drawn to the attached text of Articles 106 to 108 and Rules 97 to 98 EPC.

Registered letter
EPO Form 2327 07.19TRI

Opposition Division:

Chairman:	Schlichting, N
2nd Examiner:	Leblanc, Romain
1st Examiner:	Holtermann, Timm



Delande-Königswenger
Formalities Officer
Tel. No.: +49 89 2399-8202

Enclosure(s): 7 page(s) reasons for the decision (Form 2916)
Wording of Art. 106 - 108 and R. 97 - 98 EPC (Form 2019)
Documents relating to the amended text
Minutes of oral proceedings
Claims of auxiliary request 7, filed on 27-03-2018

to EPO postal service: 22.12.21

Registered letter
EPO Form 2327 07.19TRI

Europäisches Patentamt
European Patent Office
Office européen des brevets

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Application No. / Patent No.	Ref.	Date
11 779 702.7 - 1004 / 2 637 492 / 01	E 98381	07.01.2022
Proprietor Maschio Gaspardo S.p.A.		

Interlocutory decision in Opposition proceedings (Art. 101(3)(a) and 106(2) EPC)

The Opposition Division - at the oral proceedings dated 13.12.2021 - has decided:

Account being taken of the amendments made by the patent proprietor during the opposition proceedings, the patent and the invention to which it relates are found to meet the requirements of the Convention.

The reasons for the decision are enclosed.

Documents for the maintenance of the patent as amended:

Auxiliary Request 7

Description, Paragraphs

1-24 of the patent specification

Claims, Numbers

1-11 filed in electronic form on 27-03-2018

Drawings, Figures

1-3 of the patent specification

Possibility of appeal
This decision is open to appeal according to Article 106(2) EPC. Attention is drawn to the attached text of Articles 106 to 108 and Rules 97 to 98 EPC.

Registered letter
EPO Form 2327 07.19TRI

Opposition Division:

Chairman:	Schlichting, N
2nd Examiner:	Leblanc, Romain
1st Examiner:	Holtermann, Timm



Delande-Königswenger
Formalities Officer
Tel. No.: +49 89 2399-8202

Enclosure(s): 7 page(s) reasons for the decision (Form 2916)
Wording of Art. 106 - 108 and R. 97 - 98 EPC (Form 2019)
Documents relating to the amended text
Minutes of oral proceedings
Claims of auxiliary request 7, filed on 27-03-2018

to EPO postal service: 22.12.21

Registered letter
EPO Form 2327 07.19TRI

Article 106
Decisions subject to appeal

(1) An appeal shall lie from decisions of the Receiving Section, Examining Divisions, Opposition Divisions and the Legal Division. It shall have suspensive effect.

(2) A decision which does not terminate proceedings as regards one of the parties can only be appealed together with the final decision, unless the decision allows a separate appeal.

(3) The right to file an appeal against decisions relating to the apportionment or fixing of costs in opposition proceedings may be restricted in the Implementing Regulations.

Rule 97
Appeal against apportionment and fixing of costs

(1) The apportionment of costs of opposition proceedings cannot be the sole subject of an appeal.

(2) A decision fixing the amount of costs of opposition proceedings cannot be appealed unless the amount exceeds that of the fee for appeal.

Rule 98
Surrender or lapse of the patent

The decision of an Opposition Division may be appealed even if the European patent has been surrendered in all the designated Contracting States or has lapsed in all those States.

Article 107
Persons entitled to appeal and to be parties to appeal proceedings

Any party to proceedings adversely affected by a decision may appeal. Any other parties to the proceedings shall be parties to the appeal proceedings as of right.

Article 108
Time limit and form

Notice of appeal shall be filed, in accordance with the Implementing Regulations, at the European Patent Office within **two months** of notification of the decision. Notice of appeal shall not be deemed to have been filed until the fee for appeal has been paid. Within **four months** of notification of the decision, a statement setting out the grounds of appeal shall be filed in accordance with the Implementing Regulations.

Further information concerning the filing of an appeal

(a) Notice of appeal can be filed in accordance with Rule 1 and Rule 2(1) EPC, by delivery by hand, by post, or by technical means of communication. The filing has to comply with the details and conditions and, where appropriate, any special formal or technical requirements laid down by the President of the European Patent Office (R. 99(3) EPC).

(b) The addresses of the filing offices of the European Patent Office are as follows:

(i) European Patent Office
D-80298 Munich
Germany

Fax: +49 89 2399-4465

(ii) European Patent Office
Postbus 5818
NL-2280 HV Rijswijk (ZH)
The Netherlands

Fax: +31 70 340-3016

(iii) European Patent Office
D-10958 Berlin
Germany

Fax: +49 30 259 01-840

(c) The notice of appeal must contain the name and address of the appellant in accordance with the provisions of Rule 41(2)(c) EPC, an indication of the decision impugned, and a request defining the subject of the appeal. In the statement of grounds of appeal the appellant shall indicate the reasons for setting aside the decision impugned, or the extent to which it is to be amended, and the facts and evidence on which the appeal is based (R. 99(1) and (2) EPC). The notice of appeal and any subsequent submissions stating the grounds for appeal must be signed (R. 50(3) EPC).

(d) The fee for appeal is laid down in the Rules relating to Fees. The schedule of fees and expenses of the EPO or a reference to the current version is regularly published in the Official Journal of the European Patent Office under the heading "Guidance for the payment of fees, expenses and prices". Fee information is also published on the EPO website under www.epo.org/ fees.

After deliberation of the opposition division,

- the chairman announced the following **decision** :

"Account being taken of the amendments made by the patent proprietor during the opposition proceedings, the patent and the invention to which it relates are found to meet the requirements of the European Patent Convention. The currently valid documents are those according to the seventh auxiliary request ."

Regarding the reasons for the decision, the chairman referred to:

Article 101(3)(a)EPC: Account being taken of the amendments made by the patent proprietor during the opposition proceedings, the patent and the invention to which it relates are found to meet the requirements of the European Patent Convention.Patent is maintained as amended.

The party/parties was/were informed that the minutes of the oral proceedings and a written reasoned decision (including an indication of the possibility of appeal) will be notified to him/them as soon as possible.

The chairman **closed the oral proceedings** on 13.12.2021 at 10:27 hours.

signed:

Schlichting, N
. . . . . .
Chairman

signed:

Leblanc, Romain
. . . . . .
Minute Writer

Enclosure(s):
Form 2339.4

Documents for the maintenance of the patent as amended

Auxiliary Request 7

In the text for the Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

Description, Paragraphs

1-24	of the patent specification	

Claims, Numbers

1-11	filed in electronic form on	27-03-2018

Drawings, Figures

1-3	of the patent specification	

After deliberation of the opposition division,

- the chairman announced the following **decision**:

"Account being taken of the amendments made by the patent proprietor during the opposition proceedings, the patent and the invention to which it relates are found to meet the requirements of the European Patent Convention. The currently valid documents are those according to the seventh auxiliary request."

Regarding the reasons for the decision, the chairman referred to:

Article 101(3)(a)EPC: Account being taken of the amendments made by the patent proprietor during the opposition proceedings, the patent and the invention to which it relates are found to meet the requirements of the European Patent Convention.

The party/parties was/were informed that the minutes of the oral proceedings and a written reasoned decision (including an indication of the possibility of appeal) will be notified to him/them as soon as possible.

The chairman **closed the oral proceedings** on 13.12.2021 at 10:27 hours.

Schlichting, N
Chairman

Leblanc, Romain
Minute Writer

Annex(es):

Form 2339.4

Europäisches Patentamt
European Patent Office
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Application No.: 11 779 702.7

Patent No.: EP-B-2 637 492

Minutes of the oral proceedings before the OPPOSITION DIVISION

The proceedings were public.

Proceedings opened on 13.12.2021 at 09:03 hours

Present as members of the opposition division:

Chairman:	Schlichting, N
1st member:	Holtermann, Timm
2nd member:	Leblanc, Romain
Minute writer:	Leblanc, Romain

Present as or for the party or parties:

- For the Proprietor(s): Maschio Gaspardo S.p.A.
  Mr. Locas
- For the Opponent 1: Precision Planting LLC
  Mr. Jacob
  Mr. von Menges

The identity of the person/s (as well as, if applicable, that of the witness or witnesses) and, where necessary, the authorisation to represent/authority to act were checked.

Essentials of the oral proceedings and relevant statements of the parties:

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Application No. / Patent No.	Ref.	Date
11 779 702.7 - 1004 / 2 637 492 /	PBP11900-EP	07.01.2022
Proprietor Maschio Gaspardo S.p.A.		

Provision of a copy of the minutes in accordance with Rule 124(4) EPC

The attached copy of the minutes of the oral proceedings is sent to you in accordance with Rule 124(4) EPC.

Delande-Königswenger
Formalities Officer
Tel. No.: +49 89 2399 - 8202

Enclosure(s): Copy of the minutes (Form 2309)

Registered Letter
EPO Form 2042 12.07TRI

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European Patent Office
Office européen des brevets

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Application No. / Patent No.	Ref.	Date
11 779 702.7 - 1004 / 2 637 492 / 01	E 98381	07.01.2022
Proprietor Maschio Gaspardo S.p.A.		

Provision of a copy of the minutes in accordance with Rule 124(4) EPC

The attached copy of the minutes of the oral proceedings is sent to you in accordance with Rule 124(4) EPC.

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Formalities Officer
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Enclosure(s): Copy of the minutes (Form 2309)

Registered Letter
EPO Form 2042 12.07TRI

Amended claims - Seventh Auxiliary request clean

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

- a seed collection chamber (15) being defined in the fixed portion (11),

- a pneumatic suction chamber (17) being defined in the movable portion (12),

- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the

Amended claims - Seventh Auxiliary request clean

movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12), the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

Amended claims - Seventh Auxiliary request clean

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
- a seed collection chamber (15) being defined in the fixed portion (11),
- a pneumatic suction chamber (17) being defined in the movable portion (12),

Amended claims - Seventh Auxiliary request clean

- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the kit comprises:

- the movable portion (12) pre-assembled with:

- a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12), the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

Amended claims – Seventh Auxiliary request clean

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

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Formalities officer
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22607 Hamburg
ALLEMAGNE

Date
07.01.2022

Reference	OPPO 01	Application No./Patent No.
E 98381		11779702.7 - 1004 / 2637492
Applicant/Proprietor		
Maschio Gaspardo S.p.A.		

EPA/EPO/OEB Formblatt/Form/Formulaire : 2327

Empfangsbescheinigung über den Zugang des vorstehend bezeichneten Schriftstücks
Acknowledgement of receipt of the document specified above
Récépissé du document spécifié ci-dessus

Unter Bezugnahme auf die Mitteilung im ABl EPA 7/2010, 377 wird gebeten, die Empfangsbescheinigung mit Empfangsdatum und Unterschrift zu versehen und **umgehend** an das EPA zurückzusenden:

With reference to the Notice in OJ EPO 7/2010, 377, you are requested to date and sign the acknowledgement of receipt and return it to the EPO **immediately**:

Conformément au communiqué paru au JO OEB 7/2010, 377, vous êtes prié d'indiquer sur le récépissé la date de réception du document, de signer le récépissé et de le renvoyer **sans délai** à l' OEB:

- **über die Online-Dienste des EPA** (als Anlage zu EPA Form 1038) / **through EPO Online Services** (as annex to EPO Form 1038) / **par les services en ligne de l'OEB** (en tant que pièce jointe au formulaire OEB 1038),
- **per Fax / by fax / par téléfax (+49 (0) 89 2399-4465 or +31 (0) 70 340-3016)**
- oder per Post / or by post / ou par courrier.

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Application No. / Patent No.	Ref.	Date
11 779 702.7 - 1004 / 2 637 492 / 01	E 98381	07.01.2022
Proprietor Maschio Gaspardo S.p.A.		

Interlocutory decision in Opposition proceedings (Art. 101(3)(a) and 106(2) EPC)

The Opposition Division - at the oral proceedings dated 13.12.2021 - has decided:

Account being taken of the amendments made by the patent proprietor during the opposition proceedings, the patent and the invention to which it relates are found to meet the requirements of the Convention.

The reasons for the decision are enclosed.

Documents for the maintenance of the patent as amended:

Auxiliary Request 7

Description, Paragraphs

1-24 of the patent specification

Claims, Numbers

1-11 filed in electronic form on 27-03-2018

Drawings, Figures

1-3 of the patent specification

Possibility of appeal
This decision is open to appeal according to Article 106(2) EPC. Attention is drawn to the attached text of Articles 106 to 108 and Rules 97 to 98 EPC.

Registered letter
EPO Form 2327 07.19TRI

Opposition Division:

Chairman:	Schlichting, N
2nd Examiner:	Leblanc, Romain
1st Examiner:	Holtermann, Timm



Delande-Königswenger
Formalities Officer
Tel. No.: +49 89 2399-8202

Enclosure(s): 7 page(s) reasons for the decision (Form 2916)
Wording of Art. 106 - 108 and R. 97 - 98 EPC (Form 2019)
Documents relating to the amended text
Minutes of oral proceedings
Claims of auxiliary request 7, filed on 27-03-2018
to EPO postal service: 22.12.21

Registered letter
EPO Form 2327 07.19TRI

I. Summary of Facts and Submissions

1 European patent 2 637 492 having the title "SEED DISTRIBUTION ELEMENT FOR PRECISION SEED DRILLS, SEED DRILL INCLUDING SAID ELEMENT" is based upon European patent application No. 11779702.7 filed on 10-11-2011. The application claims priority from ITA PD 201 00338 filed on 12-11-2010.

The mention of the grant of the patent has been published in the European Patent Bulletin of 03-12-2014.

Proprietor of the patent is:

Maschio Gaspardo S.p.A.
Via Marcello 73
35011 Campodarsego (PD)
Italy,

hereinafter referred to as "the proprietor".

2 Notice of opposition has been filed on 03-09-2015 by

Precision Planting LLC
23207 Townline Road
Tremont, IL 61568
United States of America,

hereinafter referred to as "the opponent".

3 The following evidence has been submitted within the opposition period:

D1: US-B1-7 228 807
D2: EP-A1-0 536 543
D3: EP-A1-2 848 109
D4: US-A1-4 664 290
D5: EP-A1-140 699
D6: Betriebsanleitung Einzelkornsämaschine
ED 302, ED452, ED 452-K ,ED602-K, ED 902-K, Amazonen-Werke
D7: DE-T2-689 16 976
D8: WO-A1-96/02123
D9: Translation of the Italian priority document

4 A decision of the opposition division to revoke the patent (Art. 101(3)(b) EPC) was issued on 17-11-2017.

5 Notice of appeal was filed by the proprietor and received on 26-01-2018 (Art. 108 EPC). The statement of grounds of appeal was received on 27-03-2018. The proprietor requested to set aside the decision of the opposition division and to maintain the patent as granted (main request). With the statement of grounds of appeal, the proprietor filed new auxiliary requests 1 to 11.

6 The opponent's reply to the appeal was received on 14-08-2018. The opponent requested to dismiss the appeal.

7 With the reply to the appeal, the opponent submitted the following evidence:

D10: US 2003/0183647 A1
D11: US 2002/0043201 A1
D12: ES 2 013 539 and English language machine translation

8 The Board of Appeal issued a summons on 17-12-2019 to attend oral proceedings on 23-07-2020.

9 On 23-07-2020, oral proceedings were held before the Board of Appeal.

During the oral proceedings, the proprietor withdrew the main request as well as auxiliary requests 1-3 and 5 of 27-03-2018. Auxiliary request 4 of 27-03-2018 became the new main request followed by auxiliary requests 6 and 7 of 27-03-2018.

The Board of Appeal took the view that the new main request lacks novelty over D1.

The Board of Appeal decided to admit auxiliary requests 6 and 7 as well as document D10 into the proceedings.

The Board of Appeal took the view that claim 1 of auxiliary request 6 contained added subject-matter.

The claims of auxiliary request 7 were considered to comply with the requirements of both Art. 52(1) and 54 EPC as well as Art. 123(2) EPC.

10 The Board of Appeal set aside the decision under appeal and remitted the case to the opposition division in order to assess whether auxiliary request 7 meets the requirements of the EPC with regard to inventive step.

11 On 28-01-2021, the opposition division issued summons to oral proceedings to take place on 13-12-2021 (Art. 116(1) EPC).

12 By means of a notification, dated 06-10-2021, the parties were informed that the oral proceedings would be held as a videoconference.

13 In a letter, received on 12-10-2021, the opponent provided arguments as to why the subject-matter of claims 1 and 10 of auxiliary request 7 does not involve an inventive step.

14 On 13-12-2021, oral proceedings were held as a videoconference.

15 The decision is based on the following request:

Auxiliary Request 7

Description, Paragraphs

1-24	of the patent specification	

Claims, Numbers

1-11	filed in electronic form on	27-03-2018

Drawings, Figures

1-3	of the patent specification	

16 The claims under consideration are attached to this decision. As to the other documents, reference is made to the file.

II. Grounds for the decision

1 **Inventive step (Art. 52(1) and 56 EPC) - auxiliary request 7**

1.1 The opposition division comes to the conclusion that the subject-matter of claims 1 and 10 of auxiliary request 7 involves an inventive step.

D10 may be considered as the closest prior art in relation to claims 1 and 10 of auxiliary request 7, because it is from the same technical field (pneumatic seed drills) and is structurally close (knock-out assembly mounted on the movable portion of the housing and being arranged to bear some axial load).

D10 does at least not disclose the following features of claims 1 and 10 (see points 6.3 and 7 of the Decision of the Board of Appeal):

> A shaft of the thrust-bearing element is rotatably mounted by bearings and has flanging by means of which it is fixed to a thrust-bearing plate which can bear on the surface of the disc which faces the seal in a zone radially inside the ring of holes in order to withstand at least some of the axial load produced by the disc on the seal.

A technical effect related to these features is a limitation of wear on the seal (see para. 18 of the patent under dispute).

The objective technical problem may be formulated as how to provide a solution to limit wear on the seal.

The opposition division comes to the conclusion that the solution as defined by claims 1 and 10 involves an inventive step. In particular, none of the prior art documents in the procedure discloses the above-identified distinguishing features such that the skilled person could not arrive at the claimed subject-matter without applying inventive skill.

1.2 The opponent provides arguments as to why the subject-matter of claims 1 and 10 of auxiliary request 7 does not involve an inventive step.

<u>D10 as the closest prior art</u>

The opponent presents an attack departing from D10 as the closest prior art. The opponent takes the view that the only difference between the claimed subject-matter and the device of D10 is the provision of bearings to rotatably mount the shaft. It is argued that the provision of such a bearing is a straight-forward solution, which does not justify the presence of an inventive step.

As to the interpretation of D10, the opponent refers to fig. 13 of D10 and argues that the knockout assembly (120) of D10 constitutes a thrust-bearing element with a shaft (124) being rotatably mounted (at pin 126) and having a flanging (hexagonal wheel) by means of which it is fixed to a thrust-bearing plate (stepped portion of the wheel) which can bear on the surface of the disc (via prongs 132) which faces the seal in a zone radially inside the ring of holes in order to withstand at least some of the axial load produced by the disc on the seal.

D1, D4 or D5 as the closest prior art

Further attacks are presented departing from D1, D4 or D5, respectively, as the closest prior art.

Concerning D1, the opponent argues that D1 discloses the preambles of claims 1 and 10 of auxiliary request 7. Moreover, it is argued that D1 discloses a thrust-bearing element (handle 58) including a shaft (drive shaft 55) being rotatably mounted by means of bearings (see fig. 6: shaft supported by bearings) and a flanging (rotating retaining hub 56) being fixed to a thrust-bearing plate (left surface of handle 58).

The opponent argues that the subject matter of claims 1 and 10 of auxiliary request 7 differs from the disclosure of D1 in that the thrust-bearing element is mounted in the movable portion and not in the fixed portion.

The objective technical problem is seen in the provision of an alternative arrangement of the thrust-bearing element.

The opponent argues that the skilled person would know that arranging the thrust-bearing element in the movable portion makes it easier to access and/or replace parts of the seed distribution element. The arrangement of a disc supporting element in the movable portion is one of two alternatives for arranging a thrust-bearing element, which can either be arranged in the fixed or in the movable portion. The opponent concludes that the subject-matter of claims 1 and 10 of auxiliary request 7 is thereby rendered obvious.

The opponent states that similar considerations apply when departing from D4 or D5.

1.3 The opposition division comes to the conclusion that these arguments are not convincing.

D10 as the closest prior art

The opponent's attack based on D10 relies on a different interpretation of said document, which can, however, not be taken into account for the following reasons:

With regard to D10, point 6.3 of the Decision of the Board of Appeal states the following:

> *"Irrespective of whether the known arm 124 can be considered a shaft in the broad sense of the term, the board does not identify at least the following claimed features in the known knockout element: that the shaft is rotatably mounted by bearings and has flanging by means of which it is fixed to a thrust-bearing plate which can bear on the surface of the disc which faces the seal in a zone radially inside the ring of holes in order to withstand at least some of the axial load produced by the disc on the seal."*

The opposition division is bound by the Board's ratio decidendi in this regard such that the distinguishing features over D10 are the ones identified above under point 1.1. The opponent has not provided convincing arguments as to how this combination of features could be rendered obvious when departing from D10. Furthermore, in the light of the extent of technically necessary modifications in order to transform the knockout element of D10 into a thrust-bearing element according to claim 1 of the auxiliary request 7 under dispute, the opponent's argument, whereby the skilled person would simply provide bearings to rotatably mount the shaft, has to be considered as hindsight.

D1, D4 or D5 as the closest prior art

The opposition division acknowledges that D1 (see fig. 6: handle 58), D4 (see fig. 3: handle 32) and D5 (see fig. 3: handle 24) each disclose a handle, which may be considered as a thrust-bearing element having at least some sort of shaft and a flanging.

Nevertheless, the opposition division comes to the conclusion that the skilled person would face major difficulties when trying to arrange the respective thrust-bearing element on the movable portion of the housing, as suggested by the opponent. It rather seems that the elements in question are required to fix the sowing disc to the fixed portion of the housing. Hence, the skilled person would additionally need to identify a replacement for fixing the sowing disc to the fixed portion of the housing. However, such a replacement cannot be derived from

any of D1, D4, D5 or the common general knowledge. It is therefore concluded that the skilled person would not arrive at the claimed subject-matter without applying inventive skill.

2 Taking into consideration the amendments made by the proprietor of the European patent during the opposition proceedings, the patent and the invention to which it relates meet the requirements of the EPC.

In accordance with Art. 101(3)(a) EPC, the patent is maintained as amended, provided that the conditions laid down in R. 82 EPC are fulfilled.

Amended claims - Seventh Auxiliary request clean

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

- a seed collection chamber (15) being defined in the fixed portion (11),

- a pneumatic suction chamber (17) being defined in the movable portion (12),

- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the

Amended claims - Seventh Auxiliary request clean

movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12), the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

Amended claims - Seventh Auxiliary request clean

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
- a seed collection chamber (15) being defined in the fixed portion (11),
- a pneumatic suction chamber (17) being defined in the movable portion (12),

Amended claims - Seventh Auxiliary request clean

- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the kit comprises:

- the movable portion (12) pre-assembled with:

- a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12), the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

Amended claims – Seventh Auxiliary request clean

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

Article 106
Decisions subject to appeal

(1) An appeal shall lie from decisions of the Receiving Section, Examining Divisions, Opposition Divisions and the Legal Division. It shall have suspensive effect.

(2) A decision which does not terminate proceedings as regards one of the parties can only be appealed together with the final decision, unless the decision allows a separate appeal.

(3) The right to file an appeal against decisions relating to the apportionment or fixing of costs in opposition proceedings may be restricted in the Implementing Regulations.

Rule 97
Appeal against apportionment and fixing of costs

(1) The apportionment of costs of opposition proceedings cannot be the sole subject of an appeal.

(2) A decision fixing the amount of costs of opposition proceedings cannot be appealed unless the amount exceeds that of the fee for appeal.

Rule 98
Surrender or lapse of the patent

The decision of an Opposition Division may be appealed even if the European patent has been surrendered in all the designated Contracting States or has lapsed in all those States.

Article 107
Persons entitled to appeal and to be parties to appeal proceedings

Any party to proceedings adversely affected by a decision may appeal. Any other parties to the proceedings shall be parties to the appeal proceedings as of right.

Article 108
Time limit and form

Notice of appeal shall be filed, in accordance with the Implementing Regulations, at the European Patent Office within **two months** of notification of the decision. Notice of appeal shall not be deemed to have been filed until the fee for appeal has been paid. Within **four months** of notification of the decision, a statement setting out the grounds of appeal shall be filed in accordance with the Implementing Regulations.

Further information concerning the filing of an appeal

(a) Notice of appeal can be filed in accordance with Rule 1 and Rule 2(1) EPC, by delivery by hand, by post, or by technical means of communication. The filing has to comply with the details and conditions and, where appropriate, any special formal or technical requirements laid down by the President of the European Patent Office (R. 99(3) EPC).

(b) The addresses of the filing offices of the European Patent Office are as follows:

(i) European Patent Office
D-80298 Munich
Germany

Fax: +49 89 2399-4465

(ii) European Patent Office
Postbus 5818
NL-2280 HV Rijswijk (ZH)
The Netherlands

Fax: +31 70 340-3016

(iii) European Patent Office
D-10958 Berlin
Germany

Fax: +49 30 259 01-840

(c) The notice of appeal must contain the name and address of the appellant in accordance with the provisions of Rule 41(2)(c) EPC, an indication of the decision impugned, and a request defining the subject of the appeal. In the statement of grounds of appeal the appellant shall indicate the reasons for setting aside the decision impugned, or the extent to which it is to be amended, and the facts and evidence on which the appeal is based (R. 99(1) and (2) EPC). The notice of appeal and any subsequent submissions stating the grounds for appeal must be signed (R. 50(3) EPC).

(d) The fee for appeal is laid down in the Rules relating to Fees. The schedule of fees and expenses of the EPO or a reference to the current version is regularly published in the Official Journal of the European Patent Office under the heading "Guidance for the payment of fees, expenses and prices". Fee information is also published on the EPO website under www.epo.org/ fees.

Description

[0001] The subject of the present invention is a seed distribution element for precision pneumatic seed drills, a sowing element for such machines and a seed drill including a plurality of such sowing elements.

[0002] In precision pneumatic seed drills it is known to use sowing elements which are each equipped with a seed distribution element (hereinafter, in brief, distributor) for distributing one seed at a time in a controlled delivery while the sowing element moves along a sowing track.

[0003] It is equally known to use seed distributors which use an air pressure differential between opposed faces of a sowing disc (or selector) provided with one or more rings of through holes. The operating principle is based on the fact that, as a result of the pressure differential between the opposed faces of the disc, a seed adheres to each hole and is then transported by the rotation of the sowing disc from the seed selection zone to the point at which the pressure differential ceases and the seed is released to drop through a sowing pipe into the furrow or sowing track. In practice, on one of the faces of the disc a strong air suction is exerted which retains the seeds on the opposite face in the region of the respective holes. An example of such devices is disclosed in US 7 228 807.

[0004] For the correct functioning of such distributors it is necessary to ensure an effective pneumatic seal between the face of the disc that is subjected to suction and a seal which delimits the pneumatic suction chamber. The suction effect itself effects a substantial compression of the disc against the seal. If on the one hand this ensures adequate adherence of the seal to the disc surface which is subjected to negative pressure, on the other hand it involves severe abrasion of the seal which limits the effective service life thereof. It is therefore necessary periodically to replace the seal in order to prevent sowing errors arising from insufficient depressurization of the suction chamber.

[0005] On the other hand, even if replacing the seal is a simple operation, in each case it entails an unwanted machine stoppage, besides the cost of the spare part itself.

[0006] In order to remedy this drawback, seed drills have been developed which are equipped with a thrust-bearing element which relieves the heavy load on the seal. In all cases, however, the thrust-bearing element, which must be rotated with the disc, is mounted on the fixed portion of the housing, that is to say, that portion which is fixed to the framework of the sowing elements. This means that the disc must be attached to the thrust-bearing element; therefore an attachment system must be provided which in the stage of replacement of the disc must be removed, consequently lengthening the operation. This is inevitable in the known machines since it is obligatory to mount on the fixed portion the transmission which drives in rotation the motor-driven shaft which rotates the disc.

[0007] However, positioning the thrust-bearing element on the fixed portion entails the pneumatic suction chamber being provided on the fixed portion, or on the same side at which the thrust-bearing element is placed, while the seed collection chamber must be provided in the movable portion. This is the source of numerous drawbacks, including the fact that the opening of the housing necessarily involves the removal of the portion containing the seed collection chamber from the hopper type store located above, which must necessarily be fixed to the framework of the sowing element.

[0008] Furthermore, for the replacement of the sowing disc it is necessary to remove some parts of the distributor, such as the adjustable seed selector, and the seed ejector, where provided.

[0009] The problem underlying the present invention is that of providing a seed distribution element structurally and functionally designed to make it possible to remedy all the drawbacks mentioned with reference to the prior art cited.

[0010] This problem is solved by the invention by means of a seed distribution element produced in accordance with one or more of the attached claims. The features and advantages of the invention will become clearer from the following detailed description of a preferred exemplary embodiment thereof, illustrated by way of non-limiting example with reference to the appended drawings, in which:

- Fig. 1 is a perspective view of a seed distribution element produced according to the present invention;
- Fig. 2 is an exploded perspective view of a detail of the element of Fig. 1;
- Fig. 3 is a perspective view of a seed drill equipped with sowing elements with a seed distribution element according to the invention.

[0011] In the drawings the reference 1 indicates as a whole a seed distribution element intended for equipping a sowing element 2 of a precision pneumatic seed drill 3.

[0012] The distribution element 1 is the device intended to deposit one seed 4 at a time at a predetermined adjustable spacing in a sowing furrow opened by a coulter 5. The sowing element 2, besides the distribution element 1, comprises a frame 6 and a seed store or hopper 7, besides other devices which are known per se and not necessary for the understanding of the present invention. The seed drill 3 itself comprises a bearing structure 8 on which a plurality of sowing elements 2 are mounted, all connected to a pneumatic suction device 9.

[0013] The sowing element 1 itself comprises a housing 10 with a fixed portion 11 fixed in a stable manner on the frame 6 and a movable portion 12 hinged in the region of a hinge 12a on the fixed portion 11 by means of a removable hinge pin 13. The fixed portion includes a throat 14 by means of which it is connected below an

outflow mouth of the store or hopper 7 in such a way as to be fed directly by the latter.

[0014] From the throat 14 the seed flows through a gate 14a through which the seed flows into a seed collection chamber 15.

[0015] A sowing disc 16 separates the seed collection chamber 15 from a suction chamber 17 provided in the movable portion 12. A suction device 18 mounted on the bearing structure 8 is connected to the suction chamber 17 by means of pipes 19 for producing a pressure differential between the opposed surfaces 16a, 16b of the selector disc 16.

[0016] The sowing disc 16 is removably mounted on a motor-driven drive shaft 20, supported in the fixed portion 11 and driven in rotation at predetermined adjustable speeds by a transmission which is not shown. The presence of the transmission requires the shaft 20 to be mounted on the fixed portion 11 of the housing 10. The keying between the shaft 20 and the disc 16 is obtained by means of a polygonal profile 21 at the free end of the shaft 20 which protrudes beyond the disc 16 and preferably has chamfers 22 which serve to facilitate the functions explained hereinafter. At the periphery of the disc 16 is/are provided one (or several) ring(s) of holes 23 passing between the opposed faces of the sowing disc 16.

[0017] A seal 24 is fitted in the suction chamber 17 and is placed in sliding contact with the facing surface of the disc 16, when the movable portion 11 is closed on the fixed portion 12, to delimit a circumferential segment in which the holes 23 are subjected to the aforesaid pressure differential. The circumferential segment extends between the seed collection chamber 15 and a seed fall pipe 25 in which the seeds are released one at a time into the furrow formed by the coulter 5.

[0018] By reason of the pressure differential between the two opposed surfaces of the sowing disc, the seeds 4 are held, one to each hole 23, when the holes pass in the seed collection chamber 15, and are released in the region of the pipe 25 when the pneumatic effect of the pressure differential ceases or owing to the presence of a seed ejector (not shown). In order to limit the wear on the seal 24 resulting from sliding against the surface of the disc 16, a thrust-bearing element indicated as a whole by 26 is mounted on the movable portion.

[0019] The thrust-bearing element 26 comprises a shaft 27 rotatably mounted by means of bearings 28 in a seat 29 of the movable portion 12. The shaft 27 has flanging 30 by means of which it is fixed to a thrust-bearing plate 31 which can bear on that surface of the disc which faces the seal 24 in a zone radially inside the ring of holes 23 in order to withstand at least some of the axial load produced by the disc 16 on the seal 24.

[0020] The bearing between the thrust-bearing plate 31 and the disc 16 takes place in the region of a ring 31a in relief on the surface of the plate which faces the disc 16.

[0021] The thrust-bearing element 26 is driven in rotation with the sowing disc 16 when the fixed and movable portions 11, 12 are closed against one another by means of a drive element 32 which comprises a coupling device constrained for rotation with the thrust-bearing plate but with radial and/or circumferential clearance in such a way as to be self-centred in the rotational coupling with the drive shaft of the disc 16. For this purpose, in the present form of embodiment, the drive element 32 is coupled with limited radial and/or circumferential clearance to the element 26 by means of one (or more) appendage(s) 33 protruding radially towards the outside and fitted into corresponding seats 34 of the plate. The drive element 32 is coupled by means of an internal polygonal profile 35 (similar to that adopted for box-end wrenches) to the polygonal profile 21 of the free end of the shaft 20, the chamfers 22 of which serve to facilitate the centring of the two profiles and the respective engagement. The drive element 32 is thus self-centring relative to the drive shaft 20 by which it is driven. The positioning between seal 24 and plate 31 is such that the rotation of the latter will not be hindered by the presence of the seal 24 and, at the same time, both will be kept bearing against the disc 16.

[0022] Provision is also made for the thrust-bearing element 26 to be made idle and not driven in rotation by the shaft 20.

[0023] The whole of the movable portion 12 complete with thrust-bearing element 26 and seal 24 lends itself advantageously to the production of a kit for the retrofitting of existing seed drills. It is sufficient in this case to separate the old type of movable portion by removing the hinge pin 13 and replacing the old movable portion with the aforesaid kit. By reconnecting the pneumatic pipes previously disconnected, the seed drill becomes ready for use.

[0024] Among the principal advantages of the distribution element according to the invention is the fact that the wear on the seal resulting from the sliding contact with the seed selector disc is substantially reduced, if not eliminated; the thrust-bearing element is self-centring, thereby allowing easy opening and closing of the movable portion on the fixed portion of the housing; the system additionally lends itself to easy retrofitting, all without removing movable parts and/or operations of disconnecting the sowing disc.

Claims

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

   - a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
   - a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
   - a seed collection chamber (15) being defined

Amended claims - Seventh Auxiliary request clean

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

- a seed collection chamber (15) being defined in the fixed portion (11),

- a pneumatic suction chamber (17) being defined in the movable portion (12),

- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the

Amended claims - Seventh Auxiliary request clean

movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12), the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

Amended claims - Seventh Auxiliary request clean

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
- a seed collection chamber (15) being defined in the fixed portion (11),
- a pneumatic suction chamber (17) being defined in the movable portion (12),

Amended claims - Seventh Auxiliary request clean

- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the kit comprises:

- the movable portion (12) pre-assembled with:

- a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12), the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

Amended claims – Seventh Auxiliary request clean

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

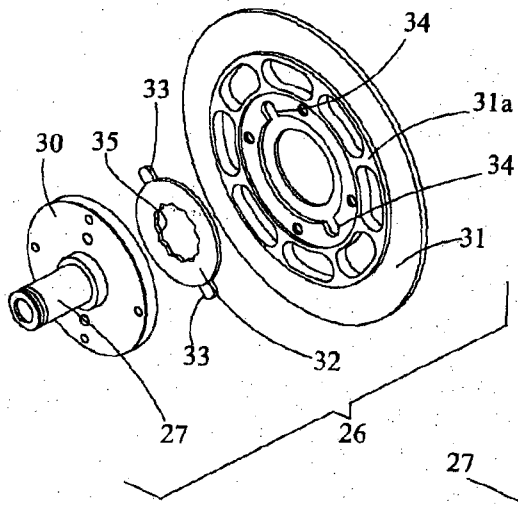

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fig. 2

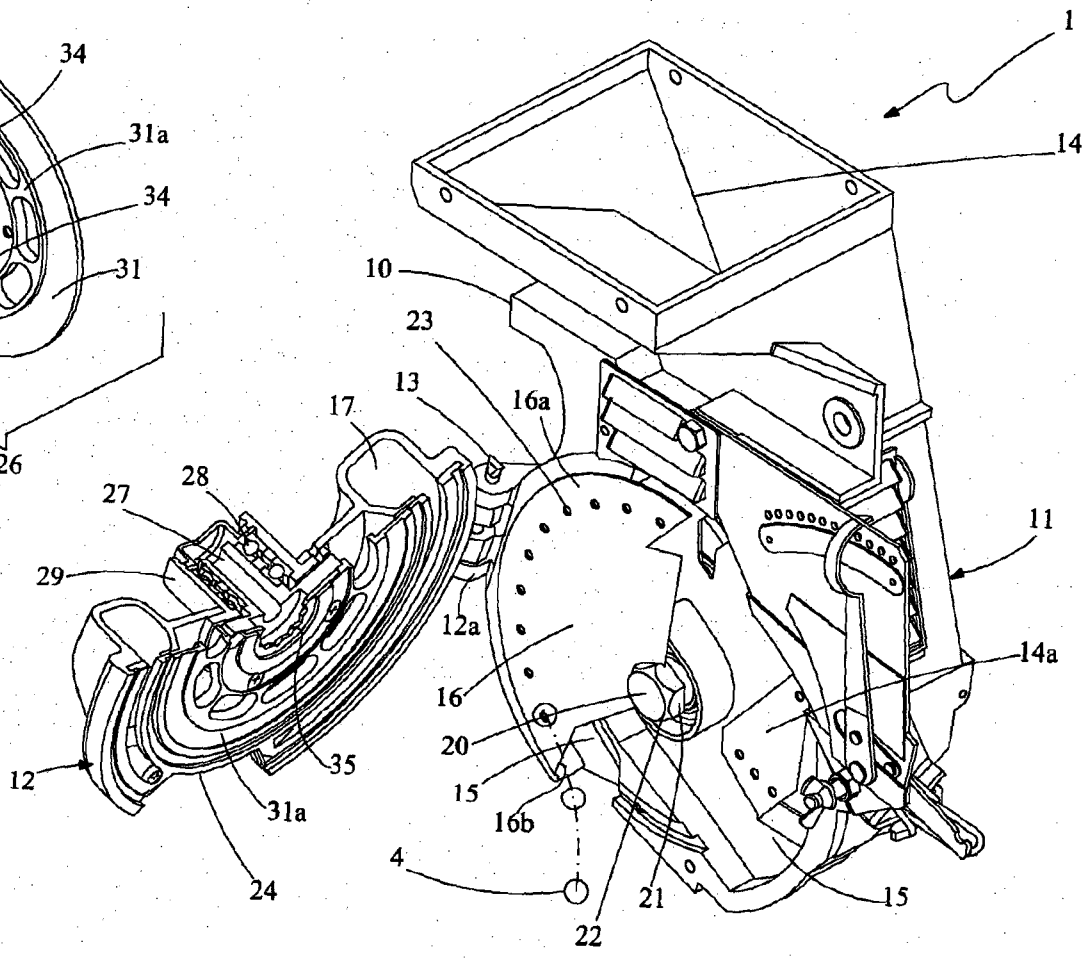

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fig. 1

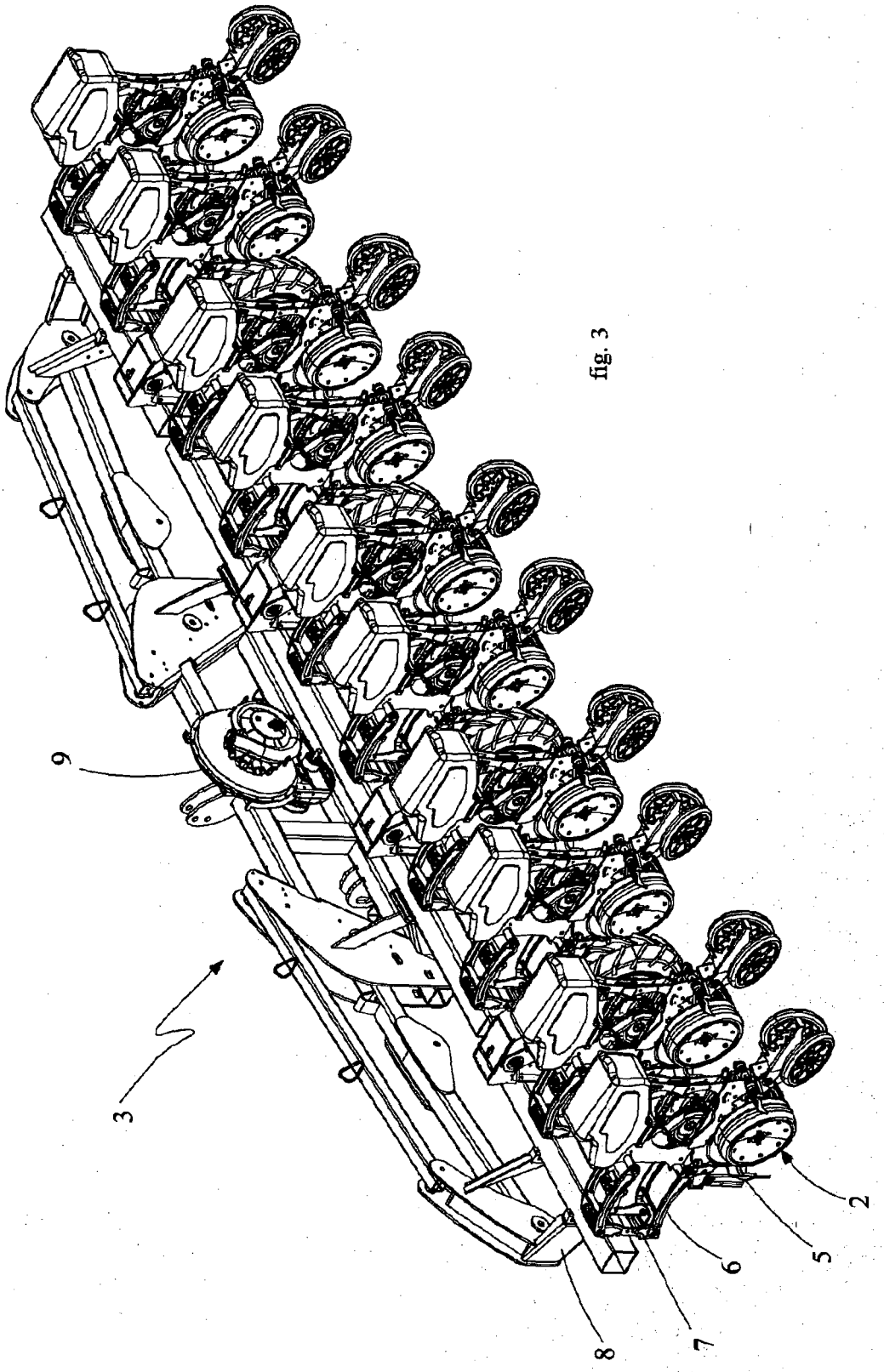


fig. 3

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Beselerstraße 4
22607 Hamburg
ALLEMAGNE

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Name: Delande-Königswenger
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+31 (0)70 340 45 00

Application No. / Patent No.	Ref.	Date
11 779 702.7 - 1004 / 2 637 492 / 01	E 98381	07.01.2022
Proprietor Maschio Gaspardo S.p.A.		

Provision of a copy of the minutes in accordance with Rule 124(4) EPC

The attached copy of the minutes of the oral proceedings is sent to you in accordance with Rule 124(4) EPC.

Europäisches Patentamt • European Patent Office • Office européen des brevets

Delande-Königswenger
Formalities Officer
Tel. No.: +49 89 2399 - 8202

Enclosure(s): Copy of the minutes (Form 2309)

Registered Letter
EPO Form 2042 12.07TRI

After deliberation of the opposition division,

- the chairman announced the following **decision** :

"Account being taken of the amendments made by the patent proprietor during the opposition proceedings, the patent and the invention to which it relates are found to meet the requirements of the European Patent Convention. The currently valid documents are those according to the seventh auxiliary request ."

Regarding the reasons for the decision, the chairman referred to:

Article 101(3)(a)EPC: Account being taken of the amendments made by the patent proprietor during the opposition proceedings, the patent and the invention to which it relates are found to meet the requirements of the European Patent Convention.Patent is maintained as amended.

The party/parties was/were informed that the minutes of the oral proceedings and a written reasoned decision (including an indication of the possibility of appeal) will be notified to him/them as soon as possible.

The chairman **closed the oral proceedings** on 13.12.2021 at 10:27 hours.

signed:

Schlichting, N
. . . . . .
Chairman

signed:

Leblanc, Romain
. . . . . .
Minute Writer

Enclosure(s):
Form 2339.4

Documents for the maintenance of the patent as amended

Auxiliary Request 7

In the text for the Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

Description, Paragraphs

1-24	of the patent specification	

Claims, Numbers

1-11	filed in electronic form on	27-03-2018

Drawings, Figures

1-3	of the patent specification	

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Application No.: 11 779 702.7

Patent No.: EP-B-2 637 492

Minutes of the oral proceedings before the OPPOSITION DIVISION

The proceedings were public.

Proceedings opened on 13.12.2021 at 09:03 hours

Present as members of the opposition division:

Chairman:	Schlichting, N
1st member:	Holtermann, Timm
2nd member:	Leblanc, Romain
Minute writer:	Leblanc, Romain

Present as or for the party or parties:

- For the Proprietor(s): Maschio Gaspardo S.p.A.
  Mr. Locas
- For the Opponent 1: Precision Planting LLC
  Mr. Jacob
  Mr. von Menges

The identity of the person/s (as well as, if applicable, that of the witness or witnesses) and, where necessary, the authorisation to represent/authority to act were checked.

Essentials of the oral proceedings and relevant statements of the parties:

Opening

The chairperson opened the proceedings (9:03).

The chairperson stated that recording is not allowed.

The parties confirmed to have received emails comprising addresses for providing/ receiving submissions and the phone number of the chairperson in case of disconnection.

Because the oral proceedings were held via Zoom, the chairperson ensured that all parties could follow the proceedings by frequently asking the representatives if their sound and image were of good quality.

The chairperson then asked the parties to confirm their request:

Patentee:

Main request: to maintain the patent in an amended form according to auxiliary request 7 filed on 27.03.2018.

Opponent:

Main request: to revoke the patent in its entirety.

Art. 56 EPC: Inventive step of the subject-matter of claims 1 and 10

The chairperson informed the parties that the opposition division is bound by the Board's ratio decidendi also with regard to the features distinguishing the subject-matter of claim 1 from the teaching of D10 which have been identified by the Board of Appeal. The chairperson asked the parties to consider this in their argumentation. The opponent repeated the arguments brought forward in writing in the letter of 11.10.2021 and referred to point 6.3 of the decision of the Board of Appeal (p. 15-16) as well as Fig. 13 in D10.

The patentee also referred to point 6.3 of the decision of the Board of Appeal and argued that the distinguishing features of claim 1 with respect to D10 have already been decided by the Board of Appeal.

Between 9:28 and 9:42, the oral proceedings were interrupted first due to a sound issue from Mr. Jacob and then due to a connection problem of Mr. Locas.

The patentee further argued that none of the documents cited by the opponent discloses the distinguishing features as defined by the Board of Appeal and that the skilled person would not modify the position of the knockout assembly without exercising an inventive activity.

After being asked by the chairperson, the opponent referred to the written submissions concerning the other lines of argumentation, i. e starting from D1, D4 or D5.

The patentee disagreed with the opponent's point of view and based his argumentation on Fig. 8 of D1.

The chairperson informed the parties that the opposition division would like to confer to deliberate about inventive step and informed the parties on the further procedural steps depending on the outcome of the deliberation.

After deliberation (9:59-10:24), the chairperson communicated to the parties that the opposition division has come to the conclusion that the subject-matter of claim 1 and the corresponding kit claim 10 of the auxiliary request 7 involves an inventive step (Art. 56 EPC).

Adaptation of the description

The chairperson communicated that the opposition division does not see a need for adaptation of the description.

After being asked by the chairperson, the opponent stated that he has no objections regarding the description.

Decision

The chairperson announced the decision that taking into account the amendments made during the opposition proceedings, the patent and the invention to which it relates meet the requirements for patentability of the EPC. The patent will be maintained in amended form under Article 101(3)(a) EPC on the basis of auxiliary request 7, provided that the requirements of Rule 82(2) EPC are fulfilled.

After being asked by the chairperson, the parties answered that the proceedings held by videoconference ran in a technically good manner.

The chairperson closed the oral proceedings (10:27).

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European Patent Office
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GERMANY

Questions about this communication?
Contact Customer Services at www.epo.org/contact

Formalities officer
Delande-Königswenger, Flavie

Locas, Davide
Cantaluppi & Partners S.r.l.
Piazzetta Cappellato Pedrocchi, 18
35122 Padova
ITALIE

Date
07.01.2022

Reference	Application No./Patent No.
PBP11900-EP	11779702.7 - 1004 / 2637492
Applicant/Proprietor	
Maschio Gaspardo S.p.A.	

EPA/EPO/OEB Formblatt/Form/Formulaire : 2327

Empfangsbescheinigung über den Zugang des vorstehend bezeichneten Schriftstücks
Acknowledgement of receipt of the document specified above
Récépissé du document spécifié ci-dessus

Unter Bezugnahme auf die Mitteilung im ABl EPA 7/2010, 377 wird gebeten, die Empfangsbescheinigung mit Empfangsdatum und Unterschrift zu versehen und **umgehend** an das EPA zurückzusenden:

With reference to the Notice in OJ EPO 7/2010, 377, you are requested to date and sign the acknowledgement of receipt and return it to the EPO **immediately**:

Conformément au communiqué paru au JO OEB 7/2010, 377, vous êtes prié d'indiquer sur le récépissé la date de réception du document, de signer le récépissé et de le renvoyer **sans délai** à l' OEB:

- **über die Online-Dienste des EPA** (als Anlage zu EPA Form 1038) / **through EPO Online Services** (as annex to EPO Form 1038) / **par les services en ligne de l'OEB** (en tant que pièce jointe au formulaire OEB 1038),
- **per Fax / by fax / par téléfax (+49 (0) 89 2399-4465 or +31 (0) 70 340-3016)**
- oder per Post / or by post / ou par courrier.

Empfangen am / Received on / Reçu le :

Unterschrift / Signature:

Empfangsberechtigter/authorised recipient/
le destinataire ou la personne dûment mandatée

Rücksende-Adresse / Return address / Adresse de retour
(Umschlag / envelope / enveloppe ISO C4 / DL / C6/C5 / C6)

Europäisches Patentamt
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DEUTSCHLAND

Rücksende-Adresse / Return address / Adresse de retour

EPA/EPO/OEB Form 2936 08.10

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Locas, Davide
Cantaluppi & Partners S.r.l.
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ITALIE

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Application No. / Patent No.	Ref.	Date
11 779 702.7 - 1004 / 2 637 492 /	PBP11900-EP	07.01.2022
Proprietor Maschio Gaspardo S.p.A.		

Interlocutory decision in Opposition proceedings (Art. 101(3)(a) and 106(2) EPC)

The Opposition Division - at the oral proceedings dated 13.12.2021 - has decided:

Account being taken of the amendments made by the patent proprietor during the opposition proceedings, the patent and the invention to which it relates are found to meet the requirements of the Convention.

The reasons for the decision are enclosed.

Documents for the maintenance of the patent as amended:

Auxiliary Request 7

Description, Paragraphs

1-24 of the patent specification

Claims, Numbers

1-11 filed in electronic form on 27-03-2018

Drawings, Figures

1-3 of the patent specification

Possibility of appeal
This decision is open to appeal according to Article 106(2) EPC. Attention is drawn to the attached text of Articles 106 to 108 and Rules 97 to 98 EPC.

Registered letter
EPO Form 2327 07.19TRI

Opposition Division:

Chairman:	Schlichting, N
2nd Examiner:	Leblanc, Romain
1st Examiner:	Holtermann, Timm



Delande-Königswenger
Formalities Officer
Tel. No.: +49 89 2399-8202

Enclosure(s): 7 page(s) reasons for the decision (Form 2916)
Wording of Art. 106 - 108 and R. 97 - 98 EPC (Form 2019)
Documents relating to the amended text
Minutes of oral proceedings
Claims of auxiliary request 7, filed on 27-03-2018

to EPO postal service: 22.12.21

Registered letter
EPO Form 2327 07.19TRI

I. Summary of Facts and Submissions

1 European patent 2 637 492 having the title "SEED DISTRIBUTION ELEMENT FOR PRECISION SEED DRILLS, SEED DRILL INCLUDING SAID ELEMENT" is based upon European patent application No. 11779702.7 filed on 10-11-2011. The application claims priority from ITA PD 201 00338 filed on 12-11-2010.

The mention of the grant of the patent has been published in the European Patent Bulletin of 03-12-2014.

Proprietor of the patent is:

Maschio Gaspardo S.p.A.
Via Marcello 73
35011 Campodarsego (PD)
Italy,

hereinafter referred to as "the proprietor".

2 Notice of opposition has been filed on 03-09-2015 by

Precision Planting LLC
23207 Townline Road
Tremont, IL 61568
United States of America,

hereinafter referred to as "the opponent".

3 The following evidence has been submitted within the opposition period:

D1: US-B1-7 228 807
D2: EP-A1-0 536 543
D3: EP-A1-2 848 109
D4: US-A1-4 664 290
D5: EP-A1-140 699
D6: Betriebsanleitung Einzelkornsämaschine
ED 302, ED452, ED 452-K ,ED602-K, ED 902-K, Amazonen-Werke
D7: DE-T2-689 16 976
D8: WO-A1-96/02123
D9: Translation of the Italian priority document

4 A decision of the opposition division to revoke the patent (Art. 101(3)(b) EPC) was issued on 17-11-2017.

5 Notice of appeal was filed by the proprietor and received on 26-01-2018 (Art. 108 EPC). The statement of grounds of appeal was received on 27-03-2018. The proprietor requested to set aside the decision of the opposition division and to maintain the patent as granted (main request). With the statement of grounds of appeal, the proprietor filed new auxiliary requests 1 to 11.

6 The opponent's reply to the appeal was received on 14-08-2018. The opponent requested to dismiss the appeal.

7 With the reply to the appeal, the opponent submitted the following evidence:

D10: US 2003/0183647 A1
D11: US 2002/0043201 A1
D12: ES 2 013 539 and English language machine translation

8 The Board of Appeal issued a summons on 17-12-2019 to attend oral proceedings on 23-07-2020.

9 On 23-07-2020, oral proceedings were held before the Board of Appeal.

During the oral proceedings, the proprietor withdrew the main request as well as auxiliary requests 1-3 and 5 of 27-03-2018. Auxiliary request 4 of 27-03-2018 became the new main request followed by auxiliary requests 6 and 7 of 27-03-2018.

The Board of Appeal took the view that the new main request lacks novelty over D1.

The Board of Appeal decided to admit auxiliary requests 6 and 7 as well as document D10 into the proceedings.

The Board of Appeal took the view that claim 1 of auxiliary request 6 contained added subject-matter.

The claims of auxiliary request 7 were considered to comply with the requirements of both Art. 52(1) and 54 EPC as well as Art. 123(2) EPC.

10 The Board of Appeal set aside the decision under appeal and remitted the case to the opposition division in order to assess whether auxiliary request 7 meets the requirements of the EPC with regard to inventive step.

11 On 28-01-2021, the opposition division issued summons to oral proceedings to take place on 13-12-2021 (Art. 116(1) EPC).

12 By means of a notification, dated 06-10-2021, the parties were informed that the oral proceedings would be held as a videoconference.

13 In a letter, received on 12-10-2021, the opponent provided arguments as to why the subject-matter of claims 1 and 10 of auxiliary request 7 does not involve an inventive step.

14 On 13-12-2021, oral proceedings were held as a videoconference.

15 The decision is based on the following request:

Auxiliary Request 7

Description, Paragraphs

1-24	of the patent specification	

Claims, Numbers

1-11	filed in electronic form on	27-03-2018

Drawings, Figures

1-3	of the patent specification	

16 The claims under consideration are attached to this decision. As to the other documents, reference is made to the file.

II. Grounds for the decision

1 **Inventive step (Art. 52(1) and 56 EPC) - auxiliary request 7**

1.1 The opposition division comes to the conclusion that the subject-matter of claims 1 and 10 of auxiliary request 7 involves an inventive step.

D10 may be considered as the closest prior art in relation to claims 1 and 10 of auxiliary request 7, because it is from the same technical field (pneumatic seed drills) and is structurally close (knock-out assembly mounted on the movable portion of the housing and being arranged to bear some axial load).

D10 does at least not disclose the following features of claims 1 and 10 (see points 6.3 and 7 of the Decision of the Board of Appeal):

> A shaft of the thrust-bearing element is rotatably mounted by bearings and has flanging by means of which it is fixed to a thrust-bearing plate which can bear on the surface of the disc which faces the seal in a zone radially inside the ring of holes in order to withstand at least some of the axial load produced by the disc on the seal.

A technical effect related to these features is a limitation of wear on the seal (see para. 18 of the patent under dispute).

The objective technical problem may be formulated as how to provide a solution to limit wear on the seal.

The opposition division comes to the conclusion that the solution as defined by claims 1 and 10 involves an inventive step. In particular, none of the prior art documents in the procedure discloses the above-identified distinguishing features such that the skilled person could not arrive at the claimed subject-matter without applying inventive skill.

1.2 The opponent provides arguments as to why the subject-matter of claims 1 and 10 of auxiliary request 7 does not involve an inventive step.

<u>D10 as the closest prior art</u>

The opponent presents an attack departing from D10 as the closest prior art. The opponent takes the view that the only difference between the claimed subject-matter and the device of D10 is the provision of bearings to rotatably mount the shaft. It is argued that the provision of such a bearing is a straight-forward solution, which does not justify the presence of an inventive step.

As to the interpretation of D10, the opponent refers to fig. 13 of D10 and argues that the knockout assembly (120) of D10 constitutes a thrust-bearing element with a shaft (124) being rotatably mounted (at pin 126) and having a flanging (hexagonal wheel) by means of which it is fixed to a thrust-bearing plate (stepped portion of the wheel) which can bear on the surface of the disc (via prongs 132) which faces the seal in a zone radially inside the ring of holes in order to withstand at least some of the axial load produced by the disc on the seal.

D1, D4 or D5 as the closest prior art

Further attacks are presented departing from D1, D4 or D5, respectively, as the closest prior art.

Concerning D1, the opponent argues that D1 discloses the preambles of claims 1 and 10 of auxiliary request 7. Moreover, it is argued that D1 discloses a thrust-bearing element (handle 58) including a shaft (drive shaft 55) being rotatably mounted by means of bearings (see fig. 6: shaft supported by bearings) and a flanging (rotating retaining hub 56) being fixed to a thrust-bearing plate (left surface of handle 58).

The opponent argues that the subject matter of claims 1 and 10 of auxiliary request 7 differs from the disclosure of D1 in that the thrust-bearing element is mounted in the movable portion and not in the fixed portion.

The objective technical problem is seen in the provision of an alternative arrangement of the thrust-bearing element.

The opponent argues that the skilled person would know that arranging the thrust-bearing element in the movable portion makes it easier to access and/or replace parts of the seed distribution element. The arrangement of a disc supporting element in the movable portion is one of two alternatives for arranging a thrust-bearing element, which can either be arranged in the fixed or in the movable portion. The opponent concludes that the subject-matter of claims 1 and 10 of auxiliary request 7 is thereby rendered obvious.

The opponent states that similar considerations apply when departing from D4 or D5.

1.3 The opposition division comes to the conclusion that these arguments are not convincing.

D10 as the closest prior art

The opponent's attack based on D10 relies on a different interpretation of said document, which can, however, not be taken into account for the following reasons:

With regard to D10, point 6.3 of the Decision of the Board of Appeal states the following:

> *"Irrespective of whether the known arm 124 can be considered a shaft in the broad sense of the term, the board does not identify at least the following claimed features in the known knockout element: that the shaft is rotatably mounted by bearings and has flanging by means of which it is fixed to a thrust-bearing plate which can bear on the surface of the disc which faces the seal in a zone radially inside the ring of holes in order to withstand at least some of the axial load produced by the disc on the seal."*

The opposition division is bound by the Board's ratio decidendi in this regard such that the distinguishing features over D10 are the ones identified above under point 1.1. The opponent has not provided convincing arguments as to how this combination of features could be rendered obvious when departing from D10. Furthermore, in the light of the extent of technically necessary modifications in order to transform the knockout element of D10 into a thrust-bearing element according to claim 1 of the auxiliary request 7 under dispute, the opponent's argument, whereby the skilled person would simply provide bearings to rotatably mount the shaft, has to be considered as hindsight.

D1, D4 or D5 as the closest prior art

The opposition division acknowledges that D1 (see fig. 6: handle 58), D4 (see fig. 3: handle 32) and D5 (see fig. 3: handle 24) each disclose a handle, which may be considered as a thrust-bearing element having at least some sort of shaft and a flanging.

Nevertheless, the opposition division comes to the conclusion that the skilled person would face major difficulties when trying to arrange the respective thrust-bearing element on the movable portion of the housing, as suggested by the opponent. It rather seems that the elements in question are required to fix the sowing disc to the fixed portion of the housing. Hence, the skilled person would additionally need to identify a replacement for fixing the sowing disc to the fixed portion of the housing. However, such a replacement cannot be derived from

any of D1, D4, D5 or the common general knowledge. It is therefore concluded that the skilled person would not arrive at the claimed subject-matter without applying inventive skill.

2 Taking into consideration the amendments made by the proprietor of the European patent during the opposition proceedings, the patent and the invention to which it relates meet the requirements of the EPC.

In accordance with Art. 101(3)(a) EPC, the patent is maintained as amended, provided that the conditions laid down in R. 82 EPC are fulfilled.

Amended claims - Seventh Auxiliary request clean

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

- a seed collection chamber (15) being defined in the fixed portion (11),

- a pneumatic suction chamber (17) being defined in the movable portion (12),

- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the

Amended claims - Seventh Auxiliary request clean

movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12), the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

Amended claims - Seventh Auxiliary request clean

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
- a seed collection chamber (15) being defined in the fixed portion (11),
- a pneumatic suction chamber (17) being defined in the movable portion (12),

Amended claims - Seventh Auxiliary request clean

- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the kit comprises:

- the movable portion (12) pre-assembled with:

- a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12), the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

Amended claims – Seventh Auxiliary request clean

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

Article 106
Decisions subject to appeal

(1) An appeal shall lie from decisions of the Receiving Section, Examining Divisions, Opposition Divisions and the Legal Division. It shall have suspensive effect.

(2) A decision which does not terminate proceedings as regards one of the parties can only be appealed together with the final decision, unless the decision allows a separate appeal.

(3) The right to file an appeal against decisions relating to the apportionment or fixing of costs in opposition proceedings may be restricted in the Implementing Regulations.

Rule 97
Appeal against apportionment and fixing of costs

(1) The apportionment of costs of opposition proceedings cannot be the sole subject of an appeal.

(2) A decision fixing the amount of costs of opposition proceedings cannot be appealed unless the amount exceeds that of the fee for appeal.

Rule 98
Surrender or lapse of the patent

The decision of an Opposition Division may be appealed even if the European patent has been surrendered in all the designated Contracting States or has lapsed in all those States.

Article 107
Persons entitled to appeal and to be parties to appeal proceedings

Any party to proceedings adversely affected by a decision may appeal. Any other parties to the proceedings shall be parties to the appeal proceedings as of right.

Article 108
Time limit and form

Notice of appeal shall be filed, in accordance with the Implementing Regulations, at the European Patent Office within **two months** of notification of the decision. Notice of appeal shall not be deemed to have been filed until the fee for appeal has been paid. Within **four months** of notification of the decision, a statement setting out the grounds of appeal shall be filed in accordance with the Implementing Regulations.

Further information concerning the filing of an appeal

(a) Notice of appeal can be filed in accordance with Rule 1 and Rule 2(1) EPC, by delivery by hand, by post, or by technical means of communication. The filing has to comply with the details and conditions and, where appropriate, any special formal or technical requirements laid down by the President of the European Patent Office (R. 99(3) EPC).

(b) The addresses of the filing offices of the European Patent Office are as follows:

(i) European Patent Office
D-80298 Munich
Germany

Fax: +49 89 2399-4465

(ii) European Patent Office
Postbus 5818
NL-2280 HV Rijswijk (ZH)
The Netherlands

Fax: +31 70 340-3016

(iii) European Patent Office
D-10958 Berlin
Germany

Fax: +49 30 259 01-840

(c) The notice of appeal must contain the name and address of the appellant in accordance with the provisions of Rule 41(2)(c) EPC, an indication of the decision impugned, and a request defining the subject of the appeal. In the statement of grounds of appeal the appellant shall indicate the reasons for setting aside the decision impugned, or the extent to which it is to be amended, and the facts and evidence on which the appeal is based (R. 99(1) and (2) EPC). The notice of appeal and any subsequent submissions stating the grounds for appeal must be signed (R. 50(3) EPC).

(d) The fee for appeal is laid down in the Rules relating to Fees. The schedule of fees and expenses of the EPO or a reference to the current version is regularly published in the Official Journal of the European Patent Office under the heading "Guidance for the payment of fees, expenses and prices". Fee information is also published on the EPO website under www.epo.org/ fees.

Description

[0001] The subject of the present invention is a seed distribution element for precision pneumatic seed drills, a sowing element for such machines and a seed drill including a plurality of such sowing elements.

[0002] In precision pneumatic seed drills it is known to use sowing elements which are each equipped with a seed distribution element (hereinafter, in brief, distributor) for distributing one seed at a time in a controlled delivery while the sowing element moves along a sowing track.

[0003] It is equally known to use seed distributors which use an air pressure differential between opposed faces of a sowing disc (or selector) provided with one or more rings of through holes. The operating principle is based on the fact that, as a result of the pressure differential between the opposed faces of the disc, a seed adheres to each hole and is then transported by the rotation of the sowing disc from the seed selection zone to the point at which the pressure differential ceases and the seed is released to drop through a sowing pipe into the furrow or sowing track. In practice, on one of the faces of the disc a strong air suction is exerted which retains the seeds on the opposite face in the region of the respective holes. An example of such devices is disclosed in US 7 228 807.

[0004] For the correct functioning of such distributors it is necessary to ensure an effective pneumatic seal between the face of the disc that is subjected to suction and a seal which delimits the pneumatic suction chamber. The suction effect itself effects a substantial compression of the disc against the seal. If on the one hand this ensures adequate adherence of the seal to the disc surface which is subjected to negative pressure, on the other hand it involves severe abrasion of the seal which limits the effective service life thereof. It is therefore necessary periodically to replace the seal in order to prevent sowing errors arising from insufficient depressurization of the suction chamber.

[0005] On the other hand, even if replacing the seal is a simple operation, in each case it entails an unwanted machine stoppage, besides the cost of the spare part itself.

[0006] In order to remedy this drawback, seed drills have been developed which are equipped with a thrust-bearing element which relieves the heavy load on the seal. In all cases, however, the thrust-bearing element, which must be rotated with the disc, is mounted on the fixed portion of the housing, that is to say, that portion which is fixed to the framework of the sowing elements. This means that the disc must be attached to the thrust-bearing element; therefore an attachment system must be provided which in the stage of replacement of the disc must be removed, consequently lengthening the operation. This is inevitable in the known machines since it is obligatory to mount on the fixed portion the transmission which drives in rotation the motor-driven shaft which rotates the disc.

[0007] However, positioning the thrust-bearing element on the fixed portion entails the pneumatic suction chamber being provided on the fixed portion, or on the same side at which the thrust-bearing element is placed, while the seed collection chamber must be provided in the movable portion. This is the source of numerous drawbacks, including the fact that the opening of the housing necessarily involves the removal of the portion containing the seed collection chamber from the hopper type store located above, which must necessarily be fixed to the framework of the sowing element.

[0008] Furthermore, for the replacement of the sowing disc it is necessary to remove some parts of the distributor, such as the adjustable seed selector, and the seed ejector, where provided.

[0009] The problem underlying the present invention is that of providing a seed distribution element structurally and functionally designed to make it possible to remedy all the drawbacks mentioned with reference to the prior art cited.

[0010] This problem is solved by the invention by means of a seed distribution element produced in accordance with one or more of the attached claims. The features and advantages of the invention will become clearer from the following detailed description of a preferred exemplary embodiment thereof, illustrated by way of non-limiting example with reference to the appended drawings, in which:

- Fig. 1 is a perspective view of a seed distribution element produced according to the present invention;
- Fig. 2 is an exploded perspective view of a detail of the element of Fig. 1;
- Fig. 3 is a perspective view of a seed drill equipped with sowing elements with a seed distribution element according to the invention.

[0011] In the drawings the reference 1 indicates as a whole a seed distribution element intended for equipping a sowing element 2 of a precision pneumatic seed drill 3.

[0012] The distribution element 1 is the device intended to deposit one seed 4 at a time at a predetermined adjustable spacing in a sowing furrow opened by a coulter 5. The sowing element 2, besides the distribution element 1, comprises a frame 6 and a seed store or hopper 7, besides other devices which are known per se and not necessary for the understanding of the present invention. The seed drill 3 itself comprises a bearing structure 8 on which a plurality of sowing elements 2 are mounted, all connected to a pneumatic suction device 9.

[0013] The sowing element 1 itself comprises a housing 10 with a fixed portion 11 fixed in a stable manner on the frame 6 and a movable portion 12 hinged in the region of a hinge 12a on the fixed portion 11 by means of a removable hinge pin 13. The fixed portion includes a throat 14 by means of which it is connected below an

outflow mouth of the store or hopper 7 in such a way as to be fed directly by the latter.

[0014] From the throat 14 the seed flows through a gate 14a through which the seed flows into a seed collection chamber 15.

[0015] A sowing disc 16 separates the seed collection chamber 15 from a suction chamber 17 provided in the movable portion 12. A suction device 18 mounted on the bearing structure 8 is connected to the suction chamber 17 by means of pipes 19 for producing a pressure differential between the opposed surfaces 16a, 16b of the selector disc 16.

[0016] The sowing disc 16 is removably mounted on a motor-driven drive shaft 20, supported in the fixed portion 11 and driven in rotation at predetermined adjustable speeds by a transmission which is not shown. The presence of the transmission requires the shaft 20 to be mounted on the fixed portion 11 of the housing 10. The keying between the shaft 20 and the disc 16 is obtained by means of a polygonal profile 21 at the free end of the shaft 20 which protrudes beyond the disc 16 and preferably has chamfers 22 which serve to facilitate the functions explained hereinafter. At the periphery of the disc 16 is/are provided one (or several) ring(s) of holes 23 passing between the opposed faces of the sowing disc 16.

[0017] A seal 24 is fitted in the suction chamber 17 and is placed in sliding contact with the facing surface of the disc 16, when the movable portion 11 is closed on the fixed portion 12, to delimit a circumferential segment in which the holes 23 are subjected to the aforesaid pressure differential. The circumferential segment extends between the seed collection chamber 15 and a seed fall pipe 25 in which the seeds are released one at a time into the furrow formed by the coulter 5.

[0018] By reason of the pressure differential between the two opposed surfaces of the sowing disc, the seeds 4 are held, one to each hole 23, when the holes pass in the seed collection chamber 15, and are released in the region of the pipe 25 when the pneumatic effect of the pressure differential ceases or owing to the presence of a seed ejector (not shown). In order to limit the wear on the seal 24 resulting from sliding against the surface of the disc 16, a thrust-bearing element indicated as a whole by 26 is mounted on the movable portion.

[0019] The thrust-bearing element 26 comprises a shaft 27 rotatably mounted by means of bearings 28 in a seat 29 of the movable portion 12. The shaft 27 has flanging 30 by means of which it is fixed to a thrust-bearing plate 31 which can bear on that surface of the disc which faces the seal 24 in a zone radially inside the ring of holes 23 in order to withstand at least some of the axial load produced by the disc 16 on the seal 24.

[0020] The bearing between the thrust-bearing plate 31 and the disc 16 takes place in the region of a ring 31a in relief on the surface of the plate which faces the disc 16.

[0021] The thrust-bearing element 26 is driven in rotation with the sowing disc 16 when the fixed and movable portions 11, 12 are closed against one another by means of a drive element 32 which comprises a coupling device constrained for rotation with the thrust-bearing plate but with radial and/or circumferential clearance in such a way as to be self-centred in the rotational coupling with the drive shaft of the disc 16. For this purpose, in the present form of embodiment, the drive element 32 is coupled with limited radial and/or circumferential clearance to the element 26 by means of one (or more) appendage(s) 33 protruding radially towards the outside and fitted into corresponding seats 34 of the plate. The drive element 32 is coupled by means of an internal polygonal profile 35 (similar to that adopted for box-end wrenches) to the polygonal profile 21 of the free end of the shaft 20, the chamfers 22 of which serve to facilitate the centring of the two profiles and the respective engagement. The drive element 32 is thus self-centring relative to the drive shaft 20 by which it is driven. The positioning between seal 24 and plate 31 is such that the rotation of the latter will not be hindered by the presence of the seal 24 and, at the same time, both will be kept bearing against the disc 16.

[0022] Provision is also made for the thrust-bearing element 26 to be made idle and not driven in rotation by the shaft 20.

[0023] The whole of the movable portion 12 complete with thrust-bearing element 26 and seal 24 lends itself advantageously to the production of a kit for the retrofitting of existing seed drills. It is sufficient in this case to separate the old type of movable portion by removing the hinge pin 13 and replacing the old movable portion with the aforesaid kit. By reconnecting the pneumatic pipes previously disconnected, the seed drill becomes ready for use.

[0024] Among the principal advantages of the distribution element according to the invention is the fact that the wear on the seal resulting from the sliding contact with the seed selector disc is substantially reduced, if not eliminated; the thrust-bearing element is self-centring, thereby allowing easy opening and closing of the movable portion on the fixed portion of the housing; the system additionally lends itself to easy retrofitting, all without removing movable parts and/or operations of disconnecting the sowing disc.

Claims

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

   - a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
   - a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
   - a seed collection chamber (15) being defined

Amended claims - Seventh Auxiliary request clean

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

- a seed collection chamber (15) being defined in the fixed portion (11),

- a pneumatic suction chamber (17) being defined in the movable portion (12),

- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the

Amended claims - Seventh Auxiliary request clean

movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12), the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

Amended claims - Seventh Auxiliary request clean

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
- a seed collection chamber (15) being defined in the fixed portion (11),
- a pneumatic suction chamber (17) being defined in the movable portion (12),

Amended claims - Seventh Auxiliary request clean

- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the kit comprises:

- the movable portion (12) pre-assembled with:

- a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12), the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

Amended claims – Seventh Auxiliary request clean

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

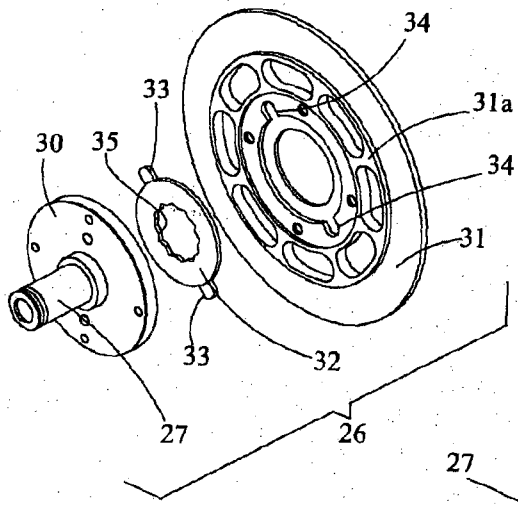

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fig. 2

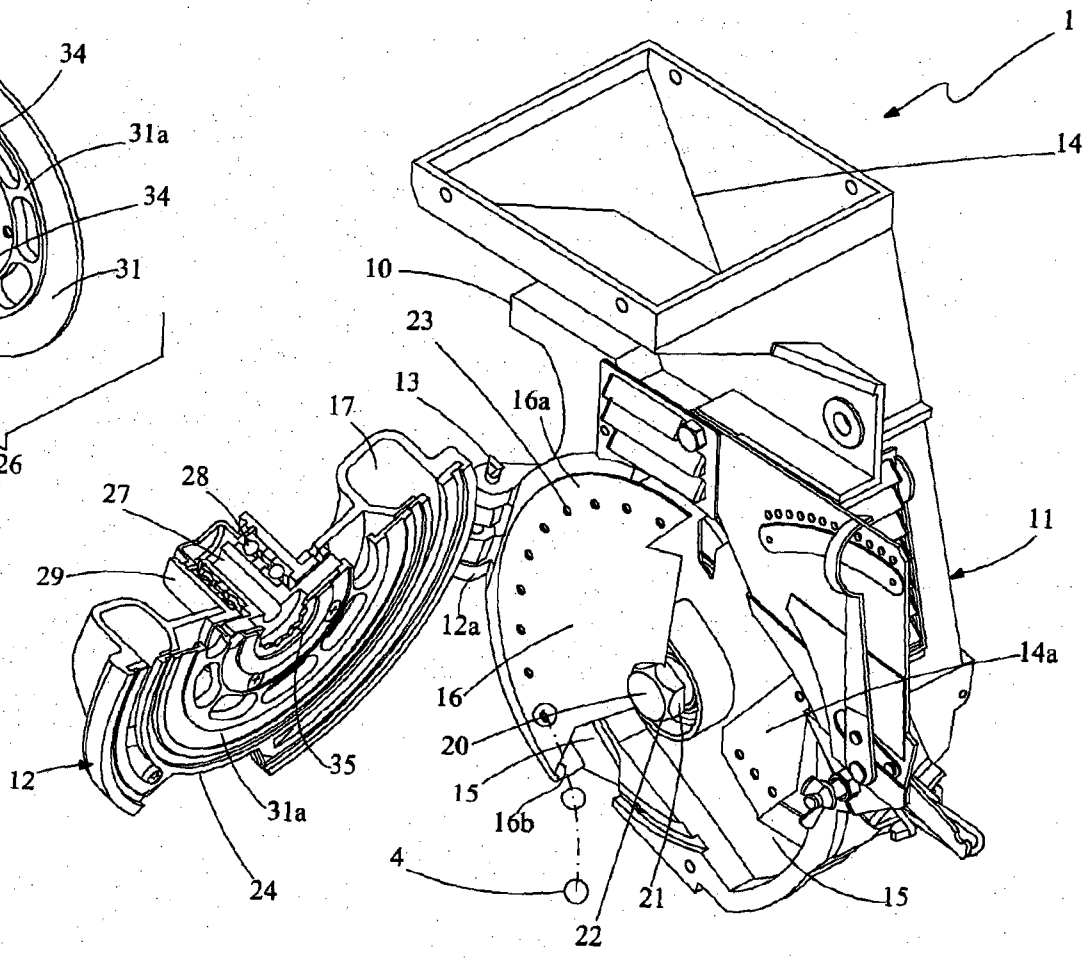

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fig. 1

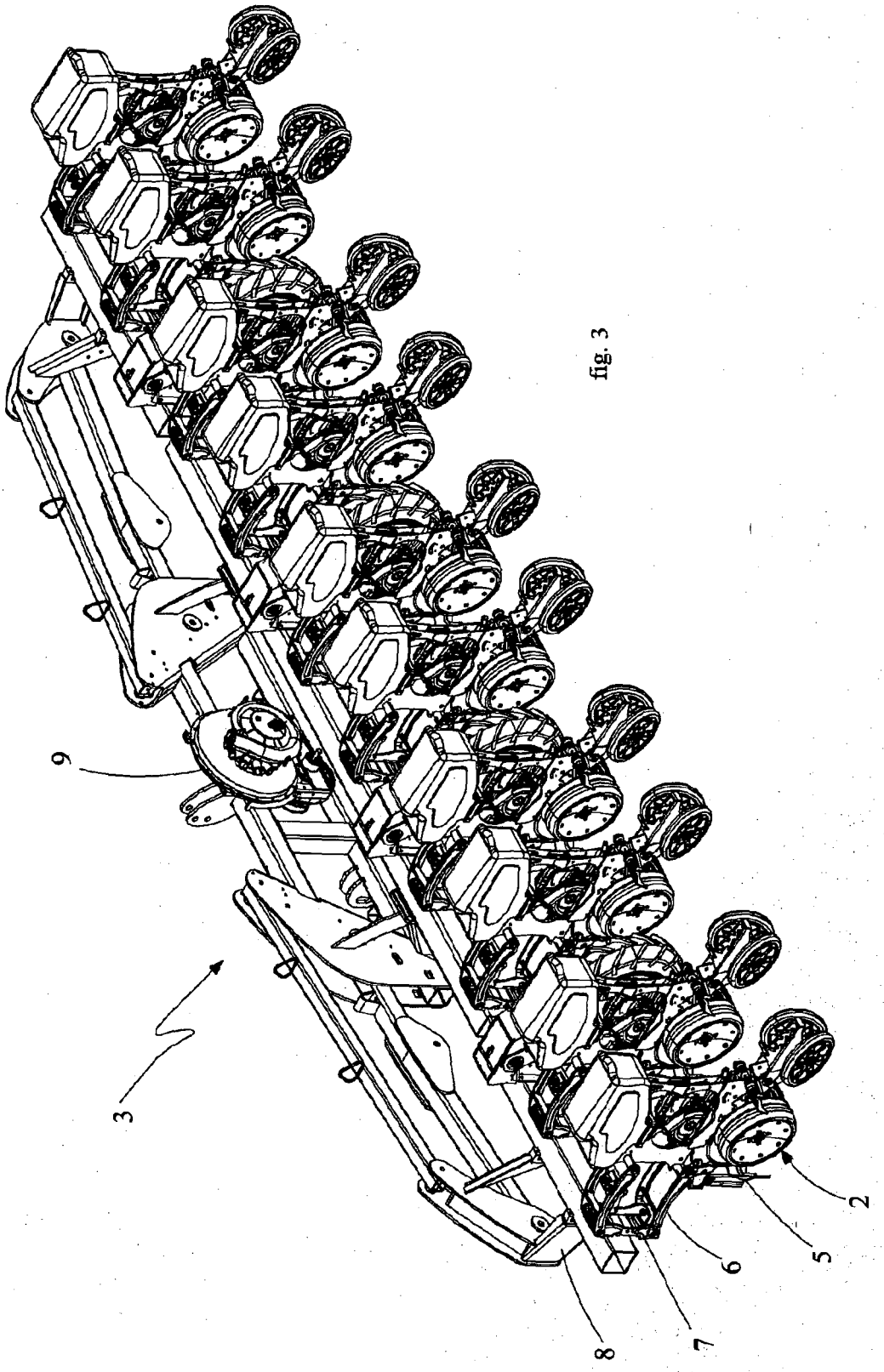


fig. 3

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Application No. / Patent No.	Ref.	Date
11 779 702.7 - 1004 / 2 637 492 /	PBP11900-EP	07.01.2022
Proprietor Maschio Gaspardo S.p.A.		

Provision of a copy of the minutes in accordance with Rule 124(4) EPC

The attached copy of the minutes of the oral proceedings is sent to you in accordance with Rule 124(4) EPC.

Delande-Königswenger
Formalities Officer
Tel. No.: +49 89 2399 - 8202

Enclosure(s): Copy of the minutes (Form 2309)

Registered Letter
EPO Form 2042 12.07TRI

Europäisches Patentamt
European Patent Office
Office européen des brevets

European Patent Office
80298 MUNICH
GERMANY
Tel: +49 89 2399 0
Fax: +49 89 2399 4465

Application No.: 11 779 702.7

Patent No.: EP-B-2 637 492

Minutes of the oral proceedings before the OPPOSITION DIVISION

The proceedings were public.

Proceedings opened on 13.12.2021 at 09:03 hours

Present as members of the opposition division:

Chairman:	Schlichting, N
1st member:	Holtermann, Timm
2nd member:	Leblanc, Romain
Minute writer:	Leblanc, Romain

Present as or for the party or parties:

- For the Proprietor(s): Maschio Gaspardo S.p.A.
  Mr. Locas
- For the Opponent 1: Precision Planting LLC
  Mr. Jacob
  Mr. von Menges

The identity of the person/s (as well as, if applicable, that of the witness or witnesses) and, where necessary, the authorisation to represent/authority to act were checked.

Essentials of the oral proceedings and relevant statements of the parties:

Opening

The chairperson opened the proceedings (9:03).

The chairperson stated that recording is not allowed.

The parties confirmed to have received emails comprising addresses for providing/ receiving submissions and the phone number of the chairperson in case of disconnection.

Because the oral proceedings were held via Zoom, the chairperson ensured that all parties could follow the proceedings by frequently asking the representatives if their sound and image were of good quality.

The chairperson then asked the parties to confirm their request:

Patentee:

Main request: to maintain the patent in an amended form according to auxiliary request 7 filed on 27.03.2018.

Opponent:

Main request: to revoke the patent in its entirety.

Art. 56 EPC: Inventive step of the subject-matter of claims 1 and 10

The chairperson informed the parties that the opposition division is bound by the Board's ratio decidendi also with regard to the features distinguishing the subject-matter of claim 1 from the teaching of D10 which have been identified by the Board of Appeal. The chairperson asked the parties to consider this in their argumentation. The opponent repeated the arguments brought forward in writing in the letter of 11.10.2021 and referred to point 6.3 of the decision of the Board of Appeal (p. 15-16) as well as Fig. 13 in D10.

The patentee also referred to point 6.3 of the decision of the Board of Appeal and argued that the distinguishing features of claim 1 with respect to D10 have already been decided by the Board of Appeal.

Between 9:28 and 9:42, the oral proceedings were interrupted first due to a sound issue from Mr. Jacob and then due to a connection problem of Mr. Locas.

The patentee further argued that none of the documents cited by the opponent discloses the distinguishing features as defined by the Board of Appeal and that the skilled person would not modify the position of the knockout assembly without exercising an inventive activity.

After being asked by the chairperson, the opponent referred to the written submissions concerning the other lines of argumentation, i. e starting from D1, D4 or D5.

The patentee disagreed with the opponent's point of view and based his argumentation on Fig. 8 of D1.

The chairperson informed the parties that the opposition division would like to confer to deliberate about inventive step and informed the parties on the further procedural steps depending on the outcome of the deliberation.

After deliberation (9:59-10:24), the chairperson communicated to the parties that the opposition division has come to the conclusion that the subject-matter of claim 1 and the corresponding kit claim 10 of the auxiliary request 7 involves an inventive step (Art. 56 EPC).

Adaptation of the description

The chairperson communicated that the opposition division does not see a need for adaptation of the description.

After being asked by the chairperson, the opponent stated that he has no objections regarding the description.

Decision

The chairperson announced the decision that taking into account the amendments made during the opposition proceedings, the patent and the invention to which it relates meet the requirements for patentability of the EPC. The patent will be maintained in amended form under Article 101(3)(a) EPC on the basis of auxiliary request 7, provided that the requirements of Rule 82(2) EPC are fulfilled.

After being asked by the chairperson, the parties answered that the proceedings held by videoconference ran in a technically good manner.

The chairperson closed the oral proceedings (10:27).

After deliberation of the opposition division,

- the chairman announced the following **decision** :

"Account being taken of the amendments made by the patent proprietor during the opposition proceedings, the patent and the invention to which it relates are found to meet the requirements of the European Patent Convention. The currently valid documents are those according to the seventh auxiliary request ."

Regarding the reasons for the decision, the chairman referred to:

Article 101(3)(a)EPC: Account being taken of the amendments made by the patent proprietor during the opposition proceedings, the patent and the invention to which it relates are found to meet the requirements of the European Patent Convention.Patent is maintained as amended.

The party/parties was/were informed that the minutes of the oral proceedings and a written reasoned decision (including an indication of the possibility of appeal) will be notified to him/them as soon as possible.

The chairman **closed the oral proceedings** on 13.12.2021 at 10:27 hours.

signed:

Schlichting, N
. . . . . .
Chairman

signed:

Leblanc, Romain
. . . . . .
Minute Writer

Enclosure(s):
Form 2339.4

Documents for the maintenance of the patent as amended

Auxiliary Request 7

In the text for the Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

Description, Paragraphs

1-24	of the patent specification	

Claims, Numbers

1-11	filed in electronic form on	27-03-2018

Drawings, Figures

1-3	of the patent specification	

Europäisches Patentamt
European Patent Office
Office européen des brevets

Application No.

11779702.7

INFORMATION

The oral proceedings of: 13.12.21

Resulted in:

☐ The European patent is revoked because at least one ground for opposition prejudices the maintenance of the European patent (Art. 101(2) EPC)

☐ The European patent is revoked because, account being taken of the amendments made by the patent proprietor during opposition proceedings, the patent and the invention to which it relates were found not to meet the requirements of the EPC (Art. 101(3)(b) EPC).

☐ The opposition(s) is/are rejected (Art. 101(2) EPC).

☑ Account being taken of the amendments made by the patent proprietor during the opposition proceedings, the patent and the invention to which it relates are found to meet the requirements of European Patent Convention (Art. 101(3)(a) EPC).

☐ Amendments filed during oral proceedings are annexed.

☐ Other:

13.12.2021
Date

Signature

NB: this form is provided for the sake of information only. The written decision prevails.

Europäisches Patentamt
European Patent Office
Office européen des brevets

Acknowledgement of receipt

We hereby acknowledge receipt of the following subsequently filed document(s):

Submission number	10414895	
Application number	EP11779702.7	
Patent number	EP2637492	
Date of receipt	23 November 2021	
Filing Office	European Patent Office, The Hague	
Procedural phase	Opposition	
Your reference	PBP11900-EP	
Documents submitted	package-data.xml ep-cms-sfd-request.pdf (1 p.)	ep-cms-sfd-request.xml OPPOANNEX.pdf\20211123_info EPO oral proceed..pdf (3 p.)
Submitted by	CN=secure.epoline.org	
Method of submission	Online	
Date and time receipt generated	23 November 2021, 12:44 (CET)	
Message Digest	9A:30:9C:8E:35:C5:5B:E8:54:D8:5B:A6:9D:3A:1F:3F:B9:BC:6D:A2	

/European Patent Office/

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European Patent Office
80298 MUNICH
GERMANY

Questions about this communication ?
Contact Customer Services at www.epo.org/contact

Formalities officer
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Locas, Davide
Cantaluppi & Partners S.r.l.
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ITALIE

Date: 15.10.2021

Reference	Application No./Patent No.
PBP11900-EP	11779702.7 - 1004 / 2637492

Applicant/Proprietor: Maschio Gaspardo S.p.A.

BRIEF COMMUNICATION

Subject:
- ☐ Your letter of
- ☐ Our telephone conversation of
- ☐ Communication of
- ☐

Enclosure(s):
- ☐ Letter from the proprietor of the patent of
- ☑ Letter from the opponent of 11.10.2021
- ☐ Copy (copies)

Communication:

☐ The documents specified as patent documents and as non-patent literature in this letter are available for inspection via the European Patent Register at **www.epo.org/register.** Should you wish to receive these documents in paper format, they will be supplied to you free of charge if specifically requested on receipt of this communication (OJ EPO 2020, A106).

☐

For the Opposition Division

Europäisches Patentamt • European Patent Office • Office européen des brevets

☑ **Registered letter**

UEXKÜLL & STOLBERG

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PARTNERSCHAFT VON PATENT- UND RECHTSANWÄLTEN mbB

Via Epoline

Europäisches Patentamt
80298 München

Patent No.: 2 637 492

Application No.: 11779702.7

Patentee: Maschio Gaspardo S.p.A.

Opponent: Precision Planting LLC

11. 10. 2021
E 98381 Me/MJ

The following observations are submitted in the name and on behalf of the Opponent, Precision Planting, in response to the preliminary opinion issued by the Opposition Division together with the summons to attend oral proceedings dated 28.01.2021:

1. Requests and Introduction

It is requested that European patent 2 637 492 be revoked in its entirety for all designated contracting states.

The undersigned expect to represent the Opponent in the hearing scheduled to take place on December 13, 2021 by videoconference. Opponent's representatives will use the English language in the hearing and request simultaneous translation into English in case the Patentee should intend to use a language other than English.

The present submission will show that contrary to the preliminary opinion of the Opposition Division (subsequently OD), the subject matter of claims 1 and 10 of Auxiliary Request 7 (subsequently AR7) lacks inventive step.

2. Lack of Inventive Step in View of D10

2.1 Document D10 represents the closest prior art on file:

In point 22 of the preliminary opinion the OD concluded that the subject matter of claims 1 and 10 of AR7 is inventive in view of the prior art, in including Document D10. In particular, the OD indicated that

> "*D10 does at least not disclose the following features of claims 1 and 10: the shaft of the thrust-bearing element is rotatably mounted by bearings and has a flanging by means of which it is fixed to a thrust-bearing plate which can bear on the surface of the disc which faces the seal in a one radially inside the ring of holes in order to withstand at least some of the axial load produced by the disc on the seal*".

These features are subsequently identified as the "allegedly distinguishing feature group".

As some of the elements of the allegedly distinguishing feature group are disclosed in D10, the OD is respectfully requested to reconsider the interpretation of D10 and as a consequence the assessment of inventive step.

As will be outlined in detail below (in point 2.2), D10 discloses the features of the generic part of claim 1 as well as a thrust-bearing element able to withstand at

least some of the axial load produced by the disc on the seal as recited in claim 1. Further, in point 2.3 the allegedly distinguishing feature group is discussed and in point 2.4 the conclusions for assessing inventive step will be explained.

2.2 D10 discloses a seed meter (seed distribution element) of the type of D1. With regard to the features of claim 1, D10 discloses:

- A sowing disc (seed disc 60; paragraph [0052]) which is rotated by a motor driven transmission shaft (drive shaft 55; paragraph [0046]) at controlled speed.

- A housing that consists of a first housing member 50 and a second housing member 90 (see Figure 8), wherein the first housing member 50 is a fixed housing portion and the second housing member 90 is a movable hosing portion which is movable relative to the fixed portion and can be closed against it by means of a pivot pin 92 (paragraph [0052]). The shaft 55 is supported rotatably in the fixed portion 50.

- A seed collection chamber that is defined in the fixed housing portion 50 (paragraph [0048]: "seeds are allowed to enter the first housing member 50").

- A pneumatic suction chamber that is defined in the movable housing portion 90 (paragraph [0058]: "creating a vacuum in the second chamber").

- The sowing disc (seed disc 60) is interposed between the two housing portions (50 and 90) and has opposed surfaces delimiting the chambers.

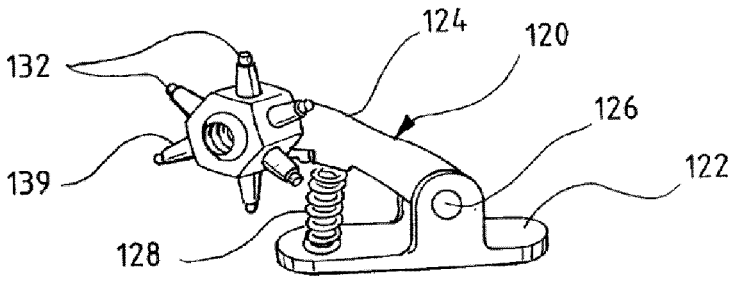
- The sowing disc (seed disc 60) has a ring of selector holes (transverse holes 67-67; paragraph [0047]) extending between the opposed surfaces.

- A sealing member 99 that is arranged on the movable housing portion (second housing member 90) and is capable of establishing sliding contact with the facing surface of the disc (seed disc 60) when the portions (50 and 90) are closed against one another (paragraph [0052]).

- A pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (paragraph [0058].

D10 further discloses a thrust-bearing element in the form of a knockout assembly 120. The knockout assembly 120 (see FIG. 13 of D10 reproduced below) is mounted on the movable portion.

FIG. 13



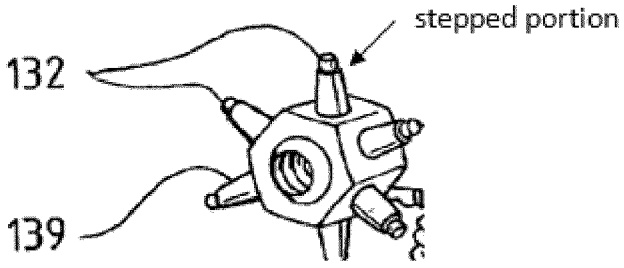
Knockout assembly 120 in Figure 13 of D10

The knockout assembly is configured "*to withstand at least some of the axial load produced by the disc on the seal*". This is the consequence of the following structural features:

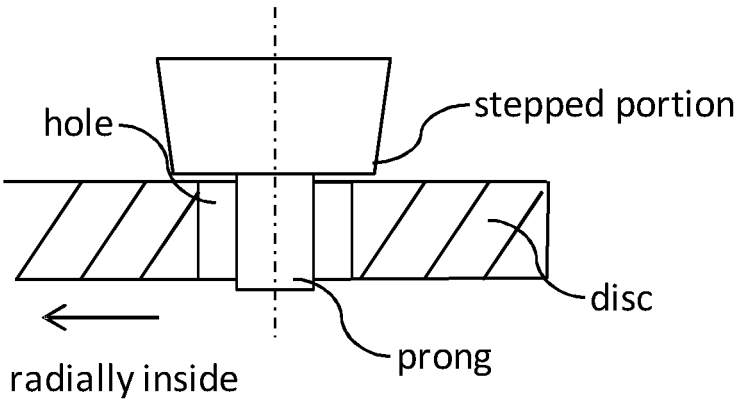
- Paragraphs [0054] and [0055] of D10 disclose that the knockout assembly 120 generally has a planar base member 122 for attachment to the rear surface portion 110 of the movable housing portion.

- The assembly 120 further includes an arm 124 pivotally attached by a pin 126 to the base member 122 and a spring 128 for urging the arm 124 away from the base member 122, i.e., spring 128 exerts a preload force on the arm 124 and presses the arm towards the disc.

- To the distal end of arm 124 is attached a rotatable wheel 130 having a plurality of equally spaced radially extending prongs 132. The prongs 132 of the knockout assembly 120 are angularly spaced on the wheel 130 such that one prong 132 will extend into each of the holes 67-67 of the seed disk 60 as the disk 60 rotates around the hub 56 (see extract of FIG. 13 below).



Each time a prong 132 dips into a hole of the seed disk, a stepped portion of the prong 132 abuts the edge of the hole. This is illustrated in the drawing below.



As shown above, the stepped portion of the prong bears against the surface of the disc in a region surrounding the hole and, in particular, in a zone radially inside the ring of holes.

The spring biases the arm against the disc to ensure that the prongs enter the holes and push the seeds out of the holes. The thrust-bearing element thus exerts an axial force against the disc via the stepped portion.

Since the strength of the axial force is not defined in claim 1 and the axial force acts against the negative pressure forces, the thrust-bearing element (knockout assembly) is able to withstand at least some of the axial load produced by the disc on the seal.

As the above explanations show, D10 discloses "a thrust-bearing element supported rotatably in the movable portion in order to withstand at least some of the axial load produced by the disc on the seal".

2.3 D10 further discloses aspects of the allegedly distinguishing feature group as identified above, i.e., the feature group "*the shaft of the thrust-bearing element is rotatably mounted by bearings and has a flanging by*

means of which it is fixed to a thrust-bearing plate which can bear on the surface of the disc which faces the seal in a one radially inside the ring of holes in order to withstand at least some of the axial load produced by the disc on the seal".

In point 6.3. of the interlocutory decision of the Board of Appeal, it is indicated that (1.) "there is no visible flanging of the shaft at the end of the arm" and that (2.) "the wheel 130 cannot be considered a plate, nor is it or any part of it including the prongs 132 seen to bear on the surface of the disc radially inside the ring of holes as claimed". However, with regard to these features the OD is requested to take the following into consideration:

(1) While the Board of Appeal did not identify a flange connection between the arm the wheel, there can be no question that the hexagonal wheel 130 itself also forms a flanging in the form of a nut-like hub flange, which in turn carries the radially extending prongs 132. The hexagonal wheel 130 is a flange within its usual meaning, i.e., a projecting flat rim, collar or rib, used to strengthen an object to guide it, to keep it in place, to facilitate is attachment to another object, or for other purposes. The fact that the flange in D10 is not part of the arm 124 (shaft in the words of the claim), but a separate element, is of no consequence, since claim 1 does not describe the flange as being integral with the shaft.

(2) The knockout assembly also provides a plate, because the wheel has the stepped portion which also forms a plate. The stepped portion is a flat annular section, which falls within the meaning of a plate, e.g., a

ring-shaped plate. As discussed above, the stepped portion abuts against the surface of the disc in a region surrounding the hole and, in particular, in a zone radially inside the ring of holes. The shaft (arm 124) is fixed to the plate (prong 132) by means of the flange (wheel 130).

2.4 In view of the above findings, the feature "a shaft (27) rotatably mounted by means of bearings in a seat of the movable portion" represents the only distinguishing feature between the subject matter of claim 1 and the disclosure of D10.

As shown in FIG. 13 of D10 reproduced above, the arm 124 (shaft in the words of the claim) is rotatably mounted by means of a pivot pin 126 in a seat (the two flanges extending from the base member 122) of the movable portion (base member 122 is fixed to the movable portion and thus constitutes part of the movable portion). Such a pin-connection certainly performs the function of a rotational bearing for the arm. However, D10 does not explicitly mention a "bearing" for this connection.

The technical effect of providing a bearing arrangement of a different type, for example a ball bearing arrangement, resides in reducing friction forces between two elements rotating relative to each other.

However, the skilled person was well aware of the fact that the bearing arrangement of claim 1 reduces the friction.

The subject matter claimed thus represents no more than an obvious modification of the teaching of D10. A skilled person could have easily replaced the pin connection

between the arm 124 (shaft) and the base 122 of D10 with a suitable ball bearing when faced with the objective technical problem to provide a low-friction rotational support for the arm 124.

In view of the above findings, the subject matter of claim 1 of AR7 lacks inventive step in view of D10.

The above conclusion also applies in view of the subject matter of claim 10, which in essence includes the features discussed above.

3. Lack of Inventive Step in View of Documents D1, D4 or D5

The subject matter of claim 1 of AR7 also lacks an inventive step in view of D1 as the closest prior art, or alternatively in view of D4 or D5

D1 discloses the features of the generic part of claim. D1 further discloses a thrust-bearing element (handle 58) and this is confirmed by point 3 of the interlocutory decision of the Board of Appeal. D1 also discloses that the thrust-bearing element (handle 58) includes a shaft (drive shaft 55) rotatably mounted by means of bearings (see FIG. 6: shaft is supported by bearings). According to D1, a flanging (rotating retaining hub 56) is fixed to a thrust-bearing plate (left surface of handle 58). The retaining hub is fixed to the handle when the device is assembled. The thrust-bearing plate (left surface of handle) can bear against the surface of the disc which faces the seal in a zone radially inside the ring of holes thereby bearing at least some of the axial load produced by the disc on the seal.

The subject matter of claim 1 therefore differs from D1 merely in that the thrust-bearing element (comprising the shaft, the flanging and the thrust-bearing plate) is mounted in the movable portion and not in the fixed portion.

The objective technical problem underlying the alleged invention in view of D1 resides in providing an alternative arrangement of the thrust-bearing element.

One of ordinary skill reading D1 would know that arranging the thrust-bearing element in the movable portion makes it easier to access and/or replace parts of the seed distribution element.

The arrangement of a disc supporting element in the movable portion is one of two alternatives for arranging a thrust-bearing element, which can either be arranged in the fixed or in the movable portion. Thus, when starting from D1, choosing the other alternative and mounting a rotatable thrust-bearing element in the movable portion cannot be considered to involve an inventive step.

The above conclusions could also have been derived using Document D4 or D5 as the closest prior art.

Again, the above conclusions also apply in view of the subject matter of claim 10 of AR7.

4. Conclusions:

The subject matter of claims 1 and 10 of AR7 lacks inventive step and revocation of the opposed patent in its entirety is therefore fully substantiated.

- *electronically signed*-

Martin D. Jacob
(Association No. 1)

Albrecht v. Menges
(Association No. 1)

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European Patent Office
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Acknowledgement of receipt

We hereby acknowledge receipt of the following submission by the opponent:

Submission number	10282742
Application number	EP11779702.7
Patent number	EP2637492
Date of receipt	12 October 2021
Your reference	E 98381
Opponent	Precision Planting LLC
Title	SEED DISTRIBUTION ELEMENT FOR PRECISION SEED DRILLS, SEED DRILL INCLUDING SAID ELEMENT
Documents submitted	package-data.xml ep-oppo.pdf (2 p.) ep-opposition-data.xml OREX3.pdf\E 98381 EPO 11.10.pdf (11 p.)
Submitted by	CN=Albrecht von Menges 23641
Method of submission	Online
Date and time receipt generated	12 October 2021, 12:06 (CEST)
Message Digest	BD:D6:68:83:6D:A4:FA:35:AE:7C:2F:2D:F9:D6:7E:86:2A:22:B0:30

/European Patent Office/

Europäisches Patentamt
European Patent Office
Office européen des brevets

Submission in opposition proceedings
made following summons to attend oral proceedings

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- representing the opponent(s):	Precision Planting LLC
Opponent/representative's reference	E 98381

The information given below is pertaining to the following patent in opposition proceedings:

Patent No.	EP2637492
Application No.	EP11779702.7
Date of mention of the grant in the European Patent Bulletin (Art. 97(3), Art. 99(1) EPC)	03 December 2014
Title of the invention	SEED DISTRIBUTION ELEMENT FOR PRECISION SEED DRILLS, SEED DRILL INCLUDING SAID ELEMENT
Proprietor of the patent	Maschio Gaspardo S.p.A.

Documents attached:

	Description of document	Original file name	Assigned file name
1	Reply to an examination report in opposition proceedings	E 98381 EPO 11.10.pdf	OREX3.pdf

Payment

1	Method of payment	Not specified
	Currency:	EUR

Signatures

Place:	**Hamburg**
Date:	**12 October 2021**
Signed by:	**Albrecht von Menges 23641**
Association:	**Uexküll & Stolberg Partnerschaft von Patent- und Rechtsanwälten mbB**
Representative name:	**Menges**
Capacity:	**(Representative)**

UEXKÜLL & STOLBERG

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DR. HANNA PIEPER+

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EUROPEAN TRADEMARK ATTORNEYS
DIPL.-ING. LARS MANKE
DR. ANATOL SPORK+

PARTNERSCHAFT VON PATENT- UND RECHTSANWÄLTEN mbB

Via Epoline

Europäisches Patentamt
80298 München

Patent No.: 2 637 492

Application No.: 11779702.7

Patentee: Maschio Gaspardo S.p.A.

Opponent: Precision Planting LLC

11. 10. 2021
E 98381 Me/MJ

The following observations are submitted in the name and on behalf of the Opponent, Precision Planting, in response to the preliminary opinion issued by the Opposition Division together with the summons to attend oral proceedings dated 28.01.2021:

1. Requests and Introduction

It is requested that European patent 2 637 492 be revoked in its entirety for all designated contracting states.

The undersigned expect to represent the Opponent in the hearing scheduled to take place on December 13, 2021 by videoconference. Opponent's representatives will use the English language in the hearing and request simultaneous translation into English in case the Patentee should intend to use a language other than English.

The present submission will show that contrary to the preliminary opinion of the Opposition Division (subsequently OD), the subject matter of claims 1 and 10 of Auxiliary Request 7 (subsequently AR7) lacks inventive step.

2. Lack of Inventive Step in View of D10

2.1 Document D10 represents the closest prior art on file:

In point 22 of the preliminary opinion the OD concluded that the subject matter of claims 1 and 10 of AR7 is inventive in view of the prior art, in including Document D10. In particular, the OD indicated that

> "*D10 does at least not disclose the following features of claims 1 and 10: the shaft of the thrust-bearing element is rotatably mounted by bearings and has a flanging by means of which it is fixed to a thrust-bearing plate which can bear on the surface of the disc which faces the seal in a one radially inside the ring of holes in order to withstand at least some of the axial load produced by the disc on the seal*".

These features are subsequently identified as the "allegedly distinguishing feature group".

As some of the elements of the allegedly distinguishing feature group are disclosed in D10, the OD is respectfully requested to reconsider the interpretation of D10 and as a consequence the assessment of inventive step.

As will be outlined in detail below (in point 2.2), D10 discloses the features of the generic part of claim 1 as well as a thrust-bearing element able to withstand at

least some of the axial load produced by the disc on the seal as recited in claim 1. Further, in point 2.3 the allegedly distinguishing feature group is discussed and in point 2.4 the conclusions for assessing inventive step will be explained.

2.2 D10 discloses a seed meter (seed distribution element) of the type of D1. With regard to the features of claim 1, D10 discloses:

- A sowing disc (seed disc 60; paragraph [0052]) which is rotated by a motor driven transmission shaft (drive shaft 55; paragraph [0046]) at controlled speed.

- A housing that consists of a first housing member 50 and a second housing member 90 (see Figure 8), wherein the first housing member 50 is a fixed housing portion and the second housing member 90 is a movable hosing portion which is movable relative to the fixed portion and can be closed against it by means of a pivot pin 92 (paragraph [0052]). The shaft 55 is supported rotatably in the fixed portion 50.

- A seed collection chamber that is defined in the fixed housing portion 50 (paragraph [0048]: "seeds are allowed to enter the first housing member 50").

- A pneumatic suction chamber that is defined in the movable housing portion 90 (paragraph [0058]: "creating a vacuum in the second chamber").

- The sowing disc (seed disc 60) is interposed between the two housing portions (50 and 90) and has opposed surfaces delimiting the chambers.

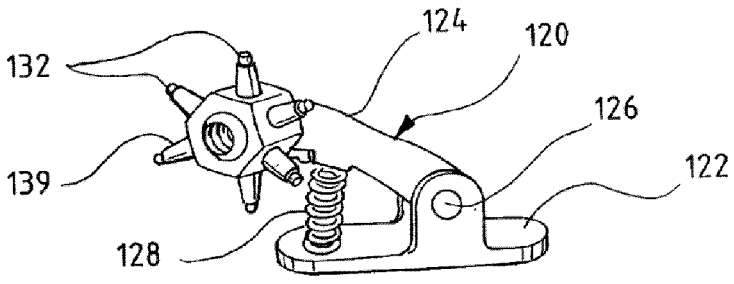
- The sowing disc (seed disc 60) has a ring of selector holes (transverse holes 67-67; paragraph [0047]) extending between the opposed surfaces.

- A sealing member 99 that is arranged on the movable housing portion (second housing member 90) and is capable of establishing sliding contact with the facing surface of the disc (seed disc 60) when the portions (50 and 90) are closed against one another (paragraph [0052]).

- A pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (paragraph [0058].

D10 further discloses a thrust-bearing element in the form of a knockout assembly 120. The knockout assembly 120 (see FIG. 13 of D10 reproduced below) is mounted on the movable portion.

FIG. 13



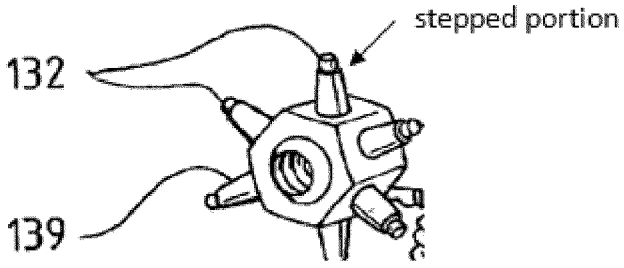
Knockout assembly 120 in Figure 13 of D10

The knockout assembly is configured "*to withstand at least some of the axial load produced by the disc on the seal*". This is the consequence of the following structural features:

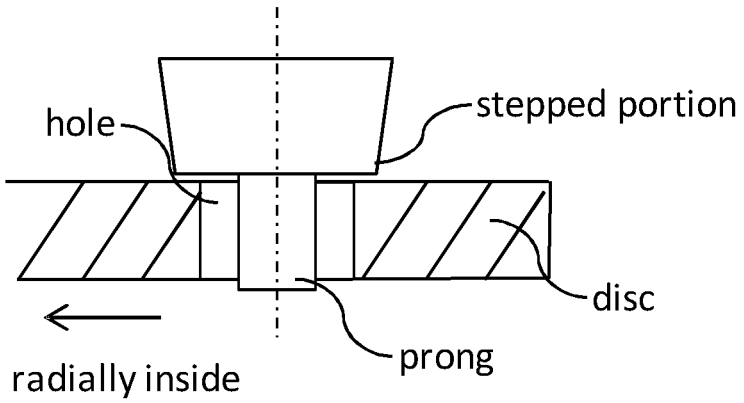
- Paragraphs [0054] and [0055] of D10 disclose that the knockout assembly 120 generally has a planar base member 122 for attachment to the rear surface portion 110 of the movable housing portion.

- The assembly 120 further includes an arm 124 pivotally attached by a pin 126 to the base member 122 and a spring 128 for urging the arm 124 away from the base member 122, i.e., spring 128 exerts a preload force on the arm 124 and presses the arm towards the disc.

- To the distal end of arm 124 is attached a rotatable wheel 130 having a plurality of equally spaced radially extending prongs 132. The prongs 132 of the knockout assembly 120 are angularly spaced on the wheel 130 such that one prong 132 will extend into each of the holes 67-67 of the seed disk 60 as the disk 60 rotates around the hub 56 (see extract of FIG. 13 below).



Each time a prong 132 dips into a hole of the seed disk, a stepped portion of the prong 132 abuts the edge of the hole. This is illustrated in the drawing below.



As shown above, the stepped portion of the prong bears against the surface of the disc in a region surrounding the hole and, in particular, in a zone radially inside the ring of holes.

The spring biases the arm against the disc to ensure that the prongs enter the holes and push the seeds out of the holes. The thrust-bearing element thus exerts an axial force against the disc via the stepped portion.

Since the strength of the axial force is not defined in claim 1 and the axial force acts against the negative pressure forces, the thrust-bearing element (knockout assembly) is able to withstand at least some of the axial load produced by the disc on the seal.

As the above explanations show, D10 discloses "a thrust-bearing element supported rotatably in the movable portion in order to withstand at least some of the axial load produced by the disc on the seal".

2.3 D10 further discloses aspects of the allegedly distinguishing feature group as identified above, i.e., the feature group "*the shaft of the thrust-bearing element is rotatably mounted by bearings and has a flanging by*

means of which it is fixed to a thrust-bearing plate which can bear on the surface of the disc which faces the seal in a one radially inside the ring of holes in order to withstand at least some of the axial load produced by the disc on the seal".

In point 6.3. of the interlocutory decision of the Board of Appeal, it is indicated that (1.) "there is no visible flanging of the shaft at the end of the arm" and that (2.) "the wheel 130 cannot be considered a plate, nor is it or any part of it including the prongs 132 seen to bear on the surface of the disc radially inside the ring of holes as claimed". However, with regard to these features the OD is requested to take the following into consideration:

(1) While the Board of Appeal did not identify a flange connection between the arm the wheel, there can be no question that the hexagonal wheel 130 itself also forms a flanging in the form of a nut-like hub flange, which in turn carries the radially extending prongs 132. The hexagonal wheel 130 is a flange within its usual meaning, i.e., a projecting flat rim, collar or rib, used to strengthen an object to guide it, to keep it in place, to facilitate is attachment to another object, or for other purposes. The fact that the flange in D10 is not part of the arm 124 (shaft in the words of the claim), but a separate element, is of no consequence, since claim 1 does not describe the flange as being integral with the shaft.

(2) The knockout assembly also provides a plate, because the wheel has the stepped portion which also forms a plate. The stepped portion is a flat annular section, which falls within the meaning of a plate, e.g., a

ring-shaped plate. As discussed above, the stepped portion abuts against the surface of the disc in a region surrounding the hole and, in particular, in a zone radially inside the ring of holes. The shaft (arm 124) is fixed to the plate (prong 132) by means of the flange (wheel 130).

2.4 In view of the above findings, the feature "a shaft (27) rotatably mounted by means of bearings in a seat of the movable portion" represents the only distinguishing feature between the subject matter of claim 1 and the disclosure of D10.

As shown in FIG. 13 of D10 reproduced above, the arm 124 (shaft in the words of the claim) is rotatably mounted by means of a pivot pin 126 in a seat (the two flanges extending from the base member 122) of the movable portion (base member 122 is fixed to the movable portion and thus constitutes part of the movable portion). Such a pin-connection certainly performs the function of a rotational bearing for the arm. However, D10 does not explicitly mention a "bearing" for this connection.

The technical effect of providing a bearing arrangement of a different type, for example a ball bearing arrangement, resides in reducing friction forces between two elements rotating relative to each other.

However, the skilled person was well aware of the fact that the bearing arrangement of claim 1 reduces the friction.

The subject matter claimed thus represents no more than an obvious modification of the teaching of D10. A skilled person could have easily replaced the pin connection

between the arm 124 (shaft) and the base 122 of D10 with a suitable ball bearing when faced with the objective technical problem to provide a low-friction rotational support for the arm 124.

In view of the above findings, the subject matter of claim 1 of AR7 lacks inventive step in view of D10.

The above conclusion also applies in view of the subject matter of claim 10, which in essence includes the features discussed above.

3. Lack of Inventive Step in View of Documents D1, D4 or D5

The subject matter of claim 1 of AR7 also lacks an inventive step in view of D1 as the closest prior art, or alternatively in view of D4 or D5

D1 discloses the features of the generic part of claim. D1 further discloses a thrust-bearing element (handle 58) and this is confirmed by point 3 of the interlocutory decision of the Board of Appeal. D1 also discloses that the thrust-bearing element (handle 58) includes a shaft (drive shaft 55) rotatably mounted by means of bearings (see FIG. 6: shaft is supported by bearings). According to D1, a flanging (rotating retaining hub 56) is fixed to a thrust-bearing plate (left surface of handle 58). The retaining hub is fixed to the handle when the device is assembled. The thrust-bearing plate (left surface of handle) can bear against the surface of the disc which faces the seal in a zone radially inside the ring of holes thereby bearing at least some of the axial load produced by the disc on the seal.

The subject matter of claim 1 therefore differs from D1 merely in that the thrust-bearing element (comprising the shaft, the flanging and the thrust-bearing plate) is mounted in the movable portion and not in the fixed portion.

The objective technical problem underlying the alleged invention in view of D1 resides in providing an alternative arrangement of the thrust-bearing element.

One of ordinary skill reading D1 would know that arranging the thrust-bearing element in the movable portion makes it easier to access and/or replace parts of the seed distribution element.

The arrangement of a disc supporting element in the movable portion is one of two alternatives for arranging a thrust-bearing element, which can either be arranged in the fixed or in the movable portion. Thus, when starting from D1, choosing the other alternative and mounting a rotatable thrust-bearing element in the movable portion cannot be considered to involve an inventive step.

The above conclusions could also have been derived using Document D4 or D5 as the closest prior art.

Again, the above conclusions also apply in view of the subject matter of claim 10 of AR7.

4. Conclusions:

The subject matter of claims 1 and 10 of AR7 lacks inventive step and revocation of the opposed patent in its entirety is therefore fully substantiated.

- *electronically signed*-

Martin D. Jacob
(Association No. 1)

Albrecht v. Menges
(Association No. 1)

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Formalities officer
Vilz, Brigitte

Date
06.10.2021

Reference	Application No./Patent No.
PBP11900-EP	11779702.7 - 1004 / 2637492
Applicant/Proprietor	
Maschio Gaspardo S.p.A.	

BRIEF COMMUNICATION

Oral Proceedings on 13.12.21

Subject:
- ☐ Letter from the proprietor of the patent of
- ☐ Letter from the opponent of

Communication:
- ☐ The summons to attend oral proceedings / taking of evidence on 13.12.21 has been cancelled.
- ☐ The procedure will be continued in writing.
- ☐ The date fixed for oral proceedings is maintained.
- ☐ A new date will be set later.
- ☒ The oral proceedings will be held as a video conference.
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Date: 06.10.2021

Reference		Application No./Patent No.
E 98381	OPPO 01	11779702.7 - 1004 / 2637492
Applicant/Proprietor: Maschio Gaspardo S.p.A.		

BRIEF COMMUNICATION

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- ☐ Letter from the proprietor of the patent of
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Submission number	9455528	
Application number	EP11779702.7	
Date of receipt	01 February 2021	
Receiving Office	European Patent Office, The Hague	
Your reference	E 98381	
Applicant	All applicants as on file	
Documents submitted	package-data.xml epf1038.pdf (1 p.)	ep-sfd-request.xml ADVOFDELIVRY-1.pdf\20210201105822677.pdf (1 p.)
Submitted by	CN=Albrecht von Menges 23641	
Method of submission	Online	
Date and time receipt generated	01 February 2021, 12:17 (CET)	
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28.01.2021

Date 28.01.2021

Reference	OPPO 01	Application No./Patent No.
E 98381		11779702.7 - 1004 / 2637492

Applicant/Proprietor
Maschio Gaspardo S.p.A.

2310

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The document(s) listed below is (are) subsequently filed documents pertaining to the following application:

Application number	11779702.7
Applicant's or representative's reference	E 98381

	Description of document	Original file name	Assigned file name
1	Acknowledgement	20210201105822677.pdf	ADVOFDELIVRY-1.pdf

	Payment	
1	Method of payment	Not specified

Signatures

Place:	**Hamburg**
Date:	**01 February 2021**
Signed by:	**Albrecht von Menges 23641**
Association:	**Uexküll & Stolberg Partnerschaft von Patent- und Rechtsanwälten mbB**
Representative name:	**Menges**
Capacity:	**(Representative)**

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Date
28.01.2021

Reference	Application No./Patent No.
PBP11900-EP	11779702.7 - 1004 / 2637492
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Maschio Gaspardo S.p.A.	

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Received at the EPO on Jan 29, 2021 11:36:55. Page 1 of 1
Duration: 01.29.2021 11:36:22 AM - 01.29.2021 11:36:55 AM. This page 1 of 1 was completed at 01.29.2021 11:36:55 AM.

Precision Exhibit 1005

1 Proprietor of the patent under dispute, EP 2 637 492, is

Maschio Gaspardo S.p.A.
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Italy,

hereinafter referred to as "the proprietor".

2 Notice of opposition has been filed by

Precision Planting LLC
23207 Townline Road
Tremont, IL 61568
United States of America,

hereinafter referred to as "the opponent".

3 In the notice of opposition, received on 02-09-2015, the opponent requested the revocation of the patent in its entirety based on Art.100(a) EPC, lack of novelty (Art. 52(1) and Art. 54 EPC) and lack of inventive step (Art. 52(1) and Art. 56 EPC), and based on 100(c) EPC).

4 The following evidence has been submitted within the opposition period:

D1: USB1-7 228 807
D2: EP-A1-0 536 543
D3: EP-A1-2 848 109
D4: US-A1-4 664 290
D5: EP-A1-140 699;
D6: Betriebsanleitung Einzelkornsämaschine
ED 302, ED452, ED 452-K ,ED602-K, ED 902-K, Amazonen-Werke
D7: DE-T2-689 16 976
D8: WO-A1-96/02123
D9: Translation of the Italian priority document

5 In the reply to the notice of opposition, received on 22-04-2016, the proprietor requested the rejection of the opposition (Article 101(2) EPC).

6 With letter of 15-07-2016, the opponent filed further arguments.

7 On 21-12-2016, the opposition division issued a summons to attend oral proceedings on 24-10-2017.

8 With letter of 24-08-2017, the proprietor filed three auxiliary requests.

9 On 24-10-2017, oral proceedings were held. During these proceedings the proprietor filed a new auxiliary request 2 replacing auxiliary request 2 filed with letter of 24-08-2016 and withdrew auxiliary request 3.

10 At the end of the oral proceedings, held on 24-10-2017, the opposition division decided to revoke the patent (Art. 101(2) and 101 (3)(b) EPC). The ground according to Art. 100(c) EPC was found to prejudice the maintenance of the patent (main request). Auxiliary request 1 was considered as not meeting the requirements of Art. 52(1) and Art. 54(1),(2) EPC and auxiliary request 2 as contravening Article 123(2) EPC.

11 The decision of the opposition division to revoke the patent was issued on 17-11-2017.

12 Notice of appeal was filed by the proprietor and received on 26-01-2018 (Art. 108 EPC).

13 The statement of grounds of appeal was received on 27-03-2018. The proprietor requested to set aside the decision of the opposition division and to maintain the patent as granted (main request). With the statement of grounds of appeal, the proprietor filed new auxiliary requests 1 to 11.

14 The opponent's reply to the appeal was received on 14-08-2018. The opponent requested to dismiss the appeal.

15 With the reply to the appeal, the opponent submitted the following evidence:

D10: US 2003/0183647 A1
D11: US 2002/0043201 A1
D12: ES 2 013 539 and English language machine translation

16 The Board of Appeal issued a summons on 17-12-2019 to attend oral proceedings on 23-07-2020.

17 On 23-07-2020, oral proceedings were held before the Board of Appeal.

During the proceedings, the proprietor withdrew the main request as well as auxiliary requests 1-3 and 5 of 27-03-2018. Auxiliary request 4 of 27-03-2018 became the new main request followed by auxiliary requests 6 and 7 of 27-03-2018.

The Board of Appeal took the view that the new main request lacks novelty over D1.

The Board of Appeal decided to admit auxiliary requests 6 and 7 as well as document D10 into the proceedings.

The Board of Appeal took the view that claim 1 of auxiliary request 6 contained added subject-matter.

The claims of auxiliary request 7 were considered to comply with the requirements of both Art. 52(1) and 54 EPC as well as Art. 123 (2) EPC.

18 The Board of Appeal set aside the decision under appeal and remitted the case to the opposition division for further prosecution.

19 Oral proceedings will be held before the opposition division (Art. 116(1) EPC).

PRELIMINARY AND NON-BINDING OPINION OF THE OPPOSITION DIVISION

20 The opposition division is of the following preliminary and non-binding opinion, which may change in the course of the proceedings.

21 As it stands, the proprietor requests maintenance of the patent in amended form (Art. 100(3)(a) EPC), wherein its main request corresponds to auxiliary request 4 of 27-03-2018. As an auxiliary measure, maintenance of the patent in amended form is requested based on auxiliary requests 6 and 7 of 27-03-2018. As agreed during the appeal proceedings, the previous numbering is kept.

The opposition division is bound by the Board's ratio decidendi in relation to these requests (Art. 111(2) EPC).

The first instance proceedings will therefore focus on the question of inventive step (Art. 52(1) and 56 EPC) in relation to auxiliary request 7.

22 **Inventive step (Art. 52(1) and 56 EPC) - auxiliary request 7**

22.1 The opposition division is of the preliminary and non-binding opinion that the subject-matter of claims 1 and 10 of auxiliary request 7 involves an inventive step.

D10 can be considered as the closest prior art in relation to claims 1 and 10 of auxiliary request 7, because it is from the same technical field (pneumatic seed drills) and is structurally close (only document used to challenge novelty concerning auxiliary request 7).

By reference to points 6.3 and 7 of the Decision of the Board of Appeal, D10 does at least not disclose the following features of claims 1 and 10:
the shaft of the thrust-bearing element is rotatably mounted by bearings and has flanging by means of which it is fixed to a thrust-bearing plate which can bear on the surface of the disc which faces the seal in a zone radially inside the ring of holes in order to withstand at least some of the axial load produced by the disc on the seal.

The description of the patent under dispute appears to be silent about a technical effect related to these features, which goes beyond the provision of an alternative thrust-bearing solution. The objective technical problem may be formulated as how to provide an alternative solution to reduce wear on the seal.

The solution as defined by claims 1 and 10 appears to involve an inventive step. It seems that none of the documents in the procedure discloses the above-identified distinguishing features.

22.2 In the reply to the appeal (section 6.2 in view of section 3.2), the opponent provides arguments as to why auxiliary request 7 does not meet the requirements of Art. 52(1) and 56 EPC. The opponent uses D7 as the closest

prior art in combination with D10. This line of argumentation is based on the assumption that D10 discloses the specific features in relation to the thrust-bearing element as identified above under point 22.1.

22.3 It seems that these arguments are not convincing, because the Board of Appeal took the view that D10 does not disclose these features.

23 During the oral proceedings, the above-mentioned point will be discussed as well as further points in relation to the EPC if necessary in the course of the procedure.

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Locas, Davide
Cantaluppi & Partners S.r.l.
Piazzetta Cappellato Pedrocchi, 18
35122 Padova
ITALIE

Date
28.01.2021

Reference	Application No./Patent No.
PBP11900-EP	11779702.7 - 1004 / 2637492
Applicant/Proprietor	
Maschio Gaspardo S.p.A.	

Summons to attend oral proceedings pursuant to Rule 115(1) EPC

You are hereby summoned to attend oral proceedings arranged in connection with the above-mentioned European patent.

The matters to be discussed are set out in the communication accompanying this summons (EPO Form 2906).

The oral proceedings, which will be public, will take place before the opposition division

on 13.12.21 at 09.00 hrs *

No changes to the date of the oral proceedings can be made, except on serious grounds (see OJ EPO 1/2009, 68). If you do not appear as summoned, the oral proceedings may continue without you (R. 115(2) EPC).

Your attention is drawn to Rule 4 EPC, regarding the language of the oral proceedings, and to the Special edition No. 3 OJ EPO 2007, 128, concerning the filing of authorisations for company employees and lawyers acting as representatives before the EPO.

The final date for making written submissions and/or amendments (R. 116 EPC) is 13.10.21.

You are requested to report in good time beforehand to the porter in the EPO foyer. Room 3473 and 3474 are available as waiting rooms.

*The parties will be informed on the form of oral proceedings nearer to the scheduled date.

1st Examiner:
Holtermann, Timm

2nd Examiner:
Leblanc, Romain

Chairman:
Schlichting, Natasch

For the Opposition Division

Annexes:
Confirmation of receipt (Form 2936)
Rule 4 EPC (EPC Form 2043)
Communication (EPO Form 2906)

Registered letter

to EPO postal service: 25.01.21

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ALLEMAGNE

Date: 28.01.2021

Reference	Application No./Patent No.
E 98381 OPPO 01	11779702.7 - 1004 / 2637492

Applicant/Proprietor: Maschio Gaspardo S.p.A.

Summons to attend oral proceedings pursuant to Rule 115(1) EPC

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The matters to be discussed are set out in the communication accompanying this summons (EPO Form 2906).

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Boards of Appeal

The Registry

Name: G. Magoullotis

Tel.: 089 / 2399 - 3241

Date: 11.11.20

Zeichen/Reference/Référence		
PBP11900-EP		/ APPR
Anmeldung Nr./Application No./Demande n°//Patent Nr./Patent No./Brevet n°	11779702.7	/ 2637492
Anmelder/Applicant/Demandeur//Patentinhaber/Proprietor/Titulaire		
Maschio Gaspardo S.p.A.		

Appeal number: T0305/18-3.2.04

EPA/EPO/OEB Formblatt/Form/Formulaire: 3032

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Page 221 of 1596
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Anmelder/Applicant/Demandeur//Patentinhaber/Proprietor/Titulaire		
Maschio Gaspardo S.p.A.		

Appeal number: T0305/18-3.2.04

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Name: G. Magouliotis

Tel.: 089 / 2399 - 3241

Date: 11.11.20

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Anmelder/Applicant/Demandeur//Patentinhaber/Proprietor/Titulaire	
Maschio Gaspardo S.p.A.	

Appeal number: T0305/18-3.2.04

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Datasheet for the decision of 23 July 2020

Case Number: T 0305/18 - 3.2.04

Application Number: 11779702.7

Publication Number: 2637492

IPC: A01C7/04

Language of the proceedings: EN

Title of invention:
SEED DISTRIBUTION ELEMENT FOR PRECISION SEED DRILLS, SEED DRILL INCLUDING SAID ELEMENT

Patent Proprietor:
Maschio Gaspardo S.p.A.

Opponent:
Precision Planting LLC

Headword:

Relevant legal provisions:
EPC Art. 54(2), 123(2)
RPBA Art. 12(4)

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Keyword:
Novelty
Amendments
Late-filed evidence - admitted (yes)
Late-filed auxiliary requests

Decisions cited:

Catchword:

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Case Number: T 0305/18 - 3.2.04

D E C I S I O N
of Technical Board of Appeal 3.2.04
of 23 July 2020

Appellant: (Patent Proprietor)	Maschio Gaspardo S.p.A. Via Marcello 73 35011 Campodarsego (PD) (IT)
Representative:	Locas, Davide Cantaluppi & Partners S.r.l. Piazzetta Cappellato Pedrocchi, 18 35122 Padova (IT)
Respondent: (Opponent)	Precision Planting LLC 23207 Townline Road Tremont, IL 61568 (US)
Representative:	Uexküll & Stolberg Partnerschaft von Patent- und Rechtsanwälten mbB Beselerstraße 4 22607 Hamburg (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 17 November 2017 revoking European patent No. 2637492 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman	A. de Vries
Members:	G. Martin Gonzalez
	N. Obrovski

Summary of Facts and Submissions

I. The patent proprietor lodged an appeal, received on 26 January 2018, against the decision of the Opposition Division posted on 17 November 2017 revoking European patent No. 2637492 pursuant to Article 101(3)(b) EPC, and simultaneously paid the appeal fee. The statement setting out the grounds of appeal was received on 27 March 2018.

II. Opposition was filed under the ground of Article 100(a) EPC for lack of novelty and for lack of inventive step and under the ground of Article 100(c) EPC for added subject-matter.

The opposition division revoked the patent having regard inter alia to the following documents:

(D1) US 7,228,807 B1
(D7) DE 689 16 976 T2

III. The respondent-opponent filed the following further evidence with their reply to the appeal of 14 August 2018.

(D10) US 2003/0183647 A1

IV. The appellant-proprietor requests that the decision be set aside and the patent maintained according to one of auxiliary requests 4,6-11, all filed with the statement of grounds of appeal of 27 March 2018. During the oral proceedings the appellant-proprietor withdrew its main request and auxiliary requests 1-3 and 5.

The respondent-opponent requests dismissal of the appeal. Should any of the appellant's requests be considered allowable with regard to added subject-matter and novelty, they further request that the case be remitted to the opposition division for further prosecution.

V. In preparation for oral proceedings the board issued a communication setting out its provisional opinion on the relevant issues.

Oral proceedings were held on 23 July 2020.

VI. The independent claims according to the relevant requests read as follows:

(a) Auxiliary request 4

"1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
- a seed collection chamber (15) being defined in the fixed portion (11),
- a pneumatic suction chamber (17) being defined in the movable portion (12),
- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),
- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another, wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24)."

"10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
- a seed collection chamber (15) being defined in the fixed portion (11),
- a pneumatic suction chamber (17) being defined in the movable portion (12),
- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),
- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another, wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the kit comprises:

- the movable portion (12) pre-assembled with:
- a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24)."

(b) Sixth auxiliary request

Claims 1 and 10 as in the fourth auxiliary request amended to add the following features at the end of both claims 1 and 10:

"..., wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12)."

(c) Seventh auxiliary request

Claims 1 and 10 as in the sixth auxiliary request amended to add the following features at the end of both claims 1 and 10:

"..., the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the

seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24)."

VII. The appellant-proprietor argued as follows:

Claims 1 and 10 of auxiliary request 4 lack novelty over D1. Auxiliary requests 6 and 7 are not admissible. The amendments of auxiliary requests 6 and 7 introduce subject-matter beyond the contents of the application as filed. New document D10 is admissible and justified as a legitimate reaction to the development of the proceedings. Claims 1 and 10 of auxiliary request 7 are not new over D10. In case of any request found by the board to be supported by the application as filed and also to be new over the cited prior art, the case should be remitted for examination of the opposition ground of inventive step raised but not dealt with in the decision under appeal.

VIII. The respondent-opponent argued as follows:

The subject-matter of Claims 1 and 10 of all requests is new over the cited prior art. Auxiliary requests 6 and 7 are a legitimate response to the findings of the opposition division and are admissible. Claims 1 and 10 of auxiliary requests 6 and 7 do not contain added subject-matter. New document D10 should not be admitted into the proceedings.

Reasons for the Decision

1. The appeal is admissible.

2. Background

The invention is directed to a seed distribution element for pneumatic seed drills, see patent specification paragraph [0001]. Pneumatic seed drills use an air pressure differential between the opposed faces of a rotating sowing disc (or selector), the disc having a ring of through holes of smaller section than the size of a seed. As a result of the pressure differential between the opposed faces of the disc, a seed adheres to each hole and is then transported by the rotation of the sowing disc from the seed selection zone to the point at which the pressure differential ceases and the seed is released to drop through a sowing pipe into the furrow or sowing track. Thus, in use, on one of the faces of the disc a strong air suction is exerted, see paragraph [0003]. The disc effects a substantial compression force against the seal that delimits the suction chamber while it slides on it, see paragraph [0004]. According to the claimed invention, in order to avoid severe abrasion of the seal, a thrust-bearing element is included to withstand some of the axial load produced by the disc, see paragraphs [0004], [0010] and claim 1.

3. Auxiliary request 4 - Novelty.

3.1 The appellant-opponent contests the conclusions of the opposition division that claim 1 lacks novelty over document D1, see section II.3.4. of the impugned decision.

3.2 The interpretation of the claimed feature "thrust-bearing element" is in dispute. In the field of mechanical engineering the term "thrust bearing" (without hyphen) has a usual and recognized meaning. For example, Wikipedia under the entry "thrust bearing" cited by the appellant gives the definition that it is "a particular type of rotary bearing. Like other bearings they permanently rotate between parts, but they are designed to support a predominantly axial load", and gives examples (thrust ball bearing, roller thrust bearing, Mitchell type thrust bearing). The Collins online dictionary (www.collinsdictionary.com/dictionary/) also cited gives as definition: "a low-friction bearing on a rotating shaft that resists axial thrust in the shaft", citing as a common example "a collar which bears against a ring of well-lubricated stationary and sometimes tilting pads". Similar definitions can be found elsewhere, as for instance in the online "engineering dictionary" (http://www.engineering-dictionary.org/Thrust bearing), cited by the appellant-proprietor.

However, in the contested claim 1, the hyphenation and unusual combination with the term "element" and the indication that the element prevents axial movement of a disc instead of that of a shaft renders the combined term ambiguous. Thus it is unclear to the skilled person reading the claim from the combined term alone whether the expression is used in its normal (engineering) sense or is meant to convey a different or wider meaning.

To the extent that on first reading of the claim alone they might not fully understand the technical significance of the term "thrust-bearing element" the

skilled reader, with their mind willing to understand, would therefore consult the rest of the patent, its description, figures and other claims in order to resolve any ambiguity. There, the thrust-bearing element is described in detail in paragraphs [0019] to [0023] in reference to figures 1 and 2, as element 26 comprising shaft 27 rotatably mounted by bearings 28 in a seat 29 and with a flange 30 fixed to a "thrust-bearing plate" 31 which bears on the surface of the disc. This element is driven in rotation with the sowing disc 16. The central part of the arrangement is the "thrust-bearing plate" 31 (named so). Plate 31 is, however, not a bearing in the conventional sense, as it is not in sliding or rolling contact with any component - as bearings should be - but rotates with both the shaft 27 and the disc 16, between which it is located. Rather, it bears against the disc 16 and is therefore meant to absorb any thrust produced by the disc on the seal. Neither plate 31 alone nor element 26 including the plate corresponds to what the skilled person would recognize as a classical thrust bearing, cf. the figures of the Wikipedia entry.

Consequently, by drawing on the description and drawings to gain a better understanding of the subject-matter of the claims, the skilled person realizes that the term "thrust-bearing" is used not to define a thrust bearing in the usual sense. Rather, they will conclude that it is used in the contested patent in a general sense to define the function of bearing or providing support against an axial force. Thus, contrary to the submissions of the appellant-proprietor, the claimed feature "thrust-bearing element", in the context of the patent, should not be given the restricted interpretation of the appellant-proprietor of rotary bearings in the form of ball

bearings or similar, but the wider interpretation of an element having a function to provide support against an axial load.

The claim further requires that the thrust-bearing element withstands at least some of the axial load produced by the disc on the seal. This load is produced by the vacuum on the side of the disc where the seal is provided. The vacuum causes the disc to move axially against the seal, thereby producing the load. Thus, any element that restrains the axial movement of the disc when vacuum is applied, as does the thrust-bearing element of the described embodiment, meets the claimed limitation.

3.3 The meaning of the expression "is supported rotatably in the movable portion" in claims 1 and 10 is also in dispute. In the board's understanding the expression only requires that the thrust-bearing element is located within the movable portion, though not necessarily supported by it, as also held by the opposition division. The skilled person has no reason to disregard this interpretation since it is a logical and credible reading of this feature that also makes technical sense and is not in contradiction to the rest of the patent. Indeed, according to the claim, the movable portion of the housing defines a suction chamber. Therefore, a thrust-bearing element located in the suction chamber and thus at the suction side of the rotating disk, is properly located to bear forces caused by that suction, however the element may be supported.

3.4 Turning to D1, this document discloses an element (handle 58) for retaining the seed disk 60 on hub 56, see column 5, lines 63-67 and figure 6. In column 6,

lines 8-15 it is further disclosed how the axial position of the seed disk 60 can be adjusted with respect to the rear wall 54 of the fixed portion 50:

> "...the retaining hub 56 can be rotated with respect to the inner shaft to thereby axially move the retaining hub 56 with respect to the rear wall 54 of the first housing member 50. Rotating the retaining hub 56 clockwise with respect to the drive shaft moves a seed disk 60 retained thereon toward the rear wall 54 and rotating the retaining hub 56 counterclockwise moves a seed disk 60 thereon away 15 from the rear wall 54 of the first housing member 50."

Subsequently it is indicated that the achieved axial relative position or axial adjustment between seed disk and rear fixed wall is locked in use:

> "Adjusting the retaining hub 56 causes the axial adjustment of the seed disk 60, after which the parts are locked into their desired orientation by locking pin 59."

In other words, axial free movement between disk 60 and housing rear wall 54 is constrained in use, when vacuum is applied. The handle 58, located in the movable portion of the housing, retains the seed disk 60 on the hub 56 (see column 5, lines 63-67) and is therefore the element constraining the disk against axial movement towards the seal. It therefore partly withstands the axial load produced on the seal, as claimed. The handle 58 is rotatably supported by the shaft 55 and is in use located in the movable portion, see figure 6 and column 6, lines 1-18.

The board thus considers that the opposition division was right to conclude that the handle 58 of D1 anticipates the claimed thrust-bearing element.

3.5 It is otherwise not in dispute that D1 also describes the other features of claim 1, namely a pneumatic seed distribution element 36 with a housing made of a fixed portion 50 and a movable portion 90, also including a sowing disc 60 with holes, the provision of a pressure differential and a seal 99, as claimed, as has been identified by the opposition division in section II. 3.4. of the impugned decision.

3.6 The board thus concludes that the subject-matter of claims 1 is not new over D1.

4. Auxiliary requests 6,7 and document D10 - Admissibility.

4.1 Auxiliary requests 6 and 7, filed with the statement of grounds, attempt to overcome the added subject-matter objection underlying the decision of the opposition division for the then auxiliary request 2 (corresponding to auxiliary request 5 also filed with the grounds but withdrawn at the oral proceedings before the Board), see written decision section 4, raised during the oral proceedings. They do so by specifying that the element is mounted *on* the movable portion as well as including detail (shaft, bearings, seat and additionally - for auxiliary request 7 - flanging, plate) of the specific mounting arrangement in the close (functional and structural) context in which the former feature is disclosed, as discussed in the impugned decision. The requests also add features further defining the location of the pressure differential, which the respondent argues are missing

from that specific context (see their reply to the appeal, page 20, point (2) at the top). Thus, these amendments can be considered as a normal reaction of a losing party to the impugned decision, as well as pre-emptively addressing issues then raised by the respondent. They do so in an foreseeable manner and at the earliest possible stage of the appeal proceedings so that the respondent has been able to respond and indeed has done so (see section 6 of their reply). It can therefore not be said that it represents a fresh case.

Finally, from the discussion of the novelty and added subject-matter issues for (now withdrawn) auxiliary request 1 in the statement of grounds, pages 7,8, relating to features also present in auxiliary requests 6 and 7 and their basis in the original disclosure, it is immediately evident to the reader why the appellant considers that these requests overcome the novelty and added subject-matter issues in the impugned decision. The statement of grounds therefore also complies with the requirement under Article 12(2) RPBA 2007 of sufficient substantiation for these auxiliary requests.

For the above reasons the Board decided to admit auxiliary requests 6 and 7 into the proceedings, using its discretion under Article 12(4) RPBA 2007.

4.2 Similarly, the filing of the new document D10 by the respondent-opponent with the reply to the appeal (and thus after the expiry of the opposition period) can also be considered as a fair and legitimate reaction to the filing of the above requests, which introduce further, unsearched features from the description. D10 is indeed the sole citation against these new features.

The Board thus also decided to admit D10 under Article 12(4) RPBA 2007

5. Auxiliary requests 6,7 - Added subject-matter.

5.1 The respondent-opponent submits that both requests contain added subject-matter in the form of an unallowable intermediate generalization.

5.2 According to established case law, it will normally not be allowable to base an amended claim on the extraction of isolated features from a set of features originally disclosed only in combination, e.g. a specific embodiment in the description. Such an intermediate generalisation is justified only in the absence of any clearly recognisable functional or structural relationship among the features of the specific combination or if the extracted features is not inextricably linked with those features, see Case Law of the Boards of Appeal, 9th edition 2019 (CLBA), II.E. 1.9. Intermediate generalisations.

5.3 Vis-à-vis auxiliary request 4, claim 1 of auxiliary request 6 has been amended to specify that the thrust-bearing element is rotatably supported on the movable portion, the thrust-bearing element comprising a shaft rotatably mounted by means of bearings in a seat of the movable portion. Textual basis for the amendment can be found on page 5, lines 22-25.

These features have only been described in combination with the shaft having flanging by means of which it is fixed to a thrust-bearing plate which can bear on the surface of the disc which faces the seal in a zone radially inside the ring of holes in order to withstand at least some of the axial load produced by the disc on

the seal, to build the thrust-bearing element structure and are therefore inextricably linked. Moreover, the complete set of features also have a clear and recognisable functional relationship since the essential thrust-bearing function of the element is only described to be provided by the whole set in combination. The inclusion of only part of these features in claim 1 of auxiliary request 6 represents therefore an unallowable intermediate generalisation.

Claim 1 is thus deficient under Article 123(2) EPC.

5.4 Claim 1 of the seventh auxiliary request overcomes the above added subject-matter objection by adding the cited missing features, for which textual basis can be found on page 5, line 25 to page 6, line 4.

The respondent-opponent further objects to the omission of the drive element 32, as also being an unallowable intermediate generalisation, since it is part of the thrust-bearing element and provides it with a rotary driven connection to the shaft 20.

The board notes that the original description further discloses on page 7, lines 2-3 for that embodiment of the thrust-bearing element that: "Provision is also made for the thrust-bearing element 26 to be made idle and not driven in rotation by the shaft 20." In the board's understanding this represents a direct and unambiguous disclosure that the drive element need not be present. In the absence of an inextricable link with the drive element, the omission of the latter does not represent an unallowable intermediate generalization.

The board is thus satisfied that claim 1 of the seventh auxiliary request complies with Article 123(2) EPC.

6. Auxiliary requests 7 - Novelty.

6.1 The respondent-opponent only contests the novelty of the claimed subject-matter in the light of D10. No other prior art is cited with regard to novelty.

6.2 New document D10 describes a seed distribution element of the type of D1. Relevant to the present auxiliary request is the detailed disclosure of the knockout assembly 120 supported on the movable portion 110, see figs 5, 13, 14 and paragraph [0055] of D10. The knockout assembly 120 includes an arm 124 pivotally attached to the movable portion and urged by a spring 128 against the seed disk 60. At the distal end of the arm 124 is a rotatable wheel 130 with a plurality of prongs 132. One prong 132 will extend into each of the passing holes 67 of the seed disk 60 for pushing out seeds that may become wedged in the holes 67 at the seed release area.

The respondent-opponent reads the specific claimed features of the thrust-bearing element in the known knockout assembly 120 of D10.

6.3 These elements are, however, not only functionally but also structurally different elements.

Irrespective of whether the known arm 124 can be considered a shaft in the broad sense of the term, the board does not identify at least the following claimed features in the known knockout element: that the shaft is rotatably mounted by bearings and has flanging by means of which it is fixed to a thrust-bearing plate which can bear on the surface of the disc which faces the seal in a zone radially inside the ring of holes in

order to withstand at least some of the axial load produced by the disc on the seal.

Neither is there explicit mention of such features, nor is the Board able to infer them from the figures. Thus, wheel 30 could easily be mounted on the distal end of the arm 24 without bearings; indeed, considering the dimensions, this seems likely. Moreover, there is no visible flanging of the shaft at the end of arm 124; a shaft is hardly visible, if at all. Furthermore, the wheel 130 cannot be considered a plate, nor is it or any part of it (including prongs 32) seen to bear on the surface of the disc in a zone radially inside the ring of holes as claimed; rather the prongs bear against the plate in the zone of the ring of holes.

6.4 The board thus concludes that the subject-matter of claim 1 is new over D10.

7. It goes without saying that the above conclusions for claim 1 with regard to added subject-matter and novelty also hold for independent claim 10 of auxiliary request 7, which includes the same features as discussed above.

8. Respondent's request for remittal

Under Article 11 RPBA 2020 the board may remit the case to the department whose decision was appealed if there are special reasons for doing so. In the present case, the opposition division did not consider the issue of inventive step, in particular not in the light of the arguments submitted against the relevant requests, see sections 6.2 in reference to section 3.2 of the respondent's reply arguing obviousness for the broader auxiliary request 2 in view of the combination of D7 and D10. Given the primary object of an appeal to

review the decision under appeal in a judicial manner, Article 12(2) RPBA 2020, and the fact that the decision under appeal does not consider the ground of inventive step, a special reason exists for the remittal of the case. Both parties indeed agree regarding the need for remittal.

For these reasons, the board remits the case to the opposition division for further prosecution on the basis of the seventh auxiliary request, that is to examine inventive step in the light of the arguments mentioned above. In this context, the board notes that the question whether the appealed decision, reasons 3.3, was right to hold a further document (D6) not proven to be prior art, need not be answered as it has no bearing on the question of inventive step for auxiliary request 7. This document was not cited in that context.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the opposition division for further prosecution.

The Registrar: The Chairman:



G. Magouliotis A. de Vries

Decision electronically authenticated

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Datum/Date
11.11.20

Zeichen/Reference/Référence	
PBP11900-EP	/ APPR
Anmeldung Nr./Application No./Demande n°//Patent Nr./Patent No./Brevet n°	11779702.7 / 2637492
Anmelder/Applicant/Demandeur//Patentinhaber/Proprietor/Titulaire	
Maschio Gaspardo S.p.A.	

Appeal number: **T0305/18-3.2.04**

Please find enclosed a copy of the decision of 23.07.20.

The Registrar G. Magouliotis
Tel.: 089 / 2399 - 3241

Annex(es): ☑ Acknowledgement of receipt - EPO Form 3936
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E 98381		/ OPPO01
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Please find enclosed a copy of the minutes of the oral proceedings of 23.07.20.

The Registrar G. Magouliotis
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Appeal number T0305/18-3.2.04

Patent No.: 2637492

Patent Proprietor: Maschio Gaspardo S.p.A.

Opponent: Precision Planting LLC

Minutes of the oral proceedings

of 23 July 2020

Composition of the Board:

Chairman: A. de Vries

Members: G. Martin Gonzalez

N. Obrovski

Start of oral proceedings: 09:00 hours

End of oral proceedings: 11:45 hours

Present on behalf of the appellant (patent proprietor) was Mr. Locas, professional representative, identified by EPO ID card.

Present on behalf of the respondent (opponent) was Mr. Jacob and Mr von Menges, professional representatives, identified by EPO ID cards.

The Chairman declared the oral proceedings open and summarised the relevant facts and submissions.

The appellant (patent proprietor) requested that the decision under appeal be set aside and that the patent be maintained as granted (main request) or, alternatively, that the patent be maintained in amended form on the basis of auxiliary requests 1-11 filed with the grounds of appeal dated 27 March 2018. The appellant further requested that documents D10-D12 not be admitted into the proceedings and that document D6 not be considered as prior art.

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The respondent (opponent) requested that the appeal be dismissed or, should any of the appellant's requests be considered allowable with regard to added subject-matter and novelty, that the case be remitted to the opposition division for further prosecution. The respondent further requested that auxiliary requests 1-3 and 6-11 not be admitted into the proceedings.

Main request

It was discussed whether claim 1 of the main request contained added subject-matter. After deliberation, the Chair announced the Board's view that this claim contained added subject-matter and was not allowable under Article 123(2) EPC.

The appellant withdrew its main request as well as auxiliary requests 1-3 and stated that auxiliary request 4 had become its new main request. It was agreed to keep the previous numbering.

Auxiliary request 4 (new main request)

It was discussed how to interpret claim 1 of auxiliary request 4 and whether the subject-matter of claim 1 was new in view of document D1. After deliberation, the Chair announced the Board's view that the subject-matter of this claim lacked novelty over D1.

The appellant withdrew auxiliary request 5.

Auxiliary requests 6 and 7

After discussion of these matters with the parties, the Board decided to admit auxiliary requests 6 and 7 as well as document D10 into the proceedings.

It was discussed whether the claims of auxiliary requests 6 and 7 contained added subject-matter. It was also discussed whether the subject-matter of these claims was new over document D10. The respondent confirmed to question novelty only with regard to document D10.

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Appeal number T0305/18-3.2.04

After deliberation, the Chair announced the Board's view that claim 1 of auxiliary request 6 contained added subject-matter. The claims of auxiliary request 7 were considered to comply with the requirements of both Article 54 and Article 123(2) EPC.

The Board then discussed the respondent's request for remittal with the parties.

The appellant confirmed to maintain auxiliary requests 4, 6 and 7. The respondent confirmed to maintain its requests as initially stated. Both parties stated that they did not have any further comments or requests.

The Chair declared the debate closed.

The following decision was given:

1.) The decision under appeal is set aside.

2.) The case is remitted to the opposition division for further prosecution.

The Chairman then closed the oral proceedings.

The Minute Writer: The Chairman:

N. Obrovski A. de Vries

Minutes electronically authenticated

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17.07.20

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Maschio Gaspardo S.p.A.	

Appeal number: T0305/18-3.2.04

Change in the composition of the Board of Appeal

Please note that there has been a change in the composition of the Board.
The composition of the Board is now as follows:

Chairman: A. de Vries

Member: G. Martin Gonzalez

Member: N. Obrovski

Member: _____

Member: _____

The Registrar G. Magouliotis
Tel.: 089 / 2399 - 3241

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Member: N. Obrovski

Member: _____

Member: _____

The Registrar G. Magouliotis
Tel.: 089 / 2399 - 3241

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Appeal number: T0305/18-3.2.04

Order

Change of the composition of the Board

compare to previous order

1.

Chairman: A. de Vries

technically qualified member: G. Martin Gonzalez

technically qualified member: _____

as legally qualified member: N. Obrovski

as legally qualified member: _____

2. The rapporteur shall be: G. Martin Gonzalez

3. The additional rapporteur shall be: _____

4. Reasons:
redistribution of workload

5. Back to the Registry for further action.

Munich, 16.07.20

The Chairman: A. de Vries

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29.06.20

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Maschio Gaspardo S.p.A.	

Appeal number: **T0305/18-3.2.04**

Please find enclosed a copy

☑ of a letter of the patent proprietor dated 26.06.20

☐ of a letter of the opponent dated

☐

for your information.

The Registrar G. Magouliotis
Tel.: 089 / 2399 - 3241

Annex(es):

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EPO Form 3345 01/11

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Acknowledgement of receipt

We hereby acknowledge receipt of the following subsequently filed document(s):

Submission number	8766644	
Application number	EP11779702.7	
Date of receipt	26 June 2020	
Filing Office	European Patent Office, The Hague	
Procedural phase	Appeal	
Your reference	PBP11900-EP	
Documents submitted	package-data.xml ep-cms-sfd-request.pdf (1 p.)	ep-cms-sfd-request.xml APPEAL-ORAL.pdf\PBP11900-EP participants in Oral proceedings.pdf (1 p.)
Submitted by	CN=secure.epoline.org	
Method of submission	Online	
Date and time receipt generated	26 June 2020, 17:58 (CEST)	
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Letter accompanying subsequently filed items

Representative:

Davide LOCAS
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The document(s) listed below is (are) subsequently filed documents pertaining to the following application:

Application number and/or EP publication number	EP11779702.7 - EP2637492
Reference	PBP11900-EP
Procedural phase	Appeal
Name of represented party	11779702.7

	Description of document	Original file name	Assigned file name
1	Letter dealing with oral proceedings during the appeal procedure	PBP11900-EP participants in Oral proceedings.pdf	APPEAL-ORAL.pdf

Signature 1

Place:	**Padova, ITALY**
Date:	**26 June 2020**
Signed by:	**/Davide LOCAS/**
Capacity:	**Representative 1**

Smart card certificate 1

Common name:	**Carlo Susanetto 12236**
EPO ID:	**12236**
Issued by:	**European Patent Office CA G2**

In cooperation with
ING. DALLAGLIO SRL- PARMA

CANTALUPPI & PARTNERS
PROPRIETA' INDUSTRIALE
INTELLECTUAL PROPERTY

PADOVA – ROMA – MILANO – BRESCIA

EUROPEAN PATENT OFFICE
80298 Munich
GERMANY

K.a. Mr. Georgios MAGOULIOTIS

Padova, June 26, 2020

Your ref.: T0305/18-3204 - 11779702.7
Our ref.: PBP11900-EP DL/ms(er)

Re: European Patent Application no. 11779702.7 in the name of Maschio Gaspardo S.p.A., regional phase of PCT/EP2011/069875 filed on 10.11.2011

Dear Mr. Magouliotis,

With reference to the email communication of the Boards of Appeal dated June 8, 2020 and referred to the case in object please be informed that the undersigned, Davide Locas, possibly accompanied by the European Patent Attorney trainee, Tommaso Cavallin, will attend in person the Oral Proceedings scheduled for 23.07.2020 in Haar.

As long as the Board Of Appeal offers the possibility of attending the Oral Proceedings in person, we respectfully ask that the Oral Proceedings are not held by videoconference.

Yours faithfully,

The Representative
CANTALUPPI & PARTNERS
Davide LOCAS

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Datum/Date
16.06.20

Zeichen/Reference/Référence	Anmeldung Nr./Application No./Demande n°//Patent Nr./Patent No./Brevet n°
PBP11900-EP APPR	11779702.7 / 2637492
Anmelder/Applicant/Demandeur//Patentinhaber/Proprietor/Titulaire	
Maschio Gaspardo S.p.A.	

Appeal number: **T0305/18-3.2.04**

Please find enclosed a copy

☐ of a letter of the patent proprietor dated

☑ of a letter of the opponent dated 15.06.20

☐

for your information.

The Registrar G. Magouliotis
Tel.: 089 / 2399 - 3241

Annex(es):

Registered letter

EPO Form 3345 01/11

Europäisches Patentamt
European Patent Office
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Acknowledgement of receipt

We hereby acknowledge receipt of the following subsequently filed document(s):

Submission number	8722621
Application number	EP11779702.7
Date of receipt	15 June 2020
Receiving Office	European Patent Office, The Hague
Your reference	E 98381
Applicant	All applicants as on file
Documents submitted	package-data.xml epf1038.pdf (1 p.) ep-sfd-request.xml APPEAL-CP-1.pdf\98381 respone to Communication BoA, video-conference.pdf (1 p.)
Submitted by	CN=Martin Jacob 37196
Method of submission	Online
Date and time receipt generated	15 June 2020, 09:56 (CEST)
Message Digest	A8:D5:A7:B5:AA:4E:78:9B:12:9E:D3:E5:C8:B6:36:5E:0C:AE:C5:1D

Correction by the EPO of errors in debit instructions filed by eOLF
Errors in debit instructions filed by eOLF that are caused by the editing of Form 1038E entries or the continued use of outdated software (all forms) may be corrected automatically by the EPO, leaving the payment date unchanged (see decision T 152/82, OJ EPO 1984, 301 and point 6.3 ff ADA, Supplement to OJ EPO 10/2007).

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Letter accompanying subsequently filed items

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The document(s) listed below is (are) subsequently filed documents pertaining to the following application:

Application number	11779702.7
Applicant's or representative's reference	E 98381

	Description of document	Original file name	Assigned file name
1	Patent Document cited during the appeal procedure	98381 respone to Communication BoA, video-conference.pdf	APPEAL-CP-1.pdf

	Payment	
1	Method of payment	Not specified

Signatures

Place:	**Hamburg**
Date:	**15 June 2020**
Signed by:	**Martin Jacob 37196**
Association:	**Uexküll & Stolberg Partnerschaft von Patent- und Rechtsanwälten mbB**
Representative name:	**Jacob**
Capacity:	**(Representative)**

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EUROPEAN PATENT ATTORNEY
EUROPEAN TRADEMARK ATTORNEY
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PARTNERSCHAFT VON PATENT- UND RECHTSANWÄLTEN mbB

<u>Online Filing</u>

European Patent Office
80298 München

Appeal No.: T0305/18-3.2.04

Patent No.: EP 2 637 492

Application No.: 11779702.7

Patentee: Maschio Gaspardo S.p.A.

June 15, 2020
E 98381 Me/MJ

To the Communication from the Board of Appeal (Form 3004), dated June 9, 2020

It is expected that the two undersigned representatives will attend the oral hearing scheduled for July 23, 2020.

It is requested that the oral hearing be held by video conference. The undersigned will use the English language. No interpretation is required for the German or English language.

- Signed electronically -

Martin D. Jacob
(Association No. 1)

Albrecht v. Menges
(Association No. 1)

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Datum / Date
09.06.2020

Zeichen/Reference/Référence		Anmeldung Nr. / Application No. / Demande n°. // Patent Nr. / Patent No. / Brevet n°.
PBP11900-EP	APPR	11779702.7 // 2637492
Anmelder / Applicant / Demandeur // Patentinhaber / Proprietor / Titulaire		
Maschio Gaspardo S.p.A.		

Appeal number: **T0305/18-3.2.04**

Communication of the Registry

The Registrar G. Magouliotis
Tel.: 089 / 2399 - 3241

Registered letter

This document: 3 page(s) including this page

Annex(es):

Communication text

In view of the current precautionary measures against the spread of coronavirus (COVID-19), in particular the travel restrictions in place in Europe, the Board wishes to enquire whether you envisage attending the oral proceedings scheduled for 23.07.2020.

In case you are prevented from attending for serious reasons in connection with the coronavirus situation, the oral proceedings will be postponed. In that case, the new date is unlikely to be earlier than 2021.

You are asked to reply to this communication as soon as possible, but no later than 16.06.2020.

If you fail to reply, the oral proceedings will take place on 23.07.2020 as scheduled.

If you envisage attending the oral proceedings, please provide the information requested below, where applicable in the present case:

- Due to the physical distancing measures currently in place, only a limited number of places will be available in the oral proceedings rooms. You are kindly requested to limit the number of participants to the absolute minimum and inform the Board of the number of representatives and accompanying persons who will attend the oral proceedings.

- A decision on the merits of the case could be issued in writing within a short period of time if you withdraw your requests for oral proceedings. Should you wish to do so, please inform the Board accordingly.

Facilities for conducting oral proceedings with **videoconferencing** technology are now also available **insofar no interpretation is required.** Should all parties so wish, arrangements will be made for the oral proceedings to be held on the original date by video conference. The parties will be notified accordingly. **Please inform the Board as soon as possible whether you wish to hold the oral proceedings by videoconference.**

The videoconferencing system is Skype for Business (SfB), which is internet-based and does not require any specific hardware. More specific technical instructions (e.g. videoconference link) will be issued in advance in preparation for oral proceedings by videoconference.

Should technical problems occur during the videoconference which cannot be overcome and prevent its conduct in accordance with Articles 113(1) and 116 EPC, the oral proceedings will be postponed and a new summons to oral proceedings will be issued.

Please observe that, due to the physical distancing measures in place, only a limited number of oral proceedings can take place each day. If the number of confirmed oral proceedings exceeds that number the Board will need to cancel oral proceedings. In this case you will be informed in advance.

The Board apologises for any inconvenience caused, but believes that these measures are in the interest of all concerned, including the professional representatives.
For the latest information on the conditions for holding oral proceedings before the Boards of Appeal, please consult the website of the European Patent Office. The link below reflects the status at the time of issuing this communication.
https://www.epo.org/law-practice/case-law-appeals/communications/2020.html

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Datum / Date
09.06.2020

Zeichen/Reference/Référence	Anmeldung Nr. / Application No. / Demande nº. // Patent Nr. / Patent No. / Brevet nº.
E 98381 OPPO 01	11779702.7 // 2637492
Anmelder / Applicant / Demandeur // Patentinhaber / Proprietor / Titulaire	
Maschio Gaspardo S.p.A.	

Appeal number: **T0305/18-3.2.04**

Communication of the Registry

The Registrar G. Magouliotis
Tel.: 089 / 2399 - 3241

Registered letter

This document: 3 page(s) including this page

Annex(es):

Communication text

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Datum/Date
06.04.20

Zeichen/Reference/Référence	Anmeldung Nr./Application No./Demande n°//Patent Nr./Patent No./Brevet n°
E 98381 OPPO01	11779702.7 / 2637492
Anmelder/Applicant/Demandeur//Patentinhaber/Proprietor/Titulaire	
Maschio Gaspardo S.p.A.	

Appeal number: T0305/18-3.2.04

Change in the composition of the Board of Appeal

Please note that there has been a change in the composition of the Board.
The composition of the Board is now as follows:

Chairman: A. de Vries

Member: G. Martin Gonzalez

Member: C. Almberg

Member: _____

Member: _____

The Registrar G. Magouliotis
Tel.: 089 / 2399 - 3241

Registered letter

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Datum/Date
06.04.20

Zeichen/Reference/Référence	Anmeldung Nr./Application No./Demande n°//Patent Nr./Patent No./Brevet n°
PBP11900-EP APPR	11779702.7 / 2637492
Anmelder/Applicant/Demandeur//Patentinhaber/Proprietor/Titulaire	
Maschio Gaspardo S.p.A.	

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Member: G. Martin Gonzalez

Member: C. Almberg

Member:

Member:

The Registrar G. Magouliotis
Tel.: 089 / 2399 - 3241

Registered letter

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Appeal number: T0305/18-3.2.04

Order

Change of the composition of the Board

compare to previous order

1.

Chairman: A. de Vries

technically qualified member: G. Martin Gonzalez

technically qualified member: _____

as legally qualified member: C. Almberg

as legally qualified member: _____

2. The rapporteur shall be: G. Martin Gonzalez

3. The additional rapporteur shall be: _____

4. Reasons:
redistribution of workload

5. Back to the Registry for further action.

Munich, 01.04.20

The Chairman: A. de Vries

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Datum / Date
24.03.2020

Zeichen/Reference/Référence		Anmeldung Nr. / Application No. / Demande n°. // Patent Nr. / Patent No. / Brevet n°.
PBP11900-EP	APPR	11779702.7 // 2637492
Anmelder / Applicant / Demandeur // Patentinhaber / Proprietor / Titulaire		
Maschio Gaspardo S.p.A.		

Appeal number: **T0305/18-3.2.04**

Communication of the Board of Appeal

The Rapporteur G. Martin Gonzalez
The Registrar G. Magouliotis
Tel.: 089 / 2399 - 3241

Registered letter

This document: 8 page(s) including this page

Annex(es):

Communication text

In preparation for the oral proceedings the board wishes to make the following preliminary, non-binding observations.

1. The proprietor appeals the decision of the opposition division to revoke their patent.

2. The appellant-proprietor requests that the decision be set aside and the patent maintained as granted, alternatively to maintain the patent according to one of auxiliary requests 1-11, all filed with the statement of grounds of appeal of 27 March 2018.

The respondent-opponent requests dismissal of the appeal.

Oral proceedings are scheduled for the 23 July 2020.

3. The issues in dispute appear to be added subject-matter, novelty, inventive step, admissibility of auxiliary requests 1-3, 6-11 and admissibility of new evidence D10-D12. Remittal of the case for the issue of inventive step may also need to be discussed.

4. Main request, Auxiliary Requests 1-3 - Added subject-matter

4.1 The feature "wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring holes" has been deleted from both independent claims 1 and 10.

Contrary to the submissions of the appellant-proprietor, a functional feature (in the present case, to provide a pressure differential) can limit the subject-matter of an apparatus claim. Even if functional this feature appears to imply otherwise undefined structural limitations necessary to achieve this result, e.g. the relevant means for establishing a differential in the areas specified. Its deletion may thus represent a generalisation.

Moreover, irrespective of whether a pressure differential between both faces of the disc is implicit in the remaining features or not, the new claim omits

the geometrical limitation that this is provided in the region of a circumferential segment of the ring holes. This function and the structural limitations implied thereby appear to be inextricably linked to the arrangement of disk, seal and thrust element within the housing portions. There appears to be no basis for its omission from this specific context in the original application documents. Consequently, claim 1 as granted appears to add subject-matter vis-a-vis the original disclosure, Art 100(c) EPC.

4.2 Regardless of the question of their admissibility none of the auxiliary requests 1 to 3 address the omission of the functional feature mentioned above. These requests therefore also appear deficient under Art 123(2) EPC.

5. Fourth auxiliary request.

5.1 This request reinstates the above discussed omitted feature and thus appears to comply with Article 123(2) EPC.

5.2 Turning to novelty, the term "thrust-bearing" appears to be used in the contested patent in a general sense for defining the function of providing support against an axial force, see e.g. the "thrust-bearing plate" 31 in paragraph [0019]. Thus, contrary to the submissions of the appellant-proprietor, it does not appear that the claimed feature "thrust-bearing element", in the context of the patent, should be given the restricted interpretation of providing thrust support to rotary bearings in the form of ball bearings or similar.

Also, the expression "is supported rotatably in the movable portion" in claims 1 and 10 only requires that the thrust bearing element is supported somehow within the movable portion, though not necessarily by it. This

is a credible technical reading of this feature. Indeed, according to the claim, the movable portion of the housing defines a suction chamber. Therefore, a thrust-bearing element located in the suction chamber and thus at the suction side of the rotating disk, is properly located to bear forces caused by that suction, however the element may be supported. For example, the element could be supported on the shaft while located within the movable housing portion. The board does not see any reason to disregard this claim interpretation and restrict the scope of the claim to a thrust-bearing element supported on the movable portion. This limitation is not claimed.

5.3 Accordingly, D1 discloses an element (handle 58), see figure 6, that anticipates the claimed thrust-bearing element. Indeed, the handle 58 is rotatably supported by the shaft 55 and is located in the movable portion and, since it axially locks the seed disk 60 (see column 6, lines 1-18), it must also withstand some of the axial load. The other claimed features appear to be clearly disclosed by D1, nor are they in dispute.

The subject-matter of claims 1 and 10 thus does not appear to be novel over D1. D4 (figure 3; col.5, ln. 15-21: handle 32) and D5 (figure 3, paragraph bridging pages 4,5: handle 24) describe similar arrangements to that of D1 and also appear to anticipate the claimed subject-matter.

6. Fifth auxiliary request - Added subject-matter.

Both claims 1 and 10 have been amended to specify that the thrust-bearing element is rotatably supported on the movable portion. Textual basis for the amendment can be found on page 5, lines 22-23, in the context of the specific embodiment of the description. It

furthermore appears that the added feature is only described in the context of this particular embodiment,

The added function of being supported specifically on the movable portion is fulfilled in that context by means of some features specific to that embodiment, namely that the thrust-bearing element comprises a shaft rotatably mounted by means of bearings in a seat of the movable portion. They are thus closely structurally and functionally linked to the new feature. The inclusion of only one of these closely linked features represents therefore an unallowable intermediate generalisation.

7. Sixth and seventh auxiliary request

7.1 The sixth auxiliary request appears to overcome the above added subject-matter issue by adding the cited missing features. The other features of the embodiment do not appear to be closely linked to the new limitation, that only amends the claimed subject-matter to specify that the support is on the movable portion.

Auxiliary request 7 also appears to overcome the added subject-matter objection, since it also includes the above features.

7.2 None of the documents D1, D4, D5 discloses a thrust-bearing element supported on the movable portion. The subject-matter of claims 1 and 10 of both requests appear thus to be new.

7.3 Insofar as the respondent-opponent cites new documents D10-D12 in relation to novelty, the admission of such new evidence is at the discretion of the board, Article 12(4) RPBA 2007.

No clear justification appears to exist for their late filing. The appellant-proprietor has always based the defence of the patent, from the beginning of the opposition proceedings, on the aspect that the thrust-bearing element is supported on the movable portion of the housing, which is the aspect that the new evidence now attempts to document. In the board's opinion the related evidence should have been presented then, in first instance.

Moreover, these documents appear not to be prima facie very highly relevant for novelty. It is not clearly derivable whether the knockout assemblies of documents D10 and D12 actually withstand axial load produced by the disc, since they mainly push the seeds to eject them from the disk holes and not the disk. It is like wise unclear, whether the meshed pinion 21 of D12 also actually withstands axial load of the disk. As regards D11, bearing surfaces 86, 88 do not appear to be rotatably mounted on cover 54.

The board is thus inclined not to admit this late filed evidence.

7.4 The subject-matter of claims 1 and 10 of these requests appears thus to be new.

8. Auxiliary requests 8-11.

Admissibility, added subject-matter and novelty of these request may need to be discussed.

9. Remittal

Under Article 11 RPBA 2020 the board may remit the case to the department whose decision was appealed if there are special reasons for doing so. In the present case, the opposition division did not consider the issue of inventive step. Given the primary object of an appeal to review the decision under appeal in a judicial manner, Art 12(2) RPBA 2020, and the fact that the decision under appeal does not consider the ground of inventive step, a special reason is seen to exist for remittal of the case. The board is thus inclined to allow the respondent's request for remittal of the case for further prosecution, should the relevant claims of one of the requests be found not to contain added subject-matter and to be novel over the cited prior art.

10. In accordance with Article 13(3) RPBA 2007, amendments to a party's case sought to be made after oral proceedings have been arranged shall not be admitted if they raise issues which the Board or the other party or parties cannot reasonably be expected to deal with without adjournment of the oral proceedings.

11. The partie's attention is further drawn to the provisions of Rule 103(3)(a), (4)(a) and (4)(c) EPC, as effective from 1 April 2020.

11.1 The appeal fee shall be reimbursed at 50% if the appeal is withdrawn within one month of notification of a communication issued by the Board in preparation for the oral proceedings, Rule 103(3)(a) EPC. If the appeal is withdrawn later but before the decision is announced at the oral proceedings 25% of the appeal fee will be reimbursed under Rule 103(4)(a) EPC.

11.2 If any request for oral proceedings is withdrawn within one month of notification of the communication issued by the Board in preparation for the oral proceedings, and no oral proceedings take place, the appeal fee shall be reimbursed at 25%, Rule 103(4)(c) EPC.

12. In the interest of efficient court planning and to avoid unnecessary costs, should the appellant intend not to attend the oral proceedings, it is kindly requested to inform the Board as soon as possible.

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Boards of Appeal

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Boards of Appeal of the
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Uexküll & Stolberg
Partnerschaft von
Patent- und Rechtsanwälten mbB
Beselerstraße 4
22607 Hamburg
ALLEMAGNE

Datum / Date
24.03.2020

Zeichen/Reference/Référence		Anmeldung Nr. / Application No. / Demande n°. // Patent Nr. / Patent No. / Brevet n°.
E 98381	OPPO 01	11779702.7 // 2637492
Anmelder / Applicant / Demandeur // Patentinhaber / Proprietor / Titulaire		
Maschio Gaspardo S.p.A.		

Appeal number: **T0305/18-3.2.04**

Communication of the Board of Appeal

The Rapporteur G. Martin Gonzalez
The Registrar G. Magouliotis
Tel.: 089 / 2399 - 3241

Registered letter

This document: 8 page(s) including this page

Annex(es):

Communication text

In preparation for the oral proceedings the board wishes to make the following preliminary, non-binding observations.

1. The proprietor appeals the decision of the opposition division to revoke their patent.

2. The appellant-proprietor requests that the decision be set aside and the patent maintained as granted, alternatively to maintain the patent according to one of auxiliary requests 1-11, all filed with the statement of grounds of appeal of 27 March 2018.

The respondent-opponent requests dismissal of the appeal.

Oral proceedings are scheduled for the 23 July 2020.

3. The issues in dispute appear to be added subject-matter, novelty, inventive step, admissibility of auxiliary requests 1-3, 6-11 and admissibility of new evidence D10-D12. Remittal of the case for the issue of inventive step may also need to be discussed.

4. Main request, Auxiliary Requests 1-3 - Added subject-matter

4.1 The feature "wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring holes" has been deleted from both independent claims 1 and 10.

Contrary to the submissions of the appellant-proprietor, a functional feature (in the present case, to provide a pressure differential) can limit the subject-matter of an apparatus claim. Even if functional this feature appears to imply otherwise undefined structural limitations necessary to achieve this result, e.g. the relevant means for establishing a differential in the areas specified. Its deletion may thus represent a generalisation.

Moreover, irrespective of whether a pressure differential between both faces of the disc is implicit in the remaining features or not, the new claim omits

the geometrical limitation that this is provided in the region of a circumferential segment of the ring holes. This function and the structural limitations implied thereby appear to be inextricably linked to the arrangement of disk, seal and thrust element within the housing portions. There appears to be no basis for its omission from this specific context in the original application documents. Consequently, claim 1 as granted appears to add subject-matter vis-a-vis the original disclosure, Art 100(c) EPC.

4.2 Regardless of the question of their admissibility none of the auxiliary requests 1 to 3 address the omission of the functional feature mentioned above. These requests therefore also appear deficient under Art 123(2) EPC.

5. Fourth auxiliary request.

5.1 This request reinstates the above discussed omitted feature and thus appears to comply with Article 123(2) EPC.

5.2 Turning to novelty, the term "thrust-bearing" appears to be used in the contested patent in a general sense for defining the function of providing support against an axial force, see e.g. the "thrust-bearing plate" 31 in paragraph [0019]. Thus, contrary to the submissions of the appellant-proprietor, it does not appear that the claimed feature "thrust-bearing element", in the context of the patent, should be given the restricted interpretation of providing thrust support to rotary bearings in the form of ball bearings or similar.

Also, the expression "is supported rotatably in the movable portion" in claims 1 and 10 only requires that the thrust bearing element is supported somehow within the movable portion, though not necessarily by it. This

is a credible technical reading of this feature. Indeed, according to the claim, the movable portion of the housing defines a suction chamber. Therefore, a thrust-bearing element located in the suction chamber and thus at the suction side of the rotating disk, is properly located to bear forces caused by that suction, however the element may be supported. For example, the element could be supported on the shaft while located within the movable housing portion. The board does not see any reason to disregard this claim interpretation and restrict the scope of the claim to a thrust-bearing element supported on the movable portion. This limitation is not claimed.

5.3 Accordingly, D1 discloses an element (handle 58), see figure 6, that anticipates the claimed thrust-bearing element. Indeed, the handle 58 is rotatably supported by the shaft 55 and is located in the movable portion and, since it axially locks the seed disk 60 (see column 6, lines 1-18), it must also withstand some of the axial load. The other claimed features appear to be clearly disclosed by D1, nor are they in dispute.

The subject-matter of claims 1 and 10 thus does not appear to be novel over D1. D4 (figure 3; col.5, ln. 15-21: handle 32) and D5 (figure 3, paragraph bridging pages 4,5: handle 24) describe similar arrangements to that of D1 and also appear to anticipate the claimed subject-matter.

6. Fifth auxiliary request - Added subject-matter.

Both claims 1 and 10 have been amended to specify that the thrust-bearing element is rotatably supported on the movable portion. Textual basis for the amendment can be found on page 5, lines 22-23, in the context of the specific embodiment of the description. It

furthermore appears that the added feature is only described in the context of this particular embodiment,

The added function of being supported specifically on the movable portion is fulfilled in that context by means of some features specific to that embodiment, namely that the thrust-bearing element comprises a shaft rotatably mounted by means of bearings in a seat of the movable portion. They are thus closely structurally and functionally linked to the new feature. The inclusion of only one of these closely linked features represents therefore an unallowable intermediate generalisation.

7. Sixth and seventh auxiliary request

7.1 The sixth auxiliary request appears to overcome the above added subject-matter issue by adding the cited missing features. The other features of the embodiment do not appear to be closely linked to the new limitation, that only amends the claimed subject-matter to specify that the support is on the movable portion.

Auxiliary request 7 also appears to overcome the added subject-matter objection, since it also includes the above features.

7.2 None of the documents D1, D4, D5 discloses a thrust-bearing element supported on the movable portion. The subject-matter of claims 1 and 10 of both requests appear thus to be new.

7.3 Insofar as the respondent-opponent cites new documents D10-D12 in relation to novelty, the admission of such new evidence is at the discretion of the board, Article 12(4) RPBA 2007.

No clear justification appears to exist for their late filing. The appellant-proprietor has always based the defence of the patent, from the beginning of the opposition proceedings, on the aspect that the thrust-bearing element is supported on the movable portion of the housing, which is the aspect that the new evidence now attempts to document. In the board's opinion the related evidence should have been presented then, in first instance.

Moreover, these documents appear not to be prima facie very highly relevant for novelty. It is not clearly derivable whether the knockout assemblies of documents D10 and D12 actually withstand axial load produced by the disc, since they mainly push the seeds to eject them from the disk holes and not the disk. It is like wise unclear, whether the meshed pinion 21 of D12 also actually withstands axial load of the disk. As regards D11, bearing surfaces 86, 88 do not appear to be rotatably mounted on cover 54.

The board is thus inclined not to admit this late filed evidence.

7.4 The subject-matter of claims 1 and 10 of these requests appears thus to be new.

8. Auxiliary requests 8-11.

Admissibility, added subject-matter and novelty of these request may need to be discussed.

9. Remittal

Under Article 11 RPBA 2020 the board may remit the case to the department whose decision was appealed if there are special reasons for doing so. In the present case, the opposition division did not consider the issue of inventive step. Given the primary object of an appeal to review the decision under appeal in a judicial manner, Art 12(2) RPBA 2020, and the fact that the decision under appeal does not consider the ground of inventive step, a special reason is seen to exist for remittal of the case. The board is thus inclined to allow the respondent's request for remittal of the case for further prosecution, should the relevant claims of one of the requests be found not to contain added subject-matter and to be novel over the cited prior art.

10. In accordance with Article 13(3) RPBA 2007, amendments to a party's case sought to be made after oral proceedings have been arranged shall not be admitted if they raise issues which the Board or the other party or parties cannot reasonably be expected to deal with without adjournment of the oral proceedings.

11. The partie's attention is further drawn to the provisions of Rule 103(3)(a), (4)(a) and (4)(c) EPC, as effective from 1 April 2020.

11.1 The appeal fee shall be reimbursed at 50% if the appeal is withdrawn within one month of notification of a communication issued by the Board in preparation for the oral proceedings, Rule 103(3)(a) EPC. If the appeal is withdrawn later but before the decision is announced at the oral proceedings 25% of the appeal fee will be reimbursed under Rule 103(4)(a) EPC.

11.2 If any request for oral proceedings is withdrawn within one month of notification of the communication issued by the Board in preparation for the oral proceedings, and no oral proceedings take place, the appeal fee shall be reimbursed at 25%, Rule 103(4)(c) EPC.

12. In the interest of efficient court planning and to avoid unnecessary costs, should the appellant intend not to attend the oral proceedings, it is kindly requested to inform the Board as soon as possible.

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Piazzetta Cappellato Pedrocchi, 18
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Boards of Appeal

The Registry

Name: G. Magoulliotis

Tel.: 089 / 2399 - 3241

Date: 19.12.19

Zeichen/Reference/Référence	Anmeldung Nr./Application No./Demande n°//Patent Nr./Patent No./Brevet n°
PBP11900-EP APPR	11779702.7 / 2637492
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Maschio Gaspardo S.p.A.	

Appeal number: T0305/18-3.2.04

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DECEMBER 30, 2019

Unterschrift / Signature:

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Received at the EPO on Dec 30, 2019 16:26:30. Page 1 of 1
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UEXKÜLL & STOLBERG
23. Dez. 2019
T:

Boards of Appeal

The Registry

Name: G. Magouliotis

Tel.: 089 / 2399 - 3241

Date: 19.12.19

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Maschio Gaspardo S.p.A.	

Appeal number: **T0305/18-3.2.04**

Summons to oral proceedings pursuant to Rule 115(1) EPC

You are hereby summoned to the oral proceedings concerning the above appeal. The proceedings are scheduled to take place

on 23.07.20 at 09:00 hrs

Richard-Reitzner-Allee 8, 85540 Haar (DE)

The proceedings will be public.

Upon arrival, please consult the notice board at reception for the number of the room in which the oral proceedings will be held.

A main waiting area is located at the entrance, directly after the security check. Further waiting rooms are located near to the oral proceedings rooms.

You are requested to make your way to the appointed room at least **10 minutes** before the hearing.

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- as regards filing authorisations for representatives or company employees, see Decision of the President of the EPO dated 12.7.2007 on the filing of authorisations in Special edition No. 3 OJ EPO 2007, 128.
- concerning the language of the proceedings, attention is drawn to Rule 4 EPC. Notice given pursuant to Rule 4(1) EPC before the first instance is not valid in proceedings before the Boards of Appeal.
- According to Rule 103(2) EPC it is possible to obtain a 50% reimbursement of the appeal fee if the appeal is withdrawn under certain circumstances (OJ EPO 2014, A3).

Composition of the Board

Chairman: A. de Vries

Member: G. Martin Gonzalez
Member: W. Van der Eijk

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If you are planning not to attend the oral proceedings or if you are aware of any matter that could have a bearing on the appointment of interpreters, you are requested to inform the Board of this, preferably in writing, at the earliest possible opportunity.

The Registrar G. Magouliotis
Tel.: 089 / 2399 - 3241

Annex(es): ☑ Confirmation of receipt Form 3936
☐ Communication pursuant to Article 15(1) of the Rules of Procedure of the Boards of Appeal
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Order

Oral proceedings are to be held

on 23.07.20

at 09:00 hours

Munich 17.12.19

The Chairman: A. de Vries

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Appeal number: T0305/18-3.2.04

Order

Change of the composition of the Board

compare to previous order

1.

Chairman: A. de Vries

technically qualified member: G. Martin Gonzalez

technically qualified member: _____

as legally qualified member: W. Van der Eijk

as legally qualified member: _____

2. The rapporteur shall be: G. Martin Gonzalez

3. The additional rapporteur shall be: _____

4. Reasons:
redistribution of workload

5. Back to the Registry for further action.

Munich, 16.12.19

The Chairman: A. de Vries

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Datum/Date
20.08.18

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Anmelder/Applicant/Demandeur//Patentinhaber/Proprietor/Titulaire	
Maschio Gaspardo S.p.A.	

Appeal number: **T0305/18-3.2.04**

Please find enclosed a copy

☐ of a letter of the patent proprietor dated

☑ of a letter of the opponent dated 14.08.18 + enclosures

☐

for your information.

The Registrar D. Hampe
Tel.: 089 / 2399 - 3241

Annex(es): see above

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EPO Form 3345 01/11

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Acknowledgement of receipt

We hereby acknowledge receipt of the following subsequently filed document(s):

Submission number	6616908
Application number	EP11779702.7
Date of receipt	14 August 2018
Receiving Office	European Patent Office, The Hague
Your reference	E 98381
Applicant	All applicants as on file

Documents submitted		
	package-data.xml	ep-sfd-request.xml
	epf1038.pdf (1 p.)	APPEAL-CP-1.pdf\D10_US20031836477A1.pdf (25 p.)
	APPEAL-CP-2.pdf\D11_US_20020043201_A1.pdf (12 p.)	APPEAL-CP-3.pdf\D12_ES_02013539_A6.pdf (8 p.)
	APPEAL-CDOC.pdf\D12'_ES2013539 machine translation.pdf (6 p.)	DG3-REPLSTGR.pdf\98381 response to appeal 14.08.pdf (34 p.)

Submitted by	CN=Albrecht von Menges 23641
Method of submission	Online
Date and time receipt generated	14 August 2018, 15:44 (CEST)
Message Digest	4D:D3:59:F3:66:48:1B:F7:2D:90:D2:5B:68:FC:37:DB:F5:32:6C:2F

Correction by the EPO of errors in debit instructions filed by eOLF

Errors in debit instructions filed by eOLF that are caused by the editing of Form 1038E entries or the continued use of outdated software (all forms) may be corrected automatically by the EPO, leaving the payment date unchanged (see decision T 152/82, OJ EPO 1984, 301 and point 6.3 ff ADA, Supplement to OJ EPO 10/2007).

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(19) REGISTRO DE LA PROPIEDAD INDUSTRIAL

ESPAÑA

(11) N.° de publicación: ES 2 013 539

(21) Número de solicitud: 8902021

(51) Int. Cl.[4]: A01C 7/10
A01C 7/20

(12) PATENTE DE INVENCION A6

(22) Fecha de presentación: **09.06.89**

(45) Fecha de anuncio de la concesión: **01.05.90**

(45) Fecha de publicación del folleto de patente: **01.05.90**

(73) Titular/es: **Pedro Antonio Concejo Sainz**
C/ Alonso Pesquera, núm. 1-2° C
47002 Valladolid, ES

(72) Inventor/es: **Concejo Sainz, Pedro Antonio**

(74) Agente: **Pons Ariño, Angel**

(54) Título: **Dosificador de semillas para máquinas sembradoras.**

(57) Resumen
Dosificador de semillas para máquinas sembradoras, que comprende una carcasa que delimita un recinto subdividido mediante un disco intermedio giratorio, en dos cámaras, una de aspiración y otra suministradora de semillas, presentando el disco orificios pasantes distribuidos circunferencialmente. La cámara de aspiración lleva montado un dispositivo expulsor de semillas que incluye al menos una aguja enfrentable sucesivamente y parcialmente introducible en los orificios del disco, cuando estos alcanzan la zona inferior en que cesa la aspiración. La aguja o agujas van montadas en un soporte móvil que es accionado sincronizadamente por el disco giratorio.

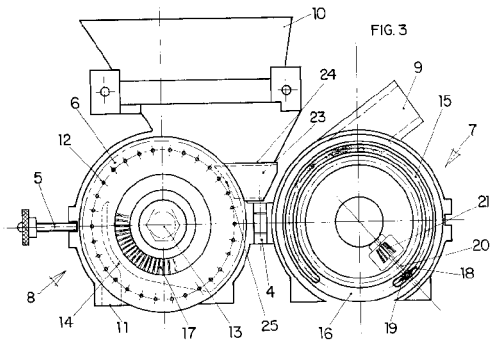


FIG. 3

DESCRIPCION

La presente invención se refiere a un dosificador de semillas para máquinas sembradoras y, más especí ficamente a un dosificador de semillas del tipo neumático constituído que asegure una distribución o dosificado de semillas regular, cualquiera que sea el tipo de semillas a sembrar.

El dosificador de la invención es del tipo que comprende una carcasa que define un recinto aproximadamente cilíndrico, en el que va montado coaxialmente un disco intermedio giratorio, que delimita dos cámaras, una de aspiración y otra suministradora de semillas; cuyo disco dispone de una serie de pequeños orificios pasantes distribuídos circularmente próximos al borde libre; y cuya cámara de aspiración dispone de un canal anular enfrentado a los orificios del disco, estando dicho canal interrumpido interiormente en un tramo y conectado superiormente a través de una boca a un dispositivo de aspiración; y cuya cámara suministradora de semillas dispone de una boca superior de entrada y una boca inferior de salida, la segunda enfrentada al tramo inferior interrumpido del canal anular de la cámara de aspiración, llevando además la carcasa montado un dispositivo limitador de semillas.

En los dosificadores del tipo indicado, cuando la cámara de aspiración se conecta a una fuente de vacío, a través de los orificios del disco giratorio se produce una succión que provoca que los granos o semillas que penetran por la boca de carga de la cámara suministradora de semillas se adhieran a dicho disco, alrededor de los orificios. Cuando los orificios alcanzan la zona inferior, en la cual está interrumpido el canal de la cámara de aspiración, los granos o semllas se desprenden y caen por gravedad a través de la boca inferior de salida de la cámara suministradora de semillas, ya que en esta zona inferior, por interrupción del canal citado, desaparece la aspiración o vacío.

Cuando las semillas son de tamaño reducido, alrededor de cada orificio del disco suelen adherirse varias semillas. Con el fin de reducir el número de éstas que son arrastradas por el disco, la cámara del dosificador llevado montado un dispositivo que elimina el exceso de semillas arrastradas en próximidad de cada orificio.

Frecuentemente las impurezas que arrastran las semillas, la cascarilla que pueden soltar las mismas o incluso las propias semillas, cuando su tamaño es próximo al de los orificios, pueden provocar la obturación de los orificios del disco giratorio. Lógicamente los orificios obstruídos no arrastrarán semillas, con lo cual en cada giro del disco se producirá un fallo en el suministro de semillas por los orificios obstruídos. Para subsanar estos fallos es necesario proceder a la apertura del dosificador y desobturar o desatascar manualmente los orificios obstruídos. Estos problemas se agraban cuando se manipulan semillas de pequeñas dimensiones y de configuración puntiforme.

Algunos fabricantes de maquinarias de este tipo han tratado de solucionar los inconvenientes señalados recurriendo a la inyección inversa de aíre, que consiste en el suministro de aíre a presión en la zona del dosificador donde no existe vacío, es decir en la parte inferior de la misma donde queda interrumpido el canal de la cámara de vacío. Para conseguir este efecto puede utilizarse el mismo ventilador mediante el que se efectúa la aspiración en la cámara de vacío. Este sistema, sin embargo, presenta el inconveniente de que las semillas son expulsadas a gran velocidad, siendo necesario disponer pantallas o tubos de acodado de salida que, si bien no evitan el exceso de velocidad, si pueden dirigir la semilla hacia el punto de siembra deseado, aúnque sin grandes garantías de precisión. Este sistema supone además un gran encarecimiento del dispositivo suministrador de semillas.

El objeto de la presente invención es desarrollar un dosificador de semillas de constitución sencilla, que evite los inconvenientes antes señalados y que permita la siembra de todo tipo de semillas, cualquiera que sea su característica y tamaño.

En el dosificador de la invención, mediante unos elementos mecánicos de constitución y funcionamiento sencillos, se evita totalmente el riesgo de obturación de los orificios del disco, asegurando de este modo un dosificado regular y uniforme de las semillas. Además permite que las semillas sean suministradas en el momento y lugar preciso de siembra, mediante un desplazamiento suave de las mismas, sin choques bruscos o roces que podrían producir su deterioro.

De acuerdo con la presente invención, en la cámara de aspiración del dosificador vá montado un dispositivo expulsor de semillas, situado en la parte inferior de dicha cámara, cuyo dispositivo incluye al menos una aguja enfrentable sucesivamente y parcialmente introducible en los orificios del disco, cuando éstos alcanzan la zona en la cual está interrumpido el canal de la cámara de aspiración, es decir cuando finaliza en los mismos la situación de vacío. La aguja citada va montada en un soporte móvil que es accionado sincronizadamente por el disco giratorio,para aproximar dicha aguja al disco, a la vez que un orificio del disco queda enfrentado a la aguja, retirándola a continuación.

El dispositivo expulsor citado puede estar compuesto por una rueda catalina, que incluye una serie de agujas radiales equidistantes situadas en un plano perpendicular al disco giratorio. El eje de esta rueda discurre paralelo y próximo al disco giratorio, en sentido radial al mismo, y va montado entre soportes extremos solidarios de la carcasa del dosificador. Además el eje de la rueda catalina lleva solidarizado un piñón cónico que engrana con una corona que es solidaria del disco giratorio y concéntrica con el mismo. La posición de las agujas de la rueda catalina y el número de dientes y tamaño de los mismos de la corona y piñón cónico, están calculados de modo que al girar la rueda, arrastrada por el disco giratorio, las diferentes agujas se introduzcan sucesivamente en los orificios del referido disco.

Con este sistema se asegura que al alcanzar los orificios del disco giratorio la zona en la que queda interrumpido el canal de la cámara de vacío, y en la que por tanto desaparece dicho vacío, las semillas y partículas que pudieran ir parcialmente introducidas en los orificios sean expulsadas de éstos, cayendo al exterior a través de la boca de

salida de la cámara suministradora de semillas.

También el dispositivo expulsor podría estar constituído por una palanca acodada, articulada a la carcasa según un eje paralelo al disco giratorio. Esta palanca va rematada enuno de sus extremos en una aguja enfrentable a los orificios del disco, mien tras que por el opuesto apoya sobre el borde de dicho disco giratorio, hacia el que está constantemente impulsado. El borde del disco giratorio está conformado de modo que presente entrantes y salientes radiales sucesivos iguales y equidistantes, de perfil sucesivamente arqueado, para definir una leva que provoca alternativamente el giro de la palanca, para aproximar y separar el extremo de la aguja al disco, estando los salientes del borde del disco giratorio dimensionados y situados de modo que en cada aproximación de la aguja al disco coincida el extremo puntiagudo de la misma con un orificio del disco.

Con la constitución comentada, mediante un sencillo mecanismo se asegura que no se prodzcan obturaciones en los orificios del disco giratorio y al mismo tiempo las semillas sean desprendidas en el punto exacto de caída.

Según otro aspecto de la invención, el dispositivo limitador de semillas arrastradas por el disco está constituído por una cuchilla parcialmente introducida en la cámara suministradora de semillas, a través de una abertura formada en la pared lateral de la cámara. Esta cuchilla queda por su extremo interno adosada al disco giratorio y presenta un frente oblícuo arqueado, cuya distancia a los orificios pueda regularse mediante introducción y extracción de la cuchilla.

Las características y ventajas expuestas se comprenderánmejor con la siguiente descripción, hecha con referencia a los dibujos adjuntos, en los que se muestra una posible forma de realización, dada a título de ejemplo no limitativo.

En los dibujos:

La figura 1 es un alzado lateral del dosificador, desde el lado de la cámara de aspiración.

La figura 2 es un alzado, según la dirección A de la figura 1.

La figura 3 es una vista similar a la figura 1, mostrando la carcasa del dosificador abierto.

La figura 4 es una vista similar a la figura 1, en la que se ha suprimido la pared exterior de la cámara de aspiración.

La figura 5 es una vista esquemática, según la dirección B de la figura 4, en la que se ha suprimido la pared lateral de la carcasa para mostrar los mecanismos internos del dosificador.

Como puede verse en las figuras 1 y 2, el dosificador comprende una carcasa 1 que delimita interiormente un recinto aproximadamente cilíndrico de eje horizontal. Esta carcasa va subdividida, según un plano perpendicular a su eje, en dos mitades referenciadas con los números 2 y 3, las cuales van relacionadas entre sí mediante una bisagra o elemento de articulación 4, disponiendo en un punto diametral de un dispositivo de cierre 5.

Dentro del recinto cilíndrico va montado un disco 6 intermedio, perpendicular al eje de la carcasa, que delimita dos cámaras, una de aspiración, referenciada con el número 7, y otra suministradora de semillas, que se referencia con el número 8. La cámara 7 dispone superiormente de un conducto 9 que se conectará a una fuente de vacío, mientras que la cámara 8 dispone superiormente de una boca 10 para el suministro de semillas, y de una boca inferior 11 para la salida de las mismas.

En la figura 3 se representa la carcasa 1 abierta, con las dos mitades relacionadas entre sí mediante el dispositivo de articulación 4.

Sobre la cámara de aspiración 8 se muestra el disco giratorio 6, el cual dispone de una infinidad de orificios 12 distribuídos circunferencialmente, cerca del borde libre del disco. El disco 6 va montado sobre un eje 13 que sobresale al exterior por la pared externa de esta cámara, para su accionamiento mediante una transmisión. Las semillas suministradas a través de la boca o tolva 10 penetran en la cámara 8 entre la pared exterior de la misma y el disco 6, disponiendo dicha cámara en este espacio de un nervio inferior 14 que limita la boca de salida 11 y servirá para la recuperación de semillas, tal y como se describirá más adelante.

La cámara de aspiración 7 dispone interiormente de un canal anular 15 enfrentable al conjunto de orificios 12 del disco giratorio 6. Este canal 15 queda interrumpido inferiormente en un tramo 16. El canal 15 va en comunicación con la boca 9, para producir el vacío en el mismo al conectar dicha boca a una fuente de aspiración.

En el disco giratorio 6 se ha practicado una corona dentada 17, concéntrica con dicho disco. Por su parte, en la cámara de aspiración 7 va montada una rueda catalina 18 que incluye una serie de agujas radiales 19 situadas en un plano perpendicular al disco giratorio 6. El eje de esta rueda catalina discurre paralelo y próximo al disco giratorio 6, en sentido radial al mismo y lleva solidarizado un piñón cónico 21 sitúa do de modo que al cerrar la carcasa engrane con la corona 17, tal y como puede apreciarse más fácilmente en las figuras 4 y 5.

Cuando la cámara 1 está cerrada, al accionar el dosificador y suministrar semillas a través de la boca 10, éstas caen en la cámara 8. Al conectar la boca 9 a una fuente de aspiración, se crea el vacío en el canal 15, produciéndose una succión a través de los orificios 12 del disco giratorio 6, con lo cual las se millas que se encuentran en la cámara 8 se adhieren al disco 6 alrededor de los orificios 12. Cuando los orificios llegan a la zona inferior, en la cual está interrumpido el canal 15, desaparece la situación de vacío, al mismo tiempo que las agujas 19 de la rueda catalina 18 van penetrando sucesivamente en los orificios, expulsando de los mismos a las semillas y partículas que pudieran haberse introducido, cayendo éstas por gravedad a través de la boca de salida 11.

Como se aprecia en la figura 5, el eje le del disco giratorio 6 sobresale al exterior, donde queda rematado en una corona dentada 22 que puede ser engranada con un piñón o accionada mediante cadena.

Para evitar que cada uno de los orificios 12 arrastre un número excesivo de semillas, se dispone un dispositivo limitador que está constituido por una cuchilla 23 que se introduce a través de una abertura ajustada 24 formada en la carcasa.

La cuchilla 23 queda adosada al disco giratorio 6 y presenta un borde interno 25 oblicuo arqueado, que se situará paralelo al círculo en el que van distribuídos los orificios 12. La cuchilla 23 puede introducirse más o menos a voluntad, con el fín de regular la distancia del borde 25 a los orificios 12. Las semillas que son desprendidas por la cuchilla 23 caen a la parte inferior de la cámara, siendo recogidos por el nervio 14, para comenzar un nuevo proceso de distribución.

Como se ha indicado anteriormente, la rueda catalina 18 puede substituirse por una palanca acodada, articulada según un eje paralelo al disco giratorio 6, la cual por un extremo está rematada en punta o aguja para introducirse sucesivamente en los orificios 12, mientras que por el opuesto apoya sobre el borde del disco 6, el cual, como se representa en la figura 4, presenta entrantes y salientes radiales arqueados sucesivos 26 que configuran una leva, mediante la cual se acciona la palanca, de modo que el extremo puntíagudo de la misma se aproxime al disco en las posiciones en que queda enfrentado a los orificios 12, al paso de los mismos.

REIVINDICACIONES

1. Dosificador de semillas para máquinas sembradoras, que comprende una carcasa que contiene un recinto aproximadamente cilíndrico, en el que va montado coaxialmente un disco intermedio giratorio, que delimita dos cámaras, una de aspiración y otra suministradora de semillas, cuyo disco dispone de una serie de pequeños orificios pasantes distribuídos circunferencialmente próximos al borde libre, y cuya cámara de aspiración dispone de un canal anular enfrentado a los orificios del disco, estando dicho canal interrumpido inferiormente un tramo y conectado superiormente a través de una boca a un dispositivo de aspiración; y cuya cámara suministradora de semillas dispone de una boca superior de entrada y una boca inferior de salida, la segunda enfrentada al tramo inferior interrumpido del canal anular de la cámara de aspiración; llevando montado además un dispositivo limitador de semillas, **caracterizado** porque la cámara de aspiración lleva montado un dispositivo expulsor de semillas, situado en la parte inferior de dicha cámara, cuyo dispositivo incluye al menos una aguja enfrentable sucesivamente y parcialmente introducible en los orificios del disco, cuando éstos alcanzan la zona en la cual está interrumpido el canal de la cámara de aspiración, estando dicha aguja montada en un soporte móvil que es accionado sincronizadamente por el disco giratorio para aproximar la aguja al disco, cada vez que un orificio de dicho disco queda enfrentado a la aguja, y retirarla a continuación; y porque el dispositivo limitador de semillas está constituído por una cuchilla parcialmente introducible en la cámara suministradora de semillas a través de su pared lateral, cuya cuchilla queda adosada al disco giratorio y presenta un frente oblícuo arqueado, cuya distancia a los orificios pueden regularse mediante introducción y extracción de la cuchilla.

2. Dosificador según la reivindicación 1, **caracterizado** porque el dispositivo expulsor está constituído por una rueda catalina, que incluye una serie de apoyos radiales equidistantes situados en un plano perpendicular al disco giratorio y cuyo eje discurre paralelo y próximo a dicho disco giratorio, en sentido radial al mismo, y va montado entre soportes extremos solidarios de la carcasa; llevando dicho eje solidarizado un piñón cónico que engrana con una corona solidaria del disco giratorio y concéntrica con el mismo; estando situadas las agujas y separadas entre sí, de modo que al girar la rueda, arrastrada por el disco giratorio, las diferentes agujas se introduzcan sucesivamente en los orificios del referido disco.

3. Dosificador según la reivindicación 1, **caracterizado** porque el dispositivo expulsor está constituído por una palanca acodada, articulada según un eje paralelo al disco giratorio, estando dicha palanca rematada en uno de sus extremos en una aguja enfrentable a los orificios de dicho disco giratorio, mientras que por el opuesto apoya sobre el borde del disco giratorio, hacia el que está constantemente impulsada, cuyo borde presenta entrantes y salientes sucesivos iguales y equidistantes, de perfil sucesivamente arqueado, para definir una leva que provoca alternativamente el giro de la palanca para aproximar y separar el extremo de la aguja al disco, estando los salientes del borde de dicho disco situados de modo que en cada aproximación de la aguja al disco coincida el extremo de la misma con un orificio del disco.

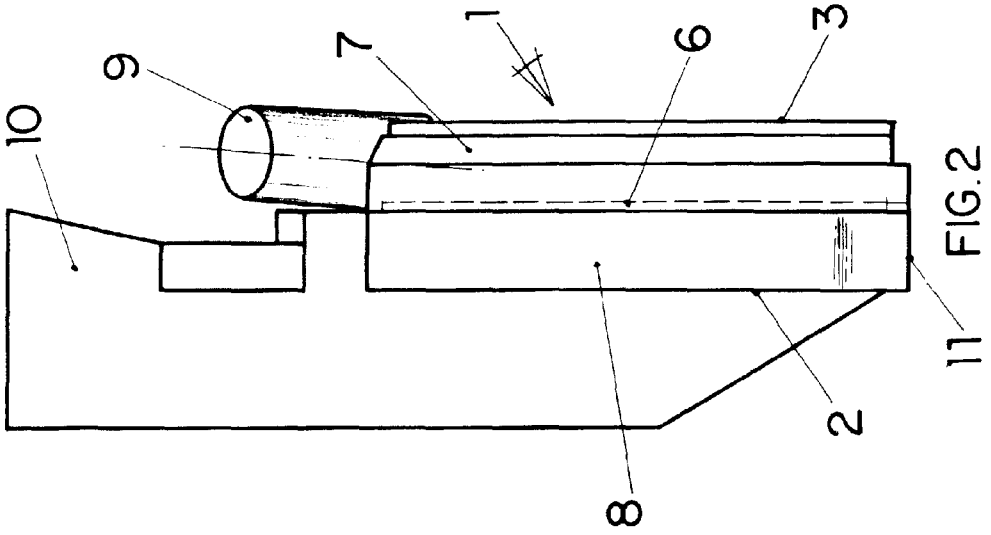


FIG.2

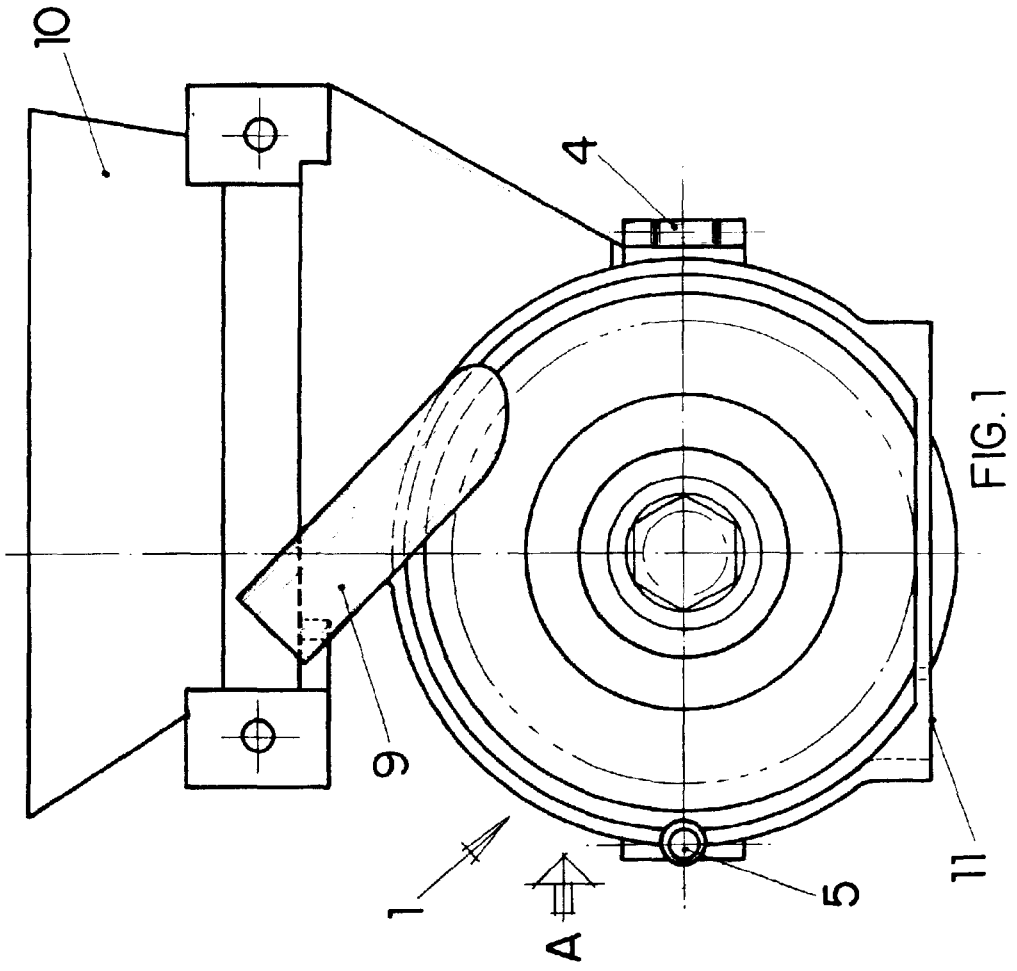
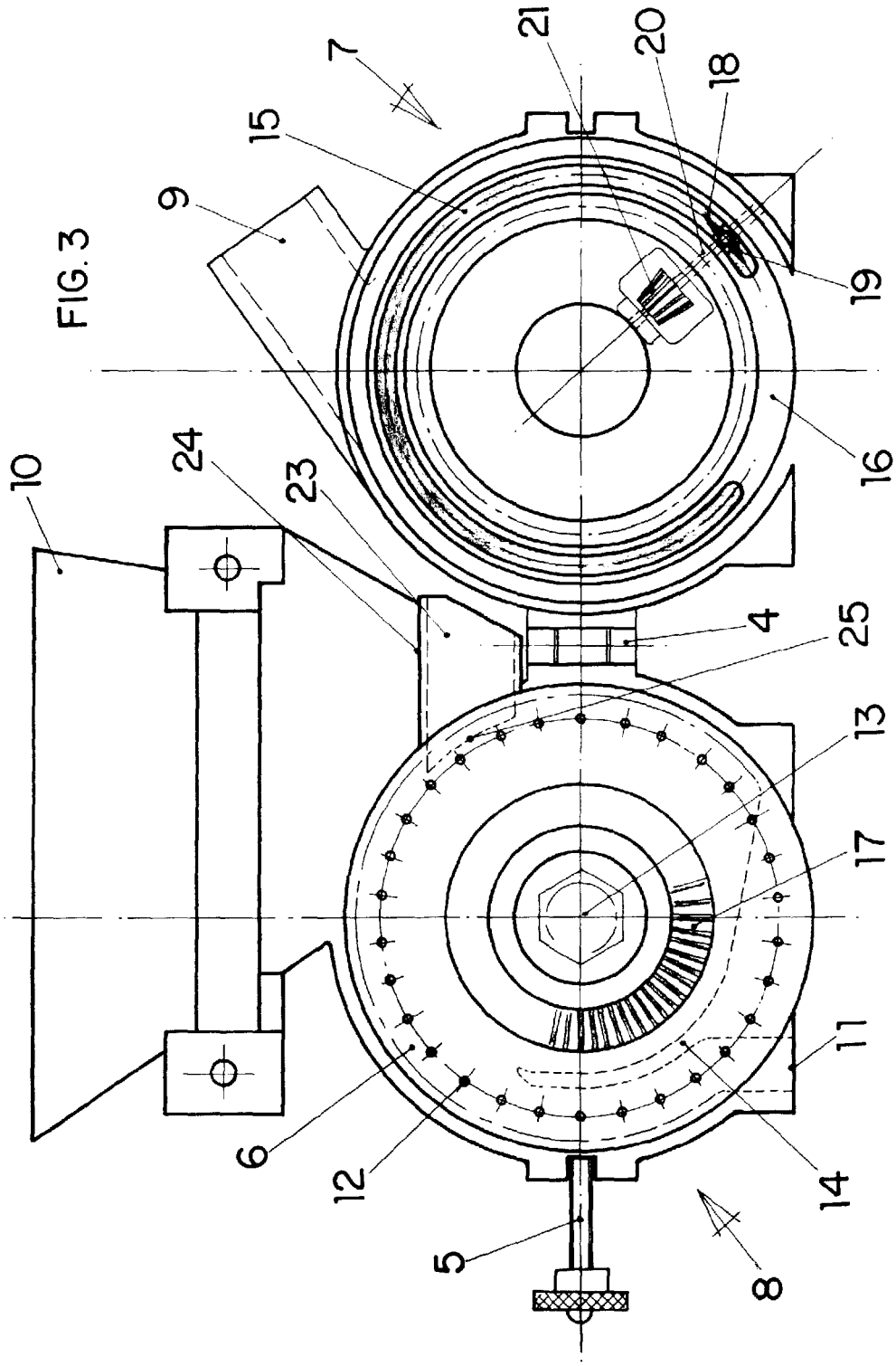
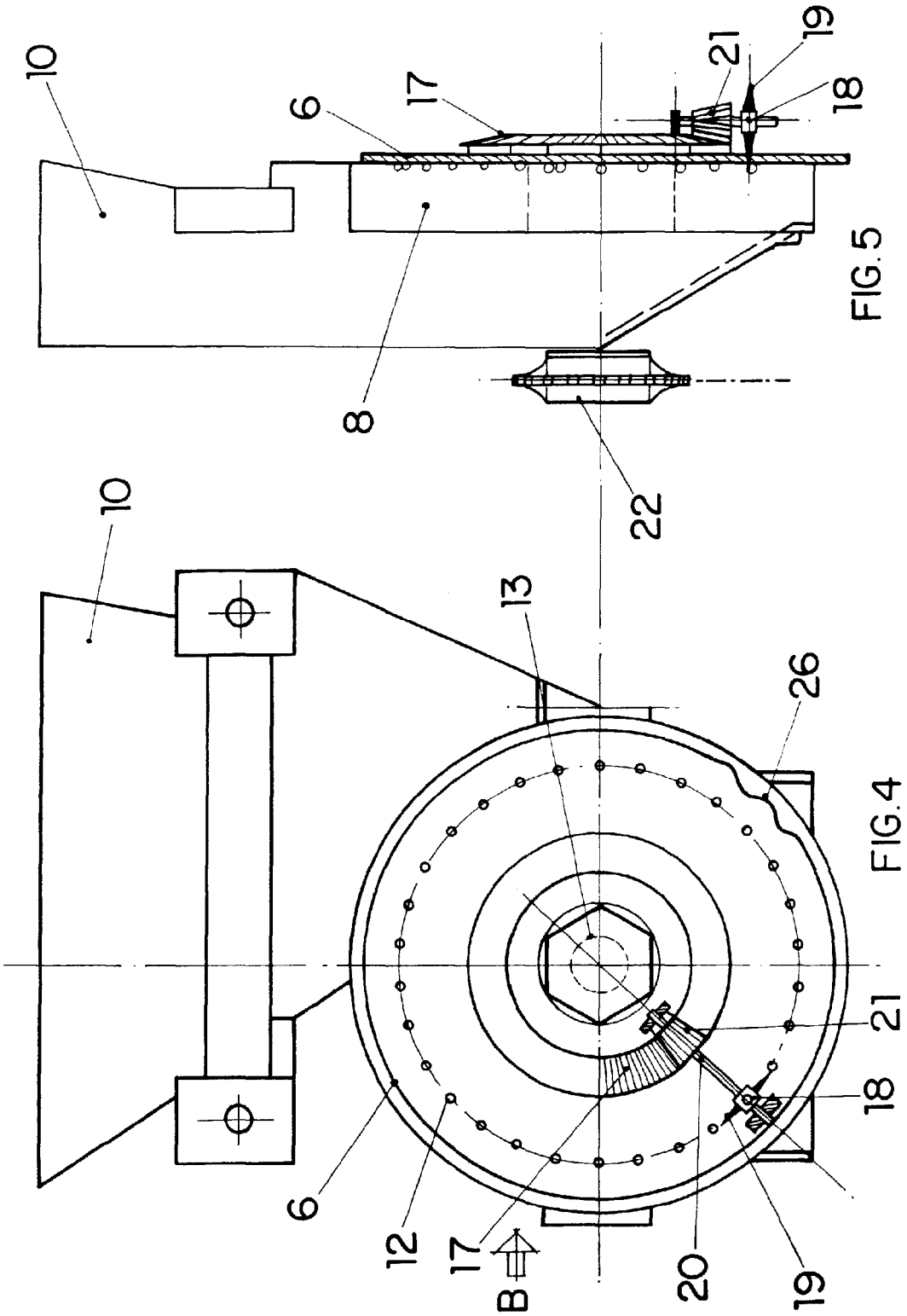


FIG.1

FIG. 3




10
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FIG.5
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FIG.4

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DESCRIPTION ES2013539

The present invention relates to a seed metering machine for seeders and, more specifically, to a seed metering device of the pneumatic type constituted to ensure a regular seed distribution or dosage, whatever the type of seeds to be sown.

The dispenser of the invention is of the type comprising a housing defining an approximately cylindrical enclosure, in which a rotating intermediate disk is mounted coaxially, delimiting two chambers, one for aspiration and another for supplying seed; whose disk has a series of small through holes distributed circularly close to the free edge; and whose suction chamber has an annular channel facing the holes of the disc, said channel being interrupted internally in a section and connected superiorly through a mouth to a suction device; and whose seed supply chamber has an upper inlet mouth and a lower outlet mouth, the second facing the interrupted lower section of the annular channel of the suction chamber, the mounted housing also carrying a seed limiting device.

In dispensers of the indicated type, when the suction chamber is connected to a vacuum source, through the holes in the rotating disc a suction is produced which causes the grains or seeds that penetrate through the loading mouth of the supply chamber of seeds adhere to said disk, around the holes. When the orifices reach the lower zone, in which the channel of the aspiration chamber is interrupted, the grains or seedlings are detached and fall by gravity through the lower outlet mouth of the seed supply chamber, since in this lower zone, by interruption of the mentioned channel, the aspiration or vacuum disappears.

When the seeds are small, around each hole of the disc several seeds usually adhere. In order to reduce the number of these that are dragged by the disc, the camera of the mounted dosing device mounted a device that eliminates the excess of seeds dragged in proximity of each hole.

Frequently the impurities that drag the seeds, the husk that can release the same or even the seeds themselves, when their size is close to that of the holes, can cause the obturation of the holes of the rotating disc. Logically, the obstructed holes will not drag seeds, which will cause a failure in the supply of seeds through the obstructed holes at each turn of the disc. To correct these faults it is necessary to open the dispenser and unblock or unblock the obstructed holes manually. These problems are aggravated when manipulating seeds of small dimensions and dotted configuration.

Some manufacturers of machinery of this type have tried to solve the drawbacks indicated by recourse to reverse air injection, which consists of the supply of air pressure in the area of the dispenser where there is no vacuum, ie at the bottom of it where the channel of the vacuum chamber is interrupted. To achieve this effect, the same fan can be used, by means of which the suction is carried out in the vacuum chamber. This system, however, has the disadvantage that the seeds are expelled at high speed, it being necessary to have screens or tubes of elbowing of exit that, although they do not avoid the excess speed, if they can direct the seed towards the point of sowing desired, even without great guarantees of precision. This system also supposes a great increase in the cost of the seed supplying device.

The object of the present invention is to develop a seed doser of simple constitution, which avoids the drawbacks indicated above and which allows the sowing of all types of seeds, regardless of their characteristics and size.

In the dispenser of the invention, by means of mechanical elements of simple constitution and operation, the risk of obturation of the holes of the disc is completely avoided, thus ensuring a regular and uniform dosing of the seeds. It also allows the seeds to be supplied at the precise time and place of sowing, by means of a smooth movement of the same, without sudden shocks or frictions that could cause their deterioration.

In accordance with the present invention, a seed ejection device, located in the lower part of said chamber, is mounted in the dosing chamber of the dispenser, the device of which includes at least

one needle that can be successively and partially inserted into the holes of the disc, when these reach the zone in which the channel of the aspiration chamber is interrupted, that is to say when the vacuum situation ends therein. The aforementioned needle is mounted on a mobile support that is driven synchronously by the rotating disc, to bring said needle closer to the disc, while a hole in the disc faces the needle, and then withdraws it.

The aforementioned ejector device can be composed of a sprocket, which includes a series of equidistant radial needles located in a plane perpendicular to the rotating disc. The axis of this wheel runs parallel and close to the rotary disc, radially thereto, and is mounted between end supports integral with the housing of the dispenser. In addition, the axis of the sprocket wheel has a conical pinion that engages with a crown that is integral with the rotating disc and concentric therewith. The position of the needles of the sprocket and the number of teeth and their size of the crown and pinion are calculated so that when the wheel is rotated, dragged by the rotating disc, the different needles are introduced successively into the holes of the mentioned disc.

With this system it is ensured that when reaching the holes of the rotating disc the area in which the channel of the vacuum chamber is interrupted, and in which therefore said vacuum disappears, the seeds and particles that could be partially introduced in the holes they are expelled from these, falling to the outside through the outlet mouth of the seed supply chamber.

The ejector device could also be constituted by an elbow lever, articulated to the housing along an axis parallel to the rotating disc. This lever is finished on one of its ends in a needle facing the holes of the disc, while on the opposite it rests on the edge of said rotating disc, towards which it is constantly driven. The edge of the rotary disc is shaped so as to present successive radially equal and equidistant projections and projections, of successively arcuate profile, to define a cam that alternately causes the rotation of the lever, to approximate and separate the end of the needle to the disc, the protrusions of the edge of the rotary disc being dimensioned and positioned so that on each approach of the needle to the disc the pointed end of the same coincides with a hole in the disc.

With the commented constitution, by means of a simple mechanism it is ensured that no seals are produced in the holes of the rotating disc and at the same time the seeds are detached at the exact point of fall.

According to another aspect of the invention, the limiting device for seeds driven by the disk is constituted by a knife partially inserted in the seed supply chamber, through an opening formed in

the side wall of the chamber. This blade is at its inner end attached to the rotating disk and has an oblique arched front, whose distance to the holes can be regulated by insertion and removal of the blade.

The features and advantages set forth will be better understood with the following description, made with reference to the attached drawings, in which a possible embodiment is shown, given by way of non-limiting example.

In the drawings:

Figure 1 is a side elevation of the dispenser, from the side of the aspiration chamber.

Figure 2 is an elevation, according to the direction A of figure 1.

Figure 3 is a view similar to Figure 1, showing the casing of the dispenser open.

Figure 4 is a view similar to Figure 1, in which the outer wall of the suction chamber has been removed.

Figure 5 is a schematic view, according to the direction B of figure 4, in which the side wall of the casing has been removed to show the internal mechanisms of the dispenser.

As can be seen in figures 1 and 2, the dispenser comprises a housing 1 that internally delimits an approximately cylindrical enclosure with horizontal axis. This housing is subdivided, according to a plane perpendicular to its axis, in two halves referenced with the numbers 2 and 3, which are related to each other by a hinge or articulation element 4, having at a diametrical point a closing device 5 .

Within the cylindrical enclosure an intermediate disc 6 is mounted, perpendicular to the axis of the casing, delimiting two chambers, one of aspiration, referenced with the number 7, and another supplier of seeds, which is referenced with the number 8. The chamber 7 has a duct 9 at its top that will be connected to a vacuum source, while the chamber 8 has a mouth 10 for supplying

seeds on the upper part, and a lower mouth 11 for the exit thereof.

In FIG. 3, the open housing 1 is shown, with the two halves connected to each other by the articulation device 4.

On the suction chamber 8 the rotary disc 6 is shown, which has an infinity of holes 12 distributed circumferentially, near the free edge of the disc. The disc 6 is mounted on a shaft 13 projecting to the outside by the external wall of this chamber, for its activation by means of a transmission. The seeds supplied through the mouth or hopper 10 enter the chamber 8 between the outer wall thereof and the disc 6, said chamber disposing in this space of a lower rib 14 that limits the outlet mouth 11 and will serve for the seed recovery, as will be described later.

The suction chamber 7 internally has an annular channel 15 facing the set of holes 12 of the rotating disc 6. This channel 15 is interrupted inferiorly in a section 16. The channel 15 goes in communication with the mouth 9, to produce the vacuum in the same when connecting said mouth to a source of aspiration.

A toothed crown 17, concentric with said disk, has been made on the rotary disk 6. For its part, a sprocket wheel 18 is mounted in the suction chamber 7, which includes a series of radial needles 19 located in a plane perpendicular to the rotating disk 6. The axis of this sprocket runs parallel to and close to the rotating disc 6, radially thereto and has a conical pinion 21 located in such a manner that, when closing the housing, it meshes with the crown 17, as can be more easily seen in FIG. Figures 4 and 5

When the chamber 1 is closed, when the dispenser is operated and seeds are supplied through the mouth 10, they fall into the chamber 8. By connecting the mouth 9 to a suction source, the vacuum is created in the channel 15, suction being produced through the holes 12 of the rotating disc 6, whereby the miles found in the chamber 8 adhere to the disk 6 around the holes 12. When the orifices reach the lower zone, in which the channel 15 is interrupted, the vacuum situation disappears, at the same time that the needles 19 of the sprocket wheel 18 penetrate successively into the holes, expelling the seeds therefrom. and particles that could have been introduced, falling by gravity through the outlet 11.

As seen in Figure 5, the shaft 10 of the rotating disc 6 protrudes to the outside, where it is topped by a toothed crown 22 that can be engaged with a pinion or driven by a chain.

To prevent each of the orifices 12 from dragging an excessive number of seeds, a limiting device is provided which is constituted by a blade 23 which is inserted through a fitted opening 24 formed in the housing. The blade 23 is attached to the rotary disc 6 and has an oblique internal arched edge 25, which will be placed parallel to the circle in which the holes 12 are distributed. The blade 23 can be inserted more or less at will, in order to regulate the distance of the edge 25 to the holes 12. The seeds that are detached by the blade 23 fall to the lower part of the chamber, being picked up by the rib 14, to begin a new distribution process.

As indicated above, the sprocket 18 can be replaced by an elbow lever, articulated along an axis parallel to the rotary disc 6, which at one end is tipped or needle to be introduced successively into the holes 12, while the The opposite one rests on the edge of the disc 6, which, as shown in FIG. 4, has successive arched radial recesses and projections 26 that form a cam, by means of which the lever is operated, so that the pointed end thereof Approach the disc in the positions in which it faces the holes 12, when passing them.

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(54) **SEED METERING SYSTEM WITH IMPROVED WEAR ENHANCEMENT**

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Related U.S. Application Data

(63) Continuation of application No. 09/061,639, filed on Apr. 15, 1998, now patented.

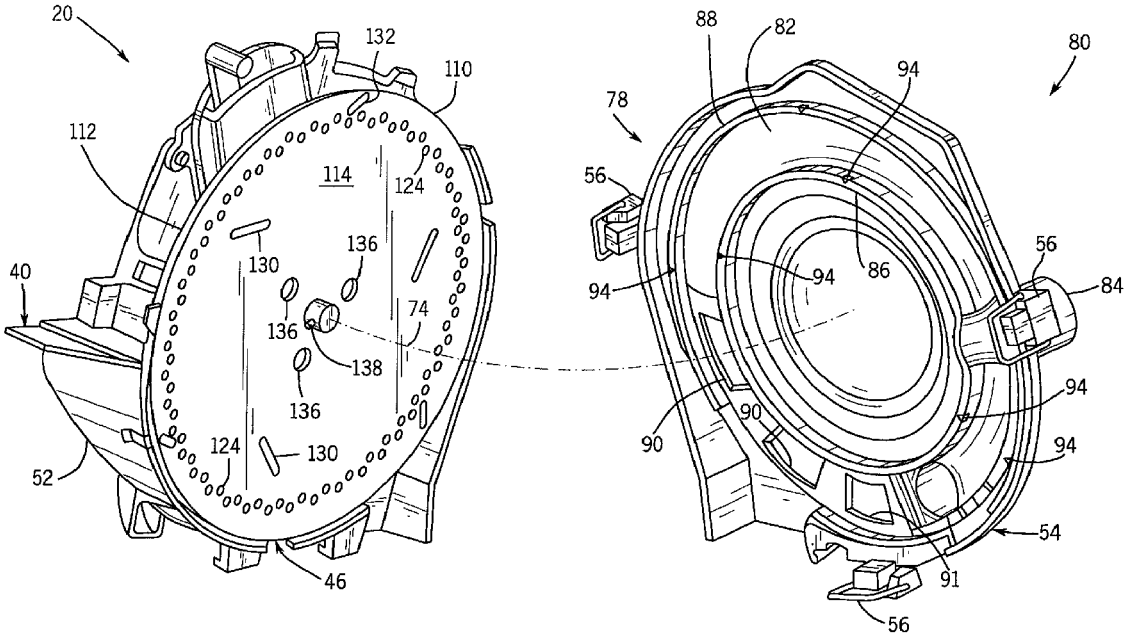
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(51) **Int. Cl.**[7] **A01C 7/00**

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(57) **ABSTRACT**

A seed metering system includes a first metering member having a first bearing surface and a second metering member having a plurality of seed engaging surfaces adapted to engage seeds and a second bearing surface positioned against the first bearing surface. The second metering member moves relative to the first metering member. At least one depression extends into the second bearing surface opposite the first bearing surface.



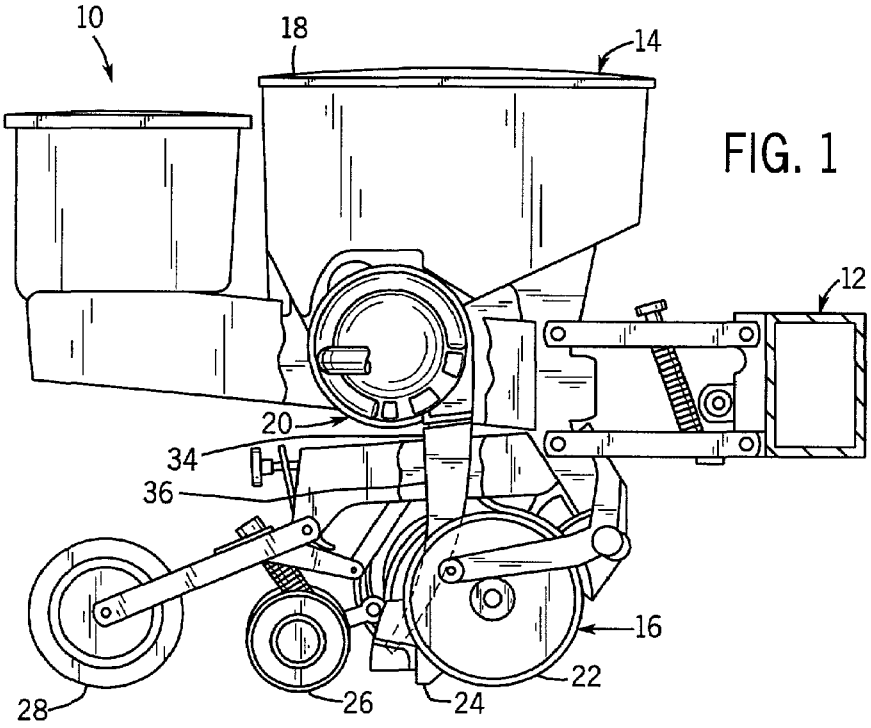


FIG. 1

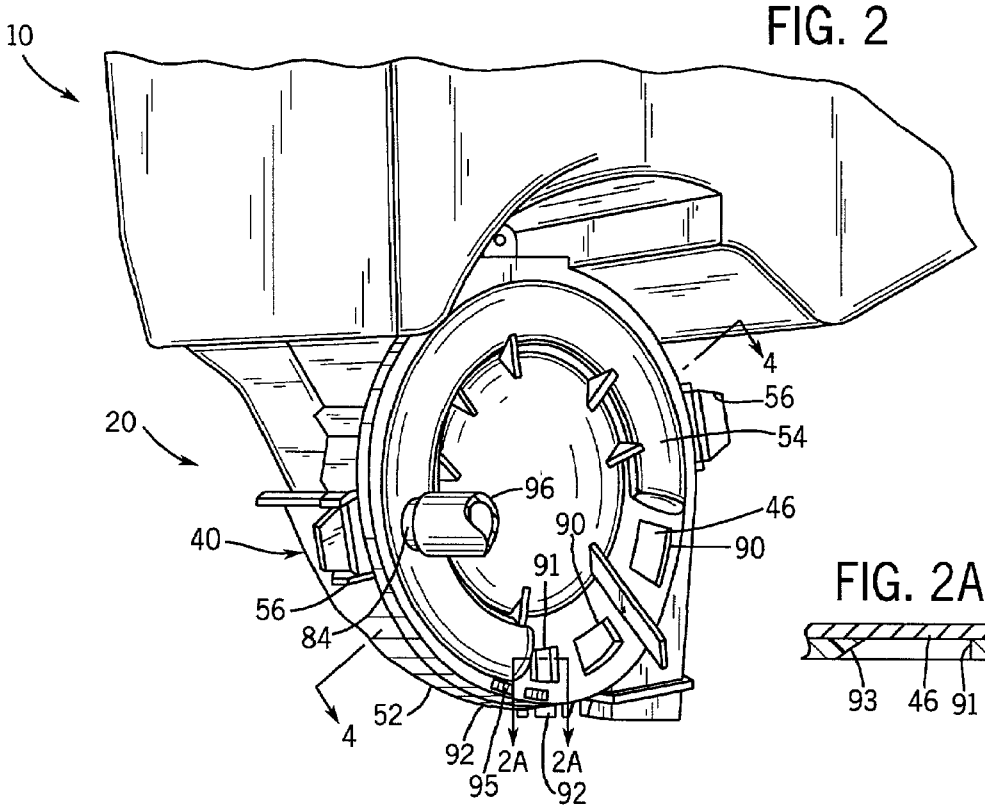


FIG. 2

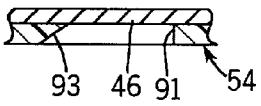


FIG. 2A

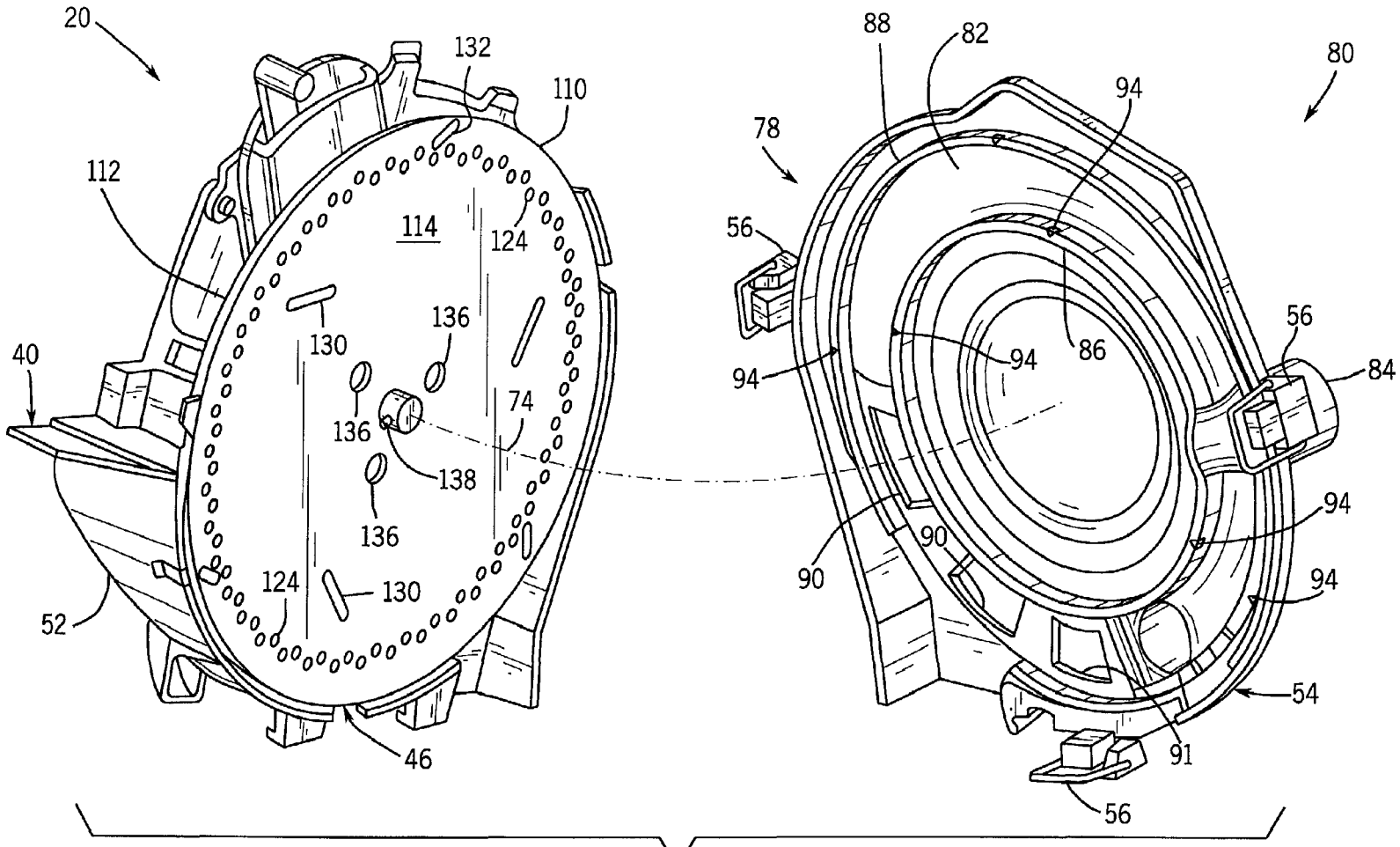

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FIG. 3

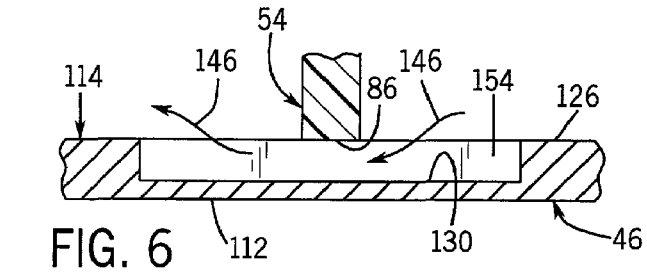


FIG. 6

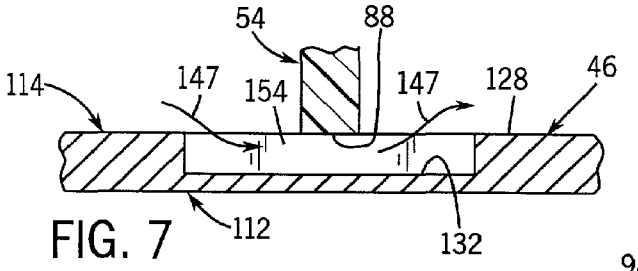


FIG. 7

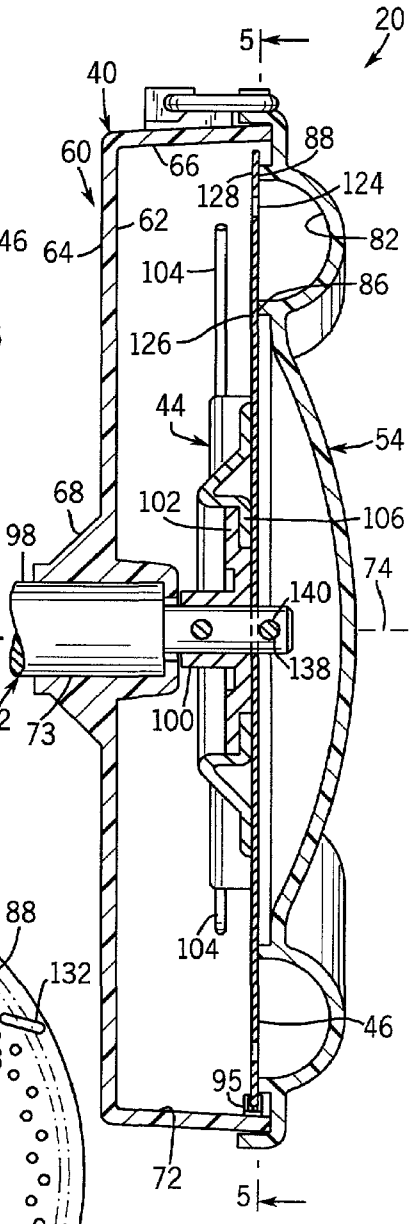


FIG. 4

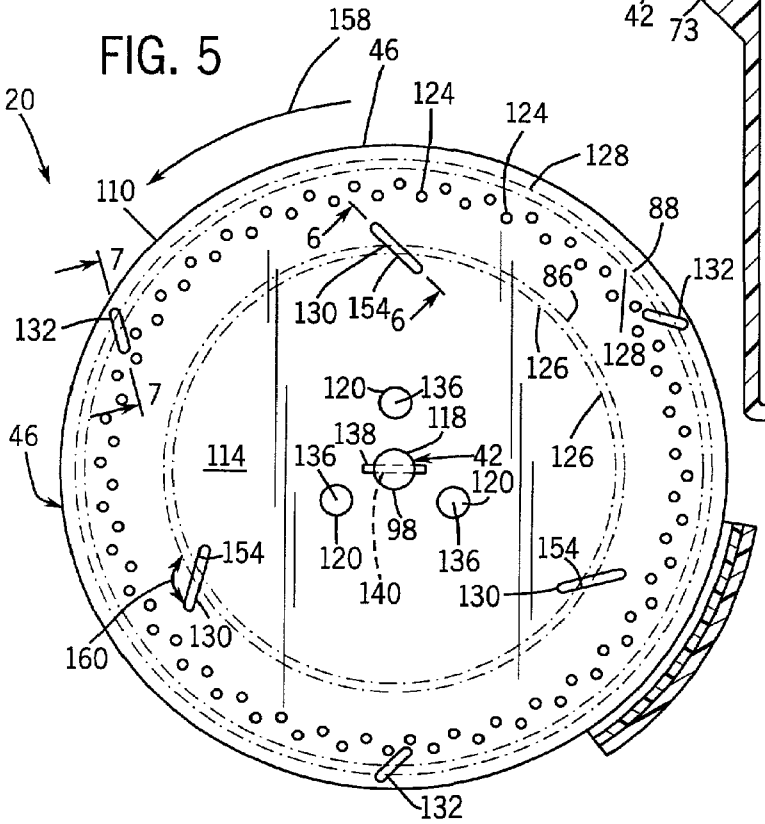


FIG. 5

SEED METERING SYSTEM WITH IMPROVED WEAR ENHANCEMENT

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This continuation application claims priority under 35 U.S.C. §120 from co-pending U.S. patent application Ser. No. 09/061,639 filed on Apr. 15, 1998 by Lisle J. Dunham, the full disclosure of which is hereby incorporated by reference.

FIELD OF THE INVENTION

[0002] The present invention relates to seed metering systems for dispensing individual seeds at a controlled rate as the seed metering system moves above and along a furrow. In particular, the present invention relates to a seed metering system having first and second metering members which move relative to one another along first and second bearing surfaces, wherein the metering system removes contaminants from between the first and second bearing surfaces to prolong the life of the metering members.

BACKGROUND OF THE INVENTION

[0003] Seed meters of various designs have been used for some time to dispense seeds at a controlled rate into a seed furrow as the seed meter is advanced above and along the seed furrow. In a typical arrangement, a tractor is coupled to tow a tool bar to which are attached in a generally parallel, spaced apart relation a plurality of planting units with seed meter arrangement attached thereto. Each planting unit typically includes a seed hopper for containing and carrying a large quantity of seeds to be planted or a smaller container fed from a centralized bin or large hopper, a device for opening a furrow in the ground as the tractor drawn tool bar is advanced across the field over the ground, a seed meter coupled to the seed hopper for dispensing individual seeds into the furrow at a controlled rate, and a further device for moving soil at the sides of the furrow to close the furrow over the seeds.

[0004] During a planting operation, the tractor typically moves across the field at speeds of about 4 to about 8 miles per hour. The spacing between adjacent individual seeds in each furrow can be as little as 0.5 inches or less or as much as 10 inches or more depending upon the particular seed being planted. The seed metering mechanism therefore must be capable of dispensing seeds at various rates in the order of 15 to 130 seeds per second or greater as well as at rates which are considerably less.

[0005] Some seed metering systems used in planting operations of the type discussed above are of the mechanical type and include a vertical or horizontal seed plate or disc with mechanically actuated fingers or similarly operated mechanical devices for separating individual seeds from the seed disc and then dispensing them into the furrow. While some mechanical seed meters are satisfactory for certain applications, they typically suffer from a number of limitations including the limited speed at which they can accurately dispense seeds, an inability to handle different type seeds without making cumbersome and extensive part changes, and an inherent design complexity which may typically add to the cost, wear and maintenance problems of the mechanically operated seed dispensing systems.

[0006] Alternatively, a seed metering mechanism which utilizes an air pressure differential has been developed in an effort to overcome some of the problems of the mechanical seed meters. Air pressure differential seed meters, which are commonly known as air seed meters, are generally of two types: the first type being the positive pressure type and the second type relying upon negative pressure or vacuum.

[0007] In the positive pressure type air seed metering mechanism, air is blown into the seed chamber and onto the surface of a rotating or otherwise movable and opening member or disc in order to create an air pressure greater than atmospheric pressure in the chamber. This forces seeds from a seed mass onto the seed member or disc where they are retained for later release. The openings or holes in the rotating member or disc are open to atmosphere, such that the individual seeds are held by the blowing air until the seeds are dispensed by interrupting the flow of air to the seeds.

[0008] Vacuum seed metering systems typically include a rotatable disc mounted for rotation within a hollow interior of a generally cylindrical two-piece housing mounted at the bottom of a seed hopper. Seeds from the seed hopper flow into a seed chamber within the housing on a side of the seed disc having a plurality of through openings provided in a circumferential arrangement adjacent the periphery of the disc. As the seed disc rotates, the openings are arranged such that they pass through the seed chamber and the seeds are drawn to the openings and held therewithin as the seed disc rotates. In vacuum seed metering mechanisms, as the seed disc rotates, the seeds are held in relation to the seed disc by a vacuum source coupled to a separate chamber on the opposite side of the seed disc from the seeds in the seed chamber. Because the pressure differential at the seed disc comes from a vacuum source on a side of the disc opposite from the seed chamber, the problem of having to direct an air flow through the seed mass and onto the seed disc is eliminated.

[0009] As is conventional, the vacuum communicates with the openings in the seed disc which extend through the thickness of the seed disc. As the individual seeds are carried by the seed disc, they eventually reach a discharge area from whence the seeds are discharged from the seed disc for gravitational deposit into the furrow passing beneath the seed metering mechanism. This is accomplished by isolating the effects of the vacuum or pressure differentials acting on the seed disc in the discharge region or area of the seed metering mechanism.

[0010] In vacuum seed metering systems, it is necessary that the vacuum chamber within the housing of the seed metering mechanism be sealed against atmospheric air so that the vacuum acting on the seeds can be confined to a particular path of movement of the openings in the seed disc. This requires sealing of the region between the outer periphery of the disc and the inner radial distance defined by the innermost circular row of openings in the disc. Complicating this requirement is the fact that the seed metering disc rotates at a speed which can be substantial.

[0011] Each of the above described seed metering systems includes a first stationary metering member against which a second metering member having a plurality of seed engaging surfaces moves to carry individual seeds from the seed mass. For example, the vertical or horizontal seed plate of

mechanical type seed metering systems typically rotates adjacent to the housing or other structure. In positive pressure types air seed metering systems, a drum having openings extending therethrough is typically rotated adjacent to a housing or other structure. With vacuum seed metering systems, a seed disc having openings extending therethrough is rotated adjacent to the housing or other structure. As a result, the bearing surfaces between the first and second metering members wear over time. This wear of the bearing surfaces accelerates when particles of dirt, seed treatment and other abrasive particles become captured between the first and second bearing surfaces. As the members move or rotate relative to one another, the particles abrade away at the bearing surfaces. As a result, this accelerated wear of the bearing surfaces requires that either the seed disc, the adjacent housing or both members be replaced more frequently.

[0012] Various attempts have been made to remove the abrasive materials and thereby prolong the life of the seed disc or abutting housing. One such attempt at removing abrasive materials has been the provision of a notch or cut-out in the small portion of the bearing surface of the adjacent housing. The notch defines a radially extending wall which scrapes material away from the opposing bearing surface. The notch is typically located at a bottom side of the housing such that material removed by the wall falls away from the housing under the force of gravity. Because the wall formed by the notch is radial, gravitational force is the only force applied to the abrasive material to remove the abrasive material from the seed disc. If the abrasive material is further mixed with grease or other sticky substances, the abrasive material will simply cling to the wall and will continue to abrade the rotating seed disc.

[0013] Another such attempt has been the provision of triangular depressions in the bearing surface of the cover. The triangular depressions typically have a wide base communicating with the vacuum chamber and narrow peak. One of the plurality of triangular depressions has a peak communicating with atmosphere.

[0014] These triangular depressions, alone, have been found to be ineffective at removing abrasive material. First, because the triangular depressions are formed at spaced locations in the bearing surface of the cover, which is stationary, the abrasive materials along substantial portions of the bearing surface of the cover are not removed. Consequently, these abrasive materials remain and continue to abrade both bearing surfaces of the seed disc and the cover. Second, the majority of the triangular depressions only communicate with the vacuum. As a result, such triangular depressions must rely solely upon scraping action to remove abrasive material. Because all the depressions are triangular in shape, removed abrasive material moves along the edge of the triangular depressions towards the peak of the triangular depression and away from the vacuum chamber. Thus, abrasive materials build up within the peak of the triangular depression and remain within the triangular depression to continue to abrade and wear the seed disc.

[0015] Thus, there is a continuing need for a seed metering system which effectively reduces abrasive materials between bearing surfaces of the metering members which move relative to one another to prolong the useful life of the metering members.

SUMMARY OF THE INVENTION

[0016] The present invention is directed to a seed metering system including a first metering member having a first bearing surface and a second metering member having a plurality of seed engaging surfaces adapted to engage seeds and a second bearing surface positioned against the first bearing surface. The second metering member moves relative to the first metering member and includes at least one depression extending into the second bearing surface opposite the first bearing surface.

[0017] According to one aspect of the present invention, the second metering member includes a plurality of depressions extending into the second bearing surface. The plurality of depressions are equidistantly spaced about an axis of rotation. In the most preferred embodiment, the plurality of depressions comprise three depressions spaced 120 degrees apart from one another about the axis.

[0018] According to yet another aspect of the present invention, the second member includes a plurality of openings extending therethrough. The openings at least partially define the seed engaging surfaces. The system further includes a vacuum chamber on one side of the second metering member adjacent at least a portion of the plurality of the openings. Preferably, the depression communicates with at least one of the vacuum chamber and atmosphere. In the most preferred embodiment, the depression communicates with both the vacuum chamber and the atmosphere.

[0019] According to yet another aspect of the present invention, the depression includes a wall obliquely extending into the second bearing surface. The wall preferably extends in a non-radial direction relative to an axis of rotation of the second metering member. In the most preferred embodiment, the second bearing surface rotates in a first predetermined direction relative to the first bearing surface and the wall extends from the second bearing surface towards the vacuum chamber in a direction so as to form an obtuse angle therebetween facing the vacuum chamber in a second opposite direction. The angle formed between the wall and the second bearing surface is preferably 135 degrees. As a result, the wall scrapes the abrasive material away from the first bearing surface and moves the abrasive material towards the vacuum chamber.

[0020] According to yet another aspect of the present invention, the first bearing surface also includes depressions extending into the first bearing surface opposite the second bearing surface. As a result, the abrasive material along the entire length of both the first bearing surface and the second bearing surface is removed.

[0021] The present invention is also directed to a seed disc for use with a seed metering system having a first bearing surface. The seed disc includes a plurality of seed engaging surfaces adapted to engage seeds, a second bearing surface adapted to be positioned against the first bearing surface and at least one depression extending into the second bearing surface.

[0022] According to one embodiment of the seed disc, the seed disc includes a plurality of depressions extending into the second bearing surface. Preferably, the plurality of depressions are equidistantly spaced from one another about an axis of rotation of the seed disc. According to yet another embodiment of the seed disc, the seed disc includes a

plurality of openings extending therethrough. The seed disc additionally includes a third bearing surface. The second bearing surface extends radially inwardly of the openings while the third bearing surface extends radially outwardly of the openings. Each of the second and third bearing surfaces are preferably provided with a plurality of depressions.

[0023] The present invention is also directed to a seed metering system including a first metering member, a second metering member and a wall. The first metering member has a first bearing surface. The second metering member includes a plurality of seed engaging surfaces and a second bearing surface positioned against the first bearing surface. The second metering member moves relative to the first metering member. The wall non radially extends from the second bearing surface in a direction oblique to the first bearing surface.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] **FIG. 1** is a side elevational view of a planter including a seed metering system of the present invention.

[0025] **FIG. 2** is an enlarged fragmentary perspective view of the seed metering system of **FIG. 1**.

[0026] **FIG. 2A** is a sectional view of the seed metering system taken along lines **2A-2A** of **FIG. 2**.

[0027] **FIG. 3** is a partially exploded perspective view of the seed metering system of **FIG. 2**.

[0028] **FIG. 4** is a cross-sectional view of the seed metering system taken along lines **4-4**.

[0029] **FIG. 5** is a sectional view of the seed metering system of **FIG. 4** taken along lines **5-5**.

[0030] **FIG. 6** is a sectional view of the seed metering system of **FIG. 5** taken along lines **6-6**.

[0031] **FIG. 7** is a sectional view of the seed metering system of **FIG. 5** taken along lines **7-7**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0032] **FIG. 1** is a side elevational view of a system **20** generally including frame **12** and planting units **14**. Frame **12** comprises an elongate structure configured to support a plurality of planting units **14** in a side by side relation so as to plant seeds in a plurality of rows. Frame **12** is preferably supported for movement across and over fields by a plurality of wheels (not shown) and is adapted to be towed in a given direction by a vehicle such as a tractor. Alternatively, frame **12** may be adapted for being directly mounted and carried by a vehicle. As will be appreciated, frame **12** may have a variety of different sizes and configurations depending upon the particular configuration and number of planting units **14**.

[0033] Planting units **14** each generally include furrow unit **16**, hopper **18** and seed metering system **20**. Furrow unit **16** is conventionally known and includes a pair of laterally spaced furrow opening discs **22**, a furrow forming point, an opener shoe **24**, furrow closer discs **26** and press wheel **28**. Furrow opener discs **22** and opener shoe **24** create a furrow in the ground as system **20** is moved across the field. Once seeds from hopper **18** have been deposited into the furrow by seed metering system **20**, furrow closer disc **26** and press wheel **28** close the furrow by covering the planted seed with adjacent soil. As will be appreciated, system **20** may alternatively be provided with any one of a variety of other furrow opening and closing devices such as runner opener types. Moreover, in lieu of furrow unit **16**, system **20** may alternatively be provided with other well known arrangements for implanting seeds provided by hopper **18** and seed metering system **20** into the ground or on the ground surface depending upon the type of seed being planted or dispensed.

[0034] Hopper **18** generally comprises a container for storing and dispensing seed material to the seed metering system **20**. Hopper **18** and its associated lid are essentially described and illustrated in U.S. Pat. No. 6,065,410 filed on Apr. 15, 1998 by Lisle J. Dunham and entitled "Hopper System with Lid", the full disclosure of which is hereby incorporated by reference. As will be appreciated, hopper **18** may have a variety of alternative sizes and configurations depending upon the configuration of seed metering system **20** as well as the size and volume of seed materials being stored. For example, hopper **18** may alternatively be connected to a centralized bin from which seed is provided. Moreover, in lieu of seed metering system **20** being provided with seed from hopper **18**, seed metering system **20** of planting unit **14** may be provided with seed from a centralized bin connected to seed metering system **20**.

[0035] Seed metering system **20** is supported by frame **12** and is configured to receive seed material from hopper **18** and to deliver seed at a controlled rate to the furrow created by furrow unit **16**. As shown by **FIG. 1**, seed metering system **20** preferably includes an elongated seed tube **34** extending to a location between shoe **24** and furrow closer discs **26**. Seed tube **34** provides a vertical passage **36** through which seeds are delivered by seed metering system **20** to the ground. In the preferred embodiment illustrated, seed tube **34** is preferably of the type disclosed in U.S. Pat. No. 5,974,988 filed on Dec. 29, 1995, the full disclosure of which is incorporated herein by reference.

[0036] During planting, as the vehicle pulls frame **12** across and over the ground, furrow opener discs **16** and shoe **24** create a furrow in the ground. Seeds from hopper **18** flow into seed metering system **20** from which seeds are introduced at a controlled rate into seed tube **34** to uniformly move through the vertical passage **36** defined by tube **34** into the furrow. Once the seeds are deposited into the furrow and into the ground, the furrow closer discs **26** close the furrow together and over the seed. Lastly, press wheel **28** compacts the soil over the planted seeds.

[0037] FIGS. **2-4** illustrate seed metering system **20** in greater detail. **FIG. 2** is an enlarged perspective view of seed metering system **20**. Alternatively, housing assembly **40** and seed plate or disc **46** will be additionally modified pursuant to U.S. Pat. No. 6,109,193 filed on Apr. 15, 1998 by Richard J. Crabb, Guntis Ozers, David N. Slowinski, Chad M. Johnson, Donald Johnson, Lisle J. Dunham, John F. Stufflebeam, Thomas A. Olson, Stephen D. Berry, Thomas Brown and Gerald J. Tiedt entitled "Seed Planter Apparatus and Method", the full disclosure of which is hereby incorporated by reference. **FIG. 3** is an exploded perspective view of seed metering system **20**. **FIG. 4** is a sectional view of seed metering system **20** taken along lines **4-4** of **FIG. 2**. Seed metering system **20** generally includes split housing assembly **40**, drive assembly **42**, agitator assembly **44** and seed plate or disc **46**. Housing assembly **40** is substantially

similar to the housing assembly disclosed and illustrated in U.S. Pat. No. 5,799,598 filed Aug. 20, 1996 and entitled "Apparatus for Sealing a Vacuum Chamber of a Seed Metering Apparatus," the full disclosure of which is hereby incorporated by reference. As shown by FIGS. **2-4**, housing assembly **40** generally includes a shell or housing **52** and a shell or cover **54** releasably connected to housing **52**. Preferably, cover **54** is releasably secured to housing **52** by a series of manually releasable fasteners **56** which enable cover **54** to be completely removed from housing **52**. Fasteners **56** secure cover **54** to housing **52** in a substantially air-tight relationship.

[**0038**] As best shown by **FIG. 4**, housing **52** includes a generally planar back wall **60** having inner and outer surfaces **62** and **64**, respectively, circumferential skirt or rim **66** and annular hub **68**. Rim **66** extends along the perimeter of back wall **60** and axially projects from inner surface **62**. Rim **66** cooperates and mates with cover **54** to close housing assembly **40**. In particular, inner surface **62** of back wall **60**, rim **66** and seed disc **46** define a seed reservoir or chamber **72** therebetween in which seeds are stored until being metered by the rotation of seed disc **46**.

[**0039**] Hub **68** is formed at the center of housing **52** and axially projects inwardly from inner surface **62**. Hub **68** defines a central bore **73** which defines a longitudinal axis **74** for seed metering system **20**. Hub **68** rotatably supports and centers drive assembly **42** along axis **74**.

[**0040**] Cover **54** is preferably formed as a unitary or one-piece member having an inner side **78** adapted to face housing **52** and seed disc **46** and an opposite outer side **80**. Cover **54** generally includes vacuum chamber **82**, vacuum port **84**, inner bearing surface **86**, outer bearing surface **88**, openings **90**, **91** and cutouts **92**. Vacuum chamber **82** is generally configured so as to extend adjacent to openings **124** in seed disc **46** as seed disc **46** lifts and carries seeds. Vacuum chamber **82** is preferably arcuately shaped and extends approximately 270 degrees along an inner periphery of cover **54**. Vacuum chamber **82** communicates with suction port **84** and is defined by bearing surfaces **86** and **88**. As best shown by **FIG. 2**, suction port **84** is connected to a flexible conduit **96**. Flexible conduit **96** is further connected to a vacuum source (not shown) such that a vacuum or negative pressure is created in chamber **82** when cover **54** is fastened to housing **52**. The negative pressure within chamber **82** draws air through openings **124** of seed disc **46** and further maintains seeds against openings **124** of seed disc **46** as the seeds are lifted and carried by seed disc **46** and are deposited into tube **34** (shown in **FIG. 1**).

[**0041**] Bearing surfaces **86** and **88** provide generally flat surfaces projecting away from inner side **78** of cover **54** so as to abut and contact seed disc **46** on opposite sides of openings **124**. As best shown by **FIG. 3**, bearing surface **86** angularly extends along inner side **78** of cover **54** adjacent vacuum chamber **82**. Bearing surface **88** arcuately extends along inner side **78** of cover **54** adjacent an outer perimeter of vacuum chamber **82**. As further shown by **FIG. 3**, bearing surfaces **86** and **88** include triangular shaped recesses or depressions **94** equidistantly positioned along vacuum chamber **82**. Depressions **94** are triangular shaped such that depressions **94** are widest adjacent to vacuum chamber **82**. Depressions **94** preferably communicate with vacuum chamber **82** but do not completely extend across bearing surface **86** and **88** so as to also communicate with atmosphere. Depressions **94** engage seed disc **46** to remove dirt and debris accumulations on seed disc **46**. As best shown by **FIG. 4**, bearing surface **86** abuts seed disc **46** radially inward of openings **124**. Bearing surface **88** engages and abuts seed disc **46** radially outward of openings **124**.

[**0042**] Openings **90**, **91** extend through cover **54** circumferentially between ends of vacuum chamber **82**. Openings **90**, **91** enable dirt and other abrasive materials on seed disc **46** to be visually inspected and to fall away from seed disc **46**. As best shown by **FIG. 2**A, opening **91** is bordered by blade **93** formed as part of cover **54** and extending into engagement with seed disc **46**. Blade **93** scrapes and removes abrasive material from seed disc **46**. The removed abrasive material falls away from seed disc **46** under the force of gravity through opening **91**.

[**0043**] Cut-outs **92** extend into a perimeter of cover **54** proximate to brush **95**. As best shown by **FIG. 4**, brush **95** includes bristles which project from housing **52** into engagement with a perimeter of seed disc **46**. Brush **95** prevents seed from becoming captured between seed disc **46** and housing **52** or cover **54**. Cut-outs **92** enable brush **95** to be visually inspected and also facilitate the removal of abrasive material from between cover **54** and seed disc **46**.

[**0044**] Drive assembly **42** axially extends through and is vertically mounted to hub **68** of housing **52**. Drive assembly **42** is substantially identical to the drive assembly described and illustrated in U.S. Pat. No. 5,799,598, the complete disclosure of which is hereby incorporated by reference. Alternatively, drive assembly **42** may be further modified from the drive assembly illustrated in U.S. Pat. No. 5,799,598, to include the coupling system described and illustrated in U.S. Pat. No. 6,003,454 entitled "Automatic Coaxial Engagement Drive Coupler" filed on Apr. 15, 1998 by Guntis Ozers and Joseph A. Michalic, the full disclosure of which is hereby incorporated by reference. As shown in **FIG. 4**, drive assembly **42** includes driven shaft **98** and rotor **100**. Driven shaft **98** is rotatably mounted within bore **73** defined in housing **52** coaxially with axis **74**. Driven shaft **98** is mounted to rotor **100**. Rotor **100** is identical to the drive rotor illustrated and described in U.S. Pat. No. 5,799,598, the full disclosure of which is hereby incorporated by reference. Rotor **100** mates with agitator assembly **44** and seed disc **46** to rotatably drive agitator assembly **44** and seed disc **46** about axis **74**.

[**0045**] Agitator assembly **44** is substantially identical to the agitator assembly described and illustrated in U.S. Pat. No. 5,799,598, the full disclosure of which is incorporated by reference. Agitator assembly **44** generally includes a disc-shaped rotor **102** from which a plurality of flexible fingers **104** radially extend. Rotor **102** includes spring structure **106** which resiliently urges seed disc **46** towards cover **54**. Fingers **104** radially extend outward from rotor **102** to agitate the seed mass in housing **52** upon rotation of rotor **102** by driven shaft **98** and drive rotor **100**.

[**0046**] Seed disc **46** is a generally circular plate having a perimeter **110**, and first and second opposing sides **112** and **114**. Seed disc **46** generally includes central opening **118**, drive sockets or openings **120**, openings **124**, inner bearing surface **126**, outer bearing surface **128**, depressions **130** and depressions **132**. Side **112** of seed disc **46** is generally planar or flat and is adapted for being positioned against drive rotor

102 and rotor 102 of agitator assembly 44. Side 114 of seed disc 46 extends opposite side 112. Side 114 is generally planar or flat and is configured for engaging bearing surfaces 86 and 88 of cover 54. Side 114 defines bearing surfaces 126, 128 and depressions 130, 132.

[0047] Openings 118 and 120 extend through seed disc 46 from side 112 to side 114. Openings 118 and 120 are preferably sized and configured for receiving drive rotor 102 of drive assembly 42 to nonrotatably couple seed disc 46 to drive assembly 42. In the preferred embodiment illustrated, opening 118 receives an end portion of driven shaft 98 while openings 120 receive pins 136 of drive rotor 102. As a result, seed disc 46 is removably mounted to drive assembly 42 to enable the seed disc to be easily replaced when worn. Seed disc 46 is axially retained on driven shaft 98 and pins 136 by pin 138 extending through bore 140 at an end of shaft 98. As will be appreciated, the size as well as the location of openings 118 and 120 will vary depending upon the size and configuration of the drive assembly to which the seed disc is mounted. Furthermore, in lieu of openings 118 and 120, seed disc 46 may have various other structures or configurations for enabling seed disc 46 to be removably mounted to a correspondingly configured portion of a drive assembly for enabling seed disc 46 to be rotated.

[0048] Openings 124 extend through seed disc 46 from side 112 to side 114. Openings 124 are preferably located so as to form two adjacent and concentric rows between bearing surfaces 126 and 128. Openings 124 are located so as to extend adjacent to vacuum chamber 82 of cover 54 when positioned adjacent cover 54. Openings 124 are sized to at least partially receive the seeds stored between housing 52 and seed disc 46 such that the negative pressure within vacuum chamber 82 draws air through openings 124 and maintains a seed against each opening 124 on side 112 of seed disc 46. As will be appreciated, the number of openings 124, the spacing between openings 124 and the exact size and configuration of openings 124 will vary depending upon the type of seed or other material being metered as well as the desired seed spacings.

[0049] Bearing surfaces 126, 128 extend along side 114 of seed disc 46. Bearing surfaces 126 and 128 comprise portions of side 114 of seed disc 46 which face and abut bearing surfaces 86 and 88, respectively, of cover 54. In the exemplary embodiment, bearing surfaces 126 and 128 are generally coplanar with the remainder of side 114 of disc 46. Alternatively, bearing surfaces 126 and 128 may axially project away from side 114 towards cover 54 or axially project away from side 114 towards side 112 of disc 46. As best shown by FIG. 5, bearing surfaces 126 and 128 extend adjacent to opposite sides of openings 124. In particular, bearing surface 126 extends radially inward of openings 124. Bearing surface 128 encircles openings 124 and extends radially outward of openings 124. Bearing surfaces 126 and 128 bear against bearing surfaces 86 and 88 to stabilize seed disc 46 between drive rotor 102 of drive assembly 42 and cover 54.

[0050] FIGS. 5-7 illustrate depressions 132 and 134 in greater detail. Depressions 130 extend into bearing surface 126 opposite bearing surface 86 of cover 54. As best shown by FIG. 6, depressions 130 preferably comprise elongate, narrow slots which communicate between vacuum chamber 82 having a negative pressure and located on a first side of bearing surface 86 and an exterior of vacuum chamber 82 having an atmospheric pressure and located on a second opposite side of bearing surface 86 of cover 54. As best shown by FIG. 7, depressions 132 also preferably comprise elongate, narrow slots which communicate between vacuum chamber 82 located on the first side of bearing surface 88 and an exterior of vacuum chamber 82 located on a second opposite side of bearing surface 88. Depressions 130 and 132 are preferably sized so as to have a cross-sectional area communicating between vacuum chamber 82 and atmosphere such that air flow through depressions 130 and 132 from atmosphere to the vacuum chamber (as indicated by arrows 146 and 147) is sufficiently high so as to draw dirt and other abrasive materials away from bearing surfaces 86 and 88. The abrasive material vacuumed away from bearing surfaces 86 and 88 by the air flow within depressions 130 and 132 is further drawn into the vacuum chamber 82 where it is ultimately discharged from system 20. In addition to vacuuming abrasive materials away from bearing surfaces 86 and 88, the air flow within depressions 130 and 132 also cool bearing surfaces 86 and 88. The cooling of bearing surfaces 86 and 88 prevents the generally plastic surfaces 86 and 88 from becoming fused to one another during the rotation of seed disc 46 relative to cover 54.

[0051] In the preferred embodiment illustrated, depressions 130 and 132 have a U-shaped cross-section with a width of approximately 2.5 millimeters and a depth of approximately 2.1 millimeters. As shown by FIG. 5, seed disc 46 preferably includes three depressions 130 and three depressions 132 equidistantly spaced along bearing surfaces 126, 128 opposite bearing surfaces 86, 88, respectively. As a result, during each revolution of seed disc 46, bearing surfaces 86 and 88 of cover 54 are vacuumed three times to remove dirt and other abrasive materials which would otherwise abrade against bearing surfaces 86, 88 and bearing surfaces 126, 128 during the rotation of seed disc 46. Because depressions 130 and 132 are located in seed disc 46, which is rotated by drive assembly 42, the entire annular bearing surface 86 is cleaned of abrasive materials by air flow passing through depressions 130 and 132.

[0052] In addition to vacuuming abrasive materials away from bearing surfaces 86, 88, depressions 130 and 132 also scrape abrasive material away from bearing surfaces 86, 88 to further clean bearing surfaces 86, 88 to prolong the useful life of bearing surfaces 86, 88 and bearing surface 126, 128. As best shown by FIGS. 6-7, depressions 130 and 132 define side walls 154 extending obliquely from side 114 towards side 112 of disc 46. In the exemplary embodiment, side walls 154 perpendicularly extend from side 114 towards side 112. Side walls 154 extend across the entire width of bearing surfaces 86 and 88 so as to abut against and scrape abrasive material away from the entire width of bearing surfaces 86 and 88. As best shown by FIG. 5, side walls 154 of each of depressions 130 and 132 non-radially extend along side 114. As a result, material removed from bearing surfaces 86 and 88 by walls 154 is further moved away from bearing surface 126 and 128. To facilitate the complete removal of abrasive material away from bearing surface 126, wall 154 is preferably oriented so as to move the abrasive material removed from bearing surfaces 86, 88 towards vacuum chamber 82 as seed disc 46 is rotated. In the exemplary embodiment illustrated in FIG. 5, seed disc 46 rotates in a counterclockwise direction as indicated by arrow 158. Each wall 154 is oriented so as to extend towards the vacuum chamber in a

direction so as to form an obtuse angle **160** facing vacuum chamber **82** in a direction opposite to the rotational direction of seed disc **46** as indicated by arrow **158**. The obtuse angle **160** is preferably approximately 135 degrees. Although less optimum, wall **154** may be oriented at various other obtuse angles so as to move the removed abrasive material towards vacuum chamber **178**. By directing removed abrasive material towards vacuum chamber **82** as seed disc **46** is rotated, walls **154** work with, rather than against, the air flow through depressions **130** and **132** to better remove the abrasive materials.

[**0053**] In addition to removing abrasive materials from along bearing surface **86** of cover **54**, depressions **130** and **132** also visually indicate the extent of wear which has occurred on seed disc **46**. As seed disc **46** rotates against cover **54**, bearing surfaces **126** and **128** ultimately become worn away over time. As a result, seed disc **46** must be periodically inspected and replaced to ensure proper functioning of system **20**. Similar to grooves in a tire tread, depressions **130** and **132** enable the operator to easily identify the extent of wear which has occurred by visually inspecting or measuring the remaining depth of depressions **130** and **132**. In particular, increased wear is indicated by depressions **130** and **132** having a diminishing depth.

[**0054**] Overall, depressions **130** and **132** of seed disc **46** prolong the life of seed disc **46**, prolong the life of cover **54** and facilitate timely replacement of seed disc **46** when worn. Because depressions **130** and **132** are formed as part of seed disc **46** which is rotated relative to cover **54**, depressions **130** and **132** remove abrasive material trapped between bearing surfaces **86**, **88** and bearing surfaces **126**, **128**, respectively, along the entire interface between cover **54** and seed disc **46**. Because cover **54** includes depressions **94** extending into bearing surfaces **86**, depressions **94** remove abrasive material from along the entire bearing surfaces **126**, **128**. At the same time, because depressions **94** do not communicate between vacuum chamber **82** and atmosphere, depressions **94** do not reduce the negative pressure within vacuum chamber **82**. Because depressions **130** and **132** further define walls **154** which scrape abrasive material away from bearing surfaces **86**, **88** of cover **54** and also move the removed abrasive material towards vacuum chamber **82**, bearing surfaces **86** and **88** are better cleaned and the removed abrasive material is completely removed from system **20** by the vacuum source to prevent the abrasive material from contacting and abrading other components of system **20**. Because each of depressions **130** and **132** communicate between vacuum chamber **82** and the exterior of vacuum chamber **82**, which is at atmospheric pressure, abrasive material is vacuumed away from bearing surfaces **86** and **88** by air drawn from atmosphere depressions **130** and **132** into vacuum chamber **82**. In addition to prolonging the useful life of seed disc **46** as well as cover **54**, depressions **130** and **132** also enable the operator to visually determine the extent of wear of seed disc **46** by inspecting the depth of depressions **130** and **132**.

[**0055**] Although the present invention has been described with reference to preferred embodiments, workers skilled in the art will recognize that changes may be made in form and detail without departing from the spirit and scope of the invention. The present invention described with reference to the preferred embodiments and set forth in the following claims is manifestly intended to be as broad as possible. For example, unless specifically otherwise noted, the claims reciting a single particular element also encompass a plurality of such particular elements.

What is claimed is:

1. A seed metering system comprising:

a first metering member having a first bearing surface;

a second metering member having a first side including a plurality of seed engaging surfaces adapted to engage seeds and a second opposite side including a second bearing surface positioned against the first bearing surface, wherein the first and second metering members move relative to one another; and

at least one depression extending into the second bearing surface.

2. The system of claim 1 including a plurality of depressions extending into the second bearing surface opposite the first bearing surface.

3. The system of claim 1 wherein the first and second members are moved relative to one another about an axis of rotation.

4. The system of claim 3 wherein the first and second bearing surfaces circumferentially extend about the axis.

5. The system of claim 4 including a plurality of depressions extending into the second bearing surface opposite the first bearing surface.

6. The system of claim 5 wherein the plurality of depressions are equidistantly spaced about the axis.

7. The system of claim 6 wherein the plurality of depressions comprise three depressions spaced 120 degrees apart from one another about the axis.

8. The system of claim 4 wherein the first and second bearing surfaces extend radially outwardly of the seed engaging surfaces.

9. The system of claim 8 wherein the first metering member includes a third bearing surface and wherein the second metering member includes a fourth bearing surface positioned against the first bearing surface, wherein the third and fourth bearing surfaces extend radially inwardly of the seed engaging surfaces.

10. The system of claim 9 including at least one depression extending into of the fourth bearing surface opposite the third bearing surface.

11. The system of claim 10 including a plurality of depressions extending into at the fourth bearing surface.

12. The system of claim 11 wherein the plurality of depressions extending into the fourth bearing surfaces are equidistantly spaced from one another.

13. The system of claim 4 including a plurality of openings extending through the second member, wherein the openings at least partially define the seed engaging surfaces.

14. The system of claim 13 including a vacuum chamber on one side of the second metering member adjacent at least a portion of the plurality of openings, wherein said at least one depression communicates with at least one of the vacuum chamber and atmosphere.

15. The system of claim 14 wherein said at least one depression communicates with both the vacuum chamber and atmosphere.

16. The system of claim 4 wherein said at least one depression includes a wall extending into the second bearing surface.

17. The system of claim 16 wherein the wall perpendicularly extends into said one of the first and second bearing surfaces.

18. The system of claim 16 wherein the wall extends in a non-radial direction relative to the axis.

19. The system of claim 14, wherein the depression includes a wall extending into the second bearing surface, wherein the second bearing surface rotates in a first predetermined direction relative to the first bearing surface and wherein the wall extends from the second bearing surface towards the vacuum chamber in a direction so as to form an obtuse angle therebetween facing the vacuum chamber in a second opposite direction.

20. The system of claim 19, wherein the obtuse angle forms between the wall and the second bearing surfaces is approximately 135 degrees.

21. The system of claim 14 wherein the first and second bearing surfaces extend radially inwardly of the vacuum chamber.

22. The system of claim 14 wherein the first and second bearing surfaces extend radially outwardly of the vacuum chamber.

23. The system of claim 22 wherein the first metering member includes a third bearing surface, wherein the second metering member includes a fourth bearing surface positioned against the third bearing surface, the third and fourth bearing surfaces extending radially inwardly of the vacuum chamber.

24. The system of claim 23 including at least one depression extending into the fourth bearing surface opposite the third bearing surface.

25. The system of claim 22 including a plurality of depressions extending into the fourth bearing surfaces.

26. The system of claim 25 wherein the plurality of depressions are equidistantly spaced from one another about the axis.

27. The system of claim 1 wherein at least one of the first and second bearing surfaces are formed from a material chosen from the class comprised of:

thermoplastic elastomers for a nylon material with antistat and low friction agents added thereto.

28. The system of claim 1 wherein the first and second bearing surfaces are resiliently urged towards one another.

29. The system of claim 1 wherein the second bearing surface is formed from a material that wears as the first and second bearing surfaces move relative to one another and wherein the at least one depression extending into the second bearing surface has a decreasing depth as a result of the second bearing surface becoming worn to indicate a degree to which the second bearing surface has become worn.

30. A seed disc for use with a seed metering system having a first bearing surface, the seed disc comprising:

a disc member including:

a first side including a plurality of seed engaging surfaces adapted to engage seeds;

a second opposite side including a second bearing surface adapted to be positioned against the first bearing surface; and

at least one depression extending into the second bearing surface.

31. The seed disc of claim 30 including a plurality of depressions extending into the second bearing surface.

32. The seed disc of claim 31 wherein the seed disc is adapted for rotation about an axis and wherein the plurality of depressions are equidistantly spaced from one another about the axis.

33. The seed disc of claim 30 wherein the disc member is adapted for being rotated about an axis and wherein the second bearing surface extends radially outwardly of the plurality of seed engaging surfaces.

34. The seed disc of claim 33 wherein the seed metering system has a third bearing surface and wherein the seed disc includes a fourth bearing surface adapted to be positioned against the third bearing surface, wherein the fourth bearing surface extends radially inwardly of the plurality of seed engaging surfaces.

35. The seed disc of claim 34 including at least one depression extending into the fourth bearing surface.

36. The seed disc of claim 30 including a plurality of openings extending through the seed disc, wherein the plurality of openings at least partially define the plurality of seed engaging surfaces.

37. The seed disc of claim 34 wherein the metering system includes a vacuum chamber adapted to be positioned adjacent to the plurality of openings and wherein said at least one depression communicates with at least one of the vacuum chamber and atmosphere.

38. The seed disc of claim 37 wherein said at least one depression communicates between the vacuum chamber and atmosphere.

39. The seed disc of claim 30 wherein the seed disc is adapted to rotate about an axis and wherein the depression includes a wall obliquely extending into the second bearing surface and non-radially extends along the second bearing surface.

40. The seed disc of claim 37 wherein the seed disc is adapted to rotate about an axis in a first predetermined direction, wherein said at least one depression includes a wall obliquely extending into the second bearing surface, wherein the wall extends from the second bearing surface towards the vacuum chamber in a direction so as to form an obtuse angle therebetween facing the vacuum chamber in a second opposite direction.

41. The seed disc of claim 40 wherein the obtuse angle formed between the wall and the bearing surface is approximately 135 degrees.

42. The seed disc of claim 39 wherein the wall extends perpendicular to the second bearing surface.

43. The seed disc of claim 30 wherein the second bearing surface is made of a material and is configured so as to form a seal against the first bearing surface.

44. The seed disc of claim 30 wherein the second bearing surface is formed from a material chosen from the class comprised of:

thermoplastic elastomers, polymers or a nylon material with antistat and low friction agents added thereto.

45. The disc of claim 30 wherein the second bearing surface is formed from a material that wears as the first and second bearing surfaces move relative to one another and wherein the at least one depression extending into the second bearing surface has a decreasing depth as a result of

the second bearing surface becoming worn to indicate a degree to which the second bearing surface has become worn.

46. A seed metering system including:

a first metering member having a first bearing surface;

a second metering member including a plurality of seed engaging surfaces for engaging seeds and a second bearing surface opposite the plurality of seed engaging surfaces and positioned against the first bearing surface, wherein the second metering member moves relative to the first metering member; and

a wall extending from the second bearing surface in a direction towards the first bearing surface.

47. The seed metering system of claim 46 wherein the wall extends in a direction perpendicular to the other of the first and second bearing surfaces.

48. The system of claim 46 wherein the second bearing surface is formed from a material that wears as the first and second bearing surfaces move relative to one another and wherein the at least one depression extending into the second bearing surface has a decreasing depth as a result of the second bearing surface becoming worn to indicate a degree to which the second bearing surface has become worn.

49. A planter comprising:

a frame;

a furrow opening unit supported by the frame;

a hopper supported by the frame; and

a seed metering system supported by the frame so as to meter seeds from the hopper to a furrow created by the furrow opening unit, the seed metering system including:

a housing;

a cover adjacent to housing; and

a seed disc having a plurality of openings extending therethrough and rotatably supported between the housing and the cover, wherein the housing and the seed disc form a seed chamber in communication with the hopper on a first side of the seed disc and a vacuum chamber on a second opposite side of the seed disc adjacent at least a portion of the plurality of openings, wherein the cover and the seed disc abut one another along the first and second bearing surfaces, respectively, and wherein the seed disc includes at least one depression extending into the second bearing surface, whereby the depression facilitates removal of contaminants from between the first and second bearing surfaces.

50. The planter of claim 49 wherein the second bearing surface is formed from a material that wears as the first and second bearing surfaces move relative to one another and wherein the at least one depression extending into the second bearing surface has a decreasing depth as a result of the second bearing surface becoming worn to indicate a degree to which the second bearing surface has become worn.

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Ven Huizen (43) **Pub. Date: Oct. 2, 2003**

(54) **METHOD AND APPARATUS FOR IMPROVING THE EFFICIENCY OF A JOHN DEERE VACUUM PLANTER**

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Publication Classification

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(52) **U.S. Cl.** **221/211**

(57) **ABSTRACT**

The efficiency of a John Deere planter to plant corn seed is improved where the planter is of the type having a vacuum operated metering unit enclosing a seed disk and a double eliminator. To improve the efficiency a kit is provided including an improved seed disk, an improved double eliminator, and an alignment tool for properly aligning the double eliminator with respect to the seed disk. When the parts are installed and properly aligned the planter can accept corn seed in the range of 1200 seeds per pound to 2800 seeds per pound without requiring readjustment of the vacuum setting or replacing the seed disk.

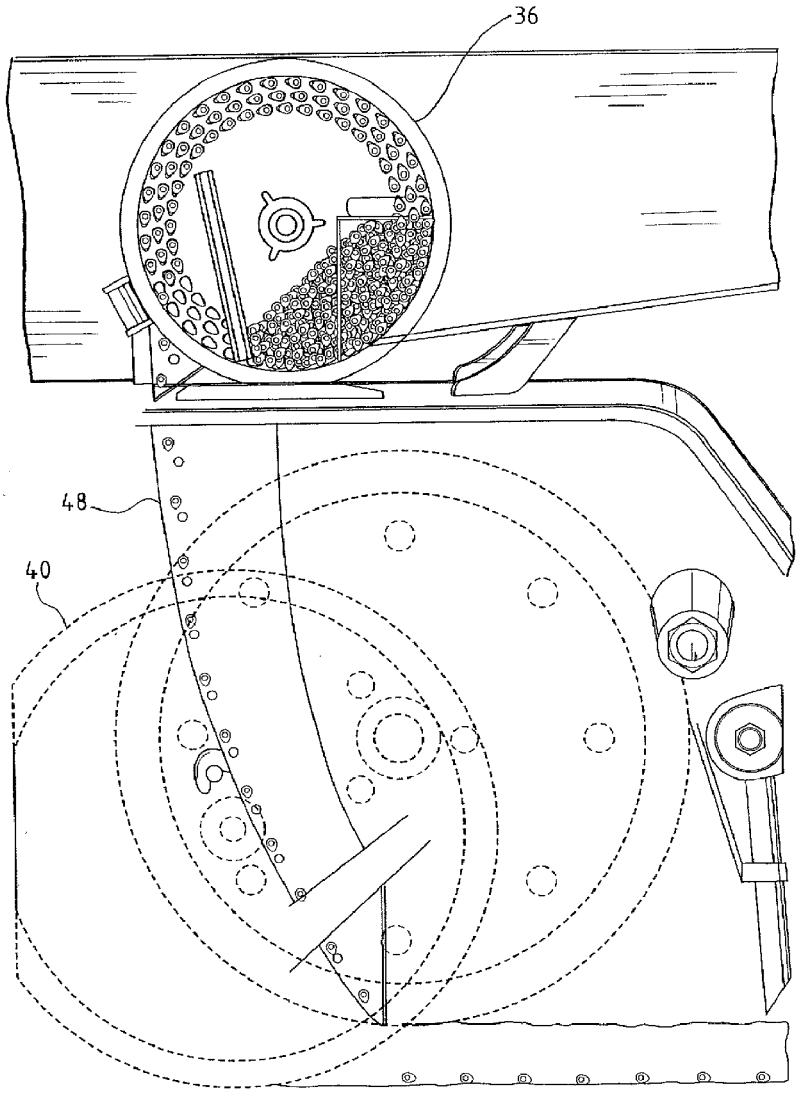


FIG. 1

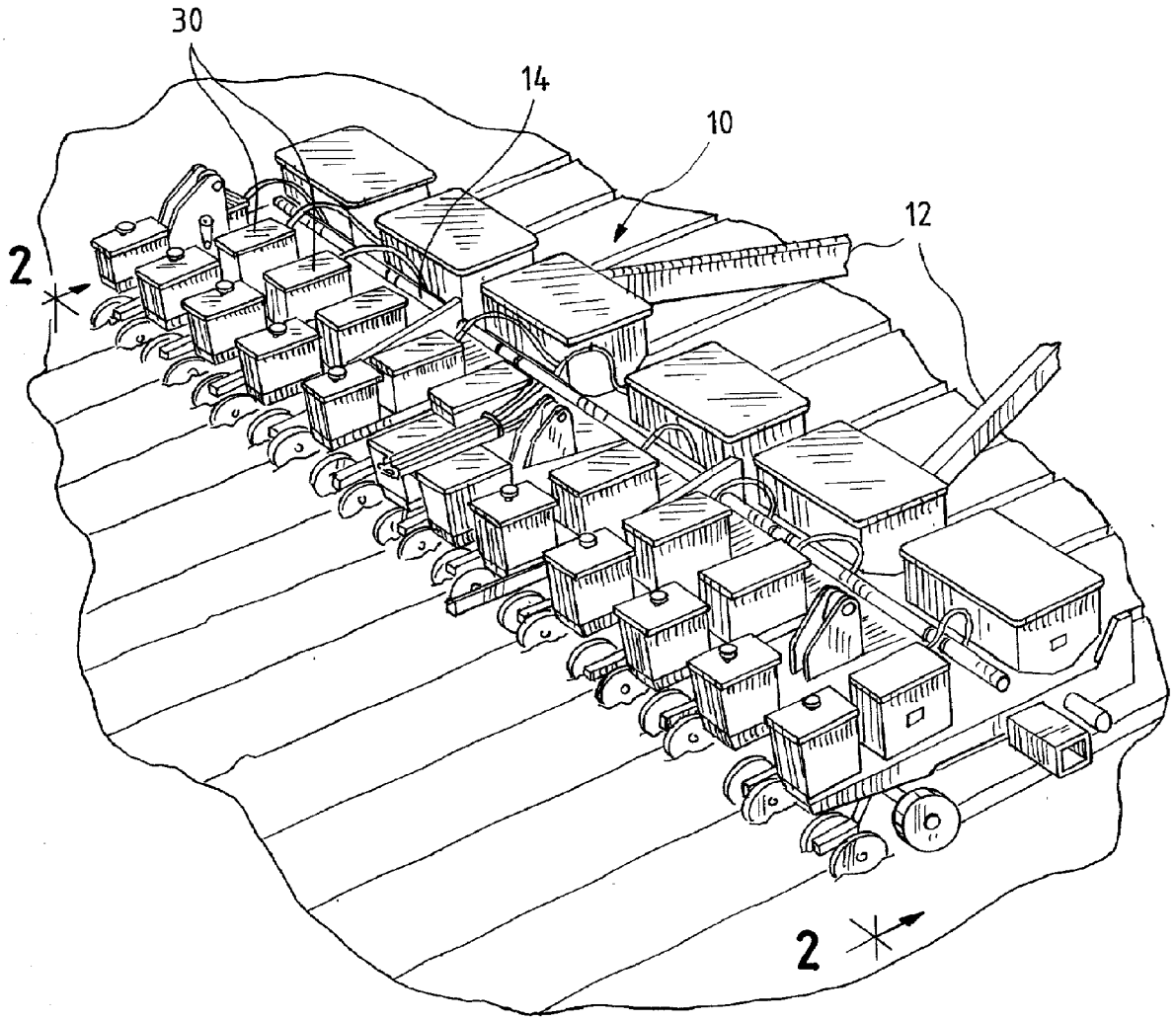
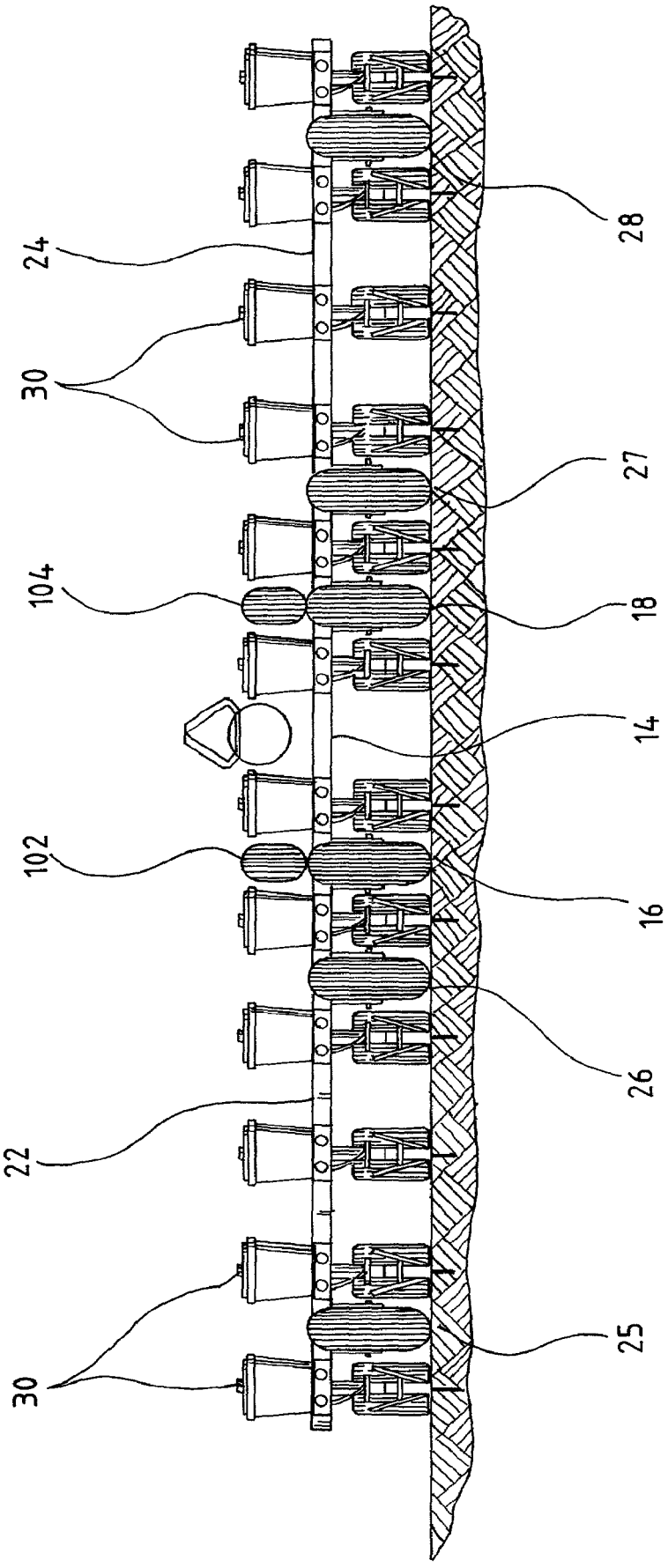


FIG. 2



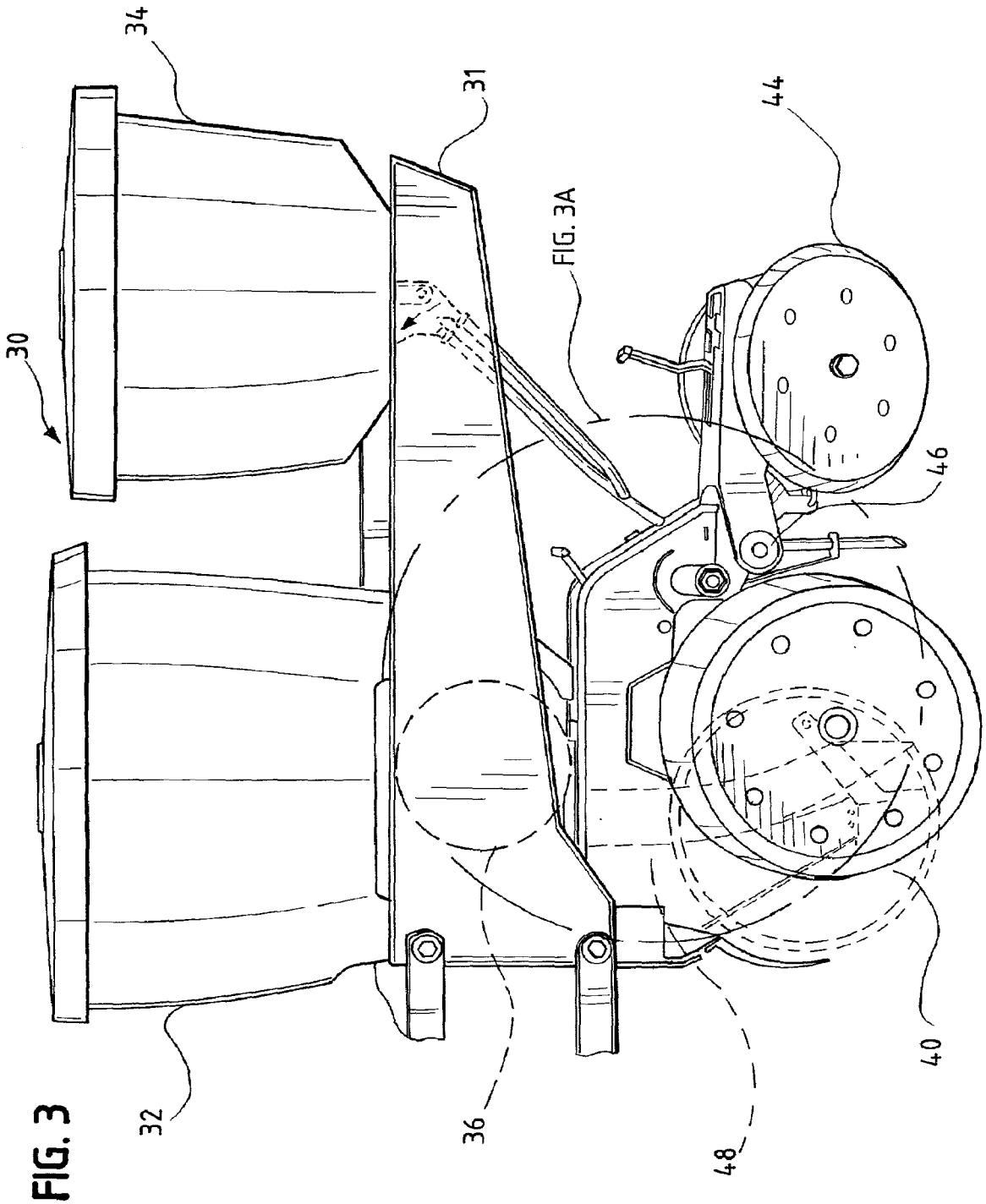


FIG. 3

FIG. 3A

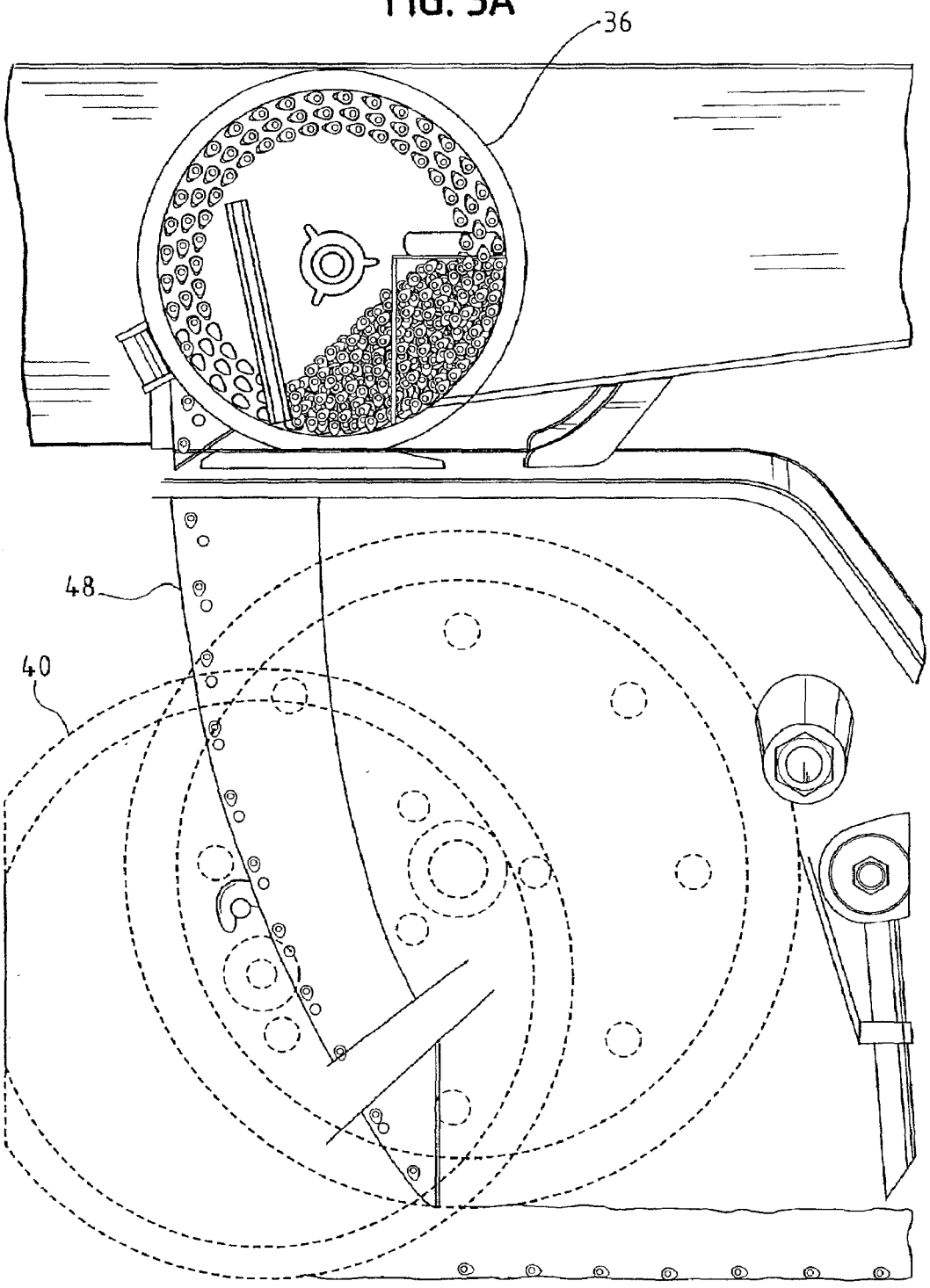
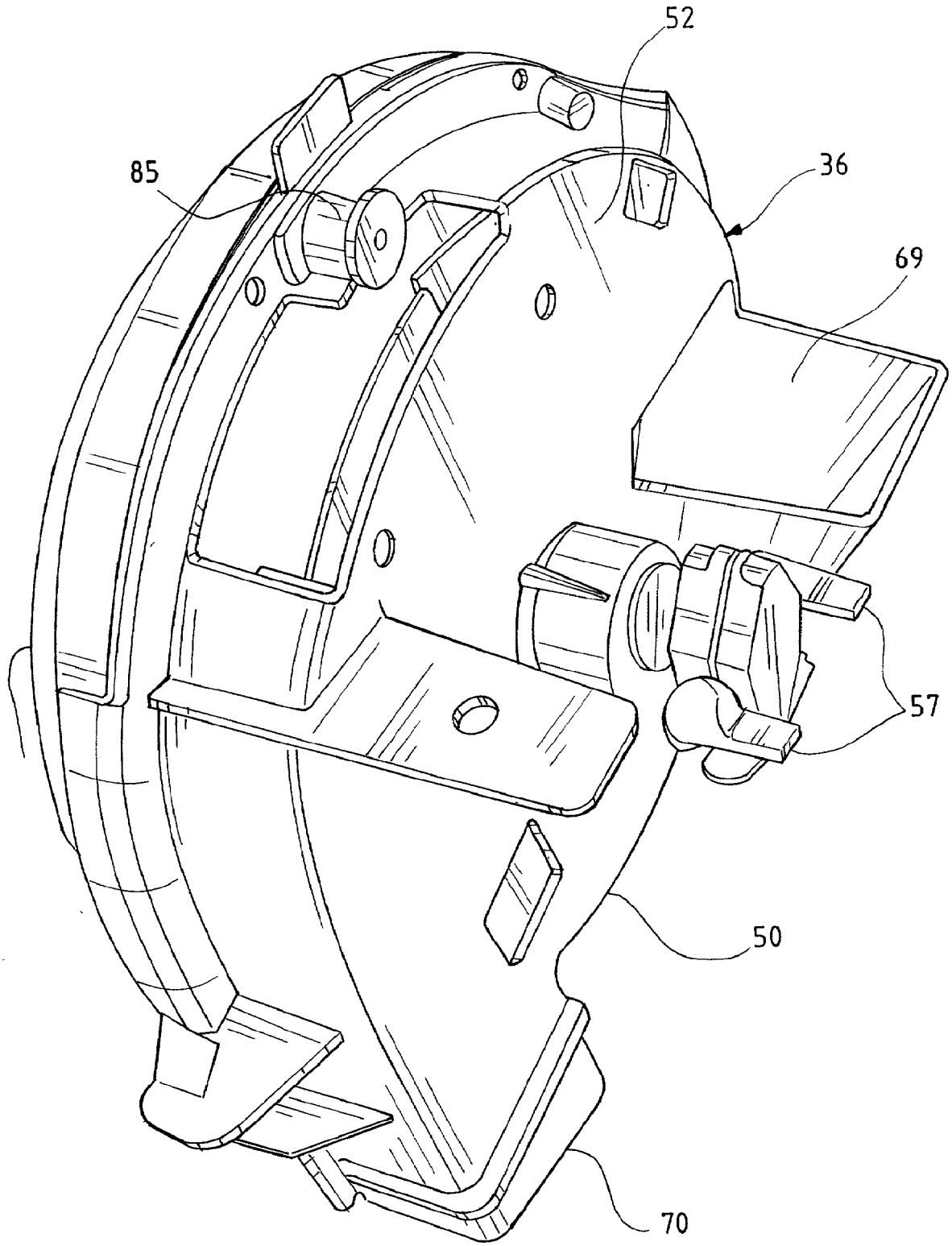


FIG. 4



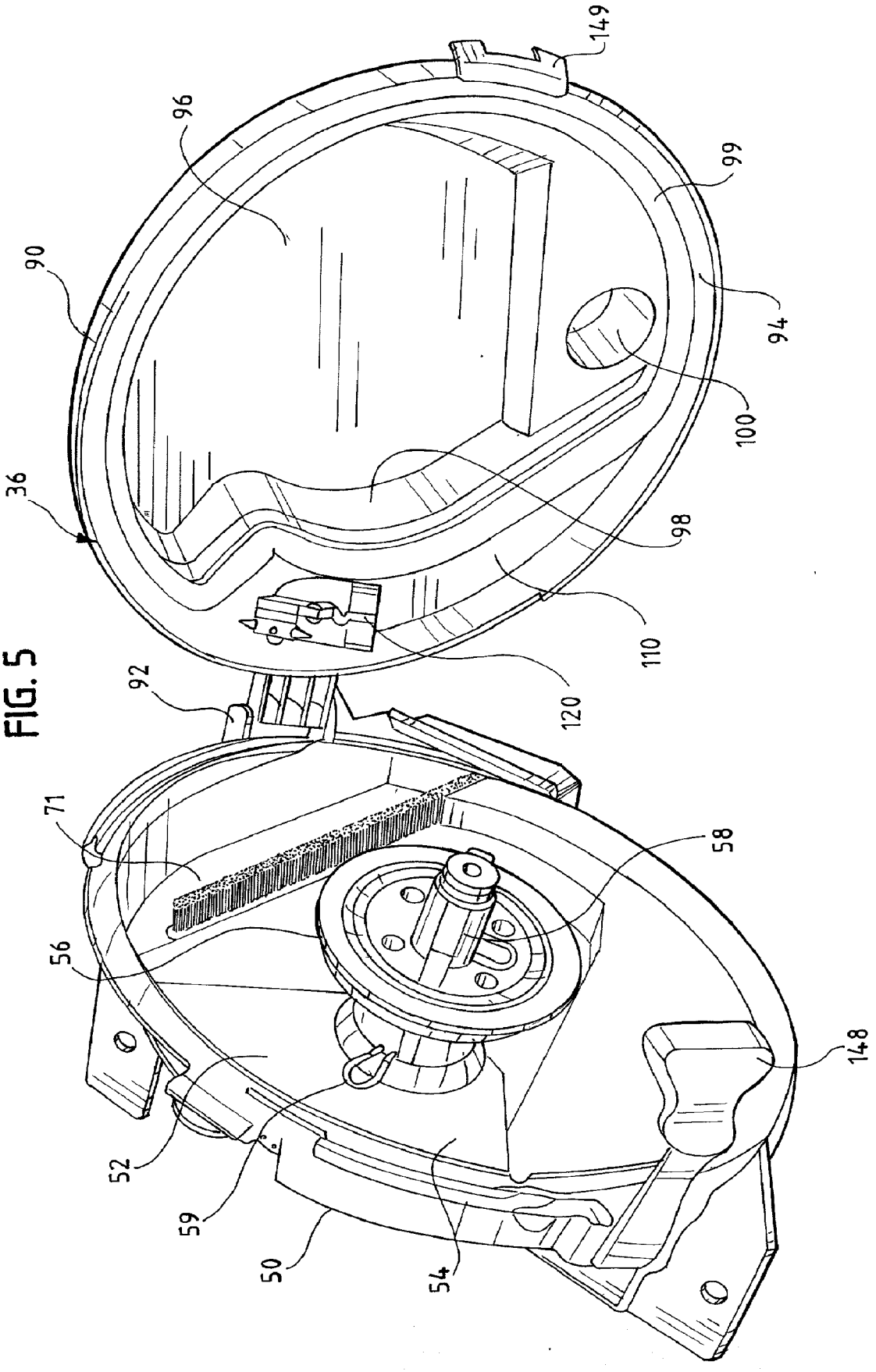


FIG. 5

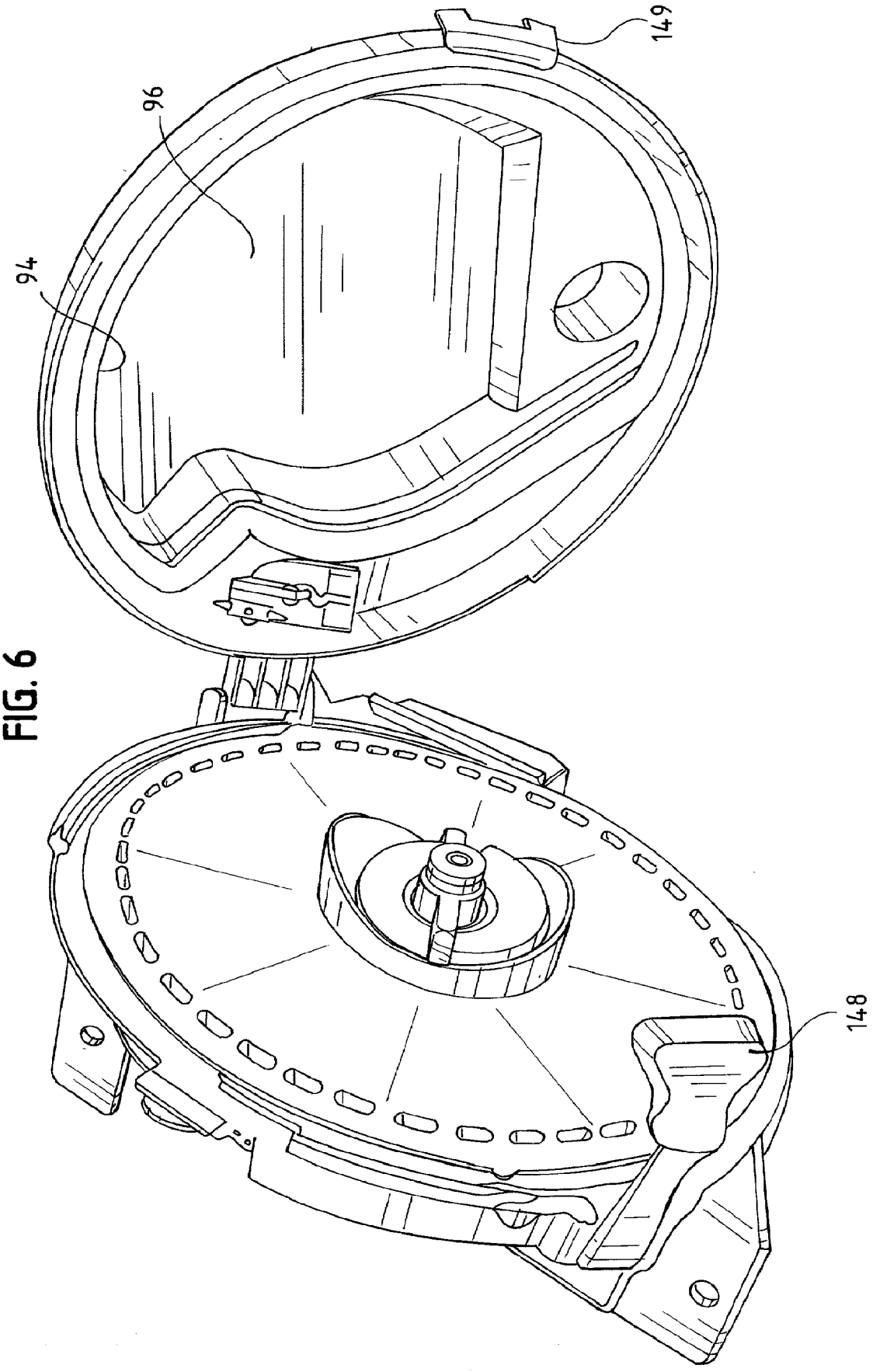


FIG. 6

FIG. 7

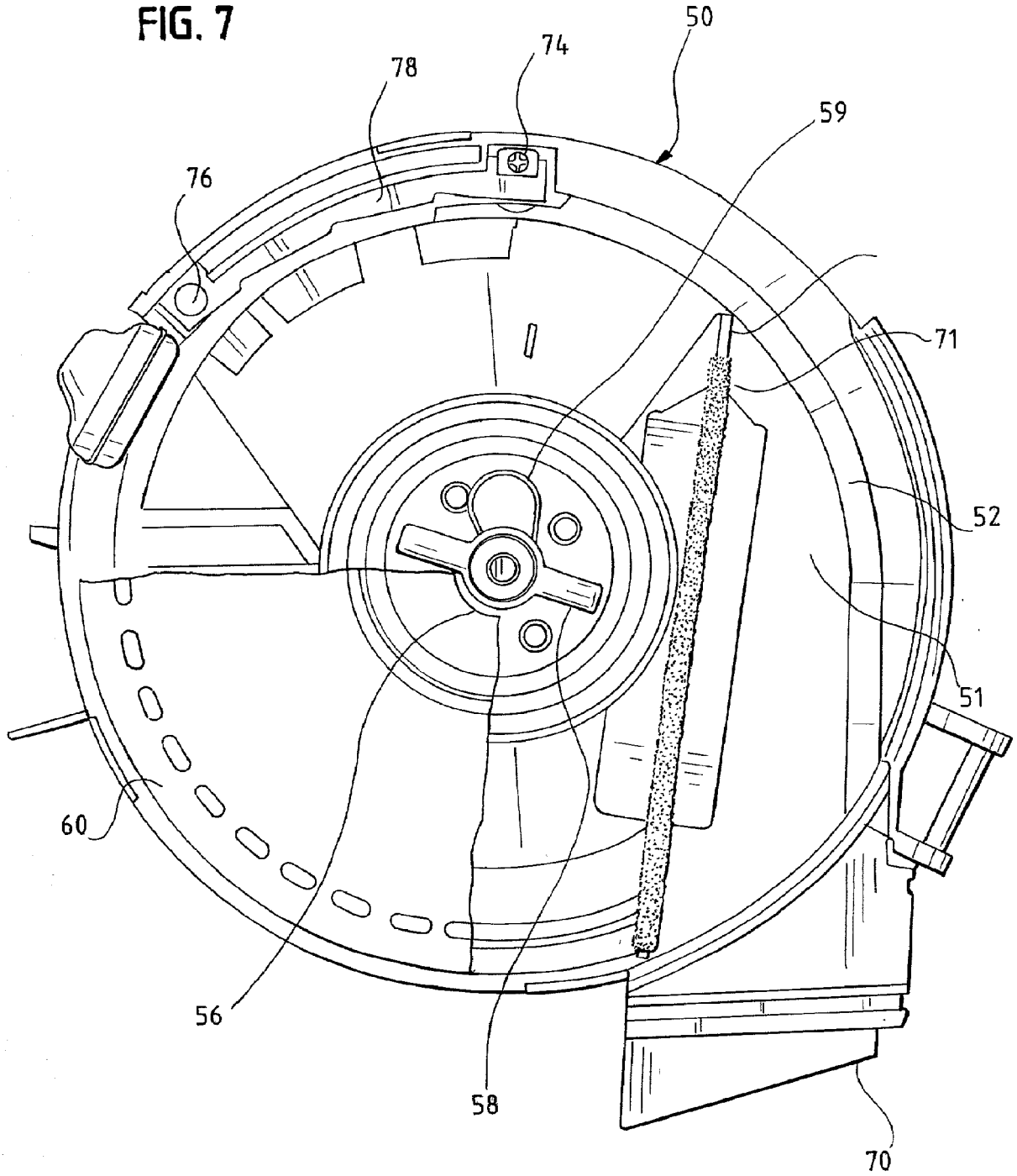


FIG. 8

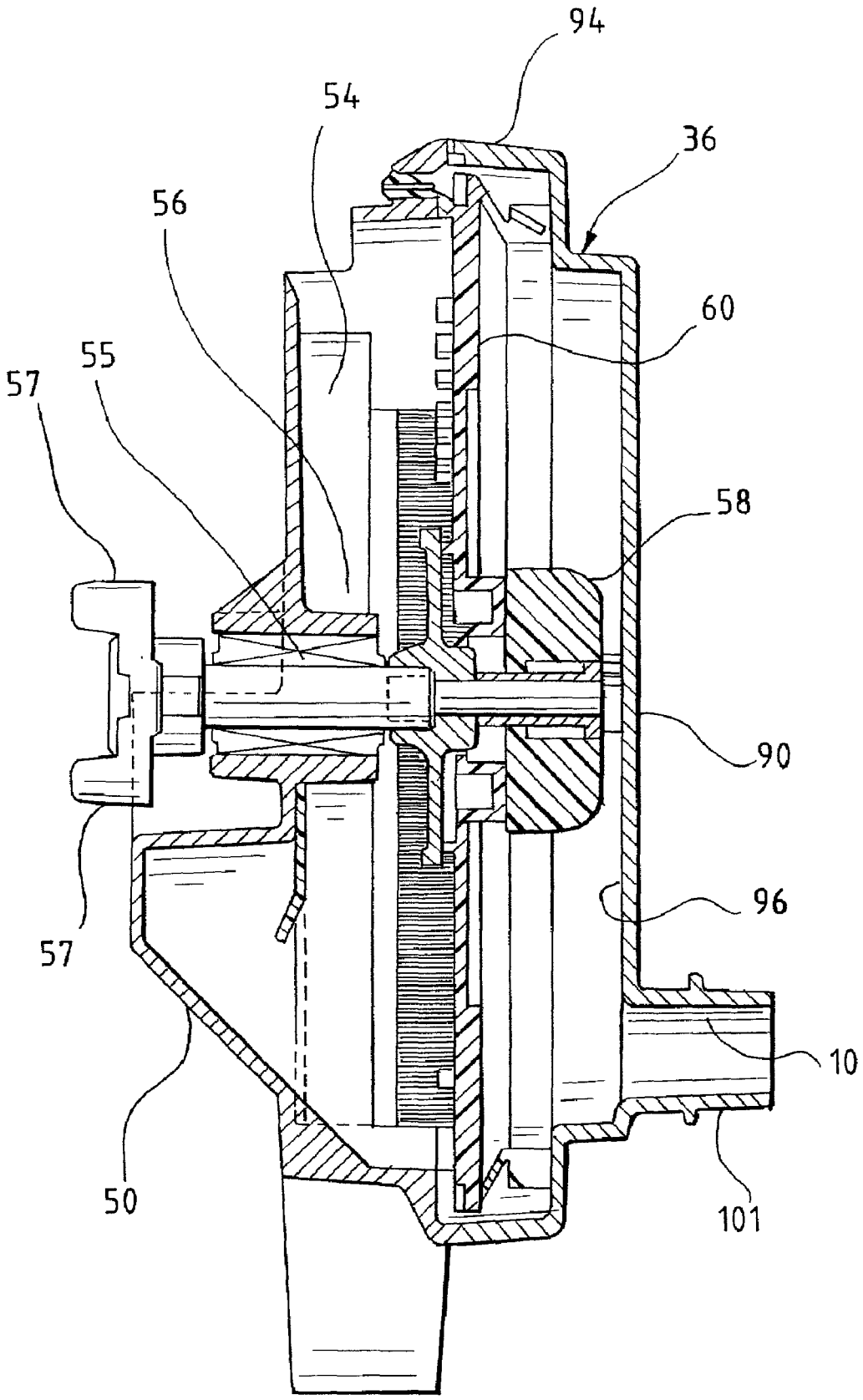


FIG. 9

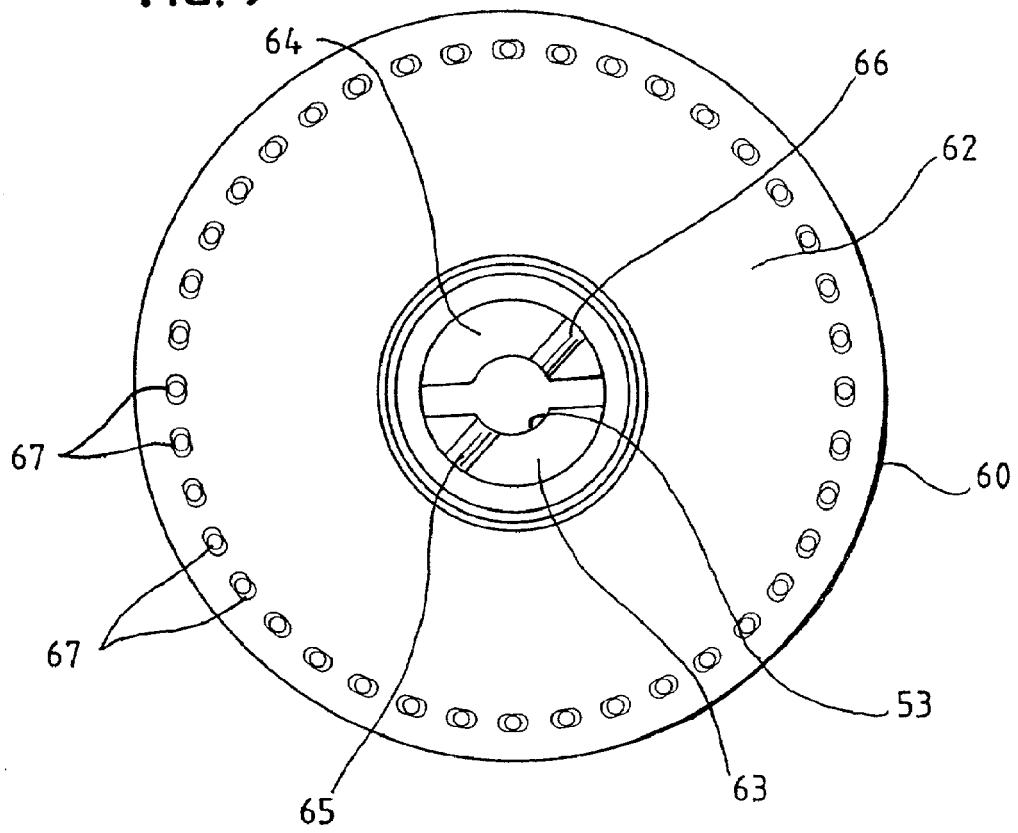


FIG. 10

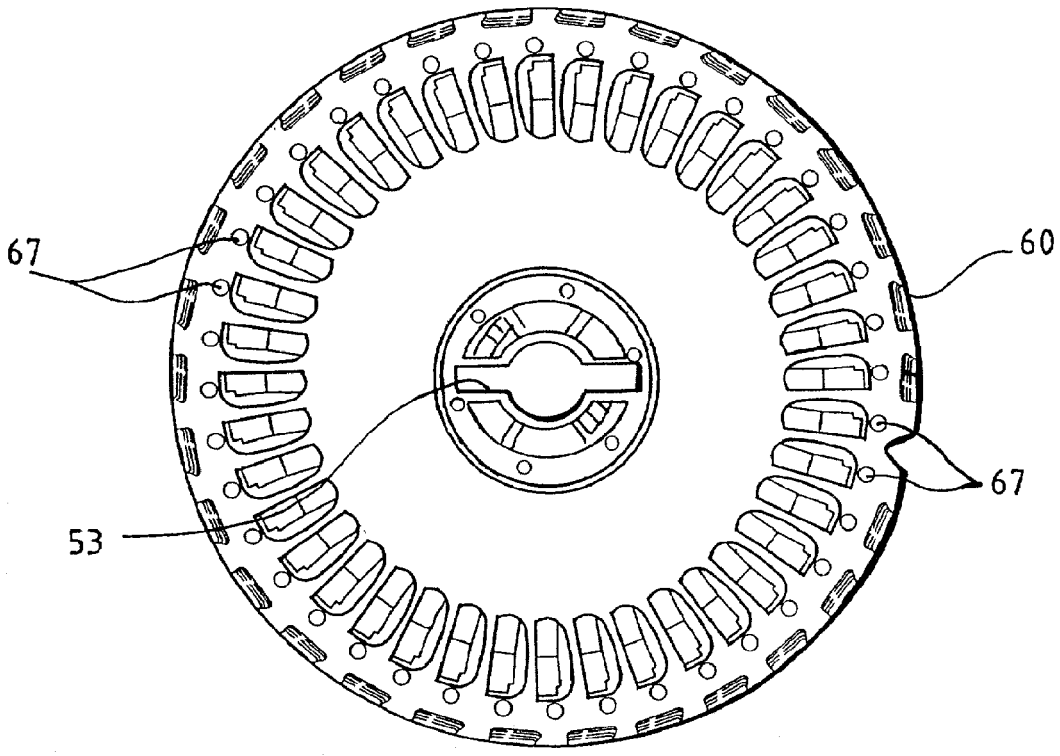


FIG. 11

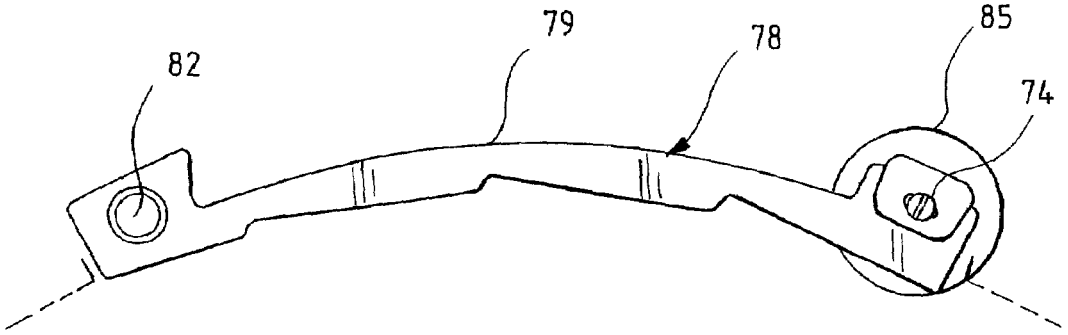


FIG. 12

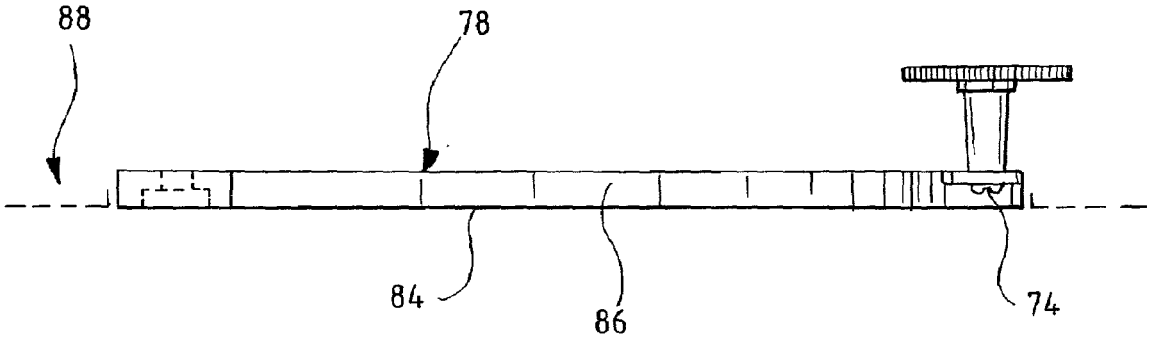


FIG. 13

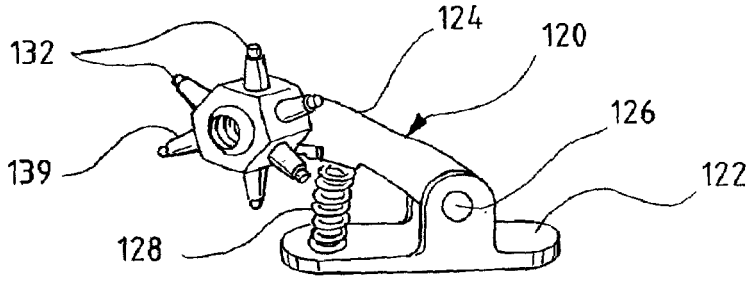


FIG. 14

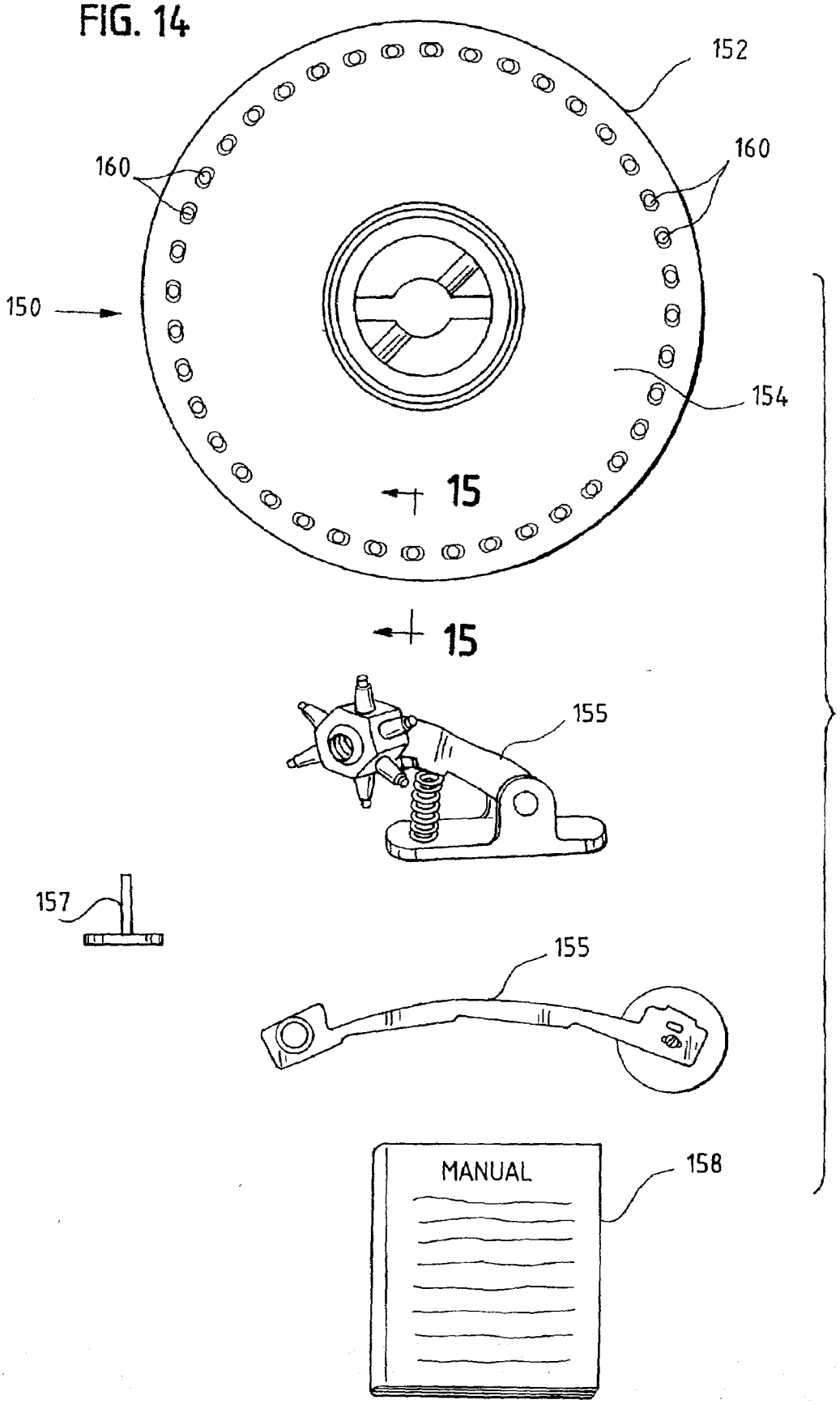


FIG. 15

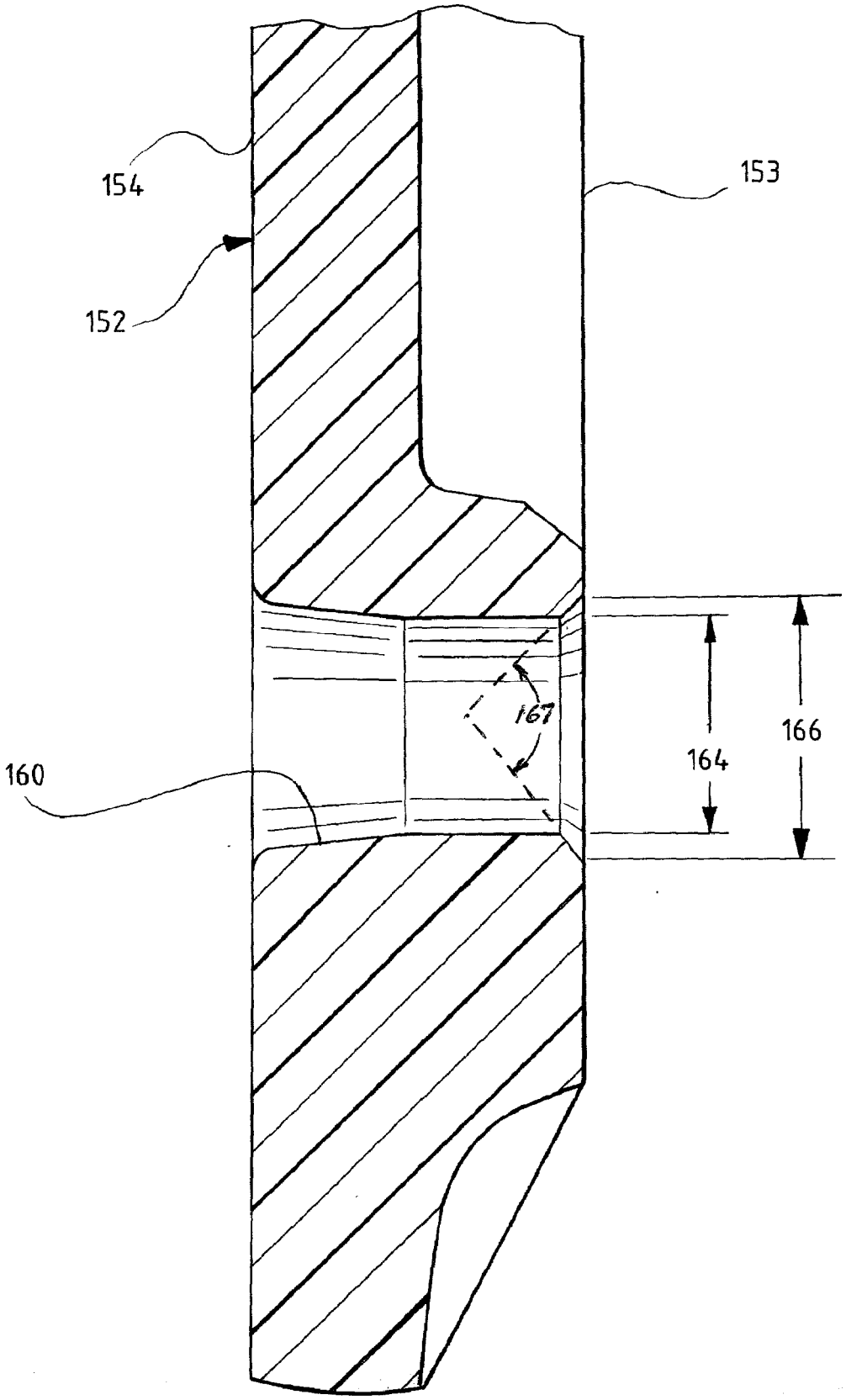


FIG. 16

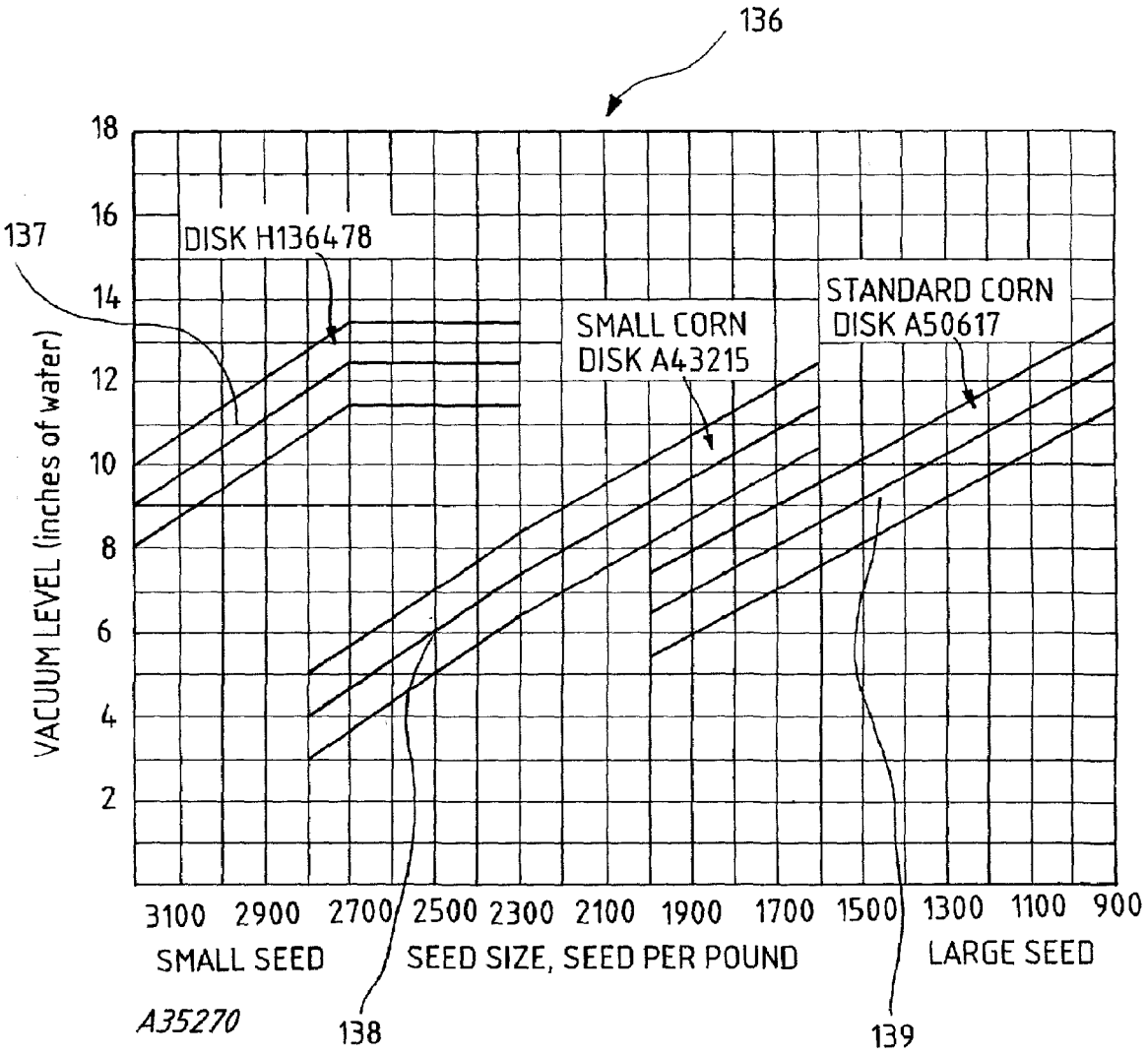

136
137
DISK H136478
SMALL CORN
DISK A43215
STANDARD CORN
DISK A50617
VACUUM LEVEL (inches of water)
18
16
14
12
10
8
6
4
2
3100 2900 2700 2500 2300 2100 1900 1700 1500 1300 1100 900
SMALL SEED
SEED SIZE, SEED PER POUND
LARGE SEED
A35270
138
139

FIG. 17

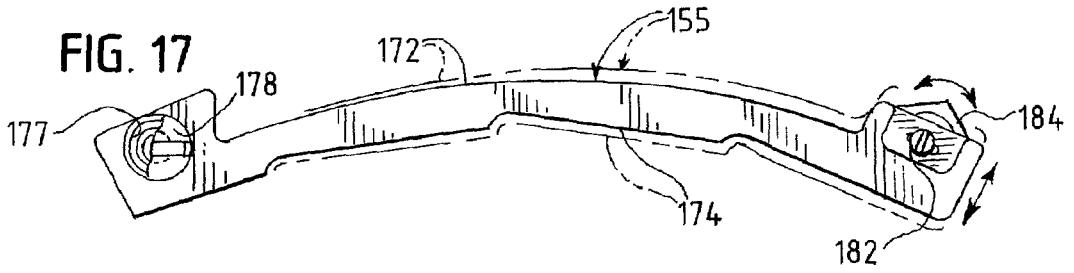


FIG. 18

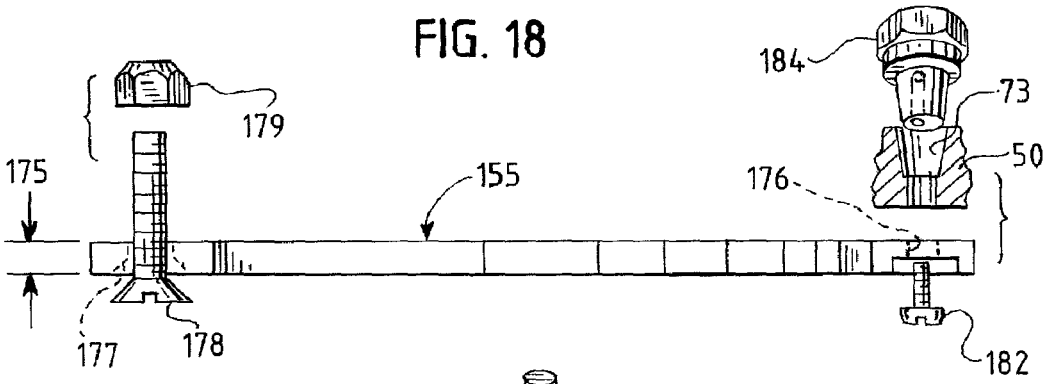


FIG. 19

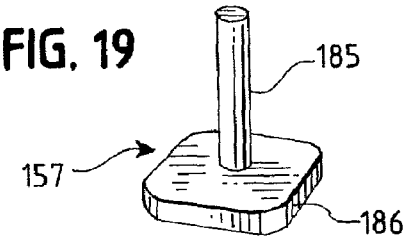


FIG. 20

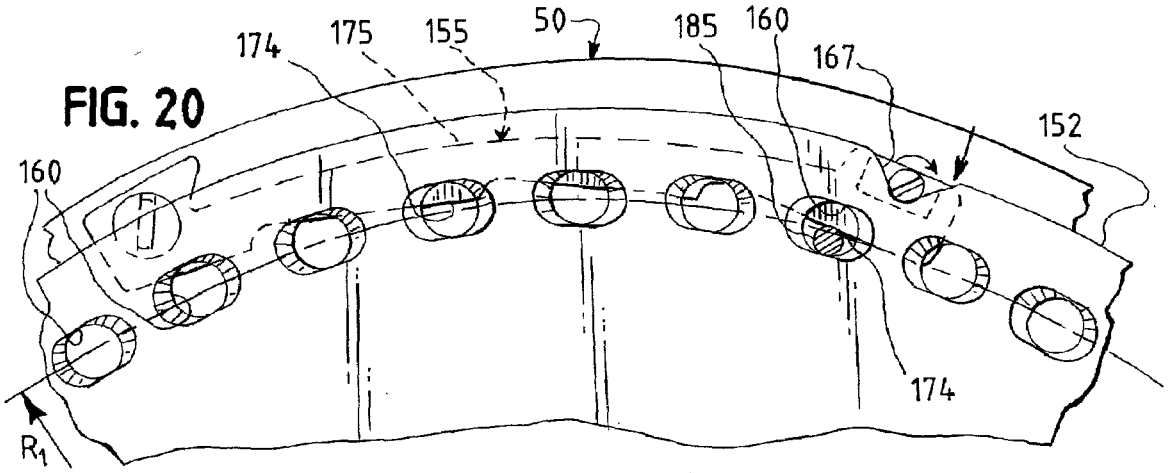
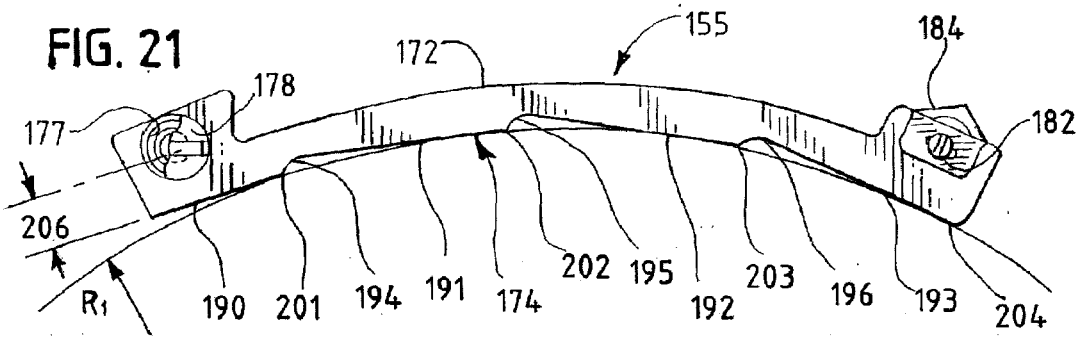


FIG. 21



METHOD AND APPARATUS FOR IMPROVING THE EFFICIENCY OF A JOHN DEERE VACUUM PLANTER

[0001] The present invention relates to seed planters of the type manufactured by John Deere which receives a rotatable seed disk, where each disk has a plurality of spaced holes sized to accommodate the planting of a given seed type or seed size and, in particular, to a method and apparatus for improving the efficiency of such machines in the planting of corn seed.

BACKGROUND OF THE INVENTION

[0002] John Deere manufactures a Max Emerge Drawn Conservation Flex-fold planter. The heart of the John Deere planter is a metering unit which retains a circular rotatable seed disk that separates the interior of the metering unit into two chambers, one on each side of the disk. The seed disks employed in the machine have a plurality of holes, with the centers thereof spaced to define a circle with its center at the center of the disk and having a radius a little less than the radius of the disk. A vacuum is drawn in the chamber formed on one side of the disk and seeds are introduced into the chamber on the opposite side of the disk. The diameter of the holes in the seed disks are sized such that, when operating properly, the vacuum will draw one seed against the aperture of each hole in the disk and retain the seed as the disk rotates to a position above a seed chute, at which point the disk moves away from the vacuum chamber and the seed falls away from the disk and into the chute to be planted.

[0003] The planter is intended for use with many types of seed, including sunflower, cotton, soybean, sorghum, sugar beets, popcorn, sweet corn, and corn seed (feed corn seed). Each type of seed has a different size and configuration and the planter is, therefore, provided with a plurality of seed disks, which each of the seed disks having a different configuration of holes through which the vacuum is drawn to move seeds from the input to the chute.

[0004] The manual for the 7200 Max Emerge, 16 row, narrow flex-fold planter, for example, describes and depicts thirteen different seed disks. According to the manual, the seed size for certain grains, such as corn seed, vary widely. The manual recommends disk H136478 for the smallest sized corn seed, recommends disk A43215 for medium sized corn seed, and recommends disk A50617 for large sized corn seed.

[0005] Another variable for the John Deere planter is the vacuum which is drawn to retain the seeds against the apertures of the seed disk. For corn seed, the vacuum level, expressed "inches of water," ranges from three as a minimum to thirteen as a maximum, as shown in a chart depicted in the manual and generally reconstructed in **FIG. 15**. Two optional pieces of equipment are provided, the use of which is recommended under certain planting situations and is not recommended in other situations, are a double eliminator and knock out assembly. The double eliminator is intended to prevent the depositing of two seeds in one planting site or hole, and the knock out assembly pushes out seeds that become wedged in the vacuum holes. The configuration of vacuum holes is different for each seed disk and John Deere does not provide a double eliminator or a knock out assembly for each one of its seed disks.

[0006] The proper operation of the John Deere planter, therefore, requires the selection of the appropriate seed disk for use with the size and type of seed to be planted, the appropriate adjustments to the vacuum, and in some cases the installation of one or both a optional double eliminator and a knock out assembly. It is also recommended that the machine be monitored during its use and that the strength of the vacuum be adjusted if the machine is found to be under planting or over planting seed.

[0007] The machine is considered to be operating at 100% efficiency if it will plant 100 seeds in 100 holes. Where the machine plants 98 seeds in one hundred holes, it is considered to be operating at 98% efficiency and where is planting 102 seeds in every 100 holes (a second seed into each of two holes), the machine is considered to be operating at 102% efficiency. A farmer will consider a machine operating at 95% or at 105% to be unacceptably inefficient and in either case will be required to adjust the vacuum or replace the seed disks of the machine to improve its efficiency. The satisfactory operating range for such machines is between 99% and 101% efficiency.

[0008] The planters manufactured by John Deere are adapted to plant from four to thirty one rows simultaneously with a hopper retaining seed, a seed disk and a double eliminator setting for each row to be planted by the machine. If the operator changes the size of the seed being planted such that the machine, as it is then configured, will on longer maintaining the required efficiency, he must stop his tractor, change the parts within the metering units, adjust the double eliminator and adjust the vacuum for the machine. It can take a farmer an hour or more to reconfigure his machine to accommodate a change in seed size.

[0009] Ideally each row of a planter will plant between 99% and 101% efficiency. Generally, farmers having a John Deere planter would be satisfied if their machines will plant corn seed at between 95% and 105% efficiency, but such rates are difficult to maintain, or even achieve because the temperamental nature of the metering units. Many farmers will set the warning alarms on their machine to sound when the efficiency of the planter falls outside the range of 90% to 110% because beyond that range the loss of crop at the planting stage is intolerable. When the machine operates beyond that range the operator will stop the machine and reconfigure the metering units as described above.

[0010] The difficulties of maintaining proper efficiency are accentuated in the case corn seed, which is one of the major grains for which the John Deere planter is employed. As shown in **FIG. 16**, corn seed ranges in size from as small as 3,100 seeds per pound to as a maximum of 900 seeds per pound. Although it would be desirable for a farmer to obtain seed which is of all the same size, as a practical matter, he must deal with seeds of varying size. As previously stated, John Deere offers three different seed disks for use in planting corn seed, one disk for each of three ranges of seed size.

[0011] John Deere has many thousands of Max Emerge planters, many of which are now being employed to plant corn seed. Farmers have found that, with respect to the planting of corn seed, the John Deere planter can best be described as temperamental. Even with frequent vacuum adjustments and the changing of seed disks, farmers have not been able to maintain the efficiency of such planters

within the desired 99% to 101% range and have been forced to accept performance in the 90% to 95% range. It would, therefore, be desirable to provide a kit for modifying the metering unit of the John Deere planter to improve the efficiency with which the planter will plant corn seed.

SUMMARY OF THE INVENTION

[0012] Briefly, the present invention is embodied in a method of improving the efficiency of a seed planter of the type manufactured by John Deere, having a metering unit for retaining a circular rotatable seed disk where the seed disk has a center, first and second opposing surfaces, and has a plurality of transverse spaced holes through the disk where the centers of the holes define a circle having its center at the center of the disk. To select individual seeds for planting, seed is introduced into a first cavity in the housing defined by the first surface of the seed disk and a vacuum in drawn in a second cavity defined by the second surface of the seed disk such that the vacuum draws individual seeds against the transverse holes in the seed disk.

[0013] In accordance with the invention, a replacement seed disk is provided where the disk has a plurality of at least forty equally spaced holes (instead of a thirty hole disk recommended by John Deere for use for planting most sizes of corn), the holes being positioned around the outer edge of the disk with each of the holes having a diameter of 3/16 inch±1/128 inch. Each transverse hole has a 45 degree angle counter sink on the first side of the seed disk, the maximum diameter of which is 15/64±128 inch, such that the vacuum force needed to retain the seeds is applied over a somewhat larger area. It is desirable to provided a countersink to expand the area across which the vacuum is drawn rather than simply making the size of the vacuum holes larger because the smaller size seed will become stuck in vacuum holes larger than 3/16 inch.

[0014] The replacement seed disk described above is used in the metering units of the planter in place of those recommended by the manufacturer. A seed disk having a countersink as described applies the force of the vacuum across a larger surface area thereby enabling the disk to effectively retain a larger size corn seed.

[0015] A double eliminator preferably made of stamped metal having a contour of the double eliminator manufactured by John Deere, but made in a stamping process and having a thickness of 5/32 to 11/64 inch (instead of 3/16 inch as does the double eliminators manufactured by John Deere), is installed in each metering unit. Finally, a knockout assembly of the type manufactured by John Deere and suitable for use with the above described replacement disk is installed into each metering unit. The vacuum for the metering units is adjusted to 10 to 12 inches of water and maintained at this setting for all sizes of seed.

[0016] I have found that a planter fitted with a seed disk, a double eliminator and a knockout assembly as described above can be operated for all sizes of seed for corn seed without requiring adjustment of the vacuum outside of the range defined by 10 to 12 inches of water. An operator of a John Deere planter which has been modified in accordance with the invention will plant all seed ranging in size from 1200 seeds per pound to 2800 seeds per pound at 99% to 101% efficiency, regardless of the mix of sizes of the corn seed in the seed hoppers of the machine.

[0017] The invention can be employed in the form of a kit for use with a planter having a metering unit of the type manufactured by John Deere. The kit includes a seed disk having a plurality of equally space transverse holes with the holes positioned around the perimeter of the disk, and the holes having diameters of 3/16 inch±1/128 inches with the aperture of the holes on the second surface of the disk have a countersink. In addition to the seed disk, the kit includes a double eliminator and a knockout assembly for use with the seed disk, the double eliminator having a thickness of 5/32 to 11/64 inch. An alignment tool consisting of a cylindrical peg approximately one inch in length and having a planar member across one end thereof is provided to properly adjust the cam of the double eliminator. Finally the kit includes a set of written instructions directing the operator to install the disk, the double eliminator and knockout assembly into the housing of the planter and to adjust the vacuum to a setting of 10 to 12 inches of water. The device will operate reliably at stronger vacuum settings but the stronger vacuum setting consumes unnecessary energy. Where the vacuum is set to 9 inches of water or less the vacuum will be inadequate to retain the larger corn seed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] A better and more complete understanding of the invention will be had after a reading of the following detailed description taken in conjunction with the drawings wherein:

[0019] **FIG. 1** is a an isometric view of a John Deere planter;

[0020] **FIG. 2** is a rear elevational view of the John Deere planter shown in **FIG. 1**;

[0021] **FIG. 3** is a side elevational view of a row unit of the planter shown in **FIG. 1** with the metering unit therein shown in broken lines;

[0022] **FIG. 3A** is an enlarged fragmentary side elevational view of the row unit shown in **FIG. 3** with the metering unit visible within;

[0023] **FIG. 4** is an isometric view of a metering unit for the row unit shown in **FIG. 3**.

[0024] **FIG. 5** is an isometric view of the metering unit as shown in **FIG. 4** with the housing opened to show the interior thereof;

[0025] **FIG. 6** is a second isometric view of the metering unit as shown in **FIG. 4** with the feed wheel installed cross sectional view of the metering unit shown in **FIG. 4**;

[0026] **FIG. 7** is a front elevational view of the first housing member of the metering unit shown in **FIG. 4** with the seed disk partially broken away;

[0027] **FIG. 8** is a cross sectional view of the metering unit shown in **FIG. 4**;

[0028] **FIG. 9** is a rear elevational view of a seed disk for use in the metering unit shown in **FIG. 4**;

[0029] **FIG. 10** is a front elevational view of the seed disk shown in **FIG. 9**;

[0030] **FIG. 11** is a disassembled view of a kit in accordance with the present invention;

[0031] **FIG. 12** is a side elevational view of the double eliminator of the type supplied by John Deere;

[0032] **FIG. 13** is an isometric view of a knock out assembly as supplied by John Deere;

[0033] **FIG. 14** is a schematic view of a kit for use in the metering unit shown in **FIG. 4**;

[0034] **FIG. 15** is an fragmentary enlarged cross sectional view of a seed disk in accordance with the present invention;

[0035] **FIG. 16** is an approximate rendition of a chart provided by John Deere for selecting a seed disk and selecting a vacuum setting needed to plant the various sizes of feed corn seed;

[0036] **FIG. 17** is a front elevational view of a double eliminator in accordance with the present invention;

[0037] **FIG. 18** is an exploded side view of the double eliminator as shown in **FIG. 17**;

[0038] **FIG. 19** is an isometric view of an alignment tool for use with the double eliminator shown in **FIG. 17**;

[0039] **FIG. 20** is fragmentary enlarged front view of the first housing member as shown in **FIG. 7** with the double eliminator shown in broken lines behind the seed disk as the double eliminator is being aligned using the tool shown in **FIG. 19**; and

[0040] **FIG. 21** is a side elevational view of the double eliminator shown in **FIG. 17** showing the relationships of the parts thereof.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

[0041] Referring to **FIGS. 1 and 2**, a John Deere planter such as a 7200 Max Emerge Flex-fold planter **10** includes a pair of elongate tow bars **12** at the rearward end of which is a cross bar **14** having wheels **16, 18** for transporting the planter **10** across the open highway. Attached by pivots, not visible, to the cross bar **14** are end sections **22, 24** having wheels **25, 26** and **27, 28** respectively. The pivots permit movement of the end sections **22, 24** from a first position in which they are folded against the tow bars **12** for transporting across an open highway, to a second position, depicted in **FIGS. 2 and 3**, in which they extend linearly outward from the ends of the cross bar **14**. Extending along the length of the cross bar **14** and the extension sections **22, 24** are a plurality of row units **3030**. John Deere manufactures planters **10** which vary in width from four to thirty one row units.

[0042] The model 7200 planter was first offered in 1987 and since then John Deere has placed several other models on the market including models 1750, 1760, 1770, and 1780, each of which has corresponding parts and the performances of all of which are improved by the use of the present invention.

[0043] Referring to **FIG. 3, 3A** and **8**, each row unit **30** has a frame **31** on which is mounted a first hopper **32** for retaining seed and a second hopper **34** for retaining a dry herbicide. Below the seed hopper **32** is a metering unit **36** and a chute, not shown, directs seed from the hopper **32** to the metering unit **36**. Below the metering unit **36** is a trenching wheel **40**. Rearward of the trenching wheel **40** is a planting wheel **44**, the elevation of which is adjustable through a pivot **46** to thereby permit the plant wheel **44** to create a trench of the depth desired for the seed being planted.

[0044] A second chute **48** extends from the metering unit **36** to a position near the planting wheel **44** for directing individual seeds singulated by the metering unit **36** into the furrow of ground formed by the plant wheel **44**, thereby planting the seed. A gearing assembly, not shown, connected to the wheels **16, 18, 25-28** rotates a drive member, not show, which engages a winged connector **57** on the inner shaft **55** of the metering unit **36** at a speed the speed that is coordinated to the ground speed of the planter **10** to insure that the planter **10** will plant seeds at the desired spacing.

[0045] Referring to **FIGS. 4, 5, 6, 7** and **8**, the metering unit **36** includes a first housing member **50**, having a generally cylindrical outer wall **52** and a planar rear wall **54** thereby forming a cavity. Extending from the rear wall **54**, axially with respect to the cylindrical outer wall **52**, is a tubular retaining hub **56** at the distal end of which is a winged hub handle **58** which is rotatable between a first position for receiving or removing a seed disk **60** (shown in **FIGS. 9 and 10**) and a second position for retaining a seed disk **60** on the hub **56**.

[0046] Referring to **FIGS. 5 and 8**, the retaining hub **56** is threaded on a cylindrical drive shaft **55** at the distal end of which are a pair of flanges **57** for drivingly engaging a drive member, not shown, which in turn is drivingly connected by the gearing, also not shown, to the wheels **16, 18, 25-28**. A removable spring locking pin **59** extends through holes, not shown, in the tubular retaining hub **56** and through the inner drive shaft **55**. By removing the spring locking pin **59**, the retaining hub **56** can be rotated with respect to the inner shaft to thereby axially move the retaining hub **56** with respect to the rear wall **54** of the first housing member **50**. Rotating the retaining hub **56** clockwise with respect to the drive shaft moves a seed disk **60** retained thereon toward the rear wall **54** and rotating the retaining hub **56** counter clockwise moves a seed disk **60** thereon away from the rear wall **54** of the first housing member **50**.

[0047] Referring briefly to **FIGS. 9 and 10**, the seed disk **60** has a generally circular body with first and second planar surfaces **61, 62**, and having a wing shaped central opening **53**. The opening **53** is shaped to receive the winged hub handle **58** at the distal end of the retaining hub **56** of first housing member **50**. Surrounding the central opening **53** on the second side **62** are two arcuately shaped opposing ramped surfaces **63, 64** and opposing locking notches **65, 66** for locking the seed disk **60** to the hub **56**. Extending around a circle which is spaced a short distance within the outer circumference of the seed disk **60** are a plurality of spaced transverse holes **67-67**. The diameter of the cylindrical outer end **68** of the seed disc **60** is a little less than the inner diameter of the tubular outer wall **52** housing member **50** of the metering unit **36** (and of the cylindrical outer wall of the second housing member **90**, as is further described below).

[0048] Referring further to **FIG. 4**, the first housing **50** includes an upwardly opening access port **69** in the rear wall **52** into which the lower end of the chute from the hopper **32** extends, allowing seeds to enter the first housing member **50**. Approximately diametrically opposite the access port **69** is a discharge opening **70** in the cylindrical wall **52** of the housing member **50** through which singulated seeds can

drop and fall into the second chute **48** for planting. When assembled on a row unit **30**, the metering unit **36** is oriented with the axis of the hub **56** horizontal and the discharge opening **70** positioned downward as is shown in **FIG. 4**.

[**0049**] Referring to **FIG. 5**, extending across the rear surface adjacent the hub **56** is an elongate brush **71** having one end connected to the outer wall **52** and the second end spaced a short distance from the cylindrical outer wall **52** leaving a gap **65** between the distal end of the brush **71** and the inner surface of the cylindrical outer wall **52**. The brush **71** is positioned to separate seed entering the access port **69** from inadvertently reaching the discharge opening **70**. The bristles of the brush **71** extending axially away from the rear wall **52** and brush against the first surface **61** of a seed disk **60** which has been retained the retaining hub **56** thereby creating a partial barrier between the outer wall **52** and the seed disk **60**. The brush **71** insures that seeds singulated by the seed disk **60** are removed therefrom as the disk pass over the opening **70** in the wall **52** and further to separate the loose seeds entering through the port **69** from inadvertently entering the discharge opening **70** and falling into the chute **48**.

[**0050**] Referring to **FIGS. 7, 11**, and **12**, positioned along the outer wall **52** of the first housing member **50** are a pair of axially orientated mounting holes, **72, 73** through which the retention parts needed for securing an arcuate double eliminator **78** are inserted. The double eliminator **78**, as manufactured by John Deere, has an elongate body having an arcuate convex outer side **79**, and a generally arcuate inner side **86** having a plurality of steps, or ripples in the surface thereof. The forward and rearward surfaces **84, 85** thereof are planar and parallel to each other. The first end of the double eliminator has a pair of holes **80, 81**, either of which can receive a screw **74** which threads into the distal end of a tapered cam shank **83**, rotatable by a thumb wheel **77**. At the second end of the double eliminator is a third hole **82**, and a removable retaining pin **76** extends through the third hole **82** and one of the mounting holes **72** on the first housing member **50**. The cam shank **83** extends through the second mounting hole **73** such that rotation of the thumb wheel **76** and shank **83** will move the first end of the double eliminator radially with respect to the seed disk **60**. As manufactured by John Deere, the double eliminator has a thickness **88** of about 3⁄16 inch.

[**0051**] When in use, the cam **83** is adjusted such that the end of the steps, or the tips of the ripples, of surface **86** will partially cover the openings of the transverse holes **67-67** of a seed disk **60** as the seed disk **60** rotates with the hub **56**. When the double eliminator is functioning properly, the end of the steps, or the peeks of the ripples, of surface **86** will knock off the second seed where two seeds are held by the vacuum against one of the holes **67-67** of the seed disk **60**.

[**0052**] Referring further to **FIGS. 4, 5, 6** and **8**, the metering unit **36** includes a second housing member **90** attached by a pivot pin **92** to the first housing member **50**. The second housing member **90** has a generally tubular outer wall **94** and a planar rear surface **96** such that it too has a cavity therein. The tubular outer wall **96** includes an intrusions portion **98** and around the inner edge of the outer wall **94** and the intrusion portion **98** is a rubberizes sealing member **99** which seals against the second surface **62** of a seed disk **60** when the housing members **50, 90** are assembled against each other as further described below.

[**0053**] The second housing member **90** further has an aperture **100** in the rear wall **96** and the outer surface of the second housing member has a tubular protrusion **101** the inner opening of which communicates with the aperture **100** and is adapted to receive a vacuum hose, not shown, leading from a vacuum pump. Most John Deere planters **10** have one or two vacuum pumps **102, 104** (visible in **FIG. 2** only).

[**0054**] Referring to **FIGS. 5, 6** and **13**, within the intrusion portion **98** of the second housing member **90** is a third cavity defined by a portion of the cylindrical outer wall **94** and the wall of the intrusion portion **98**, and a portion **110** of the rear surface **96**. A pair of threaded holes, not shown, in the rear surface **110** are adapted to receive a knockout assembly **120** of the type manufactured by John Deere.

[**0055**] Referring only to **FIG. 13**, the knockout assembly **120** has a generally planar base member **122** with holes **123, 125** therein through which threaded screws, not shown, can be inserted and threaded into the holes in the rear surface portion **110** for attachment of the knockout assembly **120** thereto. The assembly **120** further includes an arm **124** pivotally attached by a pin **126** to the base member **122** and a spring **128** for urging the arm **124** away from the base member **122**. At the distal end of the arm **124** is a rotatable wheel **130** having a plurality of equally spaced radially extending prongs **132-132**. The prongs **132-132** of the knockout assembly **120** are angularly spaced on the wheel **130** such that one prong **132** will extend into each of the holes **67-67** of the seed disk **60** as the disk **60** rotates around the hub **56**.

[**0056**] A latch assembly **148** on the first housing member **50** is adapted to engage a second latch member **149** on the second housing member **90** for retaining the two housing members **50, 90** engaged with one another, to thereby form the assembled metering unit **36**.

[**0057**] When the two housing members **50, 90** are latched in assembled relationship, with a seed disk **60** retained on the retaining hub **56** of the housing member **50**, the interior of the metering unit **36** will be divided into two chambers. The first chamber is defined by the cavity in the first housing member **50** and the first surface **61** of the seed disk **60**. The second chamber is defined by the cavity in the second housing member **90** and the second surface **62** of the seed disk **60**. It should be appreciated that the second chamber excludes the intrusion portion **99** of the second housing member **90**.

[**0058**] A vacuum is drawn by the vacuum pumps **102, 104** through lines connecting to the second housing member **90** and through the aperture **100** creating a vacuum in the second chamber of the metering unit **36**. Meanwhile, seeds from within the seed hopper **32** drops through the chute **38** and through the port **69** into the first chamber. When the metering unit **36** is operating properly, the vacuum in the second chamber draws through the plurality of holes **67-67** of the seed disk **60** except for those holes **67-67** positioned beyond the sealing member **99** (defined by the intrusion portion **98**). As the disk **60** rotates through the mass of seeds which accumulate near the port **69**, one seed is drawn by the vacuum against each of the transverse holes **67-67**. As the seed disk **60** continues to rotates within the metering unit **36**, the sigulated seeds are moved through the gap **65** at the distal end of the brush **71** and over the discharge opening **70** in the outer wall **52** of the second housing member **50**. As

each of the singulated seeds is moved over the discharge opening **70**, the aperture of the associated hole **67** on the second side **62** of the seed disk **60** crosses the vacuum barrier formed by the sealing member **99**, thereby releasing the seed from the first side **61**. The seeds are thereby allowed to drop through the opening **70** in the outer wall **52** of the first housing member **50**, through the second chute **48** to be planted.

[**0059**] The manuals available from John Deere describe at least eighteen different configurations of seed disks **60**, each of which is made of a hard plastic having material therein which resist the build up of static electricity. The seed disks differing in the number of holes **67-67** therein, the diameter of the holes **67-67**, and the diameter of the circle defined by the centers of the hoes **67-67**. Also, the pumps **102, 104** which draw the vacuum in the cavity formed by the second housing member **90** (the vacuum is measured in inches of water) is adjustable from a minimum of two inches of water to a maximum of fifteen inches of water.

[**0060**] Referring to **FIG. 16**, to accommodate different sizes of seeds, the manuals from John Deer provide a planting chart similar to the chart **136**. To properly operate the planter **10**, the operator must first use the chart **136** to look up the size of seed to be planted. The graphs **137, 138, 139** on the chart **136** are used to identify the seed disk **60** having the configuration of holes **67-67** suitable for use with the seed size to be planted, and will show a recommended range of vacuum settings for setting the vacuum pumps **102, 104**. According to the John Deere manuals, disk A136478 should be used for planting small corn seed, disk A43215 should be used to plant medium size seed, and disk A50617 should be used to plant the larger sizes of corn seed.

[**0061**] If, during the course using the planter **10**, it is found that the planter **10** is under planting seeds or over planting seeds (operating at less than 99% efficiency or over 101 efficiency), the operator must stop his tractor and make adjustments to the vacuum drawn by the pumps **102, 104**. Also, if the operator exhausts his supply of a given size of seed and is required to significantly change seed size, he must unlatch all of the latch assemblies **148, 149** of the metering units **36** and replace the seed disks **60** therein with another disk having the configuration of holes **69-69** suitable for the size of seed which he is now using. The instructions from John Deere may further require the installation and adjusting or removal of a double eliminator **78**, and/or the installation or removal of a knockout assembly **120**. Where a knockout assembly **120** is already in use, replacing a seed disk **60** may require the replacement of the knockout assembly **120** because the arm **124** must be configured differently for each of the seed disks **60**. Similarly, the changing of a seed disk **60** may require the adding, removal, or adjustment of a double eliminator **78**.

[**0062**] Referring to **FIG. 14, a** kit **150** in accordance with the present invention can be used to improve the efficiency of a planter **10** to plant any size seed of corn seed without requiring re-adjustment of the vacuum drawn by the pumps **102, 104**, or requiring replacement of the seed disk. The kit **150** includes a seed disk **152** constructed in accordance with the invention, having a first side **154** and a second side **153**, a double eliminator **155**, also constructed in accordance with the invention, a knockout assembly **156**, an alignment tool **157**, and a set of instructions **158** regarding the use of the kit **150**.

[**0063**] It is well known that when a John Deere planter **10** is used to plant corn seed using a metering unit employing conventional parts and configured according to the instructions of a John Deere manual. The planter **10** is intended to be operated at speeds from 4.0 miles per hour (mph) to 6.5 mph, and for planting corn seed, the efficiency is maximized when it is pulled at a speed of about five miles per hour. The operators of most planters, however, prefer to pull their machines at six miles per hour, causing a correspondingly faster rotation of the associated seed disk and a reduction in the efficiency of the planter. The seed disk **152** of the present invention has forty equally spaced holes **160-160** the centers of which define a circle having a radius **R1**, which is a little less than the radius R2 of the seed disk **152**. The provision of forty holes **162** enables the seed disk **152** to rotate more slowly within the metering unit **36** for any given speed of the seeder **10** than is the case where a seed disk **60** having thirty holes **67-67** is employed. The provision of forty holes **160-160** requires that the gearing for the seed disk **152** be correspondingly changed so that the corn seeds are planted the desired distance apart from one another (4.4 inches to 11.2 inches), for all speeds within the 4.0 to 6.5 mph range. The result is that the reconfigured feeder will operate at a speed of six miles per hour without causing a reduction in its efficiency.

[**0064**] Referring to **FIGS. 9, 10, 14** and **15**, the diameters of the holes **67-67** of the prior art seed disks **60** vary from one disk to another to suit the type of seed that the disk is intended to plant and the maximum diameter of a vacuum hole **67** of any seed disk provided by John Deere is 3/16 inch. The diameter **164** of each hole **160** of seed disk **152** is 3/16 inch±1/64 inch. If the size of the hole **160** is less than 3/16 inches the vacuum drawn through the holes will be correspondingly reduced thereby reducing the ability of the seed disk to retain a large kernel of corn seed against the hole. If the size of the hole **160** is greater than 3/16 inch the smaller sizes of corn seed may become wedged in the hole **160**, thereby reducing the efficiency at which the planter operates. Also, each of the holes **160** has a countersink **165** in the first surface **153** of the disk **152** against which seeds are drawn when the disk is in the metering unit **36**, the countersink having a diameter of 15/64±1/64 inch. The countersink **165**, which may be either cylindrical or angular as shown, is critically important in retaining the larger sizes of seed against the opening of the holes **160-160** because it increases the area across which the force of the vacuum is applied. I have found that a tapered or frustoconical countersink with a combined angle **167** of 60 degrees yields the best results.

[**0065**] Referring to **FIGS. 14, 17, 18, 20** and **21**, the kit further includes a double eliminator **155**. The double eliminator **155** of the present invention has arcuatety shaped outer side **172** and a stepped inner side **174** which appear similar to the outer and inner sides **79, 86** of the prior art double eliminators **78**. In the preferred embodiment the double eliminator **155** has four steps **190, 191, 192, 193** along the inner side **174**, each of the steps has an outer end portion **201, 202, 203, 204** respectively, and between each pair of the successive steps **190-193** are risers **194, 195, 196**, respectively. As is shown in **FIG. 21**, the surfaces defined by each of the four steps **190, 191, 192, 193** define tangent to a circle having a radius of R1 (the circle defined by the centers of the holes **167-167**). The steps **190-193** are arranged on the double eliminator **155** with each step defining a fragment of a tangent line, the fragment joining the circle of radius R1

at the end portion **201, 202, 203, 204** of each of the step **190-193** respectively. When the double eliminator is positioned on the first housing member **50**, each of the steps **190-193** slopes radially inwardly, with the ends joining the risers **194-196** being the radially outward ends, and the outer end portions **201-204** of the steps being the radially inward ends thereof.

[**0066**] The double eliminator **155** further has only one hole **176** at the first end thereof (instead of two, namely **80** and **81** of the John Deere eliminator **78**) and a second hole **177** at the second end thereof. Instead of the retaining pin **76** provided by John Deere, a bolt **178** is fitted through mounting hole **72** on the first housing member **50** and hole **177** of the double eliminator **155** and the parts are retained in place by a nut **179**. The threaded end of a screw **182** is extended through the hole **176** at the first end of double eliminator **155**, through the mounting hole **73** on the first housing member **50** and into a threaded hole in the A tapered cam shank **180** is retained to the first end of the double eliminator **155** by a screw **182** through the hole **176** at the first end thereof, and the axis of the screw **182** is parallel to but offset from the axis if the shank **180**, as in the case of the John Deere double eliminator **78**. A hex head **184** is provided on the cam shank **180** instead of the thumb wheel **76**.

[**0067**] As shown in **FIGS. 18 and 20** the seed disk **155** further has a notch **165** in the outer circumference thereof to allow a screw driver to have access to the head of the screw **182** while the seed disk is attached to the hub **56** to tighten the cam **180** into the tapered bore **73** of the first housing member **50**.

[**0068**] The seed disk, as depicted in **FIG. 20**, rotates clockwise with seed being drawn by the vacuum against the holes **160-160** on the first side **153** of the seed disk **152** (the first side being visible in this view). As the seed disk rotates, seeds held by the vacuum against the holes **160-160** successively encounter the angled surfaces of steps **190-193** of the double eliminator **155**, thereby applying a force against the seeds, in the form of an impact, the force being applied parallel to the surfaces **153, 154** of the seed disk **152**. Where only one seed is held against a hole **160** by the vacuum, none of the successive impacts is sufficient to dislodge the seed from it position as it is held by the vacuum against the hole **160**. In some cases, however, two seeds will be drawn by the vacuum against a single hole **160**, and when the two seeds encounter the steps **190-193** of the double eliminator the successive impacts of the four steps **190-193** will dislodge one of the two seeds held against the hole **160**. If the double eliminator operate properly, whenever two seeds are retained against a hole the second seed will be knocked off, and the planter **10** will never plant more than one seed in a hole.

[**0069**] To operate properly the four steps **190-193** of the double eliminator **155** must all apply approximately the same impact against the seeds held against the seed disk **155**, and therefore the double eliminator must be positioned so that the outer end portions **201-204** of the steps **190-193** equally obstruct the holes **160-160** of the seed disk **155**. The cam **180** provides a radial adjustment for the cam end of the double eliminator **155**, but the pivot end is unadjustably secured by a pin or screw **178** through the hole **177**. Where the hole **177** is not properly positioned with respect to the steps **190-193** the double eliminator **155** will not operate properly. As shown on **FIG. 21, I** have fount that for a John Deere metering unit **36** the double eliminator **155** will operate most efficiently where the perpendicular distance **206** between the center of mounting hole **177** and the surface of step **190** is about 0.033 inch.

[**0070**] I have found that the hole **82** of the double eliminator **78** as manufactured by John Deere is not properly positioned with respect to the steps thereof and that there is approximately 0.028 inch between the center of the hole **82** and the surface of the first step thereof. When a John Deere double eliminator **78** is assembles to the first housing member **50**, only two of the four steps of the double eliminator **78** apply the desired force against seeds as they are moved into the double eliminator **78** by the rotating seed disk **60**. The result is that the John Deere double eliminator **78** frequently fails to dislodge one of the seeds when two seeds are drawn against a vacuum hole of a seed disk.

[**0071**] The double eliminator **155** of the present invention also differs from that of the prior art double eliminator **78** in that it has a thickness **175** of no more than 11/64 inch. The 3/16 inch thickness of the John Deere double eliminator **78** causes the forward surface thereof to engage the first surface **61** of the seed disk **60** and interfere with its operation. To accommodate the thickness of the John Deere double eliminator the retaining hub **56** must be axially adjusted to move the first surface **61** of the seed disk **60** outward of the rear wall **54** of the first housing member. This requires the removal of the spring locking pin **59**, the rotation of the retaining hub **56** with respect to the inner tubular shaft to unscrew the hub **56** with respect to the drive shaft, not shown, after which the locking pin **59** is reinserted. When this is done the plane defined by the first surface **61** of the seed disk **60** will be spaced from the plane defined by the open end of the cylindrical wall **52** of the first housing member **50**, thereby allowing small seeds to work between the outer end of the seed disk **60** and the inner surface of the metering unit housing.

[**0072**] Where the thinner double eliminator **155** of the present invention is employed, the seed disk **152** of the present invention may be retained on a retaining hub **56** with the locking pin **59** assembled in the same orientation as when there is no double eliminator in use, thereby avoiding the misalignment of the parts caused by the use of the John Deere double eliminator **78**. The wedging of the corn seed between the outer end of a seed disk and the inner surface of the metering unit can result in cracking of corn seed and the planting of defective corn seed.

[**0073**] Referring to **FIGS. 14, 17, 18, 19** and **20**, in accordance with the invention the cam **180** of the double eliminator **155** must be properly adjusted to avoid the inadvertent planting of two seeds in one hole during the operation of the planter **10**, and accordingly an alignment tool **157** is provided. The adjustment of the double eliminator **155** is carried out by using the hex head **184** to turn the cam **180** within the tapered bore **72**. The alignment tool **157** consists of a cylindrical peg **185** having a diameter of 1/8th inch and a length of about one inch, and a planar disk **186** mounted perpendicularly to one end of the peg **185**.

[**0074**] As shown in **FIGS. 18 and 20**, the adjustment of the double eliminator **155** is carried out by using the hex head **184** to turn the cam **180** within the tapered bore **73**. The double eliminator **155** in properly aligned in the first housing

member **50** by assembling the seed disk **152** on the hub **56** of the first housing member **50**, rotating it until the notch **165** exposed the head of the retaining screw **182**. The peg **185** of the alignment tool **157** is inserted through one of the vacuum holes **160** of the of the seed disk **152** adjacent the first end of the double eliminator **155** (the end to which the cam **180** is attached). The cam **180** is then adjusted until the side **176** of the double eliminator **155** presses against the peg **185** of the alignment tool **157**. When the peg **185** is in contact with both the inner wall of the vacuum hole **160** and the fourth step **193** of the double eliminator **155**, a screw driver is inserted through the notch **165** of the seed disk **152** and the screw **182** tightened. Tightening the screw **182** locks the cam **180** in place, after which the peg **185** of the alignment tool **157** is withdrawn from the hole **160** in the seed disk **152**.

[**0075**] The knockout assembly **156** of the present invention is identical to the knockout assembly **120** of the prior art where the prongs **132-132** on the wheel **130** thereof are spaced in a position to engage the forty holes **160-160** of the seed disk **152**. John Deere makes a knock out assembly usable with its forty hole disks, and most importantly, with its forty hole sweet corn disks sold as part numbered A52391 and A52390. Since a knock out assembly suitable for use with the invention is already available from John Deere the kit **150** can be sold without the knock out assembly **156**, in which case the instructions **158** will inform the user to acquire and insert a knock out assembly into the metering units of his planter **10**, and to install and adjust the double eliminator using the alignment pin **157**.

[**0076**] When the seed disk **152**, the double eliminator **155**, and a knockout assembly **156** are assembled into all of the metering units **36** of a the planter **10**, the pumps **102**, **104** can be adjusted to provide a vacuum of ten to twelve inches of water, the planter **10** can be pulled at a speed of six miles an hour an hour and will plant between 99% and 101% efficiency for all available sizes of feed corn seed. Accordingly, an operator can operate the planter **10** without making periodic adjustments to the vacuum and without replacing the seed disk **152** regardless of the size of the seed which inserted into the hoppers **32** of the row units **30-30**. The device will plant reliably if the vacuum is set greater than **12**, however, such higher settings will cause the vacuum pumps to operate faster and will require the use of more energy. When the vacuum is set below **9** in will be insufficient to retain the larger corn seed.

[**0077**] Although the John Deere planter will operate reliably after it has been modified as described above, the introduction of less than all the elements of the invention within a metering unit can significantly improve the performance of the planter. John Deere manufactures a sweet corn seed disk **60** having a circle of forty vacuum holes **67-67** having diameters of 3/16 inch, the disk sold under part number A52391. John Deere also manufactures a knock out assembly configured for use with seed disk part number AA37348, and the double eliminator provided by John Deere can be used with these parts. The mere assembly of these parts into the metering units of the John Deere planter will not significantly improve the performance of the planter. However, the vacuum holes **67-67** of seed disk part number A52391 can be easily drilled to a diameter of $13/64 \pm 1/128$ inch, and this will result in a seed disk with a wider range of planting capabilities. With the vacuum permanently set at 11 to 12 inches of water, a row unit with a metering unit having this configuration will plant both small and medium size corn seed and will reliably maintain an efficiency of 96% to 104%. Farmers who have tested metering units fitted accordingly have been very pleased with this improvement.

[**0078**] The seed disk **152**, having vacuum holes **160** with a countersink **165** as described, is the single most important element of the invention and the use of the seed disk **152** in conjunction with a double eliminator and knock out assembly of the type manufactured by John Deere will greatly improve the efficiency of the John Deere vacuum planter. The seed disk therefore could be marketed along with instructions **158** directing the user to acquire and install a prior art double eliminator and a knock out assembly along with the seed disk **152**. The double eliminator **155** could also be marked alone or in conjunction with the alignment tool **157**.

[**0079**] While the present invention has been described with respect to a single embodiment, it will be appreciated that many modifications and variations may be made without departing from the true spirit and scope of the invention. It is, therefore, the intent of the appendant claims to cover all such modifications and variations which fall within the true spirit and scope of the invention.

What is claimed:

1. A kit for a seed planter of the type manufactured by John Deere having a metering unit for retaining a circular rotatable seed disk, said seed disk having a center, a first surface, a second opposing surface, and a plurality of transverse spaced vacuum holes through said seed disk, wherein seeds are introduced into a first cavity in a housing defined by said first surface and a vacuum is drawn into a second cavity in said metering unit defined by said second surface, wherein the efficiency of said planter to plant seeds of varying sizes is improved without requiring adjustment of vacuum or replacement of said seed disk, said kit comprising

a seed disk having a center, a plurality of spaced vacuum holes, each of said vacuum holes having a countersink on said first side having a maximum diameter of $15/64 \pm 1/64$ inch, and

a set of instructions directing that said the vacuum of said planter be adjusted to a setting of at least ten inches of water.

2. The kit of claim 1 wherein said vacuum holes are have a diameter of $3/16 \pm 1/64$ inch and said countersink is frusto-conical.

3. The kit of claim 1 and further comprising a double eliminator.

4. The kit of claim 3 wherein said double eliminator has a thickness of no more than 11/64 inch.

5. The kit of claim 1 and further comprising a knock out assembly.

6. The method of claim 1 and further comprising the steps of

Providing a double eliminator adjustment tool where said double eliminator adjustment tool has a cylindrical member and a planar member mounted perpendicular to one end of said cylindrical member, and

Extending said cylindrical member through one of said vacuum holes, and

Adjusting said double eliminator to contact one side of said cylindrical member while an opposite side of said cylindrical member is in contact with an inner wall of said one of said vacuum holes.

7. The kit of claim 1 wherein said vacuum holes have a diameter of 3/16±1/64 inch and said kit further comprises:

a double eliminator, and

a knock out assembly.

8. The kit of claim 7 wherein the centers of said plurality of transverse spaced vacuum holes define a circle of radius **R1** and said double eliminator comprises

an arcuate body having an inner side, a pivot pin hole and a cam pin hole,

said inner side having a plurality of steps with a riser between adjacent ones of said steps,

each of said steps having a planar surface,

said planar surface of each of said steps being tangent to a circle having a radius equal to **R1**,

said hole for retaining a pivot spaced a perpendicular distance from one of said steps a distance of about 0.033 inch, and

said arcuate body having a thickness of no more than 11/64 inch.

9. The method of claim 8 and further comprising the steps of

Providing a double eliminator adjustment tool where said double eliminator adjustment tool has a cylindrical member and a planar member mounted perpendicular to one end of said cylindrical member, and

Extending said cylindrical member through one of said vacuum holes, and

Adjusting said double eliminator to contact one side of said cylindrical member while an opposite side of said cylindrical member is in contact with an inner wall of said one of said vacuum holes.

10. A method of improving the efficiency of a seed planter of a type manufactured by John Deere having a metering unit for retaining a circular rotatable seed disk, said seed disk having a center, a first surface, a second opposing surface, and a plurality of transverse vacuum holes through said seed disk, wherein an adjustable vacuum is drawn in a second cavity of said metering unit defined by said second surface and seeds are introduced in a first cavity of said metering unit defined by said first surface, said method comprising the steps of

providing a seed disk having a plurality of spaced vacuum holes, each of which has a diameter of 3/16±1/64 inch and having a countersink with a maximum diameter of 15/64 inch±1/64 inch,

installing said seed disk in said planter,

providing a double eliminator,

installing said double eliminator in said planter,

providing a knockout assembly adapted to knockout seeds from said plurality of vacuum holes of said seed disk,

installing said knockout assembly in said metering unit, and

adjusting said vacuum to a setting of at least ten inches of water.

11. The method of claim 10 and further comprising the steps of

Providing a double eliminator adjustment tool where said double eliminator adjustment tool has a cylindrical member and a planar member mounted perpendicular to one end of said cylindrical member, and

Extending said cylindrical member through one of said vacuum holes, and

Adjusting said double eliminator to contact one side of said cylindrical member while an opposite side of said cylindrical member is in contact with an inner wall of said one of said vacuum holes.

12. A seed disk for use in a seed planter of the type manufactured by John Deere having a metering unit for retaining said seed disk, said metering unit having a first cavity defined by a first side of said seed disk in which seeds are introduced and a second cavity defined by a second side of said seed disk in which a vacuum is drawn, said seed disk comprising

a seed disk body having a first side, a second side, and a plurality of spaced vacuum holes,

said vacuum holes having diameters of 3/16±1/64 inch, and

said vacuum holes having a countersink on said first side, said countersink having a maximum diameter of 15/64 inch±1/64 inch.

13. A seed disk for use in a seed planter of the type manufactured by John Deere having a metering unit for retaining said seed disk, said metering unit having a first cavity defined by a first side of said seed disk in which seeds are introduced and a second cavity defined by a second side of said seed disk in which a vacuum is drawn, said seed disk comprising

a seed disk body having a first side, a second side, and a plurality of spaced vacuum holes,

said vacuum holes having a countersink in said first side, and

said countersink having a diameter of 15/64±1/64.

14. An alignment tool for aligning a double eliminator in a seed planter of the type manufactured by John Deere having a metering unit for retaining a circular rotatable seed disk, said seed disk and a double eliminator, said seed disk having a center, a first surface, a second opposing surface, and a plurality of transverse spaced vacuum holes through said seed disk, wherein a vacuum is drawn in a first cavity in a housing defined by said first surface and seed is introduced into a second cavity in said metering unit defined by said second surface, said alignment tool comprising

a cylindrical member having two ends, and

a second member attached to one of said ends of said cylindrical member, said second member defining a transverse surface at said one of said ends.

15. An alignment tool in accordance with claim 14 wherein said second member is planar.

16. A double eliminator for a vacuum planter having a metering unit including a seed disk having a plurality of vacuum holes the centers of which are positioned in a circle defining a radius R1, said metering unit further having a first

hole for retaining a pivot end of a double eliminator and a second hole for retaining a cam at a cam end of a double eliminator, said double eliminator comprising,

an arcuate body having an inner side, a pivot pin hole and a cam pin hole,

said inner side having a plurality of steps with a riser between adjacent ones of said steps,

each of said steps having a planar surface,

said planar surface of each of said steps being tangent to a circle having a radius equal to R1,

said hole for retaining a pivot radially spaced a perpendicular distance from one of said steps a distance of about 0.033 inch.

17. A double eliminator in accordance with claim 16 wherein said arcuate body has a thickness of no more than $^{11}/_{64}$ inch.

* * * * *

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Letter accompanying subsequently filed items

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The document(s) listed below is (are) subsequently filed documents pertaining to the following application:

Application number	11779702.7
Applicant's or representative's reference	E 98381

	Description of document	Original file name	Assigned file name
1	Patent Document cited during the appeal procedure	D10_US2003183647A1.pdf	APPEAL-CP-1.pdf
2	Patent Document cited during the appeal procedure	D11_US_20020043201_A1.pdf	APPEAL-CP-2.pdf
3	Patent Document cited during the appeal procedure	D12_ES_02013539_A6.pdf	APPEAL-CP-3.pdf
4	Cited document during appeal procedure	D12'_ES2013539 machine translation.pdf	APPEAL-CDOC.pdf
5	Reply to appeal	98381 response to appeal 14.08.pdf	DG3-REPLSTGR.pdf

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1	Method of payment	Not specified

Signatures

Place:	**Hamburg**
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Patent No.: EP 2 637 492

Application No.: 11779702.7

Patentee: Maschio Gaspardo S.p.A.

14.08.2018
E 98381 Me/MJ

In the name and on behalf of the Opponent, Precision Planting, 23207 Townline Road, Tremont, IL 61568 USA, the following submission is made in response to Patentee's grounds for appeal:

A Requests

It is requested that the appeal be dismissed.

Oral proceedings are requested if the Board of Appeal should not intend to dismiss the appeal in the written proceedings.

It is further requested that none of Auxiliary Requests 1 to 3 and 6 to 11 be admitted into the appeal proceedings. These Requests were only filed with the grounds for appeal and should have been filed in the first instance proceed-

ings. As will be outlined in more detail below, Auxiliary Requests 4 to 11 are also directed to subject-matter which is not convergent with the subject-matter of the Main Request and the first to third Auxiliary Requests.

In case the Board of Appeal should come to the conclusion that the subject matter of any Request on file is supported by the application as filed (and thus in compliance with Article 123 EPC) and novel in view of the prior art (and thus in compliance with Article 54 EPC), it is requested that the present case be remitted back to the first instance for the assessment of inventive step. The detailed lack of inventive step objections raised by the Opponent have not been discussed in any detail by the Opposition Division.

B The prior art

In the appeal proceedings reference will be made to Documents D1 to D9 filed in the first instance proceedings and to Documents D10 to D12 newly submitted herewith.

As indicated in the minutes of the first instance hearing, a new Request was submitted by the Patentee in the hearing as Auxiliary Request 2 (in the appeal proceedings this corresponds to Auxiliary Request 5), wherein features of the description were introduced into the claims. As the Request was admitted by the Opposition Division, the Opponent searched for additional prior art documents. The following documents are introduced into the proceedings specifically in response to the new Requests and are relied upon in addition to Documents D1 to D9:

D10: US 2003/0183647 A1
D11: US 2002/0043201 A1

D12: ES 2 013 539 and English language machine translation (D12')

C Main Request

1. Extended subject matter – Article 123(2) EPC:

1.1 The subject matter of claims 1 and 10 of the Main Request (patent as granted) extends beyond the disclosure of the application as filed, because the feature "*wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes*", which was part of the claims 1 and 10 of the application as originally filed, has been omitted. Further, the omitted feature is disclosed in the application as an essential and indispensable feature for the seed distribution element.

1.2 Page 3, lines 13 to 14, of the application as originally filed states that the solution to the claimed problem resides in the embodiments of the claims as filed which contain the omitted feature. The embodiments disclosed in the application as filed further disclose a pressure differential in the region of the selector holes. The claims and the description of the application as filed evidently refute Patentee's allegation that the omitted feature is not essential.

1.3 The omitted feature provides an essential structural and functional limitation, namely the specific location of the pressure differential, which is not characterized in claim 1 as granted and the omitted feature is therefore also not inherent in the structural elements contrary to the allegations of the Patentee.

Claim 1 as granted defines (1.) that the sowing disc is interposed between the fixed portion and the movable portion, (2.) that the sowing disc has opposed surfaces delimiting the chambers and (3.) that the sowing disc has a ring of selector holes extending between the opposed surfaces. However, claim 1 does not define that the "selector holes" connect the two chambers, which is necessary for the basic functioning of the seed distribution element, i.e. the transportation of the seed by means of underpressure at the selector holes.

Evidently, there is no functional relationship between the selector holes and the suction chamber. Hence, the skilled person cannot recognize that a pressure differential at a specific region of the ring of holes has to be provided. This teaching is highly relevant and would only be provided by the omitted feature.

1.4 Because of the lacking functional relationship between the selector holes and the suction chamber, the purpose of the selector holes is not defined in claim 1 and thus, contrary to the allegations of the Patentee, the skilled person is not taught that the selector holes serve for transporting the seeds. In the absence of a functional or structural specification of the "selector holes", which would only be provided by the feature omitted, the term "selector holes" also covers holes in the disc outside the region of the chambers. For example, the "selector holes" could be through-holes in the central region of the sowing disc for the insertion of fastening screws to fix the sowing disc to the shaft.

For the sake of completeness it is noted that the term "selector hole" neither has a specific meaning in the

technical field nor is it used by the prior art documents in the proceedings.

1.5 It appears that the Patentee concluded that the combination of features claimed is implicitly disclosed (pages 1 and 2 of the grounds for appeal).

However, given the fact that the application discloses that the omitted feature is linked to the above structural and functional features this conclusion clearly represents an error.

1.6 It follows that feature at issue cannot be omitted as it is essential and indispensable for the alleged invention.

2. Lack of novelty in view of D1, D4 and D5 – Article 54 EPC:

The Opposition Division correctly concluded that the subject matter of independent claims 1 and 10 lacks novelty in view of D1, D4 and D5.

The contrary conclusion provided by the Patentee in the grounds for appeal is primarily based on a misinterpretation of the claims:

2.1 Patentee's argument that the subject matter claimed differs from D1, D4 and D5 is based on the feature:

> *"thrust bearing element is supported rotatably in the movable portion for withstanding at least some of the axial load produced by the sowing disc on the seal"*

2.2 With regard to the interpretation of claim features in general, the Boards of Appeal have repeatedly confirmed that the assessment of novelty and inventive step should

not be based on a narrow interpretation of the claims – as suggested by the Patentee – but rather follow a literal approach. It is common case law that in examination and opposition proceedings that the value of future legal certainty is paramount. The claims define the matter for which protection is sought. There is no support for anything other than a strict definitional approach to ensure legal certainty in assessing patent ability, in particular novelty and inventive step over the prior art.

2.3 The term "thrust bearing element" is composed of the words **"thrust"**, **"bearing"** and "**element**". Interpreting these features in accordance with the above principles, this feature group refers to an element ("element") having the function to provide support ("bearing") against an axial load ("thrust"). The allegation of the Patentee that a handle would not constitute a thrust bearing element is incorrect, because the above properties of a "thrust bearing element" are fulfilled by the handles in D1, D4 or D5 which bear axial thrust due to the fact that any of the handles lock the disc on a shaft to retain the disc in position, whereby a surface of the handle contacts the corresponding surface part of the disc. When a suction force is applied on the disc, this drags the outer section of the disc in direction to the suction chamber and thereby compresses the seal. The handle withstands at least some of the axial load produced by the disc on the seal. The decision of the Opposition Division that the handles in D1, D4 or D5 constitute "thrust bearing elements" is therefore fully correct.

2.4 In no case can the term "thrust bearing element" be interpreted as referring to some sort of roller bearing or rotary bearing as alleged by the Patentee (Patentee's submission pages 4 and 5). In fact, the claim wording itself

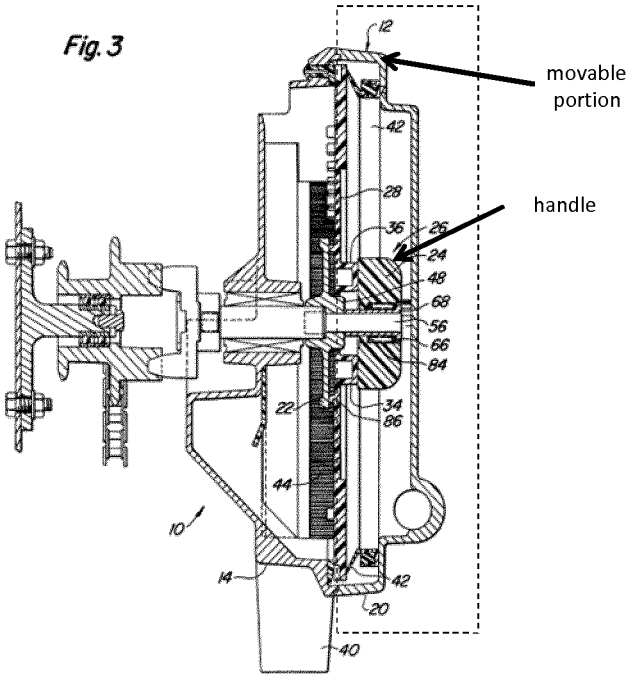
defines the thrust bearing element in a broad sense and does not support a narrow interpretation of the term "thrust bearing element", i.e. an interpretation in the sense of a rotary bearing.

If the term "thrust bearing element" only refers to a rotary bearing as alleged by the Patentee, then the additional feature which requires that *the thrust bearing element is supported rotatably in the movable portion* would be redundant as the rotary bearing itself already allows for relative rotation.

The function of the "thrust bearing element" only resides in providing support against axial thrust forces. Rotational properties of the thrust bearing element are defined by a complementary rotational support, i.e. by the additional feature "[the thrust bearing element] *is supported rotatably*" (e.g. by means of additional bearings 28 in a seat 29 of the movable portion 12; page 5, lines 24-25). Hence, any element that provides support against axial thrust on the disc is a thrust bearing element.

2.5 With respect to the location of the rotational support of the thrust bearing element, it is emphasized that the feature requiring that "*the thrust bearing element is supported rotatably in the movable portion*" does not necessarily require that the thrust bearing element is actually mounted on the movable portion or is in direct contact with the movable portion, as suggested by the Patentee (Patentee's submission pages 2 to 4). The wording of claim 1 does not specify a position of the thrust-bearing element in relation to the movable part or with respect to a specific part of the movable portion.

For the sake of completeness, it is noted that the Collins dictionary definition of "in" provided by the Patentee ('in' means "*something that is in something else is enclosed or surrounded by it*"; Patentee's submission page 3)) corresponds to the arrangement of the handles in D1, D4 and D5. Fig. 3 of D5 is illustrated below and the thrust bearing element (handle) is located <u>in</u> the movable portion (respective area indicated with broken lines), which <u>surrounds</u> the handle so that the handle is situated therein. The corresponding assessment of the Opposition Decision does not give cause for objection here, too.



<u>Fig. 3 of D3</u>

2.5 The above shows that the handles in D1, D4 and D5 are "thrust bearing elements" in the sense of the opposed patents because the handles are elements that forcibly withstand at least some of the axial load produced by the disc on the seal. The handle of any of the Documents D1, D4 and D5 is supported rotatably <u>in</u> the movable portion, as any of the handles disclosed in these documents are positioned <u>in</u> the movable portion and are rotatably supported on

shafts. As the features at issue are disclosed in D1, D4 and D5, respectively, and the disclosure of the remaining features of claims 1 and 10 is correctly not disputed, novelty is to be denied.

3. Lack of Novelty in view of D10 – Article 54 EPC:

Claims 1 and 10 of the Main Request lack novelty over D10 (US 2003/0183647 A1).

D10 discloses a seed meter (seed distribution element) whose structure substantially corresponds to the devices disclosed in D1, D4 and D5 (see Figures 5, 6 and 8). With regard to the features of claim 1, D10 discloses:

- A sowing disc (seed disc 60; paragraph [0052]) which is rotated by a motor driven transmission shaft (drive shaft 55; paragraph [0046]) at controlled speed.

- A housing that consists of a first housing member 50 and a second housing member 90 (see Figure 8), wherein the first housing member 50 is a fixed housing portion and the second housing member 90 is a movable hosing portion which is movable relative to the fixed portion and can be closed against it by means of a pivot pin 92 (paragraph [0052]). The shaft 55 is supported rotatably in the fixed portion 50.

- A seed collection chamber that is defined in the fixed housing portion 50 (paragraph [0048]: "seeds are allowed to enter the first housing member 50").

- A pneumatic suction chamber that is defined in the movable housing portion 90 (paragraph [0058]: "vacuum is created in the second chamber").

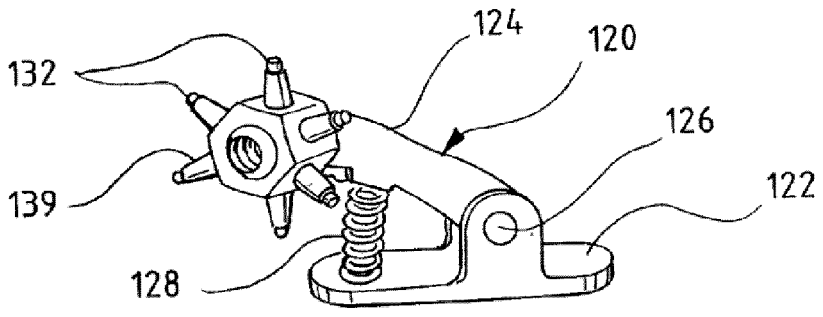
- The sowing disc (seed disc 60) is interposed between the two housing portions (50 and 90) and has opposed surfaces delimiting the chambers.

- The sowing disc (seed disc 60) has a ring of selector holes (transverse holes 67-67; paragraph [0047]) extending between the opposed surfaces.

- A sealing member 99 that is arranged on the movable housing portion (second housing member 90) and is capable of establishing sliding contact with the facing surface of the disc (seed disc 60) when the portions (50 and 90) are closed against one another (paragraph [0052]).

- Finally, the seed meter discloses a thrust bearing element in the form of a knockout assembly 120 that is mounted on the movable portion and that is able to withstand at least some of the axial load produced by the disc on the seal. Said knockout assembly is illustrated below.

FIG. 13



Knockout assembly 120 in Figure 13 of D10

Paragraphs [0054] and [0055] of D10 disclose that the knockout assembly 120 generally has a planar base member 122 for attachment to the rear surface portion 110 of the movable housing portion. The assembly 120 further includes an arm 124 pivotally attached by a pin 126 to the base member 122 and a spring 128 for urging the arm 124 away from the base member 122, i.e., towards the sowing disc.

At the distal end of arm 124 is a rotatable wheel 130 having a plurality of equally spaced radially extending prongs 132. The prongs 132 of the knockout assembly 120 are angularly spaced on the wheel 130 such that one prong 132 will extend into each of the holes 67-67 of the seed disk 60 as the disk 60 rotates around the hub 56. There is a stepped portion between the prong 132 and the base shaft of the prong, which engages the edge of the holes in the disc to limit the intrusion of the prong into the seed hole.

Consequently, D10 discloses a thrust bearing element in the sense of the term used in claim 1, which

(a) is mounted in (and on) the movable portion (the knockout assembly is mounted on the movable portion);
(b) is supported rotatably in the movable portion (wheel 130 is rotatable); and
(c) provides an axial force (the wheel is biased against the sowing disc spring 128) against the disc opposite to the direction of the suction forces and is thus capable of "*withstanding some of the axial loads produced by the disc on the seal*".

It follows from the above that D10 anticipates the subject matter of claim 1 of the Main Request. The same applies *mutatis mutandis* to the subject matter of claim 10.

4. Inventive step – Artice 56 EPC:

As indicated above, the lack of inventive step objections raised by the Opponent in the first instance proceedings have not been discussed in the first instance hearing and are not reviewed in the decision of the Opposition Division. Not even the grounds for appeal of the Patentee contain a detailed analysis of inventive step. It is merely alleged in general that the Document used by the Opponent as the closest prior art in the problem-and-solution approach does not represent the closest prior art.

In case the Board of Appeal should come to the conclusion that the subject matter of any Request on file is supported by the application as filed (and thus in compliance with Article 123 EPC) and novel in view of the prior art (and thus in compliance with Article 54 EPC), it is therefore requested that the present case be remitted back to the first instance for the assessment of inventive step.

The following assessment of inventive step is provided only in case the Board of Appeal should not intend to remit the case to the Opposition Division for the assessment of inventive step:

4.1 Claims 1 and 10 also lack inventive step over D7 in combination with the common general knowledge of the skilled person or D7 in combination with D8.

4.2 Documents D7 and D8 can be summarized as follows:

D7 discloses:

- A sowing disc 18 (Figure 3) which is rotated by a motor driven transmission shaft 16 at controlled speed.

- A housing that consists of a first housing member 4 and a second housing member 1 (see Figure 1), wherein the first housing member 4 can be considered a fixed housing portion and the second housing member 1 can be considered a movable hosing portion which is movable relative to the fixed portion and can be closed against. The shaft is supported rotatably supported by a bearing in the fixed portion 4.

- A seed collection chamber 6 that is defined in the fixed housing portion 4.

- A pneumatic suction chamber that is defined in the movable housing portion 1.

- The sowing disc 18 is interposed between the two housing portions (1 and 4) and has opposed surfaces delimiting the chambers.

- The sowing disc 18 has a ring of selector holes 50 (see Figure 2) extending between the opposed surfaces.

- The seed meter also discloses a thrust bearing element in the sense of the opposed patent. The shaft 16 is rigidly connected to the distributor disk 18 (page 3, lines 21 to 24). As shown in Figure, there is a pin connection (circle on shaft) where the sowing disc is mounted on the shaft. Thus, any axial load created by the disk 18 is transmitted to the shaft 16, which has to withstand at least some of the axial loads trans-

mitted though the distributor disk 18. Moreover, the shaft 16 is supported rotatably in both portions 1, 4 of the distributor, i.e. in the movable portion.

However, D7 does not disclose a seal arranged in the movable portion and which is capable of sliding contact with the facing surface of the disc.

D8 also discloses a seed distribution element with a seed disk (see Figures 2 and 2A) arranged between a suction chamber and a seed collection chamber. Seed selector holes 24 connect the chambers. Most importantly, D8 additionally discloses a seal for sealing the suction chamber, wherein the seal is in sliding contact with the facing surface of the disc.

4.2 D7 represents a suitable starting point for assessing inventive step of the opposed patent. Contrary to the allegations of the Patentee, the criteria for using D7 as closest prior art have been set out in detail throughout the opposition proceedings.

4.3 Selecting D7 as closest prior art document follows the established practice for applying the problem-solution approach. The closest prior art for assessing inventive step is the prior art document disclosing subject matter conceived for the same purpose or aiming at the same objective as the claimed invention and having the most relevant technical features in common, i.e. requiring the minimum of structural modifications (*see Case Law of the Board of Appeal (2016), I. D. 3.1*).

It is not uncommon that there are several starting points for the assessment of inventive step, in particular when the skilled person can start from different documents, which might lead to the invention. It is sufficient to

show, on the basis of one relevant piece of prior art in respect of at least one of these solutions, that the claimed subject-matter lacks an inventive step. In such a situation, there is no need to discuss which document is "closest" to the invention; the only relevant question is whether the document used is a feasible starting point for assessing inventive step. This is valid even if the problem identified in a problem-and-solution approach may be different from the one identified by the Applicant/Patentee. D7 is directed to a seed distribution element conceived for the same purpose as the opposed patent.

4.4 The feature distinguishing the subject matter of claim 1 and the corresponding embodiments of D7 is a seal. However, the subject matter claimed is clearly rendered obvious by a combination of D7 and D8.

4.5 In D7, which does not have a seal, the underpressure in the suction chamber can be subject to variations as air can leak through the outer sections of the disc. Thus, constant underpressure cannot be guaranteed at the holes of the disc and the seeds might fall off the disc.

The technical effect of providing a seal resides in maintaining a state of underpressure in the suction chamber so that the risk of seeds falling off the disc during its rotation is reduced.

4.6 The objective technical problem underlying the opposed patent in view of D7 resides in maintaining constant underpressure for effectively retaining the seeds on the seed disc.

4.7 The technical solution in terms of the claimed feature is explicitly suggested in D8 (a seal). D8 explicitly men-

tions that a seal, i.e., a body member or vacuum manifold, arranged in sliding contact with a seed selection disc. Such a technical measure is long-time known for the purpose of providing an effective seal to ensure sufficient underpressure.

This shows that the subject matter claimed in the opposed patent is rendered obvious by the prior art.

For the sake of completeness, it is noted that D1, D4, D5, D10 and D11 each disclose a seal that is in contact with the sowing disc to maintain constant underpressure in the vacuum chamber. Therefore, each of these documents offers the solution to the above problem as well.

D Auxiliary Requests

1. Diverging versions of claims

1.1 Auxiliary Request 4-11 are directed to subject-matter that is not convergent with the subject-matter of the Main Request and the first to third Auxiliary Requests.

1.2 According to the established case law of the Boards of Appeal, amendments in auxiliary requests should represent a convergent development. This requirement is not met by the presented set of Auxiliary Requests, because Auxiliary Requests 1 to 11 form three different groups I-III of requests, which each group following a different direction in further delimiting claim 1 of the Main Request:

Group I: Auxiliary Requests 1-3
Group II: Auxiliary Requests 4-7
Group III: Auxiliary Requests 8-11

1.3 The following shows the inconsistent development of claimed subject matter:

Claim 1 of Auxiliary Request 4 (Group II) significantly diverges from claim 1 of the preceding Auxiliary Request 3 (Group I).

Claim 1 of Auxiliary Request 3 has been amended with respect to the patent as granted (Main Request) by adding the features:

- *thrust bearing element mounted on the movable portion*

- *thrust bearing element comprising a shaft (27) mounted by means of bearings (28) in a seat (29) of the movable portion; and*

- *shaft (27) has a flanging (30) by means of which it is fixed to a thrust bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24)*

In contrast thereto, claim 1 of Auxiliary Request 4 (Group II) has been amended with respect to claim 1 of the Auxiliary Request 3 by deleting the features that were previously added in the Auxiliary Requests 1-3 and replacing the features by:

> *"wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23)"*

This amendment of claim 1 in Auxiliary Requests 4, does not follow a consistent development of the claimed subject-matter in the direction defined by the consecutive amendments carried out in the higher ranking auxiliary requests 1-3, but represents a new line of development diverging from the inventive concept of the previous auxiliary requests, which are focussed on a different technical aspect, i.e. the mounting of the thrust bearing element.

These observations also apply in view of the amendments incorporated into the Requests of Group III. Claim 1 of Auxiliary Request 8 (Group III) significantly diverges from claim 1 of the preceding Auxiliary Request 7 (Group II). Auxiliary Request 8 is not a further development of the preceding Auxiliary Request 7, because the limitations that were added in Auxiliary Requests 5-7 (directed to the mounting of the thrust bearing element) were replaced by a feature directed to a different technical aspect, i.e. a suction device.

1.4 It follows from the above that the Patentee is not following a consistent line of defense in its various requests but rather switches from invention to invention with diverging requests. The auxiliary requests create, both for the Opponent and the Board of Appeal, an obscure and unacceptable procedural situation in which they were obliged to select from a multiplicity of varying versions the one which could finally be valid. This contravenes the requirement for procedural economy and Auxiliary Requests 4-11 should therefore be rejected as inadmissible.

2. Auxiliary Request 1

2.1 Auxiliary Request 1 violates Article 123(2) EPC and has to be rejected as inadmissible.

(1.) Claims 1 and 10 of Auxiliary Request 1 have been amended with respect to claims 1 and 10 the Main Request by adding the feature:

> *"the thrust bearing element (26) is mounted on the movable portion"*

The added feature group is disclosed with respect to the embodiment described on pages 5 and 6 of the description as originally filed. The desired effect of withstanding at least some of the axial load produced by the disc on the seal as disclosed for this specific embodiment (page 6, lines 3 and 4) requires that the thrust-bearing element is installed on the movable portion (at least) with the specific mounting arrangements disclosed in the originally filed description, page 5, last paragraph to page 6, lines 1-4, which includes - among other features - bearings 26 and a shaft 27 with a flanging 30.

In said description paragraph, the added feature (*thrust bearing element is mounted on the movable portion*) is inextricably linked to the mounting arrangement of the specific embodiment. Furthermore, the overall disclosure of the description as originally filed does not justify the generalizing isolation of mounting the thrust-bearing element on the movable portion without the particular features of the thrust-bearing element, as the mounting of the thrust-bearing element on the movable portion has only been disclosed in connection with the embodiment described on pages 5 and 6 of the originally filed description. It follows that the added feature includes an inadmissible intermediate generalization.

(2.) In claims 1 and 10 of Auxiliary Request 1, the feature "*wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segments of the ring of holes*" is omitted. As discussed in above paragraph C.1, this feature is essential and indispensible for the seed distribution element and its omission introduces a generalization, which has no base in the application as filed.

2.2 The additional feature is disclosed in D10, D11 and D12.

D10 discloses a thrust bearing element in the form of a knockout assembly 120 capable of bearing thrust forces in the axial direction and mounted on the movable portion. Thus, claims 1 and 10 of Auxiliary Request 2 lack novelty over D10.

D11 also discloses a thrust bearing element in the form of "bearing surfaces mounted on the moveable portion". Figure 3 of D11 is illustrated below.

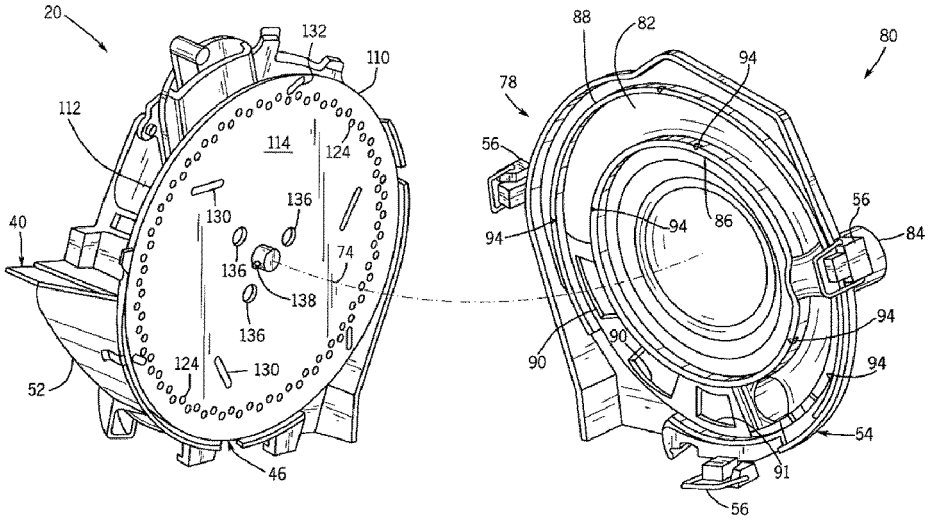


Fig. 3 of D11

D11 describes a seed metering system with a seed disc 46 mounted in the fixed housing portion 52 with the seed chamber. The movable housing 54 includes a vacuum chamber 82 and two bearing surfaces 86, 88 on the inner side of the movable portion 54 that delimit the vacuum chamber. The bearing surfaces 82, 88 abut against the seed disc and explicitly serve to stabilize the seed disc 46 during operation (par. [0049]).

D12 discloses a conical pinion 21 that is mounted on the movable portion (Figure 3). When the movable portion is closed against the fixed portion, the conical pinion meshes with a toothed crown 17 on the sowing disc to drive the pinion 21. This document discloses a rotatably supported element 21 that is mounted on the movable portion and that is in engagement with the sowing disc when the sowing disc rotates. The conical pinion is capable to withstand at least some axial load.

The subject matter of claims 1 and 10 of Auxiliary Request 1 thus also lacks inventive step in view of a combination of D7 and any one of D10, D11 and D12.

3. Auxiliary Request 2

3.1 Auxiliary Request 2 violates Article 123(2) EPC and has to be rejected as inadmissible.

(1.) Auxiliary Request 2 further characterizes Auxiliary Request 1 by incorporating into claims 1 and 10 the additional feature

"*the thrust-bearing element (26) comprises a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12)*".

The above arguments on intermediate generalization of Auxiliary Request 1 regarding the mounting of the thrust bearing element apply *mutatis mutandis* to Auxiliary Request 2. The added feature in Auxiliary Request 2 is based on page 5, lines 24 to 25 of the original description. The same paragraph describes further essential structural features connected with the mounting of the thrust bearing element, e.g. a flanging 30 and a thrust bearing plate 31. Already these elements have been omitted. It follows that Auxiliary Request 2 includes an inadmissible intermediate generalization.

(2.) In claims 1 and 10 of Auxiliary Request 2, the feature "*wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segments of the ring of holes*" is omitted. As outlined above, the omission of this feature contravenes Article 123(2) EPC.

3.2 The additional feature of Auxiliary Request 2 is disclosed in D10 and D12.

D10 discloses in Figure 13 (see also Paragraph [0055]) that the distal end of the arm 124 of the knockout assembly 120 carries a rotatable wheel 130, which implicitly includes a support shaft carrying said wheel 130. As the wheel 130 is rotatable relative to the arm 124, there has to be some sort of bearing in a seat between the wheel and the movable portion.

Also the pivotable arm 124 falls under the meaning of the added feature, because the pivotable arm 124 (support shaft) is rotatably (pivotably) supported on the base member by means of bearing section 126 of the base.

The subject matter of claims 1 and 10 of Auxiliary Request 2 thus also lacks inventive step in view of a combination of D7 and D10.

4. Auxiliary Request 3

4.1 Auxiliary Request 3 violates Article 123(2) EPC and has to be rejected as inadmissible.

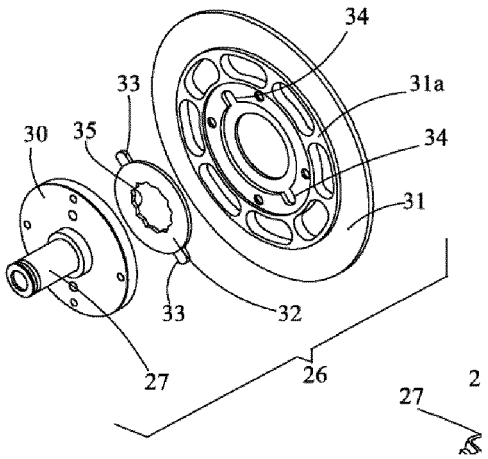
(1.) Auxiliary Request 3 further characterizes Auxiliary Request 2 by incorporating into claims 1 and 10 the additional feature

> "*the shaft (27) has flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc on the seal.*"

The added feature is based on the application as filed on page 5, line 21 to page 6, line 4 and relates to the specific embodiment of the thrust-bearing element (26) shown in Figure 2. The amendment merely introduces two components of the thrust bearing element, namely the shaft 27 with the flanging 30 and the thrust bearing plate 31. The description (also Figure 2) however discloses that the thrust-

bearing element **consists of** three assembled components:

(a.) a shaft (27) with a flanging (30),
(b.) a thrust-bearing plate (31), and
(c.) a drive element (32) sandwiched between elements (a.) and (b.).



Thrust bearing element 26 (Fig. 2 of EP 2 637 492)

Hence, the detailed description discloses that the **thrust-bearing element indicated with reference numeral (26)** does not consist of two elements, as defined in Auxiliary Request 4, but that the thrust bearing element consists of three elements (a, b and c). For these reasons alone, Auxiliary Request 4 constitutes an inadmissible intermediate generalization.

It is also evident from page 5, lines 21 to 23 that all three elements (a, b and c) are essential:

> "*In order to limit the wear on the seal 24 resulting from sliding against the surface of the disc 16, a thrust-bearing element* ***indicated as a***

whole by 26 *is mounted on the movable portion.*").

Evidently, the opposed patent defines the assembly **as a whole** to be essential to limit the wear on the seal.

(2.) In claims 1 and 10 of Auxiliary Request 3, the feature "*wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segments of the ring of holes*" is omitted. As outlined above, the omission of this feature contravenes Article 123(2) EPC.

4.2 The subject matter of Auxiliary Request 3 is also rendered obvious by the prior art, in particular in view of a combination of D7 and D10:

The feature newly introduced into the independent claims of Auxiliary Request 3 is also disclosed in D10 and thus entirely unsuitable to distinguish the subject matter claimed over the prior art.

5. Auxiliary Request 4

5.1 Claims 1 and 10 of Auxiliary Request 4 are based on claims 1 and 10 as granted and introduce the feature:

"*wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segments of the ring of holes*"

Auxiliary request 4 lacks novelty of D1, D4, D5 and D10, because each of the seed distribution elements in these documents is based on a pressure differential between the

opposed surfaces of the sowing disc in the region of a circumferential segment of the ring of holes to transport the seed.

5.2 As the subject matter of Auxiliary Request 4 already lacks novelty in view the prior art and the features introduced are therefore entirely unsuitable to distinguish the subject matter claimed over the prior art. The subject matter of Auxiliary Request 4 thus also lacks inventive step in view the prior art.

6. Auxiliary Requests 5 to 7

6.1 Auxiliary Requests 5 to 7 violate Article 123(2) EPC and have to be rejected as inadmissible.

Auxiliary Requests 5 to 7 further characterize Auxiliary Request 4 with the additional features of Auxiliary Requests 1-3.

As discussed above, the additional features of Auxiliary Requests 1-3 are based on the extraction of isolated features from a set of features originally disclosed only in combination, i.e. the specific embodiment in the description. Consequently, each of the Auxiliary Requests 5 to 7 is based on an inadmissible intermediate generalization.

6.2 As the additional features of Auxiliary Request 5 to 7 correspond to the additional features of Auxiliary Requests 1-3, reference is made to the above. At least the additional features of Auxiliary Requests 6 and 7 are disclosed or rendered obvious by D10.

7. Auxiliary Request 8

Auxiliary Request 8 further characterizes claims 1 and 10 of Auxiliary Request 4 with the additional feature that the pressure differential is provided

> *"by means of a suction device mounted on a bearing structure of the seed drill and connected to the suction chamber by means of pipes".*

Claims 1 and 10 of Auxiliary Request 8 are not new over D1 and D10:

As indicated above, D1 and D10 each disclose the features of claims 1 and 10 of Auxiliary Request 4 (see above).

In addition, **D1** discloses in col. 7, lines 31-37 a suction device ("vacuum pump") mounted on a seed drill ("seed planter 10", illustrated in Figure 1), wherein the suction device is connected to the suction chamber by means of pipes ("vacuum hose"). The seed planter 10 in Figure 1 is referred to as "prior art", but col. 5, lines 13-27 proposes to mount the seed distribution element of D1 on said seed planter.

D10 discloses a planter (Fig. 2) with suction devices (vacuum pumps (102, 104); paragraph [0058]) for producing a pressure differential in the seed distribution element.

The subject matter of claims 1 and 10 of Auxiliary Requests 5 to 7 thus also lacks inventive step in view of a combination of D7 and one of D1 or D10.

8. Auxiliary Requests 9 to 11

Auxiliary Requests 9 to 11 further characterize Auxiliary Request 8 ("suction device") with the features of Auxiliary Requests 5 to 7, respectively.

8.1 Auxiliary Requests 9 to 11 each violate Article 123(2) EPC and have to be rejected as inadmissible.

As discussed above, the additional features of Auxiliary Requests 5-7 (resp. the additional features of Auxiliary Requests 1-3) are based on the extraction of isolated features from a set of features originally disclosed only in combination, i.e. the specific embodiment in the description. Consequently, each of the Auxiliary Requests 9 to 11 includes an inadmissible intermediate generalization.

8.2 As indicated above, the features of claims 1 and 10 of Auxiliary Request 8 are known at least from D1 and D10.

As further indicated above, the additional features of Auxiliary Requests 5 and 6 are disclosed in D10.

The subject matter of claims 1 and 10 of Auxiliary Requests 9 to 11 thus also lacks inventive step in view of a combination of D7 and one of D1 or D10.

E. Claims 8 and 9 and dependent claims 2-7 and 11

Claims 8 and 9 and dependent claims 2-7 and 11 of the Main Request and the Auxiliary Requests 1-11 respectively are characterized by corresponding features. The features of these claims are not new, at least not inventive in view of the cited prior art.

1. **Claims 8 and 9**

Claim 8 is directed to a sowing element comprising a frame and a seed distribution element according to any of the preceding claims. Opponent cannot establish any substantial difference between a sowing element and a seed distribution element. A frame appears to be nothing more than an element for mounting the seed distribution element of claim 1 to a seed drill. As each of the seed distribution elements disclosed in the cited prior art is provided for mounting to a seed drill, each of the seed distribution elements comprises a frame (e.g. see Figures 1 and 2 of D1 and of D10). Claim 8 is, therefore, not novel and not inventive for the same reasons as claim 1.

Claim 9 is directed to a seed drill comprising a supporting structure on which a plurality of sowing elements as defined in claim 8 are mounted.

All seed distribution elements discussed in the prior art in the proceedings are intended for use with a seed drill. A plurality of seed distribution elements mounted to a supporting structure of a seed drill is shown, for example, in Figures 1 and 2 of D1. Thus, the subject-matter of claim 9 is not new, at least not inventive for the same reasons as claim 1.

2. **Dependent claim 2**

According to claim 2, the thrust-bearing element is rotated with the disc when the portions are closed against each other.

D1 discloses a thrust-bearing element in form of hub handle 58 arranged on the distal end of the retaining hub 56.

The retaining hub 56 is in turn attached to the rotating drive shaft 55 (column 6, lines 1 to 5). Seed disk 60 and the hub handle (thrust-bearing element) 58 are attached to the same rotatable drive shaft 55. Claim 2 is therefore not new over D1.

D4, **D5** and **D10** disclose essentially the same structure as D1 (D4: Figure 3, D5: Figure 3, D10: Figure 10), i.e. a hub handle that is attached to the shaft.

D7 provides that the thrust-bearing element is formed by the shaft 16 driving the seed disk 18 into rotation. The thrust-bearing element, therefore, necessarily rotates with the seed disk 18.

3. **Dependent claim 3**

According to claim 3, the thrust-bearing element comprises a thrust-bearing plate which can bear on that surface of the sowing disc which faces the seal, in a zone radially inward of the ring of holes.

In the absence of a more precise definition of a thrust-bearing plate, any part of a thrust-bearing element having an extended planar surface has to be considered a thrust-bearing plate that is in contact with a surface of the sowing disc facing the seal.

D1 shows in Figure 6, for example, that the hub handle's left side is in contact over an extended area with a planar surface of the sowing disc 60. The extended area of the hub handle 58, therefore, forms a thrust-bearing plate within the meaning of claim 3 which is arranged inside the ring of holes 67 (Figure 8).

D4, D5 and **D10** disclose essentially the same structure as D1 (D4: Figure 3, D5: Figure 3, D10: Figure 10), i.e. a thrust-bearing element (hub handle) in engagement with an extended surface on the first side of the sowing disc facing towards the seal. The entire contact area is arranged inside the ring of selector holes. Thus, the subject matter of claim 3 is not new.

4. Dependent claim 4

According to claim 4, the thrust-bearing element comprises a drive element which is fixed for rotation with the (thrust bearing) plate and can be coupled with the drive shaft of the disc when the portions are closed against each other.

Claim 4 defines a physical connection between the thrust bearing plate (claim 3) and the drive shaft. However, such a connection is already included in claim 3 because the thrust-bearing plate of claim 3 already rotates with the drive shaft. Claim 4 therefore cannot make a considerable technical contribution. Physical connections between drive shaft and thrust bearing plate are disclosed in **D1, D4, D5** and **D10**. The subject matter of claim 4 is not novel at least in view of D1, D4, D5 and D10 for the same reasons as the subject matter of claim 3.

5. Dependent claim 5

According to claim 5, the thrust-bearing element of claim 4 is self-centering relative to the drive shaft.

A self-centering thrust-bearing element will be understood as a thrust-bearing element which is formed such that in

use its axis of rotation is the same as the axis of rotation of the drive shaft.

D1, D4, D5 and **D10** each disclose thrust-bearing element in form of a hub handle that is directly attached to the hub rotating the sowing disc. The handles are directly attached to the hub and rotate with the hub. The axis of rotation of the handles, therefore, coincides with the axis of rotation of the hub. Claim 5 is therefore not new.

D7 also provides that the thrust-bearing element (drive shaft 16) has a continuous axis of rotation.

6. **Dependent claim 6**

According to claim 6, the drive element comprises a coupling member which rotates jointly with the thrust-bearing plate but has radial and/or circumferential clearance so as to be self-centered during rotational coupling with the drive shaft of the disc.

There is no apparent difference between a "drive element" and a "coupling member" so that these terms may refer to the same element.

It is emphasized that providing a clearance between two elements which shall be connected cannot be considered inventive. It is a simple routine task for the skilled person to compensate for potential misalignments between two components to be joined.

D1, D4, D5 and **D10** disclose that the thrust-bearing element (hub handle) is directly attached to the hub rotating the sowing disc. Before connecting the handle to the drive shaft, it can be moved freely in space and, therefore, al-

so translated in a plane perpendicular to the axis of rotation of the drive shaft (clearance). The means connecting the hub handle to the hub, which is a coupling member within the meaning of claim 6, moves with the hub handle and can, therefore, also be translated freely before connection with the hub. The hub handle, therefore, has radial and circumferential clearance to be self-centering. Thus, the features of claim 6 are also not new.

7. Dependent claim 7

According to claim 7, the movable portion is hinged to the fixed portion.

The features of claim 7 are known from D1, D4 and D5.

D1 discloses a coupling pin or hinge 92 coupling the fixed and the movable portion 50, 90 of the housing, for example, in Figures 7 and 8 (column 7, lines 19 to 21).

D4 and **D5** each disclose a hinge 18 coupling the fixed and the movable portion 14, 16 of the housing 12 (D4: Figure 2, D5: Figure 2; D4, column 5, lines 1 to 4 and D5, page 4, penultimate paragraph).

Claim 7 is also rendered obvious when combining **D7** and D8 (or the knowledge of the skilled person) and D1, D4 or D5. The skilled person starting from D7 and seeking to provide a coupling between the housing and the cover that is easier to open than by loosening bolts or nuts will consider the hinged connection shown in D1, D4 or D5. This problem is not related to the problem of providing a seal and constitutes a "partial problem" that may be solved separately. Concluding, claim 7 lacks an inventive step as well.

8. Dependent claim 11

Claim 11 is based on claim 10 (kit for retrofitting seed distribution elements) and defines that the movable portion and the thrust-bearing element comprise one or more of the features of claims 2 to 7. The arguments against claims 2-7 therefore apply *mutatis mutandis*.

For the reasons outlined above, the request for dismissal of the appeal is fully substantiated.

- Signed electronically -

Martin D. Jacob
(Association No. 1)

Albrecht v. Menges
(Association No. 1)

Encls.: D10: US 2003/0183647 A1
D11: US 2002/0043201 A1
D12: ES 2 013 539 and English language machine translation (D12')

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Maschio Gaspardo S.p.A.	

Appeal number: T0305/18-3.2.04

Please find enclosed a copy of the statement setting out the grounds of Appeal.

Any reply must be filed within **4 months** of this notification.

The Registrar K. Boelicke
Tel.: 089 / 2399 - 3241

Annex(es):

Registered letter

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We hereby acknowledge receipt of the following subsequently filed document(s):

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Application number	EP11779702.7
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Applicant	All applicants as on file
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Errors in debit instructions filed by eOLF that are caused by the editing of Form 1038E entries or the continued use of outdated software (all forms) may be corrected automatically by the EPO, leaving the payment date unchanged (see decision T 152/82, OJ EPO 1984, 301 and point 6.3 ff ADA, Supplement to OJ EPO 10/2007).

/European Patent Office/

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

<u>wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23), by means of a suction device mounted on a bearing structure (8) of the seed drill (3) and connected to the suction chamber (17) by means of pipes</u>

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33)

which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23), by means of a suction device mounted on a bearing structure (8) of the seed drill (3) and connected to the suction chamber (17) by means of pipes

characterized in that the kit comprises:

– the movable portion (12) pre-assembled with:

– a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

<u>wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23), by means of a suction device mounted on a bearing structure (8) of the seed drill (3) and connected to the suction chamber (17) by means of pipes</u>

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion.

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial

and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
- a seed collection chamber (15) being defined in the fixed portion (11),
- a pneumatic suction chamber (17) being defined in the movable portion (12),
- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23), by means of a suction device mounted on a bearing structure (8) of the seed drill (3) and connected to the suction chamber (17) by means of pipes

characterized in that the kit comprises:

– the movable portion (12) pre-assembled with:

– a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion.

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

- a seed collection chamber (15) being defined in the fixed portion (11),

- a pneumatic suction chamber (17) being defined in the movable portion (12),

- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

<u>wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23), by means of a suction device mounted on a bearing structure (8) of the seed drill (3) and connected to the suction chamber (17) by means of pipes</u>

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12), the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the

drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23), by means of a suction device mounted on a bearing structure (8) of the seed drill (3) and connected to the suction chamber (17) by means of pipes

characterized in that the kit comprises:

– the movable portion (12) pre-assembled with:

– a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12),

the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

<u>wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23), by means of a suction device mounted on a bearing structure (8) of the seed drill (3) and connected to the suction chamber (17) by means of pipes</u>

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is

capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23), by means of a suction device mounted on a bearing structure (8) of the seed drill (3) and connected to the suction chamber (17) by means of pipes

characterized in that the kit comprises:

- the movable portion (12) pre-assembled with:

- a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

- a seed collection chamber (15) being defined in the fixed portion (11),

- a pneumatic suction chamber (17) being defined in the movable portion (12),

- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-

bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12), the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial

and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
- a seed collection chamber (15) being defined in the fixed portion (11),
- a pneumatic suction chamber (17) being defined in the movable portion (12),
- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

characterized in that the kit comprises:

– the movable portion (12) pre-assembled with:

– a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12), the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

<u>wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),</u>

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the

movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is

capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the kit comprises:

- the movable portion (12) pre-assembled with:

- a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

<u>wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),</u>

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the

movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12), the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the kit comprises:

– the movable portion (12) pre-assembled with:

– a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12), the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

<u>wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),</u>

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the

movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the kit comprises:

– the movable portion (12) pre-assembled with:

– a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion.

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

characterized in that the kit comprises:

– the movable portion (12) pre-assembled with:

– a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion.

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

<u>wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),</u>

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the

movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion.

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is

capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the kit comprises:

- the movable portion (12) pre-assembled with:

- a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion.

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-

bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
- a seed collection chamber (15) being defined in the fixed portion (11),
- a pneumatic suction chamber (17) being defined in the movable portion (12),
- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),
- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and
- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

characterized in that the kit comprises:

– the movable portion (12) pre-assembled with:

– a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the

movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is

capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the kit comprises:

- the movable portion (12) pre-assembled with:

- a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-

bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
- a seed collection chamber (15) being defined in the fixed portion (11),
- a pneumatic suction chamber (17) being defined in the movable portion (12),
- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),
- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and
- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

characterized in that the kit comprises:

– the movable portion (12) pre-assembled with:

– a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

- a seed collection chamber (15) being defined in the fixed portion (11),

- a pneumatic suction chamber (17) being defined in the movable portion (12),

- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the

movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion.

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is

capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the kit comprises:

- the movable portion (12) pre-assembled with:

- a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion.

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the

movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12), the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the kit comprises:

– the movable portion (12) pre-assembled with:

– a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12), the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23), by means of a suction device mounted on a bearing structure (8) of the seed drill (3) and connected to the suction chamber (17) by means of pipes

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is

capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23), by means of a suction device mounted on a bearing structure (8) of the seed drill (3) and connected to the suction chamber (17) by means of pipes

characterized in that the kit comprises:

- the movable portion (12) pre-assembled with:

- a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the

movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the kit comprises:

– the movable portion (12) pre-assembled with:

– a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion.

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

characterized in that the kit comprises:

– the movable portion (12) pre-assembled with:

– a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion.

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

- a seed collection chamber (15) being defined in the fixed portion (11),

- a pneumatic suction chamber (17) being defined in the movable portion (12),

- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23), by means of a suction device mounted on a bearing structure (8) of the seed drill (3) and connected to the suction chamber (17) by means of pipes

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12), the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the

drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23), by means of a suction device mounted on a bearing structure (8) of the seed drill (3) and connected to the suction chamber (17) by means of pipes

characterized in that the kit comprises:

– the movable portion (12) pre-assembled with:

– a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12),

the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23), by means of a suction device mounted on a bearing structure (8) of the seed drill (3) and connected to the suction chamber (17) by means of pipes

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion.

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial

and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
- a seed collection chamber (15) being defined in the fixed portion (11),
- a pneumatic suction chamber (17) being defined in the movable portion (12),
- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23), by means of a suction device mounted on a bearing structure (8) of the seed drill (3) and connected to the suction chamber (17) by means of pipes

characterized in that the kit comprises:

– the movable portion (12) pre-assembled with:

– a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion.

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

- a seed collection chamber (15) being defined in the fixed portion (11),

- a pneumatic suction chamber (17) being defined in the movable portion (12),

- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23), by means of a suction device mounted on a bearing structure (8) of the seed drill (3) and connected to the suction chamber (17) by means of pipes

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33)

which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23), by means of a suction device mounted on a bearing structure (8) of the seed drill (3) and connected to the suction chamber (17) by means of pipes

characterized in that the kit comprises:

– the movable portion (12) pre-assembled with:

– a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-

bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12), the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial

and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
- a seed collection chamber (15) being defined in the fixed portion (11),
- a pneumatic suction chamber (17) being defined in the movable portion (12),
- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

characterized in that the kit comprises:

- the movable portion (12) pre-assembled with:

- a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion, the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12), the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

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Letter accompanying subsequently filed items

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The document(s) listed below is (are) subsequently filed documents pertaining to the following application:

Application number	11779702.7
Applicant's or representative's reference	PBP11900-EP

	Description of document	Original file name	Assigned file name
1	Statement of grounds of appeal	20180327 Grounds of appeal EPO.pdf	APPEAL-GRDS-1.pdf
2	Claims (appeal procedure)	Amended claims 1st_11th_aux req clean.pdf	DG3-CLMS.pdf
3	Amended claims with annotations (appeal procedure)	Amended claims 1st_11th_ aux req marked.pdf	DG3-CLMS-HWA.pdf

	Payment	
1	Method of payment	Not specified

Signatures

Place:	**Padova, Italy**
Date:	**27 March 2018**
Signed by:	**Davide Locas 24895**
Representative name:	**Davide LOCAS**
Capacity:	**(Representative)**

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Padova, March 27, 2018

Your ref.: 11779702.7 – 1656 / 2 637 492
Our ref.: PBP11900-EP – DL/ms

Re: Opposition Against European Patent No. 2 637 492
Title: "*Seed Distribution Element for Precision Seed Drills, Seed Drill Including said Element*"
Patentee: Maschio Gaspardo S.p.A.
Opponent: Precision Planting LLC

This constitutes the statement of appeal lodged by Patentee Maschio Gaspardo S.p.A. against the decision of the Opposition Division of November 17, 2017 to reject the main request and the first and second auxiliary requests and consequently to revoke the patent in suit.

MAIN REQUEST (PATENT AS GRANTED)

The main request has been deemed as not allowable because claim 1 would not meet the requirement of art 123(2) EPC.

According to the previously cited interlocutory decision the opposition division deemed that the feature "wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes" would be essential and indispensable for the seed distribution element contravene and thus the deletion of such feature would violate art. 123(2) EPC.

The Opposition Division arrives to such conclusion since the wording of claims 1 and 10 as granted would relate to a subject matter working without the creation of a pressure differential in the region of the disc. Accordingly, the omission of the feature would introduce a generalization which has no base in the application as filed.

Nevertheless, as a matter of fact, the omitted feature is merely functional and it does not involve any structural limitation. In fact, as will be explained in the following, the feature "wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes" is totally inherent in the other structural elements of clam 1 as granted.

In particular, claim 1 refers to a seed distribution element for pneumatic seed drill and a person skilled in the art is well aware that this kind of device operates by means of a

pressure differential.

According to the decision of the Opposition Division, the deletion of the above feature would omit in the claim further details on how the pressure differential is provided, namely between the opposed surfaces in the region of a circumferential segment of the ring of holes.

Nevertheless, such feature is clearly inherent according to the following features:

- Seed drill for which the distribution element is designed is pneumatic;
- The housing of the distribution element has a portion with a seed collection chamber and a portion with a pneumatic suction chamber with a disc interposed therebetween. This unambiguously means that there is a pressure differential between opposed surfaces of the disc.
- The disc ha at least one ring of selector holes extending between the opposed surfaces.

A first remark is should be noted that a person skilled in the art is aware that in view of the whole claim the selector holes are the one on which the seed are transported (by means of the pneumatic suction, i.e. of the pressure differential) by the disc.

Therefore it should be assessed if the feature of providing a pressure differential in the region of a ring of selector holes represent a generalization of proving a pressure differential in the region of a circumferential segment of the ring of holes.

To this regard it should be noted that according to the Collins dictionary, a ring is an object or substance that is in the shape of a circle.

As a consequence, the provision of a ring of selector holes in a pneumatic distribution element requires that a pressure differential is provided between the opposed surfaces in the region of an object in the shape of a circle, i.e. of a circumferential segment. Also, the omitted feature does not specify the length of the segment: as consequence, also a segment of 360° (as a circle) is contemplated according the such feature.

Accordingly, no generalization is introduced by the omission of the feature "wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes" thus fulfilling the requirements of Art. 123(2) EPC.

NOVELTY

Interpretation of the claim

In the present case, in order to proper assess the requirement of novelty it seems appropriate to discuss the interpretation of the claim, in particular with reference to the feature that a "*thrust-bearing element 26 is rotatably supported in the movable portion 12 for with-standing at least some of the axial load produced by the sowing disc 16 on the seal 24.*

In particular, according to the decision of the Opposition Division the wording used in claim 1 does not restrict the positioning of the thrust bearing element in a specific relation to the movable part or with respect to a specific part of the movable portion.

As a first remark it should be noted that this would be true if the meaning of the word "in" were considered as if it corresponds to "in the area of".

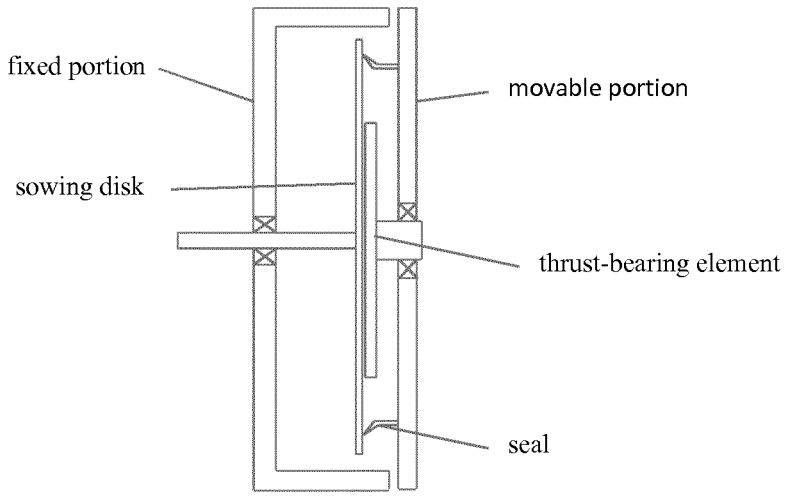
Nevertheless according to the Collins dictionary:
-"In" is a preposition having the following meaning: "someone or something that is in something else is *enclosed by* it or *surrounded by* it".
https://www.collinsdictionary.com/dictionary/english/in_1

Furthermore, still according to the Collins dictionary the words "enclosed" means "completely surrounded by something" and "surrounded" means that "if a person or thing is surrounded by something, that thing is situated all around them".

Since the thrust-bearing element **is supported in** the movable portion, in order to apply the interpretation suggested in the decision, the movable portion should necessary define a volume surrounding or enclosing the thrust-bearing element.

Nevertheless, there is no valid reason for which the person skilled in the art would identify the movable portion as a portion defining a volume.

As a matter of fact a person skilled in the art would consider also the situation represent in the following figure, in which the movable portion is flat but the thrust-bearing element is nevertheless supported in the movable portion.



Therefore, the skilled person in the art would unambiguously understand that the preposition "in" has to be interpreted as physically "inside", thus intrinsically implying that the thrust-bearing element 26 **is in contact with** the movable portion 12 and, hence, **supported on it**.

A different interpretation would on the contrary imply further limitations that cannot be read in the claim. In fact, the person skilled in the art would have no reason for considering that the movable part is necessarily hollow and, for this reason, the above interpretation is the only one in line with the wording of the claim.

It should be always remembered that, as a general rule, the skilled person, when considering a claim, should try, with synthetical propensity, i.e. building up rather than

tearing down, to arrive at an interpretation of the claim which is technically sensible and takes into account the whole disclosure of the patent.

The interpretation of the claim according to which no restriction in the position of the trust-bearing element should be taken into account provided that it is located inside the movable portion is therefore neither technically sensible nor takes into account the whole disclosure of the patent.

Comparison with the prior art

As a consequence, it is well evident that D1 does not discloses the feature that the *thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24)*.

As discussed in the previous paragraphs, D1 does not disclose a thrust-bearing element 26 which is supported in the movable portion according to the aforementioned meaning of the preposition "in" i.e. corresponding to the condition that "someone or something that is in something else is *enclosed by* it or *surrounded by* it".

Moreover, document D1 does not discloses the feature that the *thrust-bearing element (26) is supported rotatably in the movable portion (12)* in light of the interpretation of "in" as "inside" previously discussed.

As a matter of facts, as can be clearly seen from figure 6 of D1, the hub handle 58 is never in contact to or attached to the second housing member 90. In D1, the hub handle is at most supported on the fixed portion and located in the movable portion, thus disclosing a completely different situation form the one defined in claim 1 according to its correct interpretation.

Thus, the skilled person in the art would have not found any embodiment in D1 anticipating all the features of claim 1 of the opposed patent.

Furthermore, D1 does not disclose a thrust-bearing element (26) in the whole document. As defined by the "engineering dictionary" a thrust-bearing is "a bearing with flanges on its two sides that prevents a shaft such as the crankshaft from moving endwise".
http://www.engineering-dictionary.org/Thrust_bearing

Similar and coherent definitions of a "thrust-bearing" can be, for instance, identified in references and documents belonging to the common general knowledge of the person skilled in the art such as:

-AST bearings
"A thrust bearing is a particular type of rotary bearing."

https://www.astbearings.com/thrust-bearings.html

-the Collins dictionary
"A thrust-bearing is a bearing which allows parts to rotate with little friction to rotate with little friction whilst absorbing an axial thrust."

https://www.collinsdictionary.com/it/dizionario/inglese/thrust-bearing

-Wikipedia

"A thrust bearing is a particular type of rotary bearing. Like other bearings they permit rotation between parts, but they are designed to support a predominately axial load."
https://en.wikipedia.org/wiki/Thrust_bearing

It is fundamental to denote that it has not been possible to find any reference defining a thrust-bearing as a "handle".

As a matter of fact, a handle is defined by the Collins dictionary as a "small round object or a lever that is attached to a door and is used for opening and closing it."
https://www.collinsdictionary.com/dictionary/english/handle

In other words, the claim does not relate to the feature of an "element bearing some thrust of the load produced by the disc" but to the presence of a thrust bearing element which is a device having a clear and precise meaning in the art.

Therefore, it has been clearly proved that, accordingly to the common general knowledge of the person skilled in the art, a hub handle is not and cannot be considered as a "thrust-bearing".

As a matter of fact, a document takes away the novelty of any claimed subject-matter derivable directly and unambiguously from that document including any features implicit to a person skilled in the art in what is expressly mentioned in the document, thus D1, fails in anticipating the feature regarding "*thrust-bearing element (26) is supported in the movable portion*".

D1 at most discloses an element capable of bearing thrust, a part which is supported inside the movable portion, thus failing to disclose the subject matter of claim 1.

Furthermore, it should be noticed that claim 1 recite that the *thrust-bearing element is supported rotatably in the movable portion in order to withstand at least some of the axial load produced by the disc on the seal*.

It is therefore clear that the feature of being rotatably supported in the movable portion and the feature of withstanding some load are linked, therefore suggesting an interaction between the movable portion and the thrust-bearing element. On contrary, by interpreting the claim in the sense that the thrust-bearing in merely arranged inside the movable portion, no link would exist between the load withstanding feature and support in the movable portion.

This is also clear by considering document D1 in which the feature of being rotatably supported in the movable portion and the alleged feature of being capable of withstanding some load and not linked in any way.

Basically, the interpretation of claim 1 given by the Opposition Division would be such as it recites:
the thrust-bearing element is supported rotatably in the movable portion; and
the thrust-bearing element withstand at least some of the axial load produced by the disc on the seal
which is obviously not the case of the Patent in issue.

In conclusion the person skilled in art would interpret claim 1 by considering that the feature of withstanding some load is achieved by the fact of the thrust-bearing element being supported in the movable part. This necessarily implies an interaction between the

thrust-bearing element and the movable part, such as being mounted on the movable portion, as e.g. specified at the end of par. [0018] of the Patent.

Similar considerations also applies to document D4, D5 comprising a handle retaining the disc.

With reference to D6 – although the Division Opposition confirmed that it does not form part of the prior art in the sense of Art. 54(2) – it seems appropriate to stressed out again the fact that no specific detail of what was made available to the public and when has been provided.

The mere fact that document D6 reports a copyright date of 2005 does not necessarily means that the whole document has been drafted in 2005 or any case that its whole content has been made available to public in 2005.

As a matter of fact the copyright date could refer only to some part of the information in the manual, e.g. being the date of first issue of the manual, which that can be amended in the form presented by the Opponent only successively.

Since only the Opponent had access to the information relating to D6, only a "complete chain of proof" - which is lacking in the present case - would suffice to establish that the manual actually forms part of the prior art.

Therefore, the Opponent failed to prove beyond any reasonable doubt that document D6 was available to the public before the priority date of the Patent (or even its filing date).

Accordingly, document D6 should be disregarded in the evaluation of novelty and inventiveness of the Patent.

Notwithstanding the lack of proofs of its availability, it should be first of all noted that D6 does not discloses a motor-driven transmission shaft rotated at controlled speed a sowing disc.

It can be clearly seen from e.g. Fig. 39 in page 53 that the sowing disc is toothed and it is driven by a gear provided in the fixed portion.

Furthermore document D6 fails to disclose any thrust-bearing element withstand at least some of the axial load produced by the disc on the seal.

As it can be clearly seen in page 53, Fig. 40 the sowing disc is provided with a hole having a cylindrical surface (i.e. not having any locking element such as a seat for a key) in the centre for supporting it in the shaft. By comparing Fig. 39 and Fig. 40 a person skilled in the art would deduct that the sowing disc can freely rotate and slide on the shaft.

Therefore, the only element on which the faces of the sowing disc can rest during rotation is the seal. This is also confirmed by the fact the seal appears clearly projection in Fig. 40, as confirmed by the shadow projected therefrom. On the contrary the central portion on which the shaft is provided appears the farthest away from the disc. Therefore, the load is entirely withstood by the seal.

This is opposite from what it is stated by the Opponent according to whom one of the transition between two sections of different diameter takes up at least some of the load. Nevertheless no element suggests that any of this transition interacts with the movable portion in order to withstand some load.

In any case, this is neither explicitly nor implicitly disclosed in D6 and accordingly the subject matter of claim 1 should be considered new over D6.

Inventive step

According to the Guidelines and to the case law the first step for the assessment of the inventive step is the identification of the closest prior art.

The Opponent fails to explain why D7 can be considered the closest prior art in their inventive step attacks.

As a matter of fact D7 would never represent the closest prior art for the present invention since it fails to disclose a seal and, on the contrary, the Patent is directed to problem of avoiding excessive wear of the seal.

In any case, a person skilled in the art would never be prompted to modify the seed distributor of D7 by including a seal in order to reduce the wear therefore. As a matter of fact, no wear of the seal can occur if the seal is not even present and therefore the person skilled in the art would not be prompted to introduce such modification in D7 either by considering the common general knowledge or by the disclosure of D8.

In conclusion, the subject matter of claim 1 of the patent at issue involves an inventive step.

Dependent claims

With reference to dependent claims 2 to 11, as they incorporate the subject matter of independent claim 1, they are also to be regarded novel and involving an inventive step.

* * *

In case the Board of Appeal does not consider satisfactory the observations produced by the proprietor, the following auxiliary requests are respectfully submitted.

Auxiliary request 1

Claim 1 of the first auxiliary request is based on claim 1 as granted amended by introducing the feature "wherein the thrust-bearing element (26) is mounted on the movable portion". Claim 10 has been also amended accordingly.

Basis for this amendment can be found in the patent application as filed at page 5, lines 22-23.

According to decision of the Opposition Division, this would represent an intermediate generalization since such feature would be inextricably linked to the mounting arrangement of the specific embodiment.

In particular, the effect of withstanding at least some of the axial load produced by the disc on the seal would be achieved also by the specific mounting arrangement.

Such arrangement is described in page 5 and 6 of the application as file.

Analysing this passages in detail it can be noted that it refers to the following features:

The thrust-bearing element 26 comprises a shaft 27 rotatably mounted by means of bearings 28 in a seat 29 of the movable portion 12.

Nevertheless, bearing, shaft and seat are implicit in thrust bearing element mounted on a portion. Therefore, the omission of such paragraph cannot represent a generalization of the feature "wherein the thrust-bearing element (26) is mounted on the movable portion".

The description further refers to the feature that:

The shaft 27 has flanging 30 by means of which it is fixed to a thrust-bearing plate 31 which can bear on that surface of the disc which faces the seal 24 in a zone radially inside the ring of holes 23 in order to withstand at least some of the axial load produced by the disc 16 on the seal 24.
The bearing between the thrust-bearing plate 31 and the disc 16 takes place in the region of a ring 31a in relief on the surface of the plate which faces the disc 16.

This relates to how the contact between the disc and the shaft is provided. Therefore no inextricable link might exist between the feature of mounting on and the way of contact of the disc on the bearing element.

The following paragraph relates to the feature of providing a self-centering coupling, thus clearly referring to a different embodiment of the invention.

Accordingly, the introduction of the feature "wherein the thrust-bearing element (26) is mounted on the movable portion" does not represent an intermediate generalization of the description thus fulfilling the requirements of Art. 123(2).

The arguments relating to novelty and inventive step exposed in connection to claim 1 also applies to the first auxiliary request.

Auxiliary request 2

Claim 1 of the second auxiliary request is based on claim 1 of the 1st auxiliary request further amended by introducing the feature "the thrust-bearing element (26) comprising a shaft (27) rotatably mounted by means of bearings (28) in a seat (29) of the movable portion (12)".

Basis for this amendment can be find in the patent application as filed at page 5, lines 24-25.

Claim 10 has been also amended accordingly.

Auxiliary request 3

Claim 1 of the third auxiliary request is based on claim 1 of the second auxiliary request further amended by introducing the feature "the shaft (27) having flanging (30) by means of which it is fixed to a thrust-bearing plate (31) which can bear on the surface of the disc which faces the seal (24) in a zone radially inside the ring of holes (23) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24)".

Basis for this amendment can be find in the patent application as filed at page 6, lines 1-4.

Claim 10 has been also amended accordingly.

Auxiliary request 4

Claim 1 of the forth auxiliary request is based on claim 1 as granted amended by introducing the feature "wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23)".

Basis for this amendment can be find in claim 1 of the patent application as filed.

Claim 10 has been also amended accordingly.

Auxiliary requests 5 to 7

Claim 1 and 10 of the auxiliary requests 5 to 7 corresponds to auxiliary requests 1 to 3 based on claim 1 and 10 respectively of the forth auxiliary request.

Auxiliary requests 8 to 11

Claim 1 and 10 of the auxiliary requests 8 to 11 corresponds to auxiliary requests 4 to 7 further amended by introducing the feature "by means of a suction device mounted on a bearing structure (8) of the seed drill (3) and connected to the suction chamber (17) by means of pipes".

Basis for this amendment can be found in page 4, lines 20-23 of the application as filed.

* * *

In conclusion it is requested to set aside the interlocutory decision of the Opposition Division and to maintain the Patent to either the main request or to the Auxiliary requests. Oral proceedings are requested in case the Board of Appeal does not intend to follow the request in written proceedings.

The representative
CANTALUPPI & PARTNERS
Davide Locas

Europäisches Patentamt
European Patent Office
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Datum/Date
06.02.18

Zeichen/Reference/Référence	Anmeldung Nr./Application No./Demande n°//Patent Nr./Patent No./Brevet n°
E 98381 OPPO01	11779702.7 / 2637492
Anmelder/Applicant/Demandeur//Patentinhaber/Proprietor/Titulaire	
Maschio Gaspardo S.p.A.	

File number: **T0305/18-3.2.04**

Commencement of proceedings before the Board of Appeal

The letter dated 26.01.18 filed by the patent proprietor
against the decision of the European Patent Office of 17.11.17
has been referred to Board of Appeal 3204.

The reference number is mentioned above.

Any further communications should be addressed to the Boards of Appeal of the European Patent Office and should quote this reference number.

The Registrar G. Magouliotis
Tel.: 089 / 2399 - 3241

Annex: copy of the notice of appeal for the other party(ies)

Registered letter

Europäisches Patentamt
European Patent Office
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Datum/Date
06.02.18

Zeichen/Reference/Référence	Anmeldung Nr./Application No./Demande n°//Patent Nr./Patent No./Brevet n°
PBP11900-EP APPR	11779702.7 / 2637492
Anmelder/Applicant/Demandeur//Patentinhaber/Proprietor/Titulaire	
Maschio Gaspardo S.p.A.	

File number: **T0305/18-3.2.04**

Commencement of proceedings before the Board of Appeal

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against the decision of the European Patent Office of 17.11.17
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The Registrar G. Magouliotis
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Annex: copy of the notice of appeal for the other party(ies)
Registered letter

Europäisches Patentamt
European Patent Office
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European patent application No. 11779702.7

APPEAL for immediate attention

I. Findings

1. ☒ Appeal in which **more than one party** is involved (opposition procedure, except when all oppositions have been withdrawn). **Refer the case to the Board of Appeal without delay using EPO Form 2703.**

2. ☐ Appeal in which **only one party** is involved (examination procedure and opposition procedure if all oppositions have been withdrawn).

2.1 Requirements of Article 108 EPC

The **notice of appeal** has been filed within the time limit.	yes ☐	no ☐
The **appeal fee** has been paid within the time limit.	yes ☐	no ☐
The **statement of grounds** has been filed within the time limit.	yes ☐	no ☐

If **one** of the answers set out above is 'no' and if no request for re-establishment of rights under Article 122 EPC has been filed (see I.2.2), **refer the case to the Board of Appeal without delay using EPO Form 2703.** The Board of Appeal decides on the admissibility of the appeal.

If **all** the answers set out above are "yes", continue under II/III.2.

2.2 ☐ A request for re-establishment of rights into the appeal period has been filed. Refer the case to the SCAPE of the SIS Unit without delay.

2.3 Special cases which have to be referred to the Board of Appeal without delay using EPO Form 2703

☐ Withdrawal of appeal
☐ Request for correction of appeal (R. 139 EPC)
☐ Expiry of three-month time limit for interlocutory revision (Art. 109(2) EPC)

Ge 2 9. 01. 13 M. Grellere

Date	Formalities Officer	Director/SCAPE (for information)

II. Appeal against the decision of the Formalities Officer

1. ☐ Re-establishment of rights (Guidelines E-VII, 2.2.7)
   ☐ The conditions for granting re-establishment of rights are fulfilled. The request can be granted if this can be done within the three-month time limit of Article 109(2) EPC and if the conditions for granting interlocutory revision are fulfilled. Continue under II.2.
   ☐ The request for re-establishment of rights cannot be granted. **Refer the case to the Board of Appeal without delay using EPO Form 2703.**

2. ☐ The appeal is allowable and well-founded. The decision under appeal is rectified (Art. 109(1) EPC). EPO Form 2710 is to be dispatched.
   ☐ The decision under appeal is not rectified. **Refer th case to the B ard f App al with ut delay using EPO Form 2703 (Art. 109(2) EPC).**

MG21642
Precision Exhibit 1005

3. Reimbursement of appeal fee

☐ No request for reimbursement of the appeal fee has been filed.

☐ The Formalities Officer orders reimbursement of the appeal fee of his own motion (R. 103 EPC, Guidelines E-X, 7.3).

☐ A request for reimbursement of the appeal fee has been filed.

☐ Reimbursement of the appeal fee is ordered (R. 103 EPC).

☐ The request for reimbursement of the appeal fee cannot be allowed. **Refer the case to the Board of Appeal without delay using EPO Form 2703 (R. 103(2) EPC).**

.....	.....	.....
Date	Formalities Officer	SCAPE (for information)

III. Appeal against the decision of the Examining/Opposition Division

1. ☐ Re-establishment of rights (Guidelines E-VII, 2.2.7)

☐ The conditions for granting re-establishment of rights are fulfilled. The request can be granted if this can be done within the three-month time limit of Article 109(2) EPC and if the conditions for granting interlocutory revision are fulfilled. Continue under III.2.

☐ The request for re-establishment of rights cannot be granted. **Refer the case to the Board of Appeal without delay using EPO Form 2703.**

2. ☐ **To the Examining Division** ☐ **To the Opposition Division**

☒ TO DG3

.....Ge 2 9. 01. 18.....	..... M. Ghellere
Date	Formalities Officer

To the Formalities Officer

3. ☐ The appeal is allowable and well-founded. The decision under appeal is rectified (Art. 109(1) EPC). EPO Form 2710 is to be dispatched.

☐ The decision under appeal is not rectified. **Refer the case to the Board of Appeal without delay using EPO Form 2703 (Art. 109(2) EPC).**

4. Reimbursement of appeal fee

☐ No request for reimbursement of the appeal fee has been filed.

☐ The Division orders reimbursement of the appeal fee of its own motion (R. 103 EPC, Guidelines E-X, 7.3).

☐ A request for reimbursement of the appeal fee has been filed.

☐ Reimbursement of the appeal fee is ordered (R. 103 EPC).

☐ The request for reimbursement of the appeal fee cannot be allowed. **Refer the case to th B ard f App al without delay using EPO F rm 2703 (R. 103(2) EPC).**

.....	☐ Examining Division	☐ Opposition Division
Date		

.....	.....	.....	.....
Chairman	2nd Examiner	Primary Examiner	Legal Member

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Acknowledgement of receipt

We hereby acknowledge receipt of the following subsequently filed document(s):

Submission number	5998301
Application number	EP11779702.7
Date of receipt	26 January 2018
Receiving Office	European Patent Office, The Hague
Your reference	PBP11900-EP
Applicant	All applicants as on file
Documents submitted	package-data.xml epf1038.pdf (2 p.) ep-sfd-request.xml APPEAL.pdf\20180126 notice of appeal.pdf (1 p.)
Submitted by	CN=Davide Locas 24895
Method of submission	Online
Date and time receipt generated	26 January 2018, 17:28 (CET)
Message Digest	98:88:0D:50:A1:D1:41:2B:FE:C1:18:88:27:A8:65:A3:3E:A0:86:7F

Correction by the EPO of errors in debit instructions filed by eOLF
Errors in debit instructions filed by eOLF that are caused by the editing of Form 1038E entries or the continued use of outdated software (all forms) may be corrected automatically by the EPO, leaving the payment date unchanged (see decision T 152/82, OJ EPO 1984, 301 and point 6.3 ff ADA, Supplement to OJ EPO 10/2007).

/European Patent Office/

Europäisches Patentamt
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Letter accompanying subsequently filed items

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The document(s) listed below is (are) subsequently filed documents pertaining to the following application:

Application number	11779702.7
Applicant's or representative's reference	PBP11900-EP

	Description of document	Original file name	Assigned file name
1	Notice of appeal	20180126 notice of appeal.pdf	APPEAL.pdf

	Fees	Factor applied	Fee schedule	Amount to be paid
15-1	011 Fee for appeal	1	1 880.00	1 880.00
	Total:		**EUR**	**1 880.00**

	Payment	
1	Method of payment	Debit from deposit account
	Currency:	EUR
	The European Patent Office is hereby authorised, to debit from the deposit account with the EPO any fees and costs indicated on the fees page.	
	Deposit account number:	28070123
	Account holder:	CANTALUPPI & PARTNERS S.R.L.
2	Refund/Reimburserment	
	Reimbursement (if any) to be made to EPO deposit account:	28070123
	Account holder:	CANTALUPPI & PARTNERS S.R.L.

Signatures

Place:	**Padova, Italy**
Date:	**26 January 2018**
Signed by:	**Davide Locas 24895**
Representative name:	**Davide LOCAS**
Capacity:	**(Representative)**

CANTALUPPI&PARTNERS

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In cooperation with MÜLLER & SCHUBERT Munich – Berlin

EUROPEAN PATENT OFFICE
80298 MUNICH
GERMANY

By EPOLINE

Padova, 26 January 2018

Your ref.: EP 2637492
Our ref.: PBP11900-EP - DL/ms(mg)

Re: Opposition against European Patent n. 2637492 in the name of MASCHIO GASPARDO S.p.A.

On behalf of the Proprietor:

MASCHIO GASPARDO S.P.A.
Via Marcello n. 73
35011 CAMPODARSEGO (PD)
ITALY

an APPEAL is hereby filed against the Interlocutory Decision issued by the Opposition Division dated 17.11.2017 to revoke the European Patent n. 2637492.

It is requested to set aside the Interlocutory Decision and to maintain the European Patent as granted.

Should the Board of Appeal consider to take any decision adverse the Opponent, Oral Proceedings are requested.

A statement setting out the grounds of appeal will be filed within the time limit pursuant to Art. 108 EPC.

The Representative
CANTALUPPI & PARTNERS
Davide Locas

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35122 Padova
ITALIE

Date
17.11.2017

Reference	Application No./Patent No.
PBP11900-EP	11779702.7 - 1656 / 2637492
Applicant/Proprietor	
Maschio Gaspardo S.p.A.	

EPA/EPO/OEB Formblatt/Form/Formulaire : 2331

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23. Nov. 2017

UEXKÜLL & STOLBERG
20. Nov. 2017

T: 3911 | Date 17.11.2017

Reference		Application No./Patent No.
E 98381	OPPO 01	11779702.7 - 1656 / 2637492
Applicant/Proprietor		
Maschio Gaspardo S.p.A.		

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After the chairman opened the proceedings, the parties stated their requests:

Patentee:

Main request: to reject the opposition and to maintain the patent as granted

Auxiliary requests: 1-3 filed with the letter of 24.08.2017

Opponent:

Main request: to revoke the patent in its entirety on grounds of:

- Art. 100(c) EPC, extension beyond the content of the application as filed, Art. 123(2) EPC
- Art. 100(a) EPC, lack of novelty, Art. 54 EPC; lack of inventive step, Art. 56 EPC

Main request

Extension beyond the content of the application as filed: Art. 123(2) EPC was discussed.

The opponent's arguments were mainly focused on

- the deletion of the feature "wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes" in claims 1 and 10 which induces a generalisation
- the patent application, p. 1 l. 23-25, p. 2 l. 11-13, p. 3 l. 13-14
- the patent application, p. 5 l. 16-20: the ejector is an additional feature, not an alternative

The proprietor's arguments were mainly focused on

- the patent application, p. 5 l. 16-20 and fig. 1: possibility of the presence of a seed ejector
- the fact that the pressure generating means are not essential, only the pneumatic suction chamber

After deliberation the chairman communicated to the parties that the opposition division has come to the conclusion that the subject matter of claims 1 and 10 of the main request does not satisfy the requirements of Art. 123(2) EPC.

Auxiliary request 1

The opponent had no objections under Art. 123(2) EPC.

Clarity: Art. 84 EPC was discussed.

The opponent's arguments were mainly focused on

- The feature "wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes" in claims 1 and 10 is a method step, no means for achieving this result are provided
- This feature is not clear in the context of a kit (claim 10)

The proprietor's arguments were mainly focused on

- the fact that this feature is a better explanation of the claim

After deliberation the chairman communicated to the parties that the opposition division has come to the conclusion that the subject matter of claims 1 and 10 of the auxiliary request 1 satisfies the requirements of Art. 84 EPC.

Novelty: Art. 54 EPC with respect to claims 1 and 10 was discussed.

The chairman asked the opponent if he still relies on document D6, because the date of the public availability has been challenged by the proprietor and no further arguments were given.

The opponent confirmed that D6 was still to be considered concerning the novelty of claims 1 and 10.

The chairman consequently opened the discussion about whether D6 can be considered as prior art in the sense of Art. 54(2) EPC.

The opponent's arguments were mainly focused on

- the fact that D6 is a user manual which is intended to be available to the public
- p. 3 of D6 : "Erstelldatum: 10.05"

The proprietor's arguments were mainly focused on

- "Erstelldatum" means "production date" and not "publication date"
- the fact that the opponent failed to provide further evidences of the public availability of D6 before the priority date

After deliberation the chairman communicated to the parties that the opposition division has come to the conclusion that D6 does not form part of the prior art in the sense of Art. 54(2) EPC.

Novelty with regard to D1, D4 and D5 was discussed

The opponent's arguments were mainly focused on

- the wording "supported rotatably in the movable portion"
- D1, fig. 6, 7, 8 and col. 5 l. 62-67. The opponent interprets the hub handle 58 as the thrust-bearing element

- D4, fig. 3
- D5, fig. 3

The proprietor's arguments were mainly focused on

- the same passages as the opponent. The proprietor interprets the bearing 106 in D4 as the thrust-bearing element.
- the decision T23/86

After deliberation the chairman communicated to the parties that the opposition division has come to the conclusion that the subject matter of claims 1 and 10 does not satisfy the requirements of Art. 54 EPC.

The proprietor wished to file a new auxiliary request 2 in place of the previous auxiliary requests 2 and 3.

After a short break, the proprietor filed the new auxiliary request 2, which is based on the auxiliary request 1 and on the description of the originally filed application p. 5 l. 21-23, precising that the thrust-bearing element is mounted on the movable portion.

The opponent requested to have some time to study the newly filed request.

After a short break, the opponent requests the auxiliary request 2 being not admitted into the procedure and provided the following arguments:

- the auxiliary request 2 is late filed
- feature taken from the description: need to conduct a further search
- the auxiliary request is not clearly allowable concerning Art. 123(2) and 84 EPC

The proprietor argued that new arguments have been put forward during the oral proceedings and for this reason, he had to adapt the requests.

After deliberation the chairman communicated to the parties that the opposition division has come to the conclusion that the newly filed auxiliary request 2 is admissible.

Auxiliary request 2

Extension beyond the content of the application as filed: Art. 123(2) EPC was discussed.

The opponent's arguments were mainly focused on

- the fact that the amendments made induce an intermediate generalisation
- the patent application p. 5, l. 16 to p. 5 l. 5 and p. 5 l. 21

The proprietor's arguments were mainly focused on

- the fact that the amendments are consistent with the overall content of the application

Before deliberating, the chairman asked the parties to confirm their requests:

- Opponent: revocation of the patent in its entirety
- Proprietor: to maintain the patent as granted (main request), in an amended form according to auxiliary request 1 (filed on 24.08.2017), or in an amended form according to auxiliary request 2 (filed during the oral proceedings)

After deliberation the chairman communicated to the parties that the opposition division has come to the conclusion that the subject matter of claims 1 and 10 of the auxiliary request 2 does not satisfy the requirements of Art. 123(2) EPC.

The chairman informed the parties that in view of this, the opposition division was apparently in a position to issue a decision. Consequently, the chairman announced the decision and closed the proceedings.

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Application No.: 11 779 702.7

Patent No.: EP-B-2 637 492

Direct Decision:

☐ **yes** ☒ **no**

Revocation of the European Patent (Art. 101(2) and 101(3)(b) EPC)

The Opposition Division - at the oral proceedings dated 24.10.2017 - has decided:

European Patent No. EP-B- 2 637 492 is revoked.

The Grounds for the decision (Form 2916) are enclosed.

03-11-17
Date

Chairman	1st Examiner	2nd Examiner	Legally qualified member
Baltanás y Jorge, R	Lucchesi-Palli, C	Leblanc, Romain	

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Locas, Davide
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Application No. / Patent No.	Ref.	Date
11 779 702.7 - 1656 / 2 637 492 /	PBP11900-EP	17.11.2017
Proprietor Maschio Gaspardo S.p.A.		

Decision revoking the European Patent (Art. 101(2) and 101(3)(b) EPC)

The Opposition Division - at the oral proceedings dated 24.10.2017 - has decided:

European Patent No. EP-B- 2 637 492 is revoked.

The reasons for the decision are enclosed.

Possibility of appeal
This decision is open to appeal. Attention is drawn to the attached text of Articles 106 to 108 and Rules 97 to 98 EPC.

Opposition Division:

Registered letter with advice of delivery
EPO Form 2331 12.07TRI

Chairman: Baltanás y Jorge, R
2nd Examiner: Leblanc, Romain
1st Examiner: Lucchesi-Palli, C

Fischer, Jana
Formalities Officer
Tel. No.: +49 89 2399-4758

Enclosure(s): 9 page(s) reasons for the decision (Form 2916)
Wording of Articles 106 - 108 and Rules 97-98 EPC (Form 2019)
Minutes of oral proceedings
Annex 1: claims of the main request; Annex 2: claims of auxiliary request I; Annex 3 claims of auxiliary request II

to EPO postal service: 10.11.17

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I. Summary of Facts and Submissions

1. European patent 2 637 492 having the title "SEED DISTRIBUTION ELEMENT FOR PRECISION SEED DRILLS, SEED DRILL INCLUDING SAID ELEMENT" is based upon European patent application No. 11 779 702.7 filed on 10-11-2011. It claims priority of IT PD20100338 filed on 12-11-2010.

2. The mention of the grant of the patent has been published in the European Patent Bulletin of 03-12-2014. Proprietor of the patent is
Maschio Gaspardo S.p.A.
Via Marcello 73
35011 Campodarsego (PD), IT

3. Notice of opposition has been filed on 02-09-2015 by
Precision Planting LLC
23207 Townline Road
Tremont, IL 61568, US

4. The opponent requests revocation of the patent in its entirety based on Articles 100(a) EPC in combination with Articles 52(1), 54(1),(2),(3), Article 56 EPC and 100(c)/Article 123(2) EPC.

5. The following evidence has been submitted within the opposition period: D1, US-B1-7 228 807; D2: EP-A1-0 536 543: D3:EP-A1-2 848 109; D4: US-A1-4 664 290; D5: EP-A1-140 699; D6: Betriebsanleitung AMAZONE Einzelkornsämaschine ED 302 ED452 ED 452-K ED602-K ED 902-K; D7: DE-T2-689 16 976; D8:WO-A1-96/02123, D9:Translation of the Italian priority document.

6. In a letter received on 22-04-2016, the proprietor requested the rejection of the opposition (Article 101(2) EPC).

7. With letter of 15.07.2016 the opponent filed further arguments.

8. On 21-12-2016 the opposition division issued a summons to attend oral proceedings on 24-10-2017.

9. With letter of 24.08.2017 the patent proprietor filed three auxiliary requests.

10. On 24-10-2017, oral proceedings were held. During these proceedings the patent proprietor filed a new second auxiliary request replacing the second auxiliary request filed with letter of 24.08.2016 and withdrew the third auxiliary request.

11. The claims under consideration are attached to this decision. As to the other application documents, reference is made to the file.

II. Grounds for the decision

1. The opposition is admissible because it meets all the requirements of Articles 99(1) and 100 EPC and Rules 3(1) and 76(1)(2) EPC.

2. MAIN REQUEST

Claims 1 and 10 of the main request contravene the provisions of Article 123(2) EPC:

Claims 1 and 10 of the granted patent differ from originally filed claims 1 and 10 in that the feature "wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes" has been deleted.

In the introductory part of the originally filed description of the patent in suit, page 1, lines 11 to 18, the operating principle of seed distributors using an air pressure differential is described and on page 1, line 23 to page 2, line 2, it is disclosed that for such distributors it is necessary to ensure an effective pneumatic seal between the face of the disc which is subjected to suction and a seal which delimits the pneumatic suction chamber, and that the suction effect produces a substantial compression of the disc against the seal and thus the need to relieve the load on the seal by the claimed thrust-bearing element. It follows that without provision of a pressure differential between the opposed surfaces of the sowing disc in the region as claimed a substantial compression would not take place, which would be on one side contrary to the above mentioned operating principle of the specific type of pneumatic seed distributors and on the other side would not lead to the stated problem of abrasion of the seal (originally filed description, page 2, lines 2 to 5). The originally filed page 3, lines 13 and 14 indicating the solution to the claimed problem refers only to the originally filed claims which contain the omitted features and also the disclosed embodiments refer to seed distribution using pressure differential between the opposed faces of the disc. Thus the provision of a pressure differential in the claimed region is an essential and indispensable feature for the seed distribution element(s) (see the Guidelines H-V, 3.1).

Furthermore the wording of claims 1 and 10 of the main request cover a seed distribution element and a kit for any pneumatic seed drill, which work without the creation of a pressure differential in the region of the disc. The omission of the above mentioned features introduces thus a generalisation which has no base in the application as originally filed.

The patent proprietor argued that in view of the provision of a pneumatic suction chamber, the man skilled in the art would know that a pressure differential has to be present, the provision of such a pressure differential would thus be inherent. Furthermore the person skilled in the art would directly recognize that a pressure differential is implicitly provided during operation of the distribution element by the presence of a seed collection chamber, the pneumatic suction chamber and the sowing disc with holes interposed between the chambers. This argumentation cannot be followed, as claims 1 and 10 of the main request define on one hand a pneumatic suction chamber and on the other hand a sowing disc delimiting the two claimed chambers and having at least one ring of selector holes, without a functional relationship between the suction chamber and the selector holes and thus the man skilled in the art cannot recognize that a pressure differential at a specific region of the ring of holes has to be provided for the functioning of the device.

The patent proprietor pointed out that the omitted features are functional features and that there would be no limitation on where the pressure differential is applied with respect to the disc. While the provision of a pressure differential is clearly a functional feature, this feature has been originally disclosed in combination with a technical feature, i.e."the opposed surfaces in the region of a circumferential segment of the ring of holes", which implies that the distribution element has to have the necessary means, i.e, the region of a circumferential segment of the ring of holes to permit the function of metering the seeds.

The patent proprietor argued that in the description as originally filed, page 5, line 20 a seed ejector is disclosed as an alternative to the pressure differential. This argumentation cannot be followed as the presence of a seed ejector is only an alternative way of evacuating the seed but not an alternative to a seed metering using pressure differential to hold the seeds in the apertures of a disc.

3. AUXILIARY REQUEST I

3.1. Claims 1 and 10 of auxiliary request I meet the requirements of Article 123(2),(3) EPC:

In these claims the wording "wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes" has been introduced, this wording corresponds to the wording of originally filed claims 1 and 10 and can be found in paragraph 17 of the patent in suit.

The opponent had no objections with respect to Article 123 (2), (3) EPC.

3.2. Claims 1 and 10 meet the requirements of Article 84 EPC:

The opponent argued during the oral proceedings that the added features are functional features, the pressure differential would only be produced when the device is in use and that the structural features responsible for the claimed function are missing.

While the wording "a pressure differential is provided" relates to a function, this function is essential for the working of the element (see point 2) and also delimited by structural features relating to the application of this pressure differential "between the opposed surfaces in the region of a circumferential segment of the ring of holes". It follows that claims 1 and 10 of the first auxiliary request clearly indicate the necessary structural features which enable the functioning of the claimed devices.

3.3. During the oral proceeding the opposition division decided that document D6 cited by the opponent does not form part of the prior art according to Article 54(2) EPC:

The opponent cited D6 as disclosing all features of claim 1 as granted. The patent proprietor already contested in his letter of 22.04.2016 the public availability of this document, arguing that the alleged date mentioned on the first page of D6, i.e.10.05, constitutes a copyright date which would not necessarily mean that the whole content of D6 has been made available to the public in 2005 and that this date could refer only to some part of the manual. The opponent argues that the date 10.05 is not the date of the copyright for the publication, but the issue date. Despite the arguments presented by the patent proprietor, the opponent failed to provide the necessary evidence that the numbers "10.05" relate firstly to a date and secondly that these numbers constitute the date on which the content of the manual has been made available to the public.

3.4. Claims 1 and 10 of the auxiliary request I do not meet the requirements of Articles 52(1) and 54(1),(2) EPC as their subject matter is not new in view of D1, D4 or D5:

D1 discloses a seed distribution element 36 for precision pneumatic seed drills including a sowing disc 60 which is rotated by a motor-driven transmission shaft 55 at controlled speed (column 6, lines 1 to 5, figures 6 to 8), a housing with a fixed portion 50 in which the shaft 55 is supported (figure 6) and a portion 90 which is movable relative to the fixed portion (hinge 92, column 7, lines 19 to 21 figures 7,8) and can be closed against it (column 7, lines 28 to 30, figure 6), a seed collection chamber being defined in the fixed portion (column 7, lines 62 to 64), a pneumatic suction chamber being defined in the movable portion (column 7, lines 64 to 67), the sowing disc being interposed between the portions and having opposed surfaces delimiting the

chambers (column 7, lines 48 to 52, figure 6,7), the sowing disc having at least one ring of selector holes 67 extending between the opposed surfaces (column 6, lines 28 to 31, figure 8), a seal 99 is arranged on the movable portion and is capable of sliding contact with the facing surface of the disc when the portions are closed against one another (column 7, lines 26 to 30, figures 6 to 8). A pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (column 7, line 59 to column 8, line 16). The seed distribution element further comprises a thrust-bearing element of the sowing disc in the form of a hub handle 58 attached to the distal edge of a retaining hub 56 whereby the hub is connected to the drive shaft 55 (column 6, lines 22 to 27, figure 6), The hub handle is positioned in the movable portion (figure 6). As the hub handle is attached to the retaining hub, rotation of the hub to rotate the disc will forcingly rotate the hub handle 58. The handle 58 is thus rotatbly supported in the movable portion. As the handle has to retain the seed disc on the hub 56 (column 5, lines 66, 67) at least some of the axial load produced by the seed disc on the seal is forcingly withstood.

Thus all features of claim 1 of the first auxiliary request are known from D1. This reasoning is also applicable to the subject matter of claim 10 as the claimed distribution elements are known from D1 and are suitable to retrofit a seed distribution element of precision pneumatic seed drills.

D4 discloses a seed distribution element 10 for precision pneumatic seed drills including a sowing disc 28 rotated by a motor-driven transmission shaft 22 at controlled speed (column 5, lines 16 to 20 and column 8, lines 13 to 23, figure 3), a housing 12 with a fixed portion 14 in which the shaft 22 is supported and a portion 16 which is movable relative to the fixed portion and can be closed against it (column 4, line 67 to column 5, line 7, figure 2, hinge 18), a seed collection chamber 44 being defined in the fixed portion and a pneumatic suction chamber being defined in the movable portion whereby the sowing disc is interposed between the portions and has opposed surfaces delimiting the chambers (column 5, lines 35 to 41, figure 3) ,
- the sowing disc having at least one ring of selector holes 34 extending between the opposed surfaces (column 5, lines 27 to 35, figure 2), a seal 56 is arranged on the movable portion and due to the fact that the seed disc rotates relatively to the vacuum seal 56, there is a sliding contact with the facing surface 38 of the disc when the portions are closed against one another, a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (column 5, lines 41 to 46). The seed distribution element comprises a thrust-bearing element of the sowing disc in the form of a handle 32 positioned in the movable portion which locks the seed disc 28 on the hub 22 and rotates with the hub (column

5, lines 20, 21), which means that the handle 32 is supported rotatably in the movable portion. Due to the contact of the handle with the disc at least some of the axial load produced by the disc on the seal is withstood.

Thus all features of claim 1 of the first auxiliary request are known from D4. This reasoning is also applicable to the subject matter of claim 10 as the claimed distribution elements are known from D4 and are suitable to retrofit a seed distribution element of precision pneumatic seed drills.

D5 discloses a seed distribution element 10 for precision pneumatic seed drills including a sowing disc 28 rotatbly supported on a motor driven shaft at a controlled speed (see the description, page 4, last paragraph to page 5, first paragraph, figure 3), a housing 10 with a fixed portion 14 in which the shaft is supported and a portion 20 which is movable (hinge 18) relative to the fixed portion and can be closed against it, a seed collection chamber provided in the fixed portion and a pneumatic suction chamber provided in the movable portion whereby the sowing disc is interposed between the portions and having opposed surfaces delimiting the chambers (page 5, second paragraph, figures 2,3), the sowing disc having at least one ring of selector holes 38 extending between the opposed surfaces (page 5, second paragraph, figure 2), a seal 42 is arranged on the movable portion and is capable of sliding contact with the facing surface of the disc when the portions are closed against one another (page 5, last paragraph), a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (page 5, second paragraph). The seed distribution element comprises a thrust-bearing element in the form of an elongated handle 24 of the sowing disc. The handle 24 is supported rotatably (on hub 22) in the movable portion in order to withstand at least some of the axial load produced by the disc on the seal (page 8, third paragraph, in particular the last sentence).

All features of claim 1 of the first auxiliary request are known from D5. This reasoning is also applicable to the subject matter of claim 10 as the claimed distribution elements are known from D5 and are suitable to retrofit a seed distribution element of precision pneumatic seed drills.

The patent proprietor argued that the handles shown in any of the documents D1, D4 and D5 do not constitute a thrust-bearing element as claimed. In particular according to the patent proprietor the handles are not a thrust-bearing element which is rotatably supported in the movable portion.

However, the opposition division considers the handles disclosed in D1 or D4 or D5 as an element which bears axial thrust due to the fact that any of these handles lock the disc on a shaft to retain the disc in position, whereby a surface of the handle contacts the corresponding surface part of the disc and, when a suction force is applied on the disc dragging the outer section of the disc in direction to the suction chamber and compressing thereby the seal, the handle forcingly withstands at least some of the axial load produced by the disc on the seal. The opposition division considers also that the thrust bearing element of any of the documents D1, D4 and D5 is supported rotatably in the movable portion as any of the handles disclosed in these documents are positioned in the movable portion and are rotatably supported on shafts (see the above made analysis with respect to D1, D4 and D5). The wording used in claim 1 does not restrict the positioning of the thrust bearing element in a specific relation to the movable part or with respect to a specific part of the movable portion.

During the oral proceedings the patent proprietor argued that in D4 the thrust bearing element would be the bearing 106 provided in the fixed portion of the seed distribution elements and that this bearing withstands the load. Such a bearing would also be shown in D1 and D5 and without such a bearing the shaft would slide and without the provision of a handle the shaft would move axially. This argumentation cannot be followed as the bearing 106 of D4 and the bearings shown in figure 6 of D1 and in figure 3 of D5 do not act on the respective disc in order to withstand the axial load produced by the disc on the seal, but primarily rotatably support the shaft. Furthermore all three documents disclose an axial adjustment of the disc on a drive shaft. Consequently the shaft has to be fixed by the handle means to allow such an axial adjustment and to avoid a sliding of the shaft, see in particular D1, column 6, lines 8 to 18 in combination with column 5, lines 59 to 67; D4, column 8, lines 26 to 34 and figure 3 and D5, page 6, last paragraph to page 8, first paragraph and page 8, last paragraph, figures 3 and 4.

4. AUXILIARY REQUEST II

4.1. This request was filed by the patent proprietor during the oral proceedings. The opponent requested that this request should not be admitted in the proceedings as it was lately filed and would delay the procedure as the opponent had to conduct further search as the newly introduced features were taken from the description. The opponent also argued that the request was not prima facie allowable with regard to Article 84 EPC and Article 123(2) EPC.

The opposition division decided to admit this request (Article 114(2) and Rule 116 EPC) exercising its discretion (Guidelines, E-II 8.6) as prima facie these amendments have been foreseeable in view of the different possibilities to interpret the positioning of the thrust-bearing member as claimed in the requests on file. Moreover, the features added to the claims 1 and 10 seem to have a literal basis in the originally filed description, which prima facie does not hint at its non-allowability with respect to Article 123(2) EPC, and seem to have a clear and well defined technical meaning. As the amendment relates only to define further the positioning of the thrust-bearing, which had to be expected in view of the cited documents, it was estimated that also in view of procedural expediency this request should be allowed.

4.2. The auxiliary request II contravenes the provisions of Article 123(2) EPC as claims 1 and 10 have been amended in such a way that their subject matter extends beyond the application as originally filed.

The patent proprietor has introduced the wording "wherein the thrust-bearing element (26) is mounted on the movable portion" in claims 1 and 10 and argues that this wording is taken from the originally filed description, page 5, lines 22,23. During the oral proceedings the patent proprietor argued that it was clear for the man skilled in the art that there was no link between the last two paragraphs of page 5 and that the man skilled in the art would understand that it is consistent with the overall disclosure of the originally filed description, that the thrust-bearing element is mounted on and in the movable portion.

While the above mentioned wording has been introduced literally from the description as stated by the patent proprietor, the introduction of these features has to be considered as an intermediate generalisation (Guidelines H, V, 3.2.1).

The amended wording is disclosed with respect to the embodiment described on pages 5 and 6 of the description as originally field. The desired effect of withstanding at least some of the axial load produced by the disc on the seal as disclosed for the specific embodiment (page 6, lines 3 and 4) is achieved by the fact that the thrust-bearing element is mounted on the movable portion and with the specific mounting arrangements disclosed in the originally filed description, page 5, last paragraph to page 6, lines 1 to 4. It follows that the added feature is inextricably linked to the mounting arrangement of the specific embodiment. Furthermore, the overall disclosure of the description as originally filed does not justify the generalising isolation of mounting the thrust-bearing element on the movable portion without the particular features of the thrust-bearing element, as the mounting of the thrust bearing element on the movable portion has only been disclosed in connection with the embodiment described on pages 5 and 6 of the originally filed description.

III. Decision

As the main request contravenes the provisions of Article 123(2) EPC and as claims 1 and 10 of auxiliary request I do not meet the requirements of Articles 52(1) and 54(1),(2) EPC and claims 1 and 10 of auxiliary request II contravene Article 123(2) EPC, the European patent in suit is revoked (Article 101(2), 101(3)(b) EPC) on the grounds of Article 100(c)/100(a) EPC.

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Application No.: 11 779 702.7

Patent No.: EP-B- 2 637 492

A copy of the communication (communication, decision, minutes) was printed for and notified to each of the following representatives/parties:

Locas, Davide
Cantaluppi Partners S.r.l.
Piazzetta Cappellato Pedrocchi, 18
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After deliberation of the opposition division,

- the chairman announced the following **decision**:

"The European patent is revoked."

Regarding the reasons for the decision, the chairman referred to:

Article 101(2) EPC, first sentence: the following ground(s) for opposition mentioned in Article 100 EPC prejudice(s) the maintenance of the patent as granted.

Article 101(3)(b)EPC: Taking into consideration the amendments made by the proprietor of the patent during the opposition proceedings, the patent and the invention to which it relates do **not** meet the requirements of the Convention

The chairman **closed the oral proceedings** on 24.10.2017 at 12:30 hours.

Baltanás y Jorge, R
Chairman

Leblanc, Romain
Minute Writer

Annex(es):
Auxiliary request 2 filed during the oral proceedings

After deliberation of the opposition division,

- the chairman announced the following **decision**:

"The European patent is revoked."

Regarding the reasons for the decision, the chairman referred to:

Article 101(2) EPC, first sentence: the following ground(s) for opposition mentioned in Article 100 EPC prejudice(s) the maintenance of the patent as granted.

The division's opinion is that, even taking into consideration the amendments made by the proprietor of the patent during the opposition proceedings, the patent does **not** meet the requirements of the Convention (Article 101(3)(b)EPC)

The chairman **closed the oral proceedings** on 24.10.2017 at 12:30 hours.

signed:

Baltanás y Jorge, R
. . . . . .
Chairman

signed:

Leblanc, Romain
. . . . . .
Minute Writer

Enclosure(s):
Auxiliary request 2 filed during the oral proceedings

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Application No.: 11 779 702.7

Patent No.: EP-B-2 637 492

Minutes of the oral proceedings before the OPPOSITION DIVISION

The proceedings were public.

Proceedings opened on 24.10.2017 at 09:00 hours

Present as members of the opposition division:

Chairman:	Baltanás y Jorge, R
1st member:	Lucchesi-Palli, C
2nd member:	Leblanc, Romain
Minute writer:	Leblanc, Romain

Present as or for the party or parties:

- For the Proprietor(s): Maschio Gaspardo S.p.A.
  Mr. Locas
- For the Opponent 1: Precision Planting LLC
  Mr. Jacob
  Mr. v. Menges

The identity of the person/s (as well as, if applicable, that of the witness or witnesses) and, where necessary, the authorisation to represent/authority to act were checked.

Essentials of the oral proceedings and relevant statements of the parties:

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Application No. / Patent No.	Ref.	Date
11 779 702.7 - 1656 / 2 637 492 /	PBP11900-EP	17.11.2017
Proprietor Maschio Gaspardo S.p.A.		

Provision of a copy of the minutes in accordance with Rule 124(4) EPC

The attached copy of the minutes of the oral proceedings is sent to you in accordance with Rule 124(4) EPC.

Fischer, Jana
Formalities Officer
Tel. No.: +49 89 2399 - 4758

Enclosure(s): Copy of the minutes (Form 2309)

Registered Letter
EPO Form 2042 12.07TRI

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

- a seed collection chamber (15) being defined in the fixed portion (11),

- a pneumatic suction chamber (17) being defined in the movable portion (12),

- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the

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movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion.

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

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Precision Exhibit 1005

Amended claims - Second Auxiliary request marked

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
- a seed collection chamber (15) being defined in the fixed portion (11),
- a pneumatic suction chamber (17) being defined in the movable portion (12),
- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),
- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and
- a seal (24) which is arranged on the movable portion (12) and is

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capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the kit comprises:

- the movable portion (12) pre-assembled with:

- a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion.

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

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Precision Exhibit 1005

ANNEX 1

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:
- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
- a seed collection chamber (15) being defined in the fixed portion (11),
- a pneumatic suction chamber (17) being defined in the movable portion (12),
- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),
- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and
- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
- a seed collection chamber (15) being defined in the fixed portion (11),
- a pneumatic suction chamber (17) being defined in the movable portion (12),
- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),
- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and
- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another, characterized in that the kit comprises:
- the movable portion (12) pre-assembled with:
- a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

Amended claims - First Auxiliary request marked

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

- a seed collection chamber (15) being defined in the fixed portion (11),

- a pneumatic suction chamber (17) being defined in the movable portion (12),

- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the

movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

Amended claims - First Auxiliary request marked

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
- a seed collection chamber (15) being defined in the fixed portion (11),
- a pneumatic suction chamber (17) being defined in the movable portion (12),
- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),
- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and
- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed

surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the kit comprises:

- the movable portion (12) pre-assembled with:

- a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

ANNEX 3

Amended claims - Second Auxiliary request marked

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

- a seed collection chamber (15) being defined in the fixed portion (11),

- a pneumatic suction chamber (17) being defined in the movable portion (12),

- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

<u>wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),</u>

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the

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movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion.

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

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Precision Exhibit 1005

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
- a seed collection chamber (15) being defined in the fixed portion (11),
- a pneumatic suction chamber (17) being defined in the movable portion (12),
- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),
- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and
- a seal (24) which is arranged on the movable portion (12) and is

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capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the kit comprises:

- the movable portion (12) pre-assembled with:

- a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24), wherein the thrust-bearing element (26) is mounted on the movable portion.

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

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Precision Exhibit 1005

Europäisches Patentamt
European Patent Office
Office européen des brevets

Application No.

11779702.7

INFORMATION

The oral proceedings of: 24.10.17

Resulted in:

☐ The European patent is revoked because at least one ground for opposition prejudices the maintenance of the European patent (Art. 101(2) EPC)

☒ The European patent is revoked because, account being taken of the amendments made by the patent proprietor during opposition proceedings, the patent and the invention to which it relates were found not to meet the requirements of the EPC (Art. 101(3)(b) EPC).

☐ The opposition(s) is/are rejected (Art. 101(2) EPC).

☐ Account being taken of the amendments made by the patent proprietor during the opposition proceedings, the patent and the invention to which it relates are found to meet the requirements of European Patent Convention (Art. 101(3)(a) EPC).

☐ Amendments filed during oral proceedings are annexed.

☐ Other:

24/10/2017
Date

Signature

NB: this form is provided for the sake of information only. The written decision prevails.

Europäisches Patentamt
European Patent Office
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80298 MUNICH
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Questions about this communication ?
Contact Customer Services at www.epo.org/contact

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Date: 30.08.2017

Reference	Application No./Patent No.
E 98381 OPPO 01	11779702.7 - 1656 / 2637492
Applicant/Proprietor: Maschio Gaspardo S.p.A.	

BRIEF COMMUNICATION

Subject:
- ☐ Your letter of
- ☐ Our telephone conversation of
- ☐ Communication of
- ☐

Enclosure(s):
- ☒ Letter from the proprietor of the patent of 24.08.17
- ☐ Letter from the opponent of
- ☐ Copy (copies)

Communication:

☐ A letter from the opponent /proprietor was received on ..... . The documents specified as patent documents in this letter are available via the European Patent Register at **www.epo.org/register.** Should you wish to receive these documents in paper format, they will be supplied to you free of charge if specifically requested on receipt of this communication (OJ EPO 2009, 434).

☐

For the Opposition Division

Europäisches Patentamt • European Patent Office • Office européen des brevets

☒ **Registered letter**

Europäisches Patentamt
European Patent Office
Office européen des brevets

Submission in opposition proceedings
made following summons to attend oral proceedings

Representative:

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- representing the proprietor(s):	MASCHIO GASPARDO S.P.A.
Proprietor/representative's reference	PBP11900-EP

The information given below is pertaining to the following patent in opposition proceedings:

Patent No.	EP2637492
Application No.	EP11779702.7
Date of mention of the grant in the European Patent Bulletin (Art. 97(3), Art. 99(1) EPC)	03 December 2014
Title of the invention	SEED DISTRIBUTION ELEMENT FOR PRECISION SEED DRILLS, SEED DRILL INCLUDING SAID ELEMENT
Proprietor of the patent	MASCHIO GASPARDO S.P.A.

Requests:

- Oral proceedings are hereby requested auxiliarily.
- Interpreting is requested in the following languages:
  - listening in: **English**
  - speaking in: **English**

Documents attached:

	Description of document	Original file name	Assigned file name
1	Reply to an examination report in opposition proceedings	20170824_Observations to summons.pdf	OREX3.pdf

2	Auxiliary request in opposition	Amended claims 1st aux req clean.pdf	AUXREQ-1.pdf
3	Auxiliary request in opposition	Amended claims 1st aux req marked.pdf	AUXREQ-2.pdf
4	Auxiliary request in opposition	Amended claims 2nd aux req clean.pdf	AUXREQ-3.pdf
5	Auxiliary request in opposition	Amended claims 2nd aux req marked.pdf	AUXREQ-4.pdf
6	Auxiliary request in opposition	Amended claims 3rd aux req clean.pdf	AUXREQ-5.pdf
7	Auxiliary request in opposition	Amended claims 3rd aux req marked.pdf	AUXREQ-6.pdf

Signatures

Place:	**Padova, Italy**
Date:	**24 August 2017**
Signed by:	**Davide Locas 24895**
Representative name:	**Davide LOCAS**
Capacity:	**(Representative)**

CANTALUPPI & PARTNERS

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INTELLECTUAL PROPERTY

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Padova, August 24, 2017

Your ref.: 11779702.7 – 1656 / 2637492
Our ref.: PBP11900-EP –DL/mg

Re: European Patent Application No. 11779702.7
Proprietor: MASCHIO GASPARDO S.P.A.

OBSERVATIONS OF THE PROPRIETOR TO THE SUMMONS TO ATTEND ORAL PROCEEDINGS PURSUANT TO R. 116 EPC

Further to the Communication of the Opposition Division dated December 21, 2016, summoning the parties to attend the Oral Proceedings and in view of the observations of the Division annexed to such Communication, in addition to the main request of maintaining the patent as granted, the following auxiliary requests are hereby submitted.

First Auxiliary Request

In case the Opposition Division does not intend to maintain the Patent in the form as granted, it is requested to maintain the Patent in amended form according to the set of amended claims herewith attached and labelled "1St Aux Req" and to reject the oppositions in their entirety.

The set of claims forming the first auxiliary request corresponds to the claims as filed. Accordingly, it appears that no comments are required for the fulfilment of the provision of art. 123(2). Furthermore, the claims has been amended by introducing a feature, therefore no doubts on the fact that the amendment does not also offend art. 123(3).

Novelty and inventive step

The same arguments in connection to the main request also applies for the present auxiliary request.

* * *

Second Auxiliary Request

In case the Opposition Division does not intend to maintain the Patent in the form according to the First Auxiliary Request on record, it is requested to maintain the Patent in amended form according to the set of amended claims herewith attached and labelled "2nd Aux Req" and to reject the oppositions in their entirety.

In the set of claims forming the second auxiliary request, independent claim 1 and claim 10 of the first auxiliary request (i.e. of the claims as filed) has been amended by introducing the feature that the pressure differential is provided *by means of a suction device mounted on a bearing structure (8) of the seed drill (3) and connected to the suction chamber (17) by means of pipes*.

Such subject matter is literally disclosed in page 4, lines 20-23 of the application as filed.

Accordingly, Art. 123(2) and 123(3) EPC are therefore not offended.

Novelty and inventive step

The same arguments in connection to the main request also applies for the present auxiliary request.

* * *

Third Auxiliary Request

In case the Opposition Division does not intend to maintain the Patent in the form according to the Second Auxiliary Request on record, it is requested to maintain the Patent in amended form according to the set of amended claims herewith attached and labelled "3rd Aux Req" and to reject the oppositions in their entirety.

In the set of claims forming the third auxiliary request, independent claim 1 corresponds to claim 9 of the second auxiliary request rewritten in independent form.

Accordingly, Art. 123(2) and 123(3) EPC are therefore not offended.

Novelty and inventive step

The same arguments in connection to the main request also applies for the present auxiliary request.

Respectfully submitted

The representative

CANTALUPPI & PARTNERS
Davide Locas

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

- a seed collection chamber (15) being defined in the fixed portion (11),

- a pneumatic suction chamber (17) being defined in the movable portion (12),

- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the

movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed

surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the kit comprises:

- the movable portion (12) pre-assembled with:
- a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23) by means of a suction device mounted on a bearing structure (8) of the seed drill (3) and connected to the suction chamber (17) by means of pipes,

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is

capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23) by means of a suction device mounted on a bearing structure (8) of the seed drill (3) and connected to the suction chamber (17) by means of pipes,

characterized in that the kit comprises:

- the movable portion (12) pre-assembled with:
- a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

CLAIMS

1. A seed drill (3) comprising a bearing structure (8) on which a plurality of sowing elements including a frame (6) on which a seed distribution element (1) are mounted, the seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

- a seed collection chamber (15) being defined in the fixed portion (11),

- a pneumatic suction chamber (17) being defined in the movable portion (12),

- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23) by means of a suction device mounted on the bearing

structure (8) and connected to the suction chamber (17) by means of pipes,

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. The seed drill (3) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. The seed drill (3) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. The seed drill (3) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. The seed drill (3) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. The seed drill (3) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or

circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. The seed drill (3) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
- a seed collection chamber (15) being defined in the fixed portion (11),
- a pneumatic suction chamber (17) being defined in the movable portion (12),
- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),
- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and
- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of

holes (23) by means of a suction device mounted on a bearing structure (8) of the seed drill (3) and connected to the suction chamber (17) by means of pipes,

characterized in that the kit comprises:

– the movable portion (12) pre-assembled with:

– a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

9. A kit according to Claim 8, wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the

movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
- a seed collection chamber (15) being defined in the fixed portion (11),
- a pneumatic suction chamber (17) being defined in the movable portion (12),
- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),
- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and
- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed

surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the kit comprises:

- the movable portion (12) pre-assembled with:

- a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

Amended claims – Second Auxiliary request marked

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23) by means of a suction device mounted on a bearing structure (8) of the seed drill (3) and connected to the suction chamber (17) by means of pipes,

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is

capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23) by means of a suction device mounted on a bearing structure (8) of the seed drill (3) and connected to the suction chamber (17) by means of pipes,

characterized in that the kit comprises:

- the movable portion (12) pre-assembled with:
- a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

CLAIMS

1. A seed drill (3) comprising a bearing structure (8) on which a plurality of sowing elements including a frame (6) on which a seed distribution element (1) are mounted, ~~A~~the seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23) by means of a suction device mounted on the bearing

structure (8) and connected to the suction chamber (17) by means of pipes,

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. The seed drill (3) ~~A seed distribution element (1)~~ according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. The seed drill (3) ~~A seed distribution element (1)~~ according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. The seed drill (3) ~~A seed distribution element (1)~~ according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. The seed drill (3) ~~A seed distribution element (1)~~ according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. The seed drill (3) ~~A seed distribution element (1)~~ according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling

member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. The seed drill (3)~~A seed distribution element (1)~~ according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

~~8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.~~

~~9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.~~

~~10.~~8. ~~A~~ kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23) by means of a suction device mounted on a bearing structure (8) of the seed drill (3) and connected to the suction chamber (17) by means of pipes,

characterized in that the kit comprises:

- the movable portion (12) pre-assembled with:

- a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

~~11~~9. A kit according to Claim ~~10~~ 8, wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

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Acknowledgement of receipt

We hereby acknowledge receipt of the following submission by the proprietor:

Submission number	5561991
Application number	EP11779702.7
Patent number	EP2637492
Date of receipt	24 August 2017
Your reference	PBP11900-EP
Proprietor	MASCHIO GASPARDO S.P.A.
Title	SEED DISTRIBUTION ELEMENT FOR PRECISION SEED DRILLS, SEED DRILL INCLUDING SAID ELEMENT
Documents submitted	package-data.xml ep-oppo.pdf (2 p.) AUXREQ-1.pdf\Amended claims 1st aux req clean.pdf (4 p.) AUXREQ-3.pdf\Amended claims 2nd aux req clean.pdf (4 p.) AUXREQ-5.pdf\Amended claims 3rd aux req clean.pdf (4 p.)
	ep-opposition-data.xml OREX3.pdf\20170824_Observations to summons.pdf (2 p.) AUXREQ-2.pdf\Amended claims 1st aux req marked.pdf (4 p.) AUXREQ-4.pdf\Amended claims 2nd aux req marked.pdf (4 p.) AUXREQ-6.pdf\Amended claims 3rd aux req marked.pdf (4 p.)
Submitted by	CN=Davide Locas 24895
Method of submission	Online
Date and time receipt generated	24 August 2017, 17:45 (CEST)

Message Digest	AF:3C:7C:17:8C:23:F6:D3:BE:97:D7:5B:22:4C:8B:4E:4B:3C:95:75

Correction by the EPO of errors in debit instructions filed by eOLF

Errors in debit instructions filed by eOLF that are caused by the editing of Form 1038E entries or the continued use of outdated software (all forms) may be corrected automatically by the EPO, leaving the payment date unchanged (see decision T 152/82, OJ EPO 1984, 301 and point 6.3 ff ADA, Supplement to OJ EPO 10/2007).

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Uexküll & Stolberg
Partnerschaft von
Patent- und Rechtsanwälten mbB
Beselerstraße 4
22607 Hamburg
ALLEMAGNE

Date: 25.08.2017

Reference	Application No./Patent No.
E 98381 OPPO 01	11779702.7 - 1656 / 2637492
Applicant/Proprietor: Maschio Gaspardo S.p.A.	

BRIEF COMMUNICATION

Subject:
- ☐ Your letter of
- ☐ Our telephone conversation of
- ☐ Communication of
- ☐

Enclosure(s):
- ☒ Letter from the proprietor of the patent of 22.08.17
- ☐ Letter from the opponent of
- ☐ Copy (copies)

Communication:

☐ A letter from the opponent /proprietor was received on ..... . The documents specified as patent documents in this letter are available via the European Patent Register at **www.epo.org/register.** Should you wish to receive these documents in paper format, they will be supplied to you free of charge if specifically requested on receipt of this communication (OJ EPO 2009, 434).

☐

For the Opposition Division

Europäisches Patentamt • European Patent Office • Office européen des brevets

☒ **Registered letter**

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By fax +49 89 23994465

Padova, August 22, 2017

Your ref.: **11779702.7 – 1656 / 2637492**
Our ref.: PBP11900-EP – DL/ms

Re: Opposition Against European Patent No. **2637492**
"Seed distribution element for precision seed drills, seed drill including said element"
Patentee: Maschio Gaspardo S.p.A.
Opponent: Precision Planting LLC

Dear Sirs,

we confirm that we would like to use the English language (speaking and listening) in the oral proceedings.

If a party will not use the English language, we ask for a translation in the English language.

Very truly yours,

CANTALUPPI & PARTNERS
Davide Locas

Maschio Gaspardo/PBP11900-EP

Duration: 22.08.2017 16:01:03 - 22.08.2017 16:01:15. This page 1 of 1 was completed at 22.08.2017 16:01:15
Received at the EPO on Aug 22, 2017 16:01:15. Page 1 of 1
Page 572 of 1596 Precision Exhibit 1005

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Date
25.08.2017

Reference	Application No./Patent No.
PBP11900-EP	11779702.7 - 1656 / 2637492
Applicant/Proprietor	
Maschio Gaspardo S.p.A.	

BRIEF COMMUNICATION

Subject:
- ☐ Your letter of
- ☐ Our telephone conversation of
- ☐ Communication of
- ☐

Enclosure(s):
- ☐ Letter from the proprietor of the patent of
- ☒ Letter from the opponent O1 of 22.08.17
- ☐ Copy (copies)

Communication:

☐ A letter from the opponent /proprietor was received on ..... . The documents specified as patent documents in this letter are available via the European Patent Register at **www.epo.org/register.** Should you wish to receive these documents in paper format, they will be supplied to you free of charge if specifically requested on receipt of this communication (OJ EPO 2009, 434).

☐

For the Opposition Division

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☒ **Registered letter**

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Submission in opposition proceedings

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- representing the opponent(s):	Precision Planting LLC
Opponent/representative's reference	E 98381

The information given below is pertaining to the following patent in opposition proceedings:

Patent No.	EP2637492
Application No.	EP11779702.7
Date of mention of the grant in the European Patent Bulletin (Art. 97(3), Art. 99(1) EPC)	03 December 2014
Title of the invention	SEED DISTRIBUTION ELEMENT FOR PRECISION SEED DRILLS, SEED DRILL INCLUDING SAID ELEMENT
Proprietor of the patent	Maschio Gaspardo S.p.A.

Requests:

- Oral proceedings are hereby requested auxiliarily.
- Interpreting is requested in the following languages:
  - listening in: **English**
  - speaking in: **English**

Documents attached:

	Description of document	Original file name	Assigned file name
1	Reply to an examination report in opposition proceedings	98381 EPO 22.08.2017.pdf	OREX3.pdf

Signatures

Place:	**Hamburg**
Date:	**22 August 2017**
Signed by:	**Albrecht von Menges 23641**
Association:	**Uexküll & Stolberg Partnerschaft von Patent- und Rechtsanwälten mbB**
Representative name:	**Menges**
Capacity:	**(Representative)**

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PARTNERSCHAFT VON PATENT- UND RECHTSANWÄLTEN mbB

Europäisches Patentamt

80298 München

Patent No.: 2 637 492

Application No.: 11779702.7

Patent Proprietor: Maschio Gaspardo S.p.A.

Opponent: Precision Planting LLC

22. 8. 2017
E 98381 Me/MJ

The following observations are submitted in the name and on behalf of Opponent, Precision Planting, in response to the preliminary opinion issued together with the summons to attend oral proceedings dated 21.12.2016:

1. Requests and Introduction:

All previous requests and objections are maintained, even if not reiterated in the present submission.

It is expected that the undersigned will represent the Opponent in the oral hearing scheduled for October 24, 2017. The undersigned will use the English language in the oral hearing and request simultaneous translation into English, in case the Patentee should intend to use a language other than English.

2. Art. 100(c)/Art. 123(2) EPC - Added Subject-Matter

As explained in the submission of 15.07.2016, the omitted feature

> *"means for generating a pressure differential between said opposing surfaces in correspondence of a segment of said circumferential crown of holes"*

is inseparably connected to the transport and release mechanism for the seeds.

The application as filed does not state, suggest, or imply that the feature at issue (transport and release mechanism) was optional, or that the feature at issue could be omitted. To the contrary, the feature at issue is essential in the light of the technical problem to be solved. Claim 1, therefore, as granted fails the essentiality test.

In this context the Opposition Division is requested to take the following further remarks into consideration:

2.1 The feature *"in correspondence of a segment of said circumferential crown of holes"* not only constitutes an essential structural specification of the shape/structural form of the suction chamber (e.g. see Figure 1; arcuate-shaped recess at 24), but also imprints the configuration and construction of other parts, in particular the sowing disc support and is thus essential and indispensible in the light of the technical problem to be solved.

The application as originally filed relates to a specific seed distributor with a pressure-release drop zone and the problem underlying the patent is aimed specifically at the

improvement of this prior art (see A1: page 3, lines 9-12: "*… to remedy all the drawbacks mentioned with reference to the prior art cited*").

The skilled person when reading the original disclosure will understand the teaching described therein as a further development of this prior art. He will also recognize that when the sowing disc of the seed distributor is rotated, it is subjected to pressure. Because of the zone with no pressure differential, the pressure acting on the sowing disc is distributed irregularly. In the area of the 'suction chamber', the sowing disc is subjected to suction (underpressure), whereas in the area where the pressure differential ceases the underpressure does not exist and the seed is dropped ('drop zone').

The varying pressure conditions on the disc significantly influence the support forces of the sowing disc. It is evident for the skilled person that the pressure difference in the 'seed drop zone' (which is underpressure-free) and the 'underpressure zone' (suction zone) causes different normal forces acting on the sowing disc. The normal forces in the underpressure zone are significantly higher than in the drop zone. The result of the different normal forces in the areas is a tilting moment acting at the disc support. This tilting moment attempts to tilt the disc relative to its axis of rotation.

These circumstances have to be considered when constructing the thrust-bearing element of the sowing disc since the thrust-bearing element has to be able to support said tilting moment. Further, the thrust-bearing element has to be configured such that it prevents tilting movements of the disc, because a tilting movement of the disc would

cause irregular loading of the seal and would have a negative effect on the wear resistance of the seal.

These technical requirements for the thrust-bearing element are acknowledged by the feature "*in correspondence of a segment of said circumferential crown of holes*" and cannot be neglected. Accordingly, the feature at issue is necessary and indispensible for defining the accurate sowing disc support to solve the problem of the prior art.

2.2 Granted claim 1 of the patent at issue covers seed distributors that are not supported by the original application.

The original application is exclusively directed to a seed distributor wherein the seed is released when a suction pressure ceases. This is evident from the discussed prior art and from original claim 1. Other transportation/releases mechanism are neither discussed nor mentioned in the application as filed. On the other hand, claim 1 as granted also includes with a different functionality of the seed distributors in comparison to those discussed in the prior art or to the embodiments the application as filed. For example, seed distributors without a "non-suction drop zone" for releasing the seed would be covered by claim 1 as granted but not by the disclosure of the application as filed. Instead of an underpressure free drop zone, extra mechanical separators for mechanically removing the seed from the sowing disc may be provided.

2.3 The above shows that omitting the feature at issue leads to a broadening of the claim and to a lack of essential information for the construction/layout of the thrust-bearing element. There is no basis in the description as filed for the broader definition of the alleged invention.

Thus, granted claim 1 violates Art. 123(2) EPC.

The above applies *mutatis mutandis* for the question on the **effective priority date** so that the divisional application of the patent in suit (D3) forms prior art according to the Art. 54(3) EPC.

3. Lack of novelty in view of D1, D4 and D5

3.1 The hub handles in D1, D4 and D5 each constitute a thrust-bearing element in the sense of claim 1 of the patent in suit. Reference in this regard is made to the arguments in the Notice of Opposition and the submission of 15.07.2016.

It is the function of the claims to define the matter for which protection is sought. There is no support for anything other than to understand the claim as a strict definition to ensure legal certainty in assessing patentability, in particular novelty and inventive step over the prior art. This aspect of examination and opposition proceedings is emphasized in the case law of the Boards of Appeal (*see Case Law of the Boards of Appeal (2016), II. A. 6.3.2; also T 1279/04*).

3.2 The handles in D1, D4 and D5 functionally match with thrust-bearing element, which is defined as follows:

> "*the thrust-bearing element is supported rotatably in the movable portion in order to withstand at least some of the axial load produced by the disk on the seal*"

A skilled person would not have had any problem to interpret the feature. The meaning is clear from the wording of

the claim alone because the required structural and functional specifications are immediately evident.

Each support preventing the disc from totally compressing the seal by providing a support surface that limits the movement of the disc relative to the seal constitutes a thrust-bearing element in line with claim 1.

The handles in D1, D4 and D5 fulfill this requirement. As already explained in detail, the handles in D1, D4 and D5 each provide a support for the disc in the horizontal direction. Without the handle, the disc would be drawn of the hub, when air in the suction chamber (located on the right side of the disc) is sucked out and the disc would be urged against the seal such as to compress it excessively.

Consequently, the support fixates the relative distance between the disc surface and the seal during operation and thus prevents further compression of the seal than desired. As described in D4, col. 5, lines 20-21, "*the handle 32 is then rotated into a position to lock the seed disc 28 on the hub 22*". Thus, the handle fixates the relative position between the disc and the seal and thereby withstands the axial loads that act in the direction of the seal.

As the above shows, function and structure of the handles in D1, D4 and D5 fall within the meaning of claim 1 of the patent in suit. Claim 1 must thus be revoked already due to lack of novelty in view of D1, D4 and D5.

Albrecht v. Menges
(Association No. 1)

Martin D. Jacob
(Association No. 1)

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Acknowledgement of receipt

We hereby acknowledge receipt of the following submission by the opponent:

Submission number	5552633
Application number	EP11779702.7
Patent number	EP2637492
Date of receipt	22 August 2017
Your reference	E 98381
Opponent	Precision Planting LLC
Title	SEED DISTRIBUTION ELEMENT FOR PRECISION SEED DRILLS, SEED DRILL INCLUDING SAID ELEMENT
Documents submitted	package-data.xml ep-oppo.pdf (2 p.) ep-opposition-data.xml OREX3.pdf\98381 EPO 22.08.2017.pdf (6 p.)
Submitted by	CN=Albrecht von Menges 23641
Method of submission	Online
Date and time receipt generated	22 August 2017, 10:04 (CEST)
Message Digest	CB:AD:62:12:92:1D:F0:BB:D6:C4:BB:9F:43:FF:6D:93:6C:9B:4E:66

Correction by the EPO of errors in debit instructions filed by eOLF
Errors in debit instructions filed by eOLF that are caused by the editing of Form 1038E entries or the continued use of outdated software (all forms) may be corrected automatically by the EPO, leaving the payment date unchanged (see decision T 152/82, OJ EPO 1984, 301 and point 6.3 ff ADA, Supplement to OJ EPO 10/2007).

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Acknowledgement of receipt

We hereby acknowledge receipt of the following submission by the proprietor:

Submission number	5561991
Application number	EP11779702.7
Patent number	EP2637492
Date of receipt	24 August 2017
Your reference	PBP11900-EP
Proprietor	MASCHIO GASPARDO S.P.A.
Title	SEED DISTRIBUTION ELEMENT FOR PRECISION SEED DRILLS, SEED DRILL INCLUDING SAID ELEMENT
Documents submitted	package-data.xml ep-oppo.pdf (2 p.) AUXREQ-1.pdf\Amended claims 1st aux req clean.pdf (4 p.) AUXREQ-3.pdf\Amended claims 2nd aux req clean.pdf (4 p.) AUXREQ-5.pdf\Amended claims 3rd aux req clean.pdf (4 p.)
	ep-opposition-data.xml OREX3.pdf\20170824_Observations to summons.pdf (2 p.) AUXREQ-2.pdf\Amended claims 1st aux req marked.pdf (4 p.) AUXREQ-4.pdf\Amended claims 2nd aux req marked.pdf (4 p.) AUXREQ-6.pdf\Amended claims 3rd aux req marked.pdf (4 p.)
Submitted by	CN=Davide Locas 24895
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Correction by the EPO of errors in debit instructions filed by eOLF

Errors in debit instructions filed by eOLF that are caused by the editing of Form 1038E entries or the continued use of outdated software (all forms) may be corrected automatically by the EPO, leaving the payment date unchanged (see decision T 152/82, OJ EPO 1984, 301 and point 6.3 ff ADA, Supplement to OJ EPO 10/2007).

/European Patent Office/

Amended claims – Second Auxiliary request marked

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23) by means of a suction device mounted on a bearing structure (8) of the seed drill (3) and connected to the suction chamber (17) by means of pipes,

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is

capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23) by means of a suction device mounted on a bearing structure (8) of the seed drill (3) and connected to the suction chamber (17) by means of pipes,

characterized in that the kit comprises:

- the movable portion (12) pre-assembled with:
- a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the

movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
- a seed collection chamber (15) being defined in the fixed portion (11),
- a pneumatic suction chamber (17) being defined in the movable portion (12),
- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),
- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and
- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed

surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the kit comprises:

- the movable portion (12) pre-assembled with:

- a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

CLAIMS

1. A seed drill (3) comprising a bearing structure (8) on which a plurality of sowing elements including a frame (6) on which a seed distribution element (1) are mounted, ~~A~~the seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

- a seed collection chamber (15) being defined in the fixed portion (11),

- a pneumatic suction chamber (17) being defined in the movable portion (12),

- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23) by means of a suction device mounted on the bearing

structure (8) and connected to the suction chamber (17) by means of pipes,

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. The seed drill (3) ~~A seed distribution element (1)~~ according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. The seed drill (3) ~~A seed distribution element (1)~~ according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. The seed drill (3) ~~A seed distribution element (1)~~ according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. The seed drill (3) ~~A seed distribution element (1)~~ according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. The seed drill (3) ~~A seed distribution element (1)~~ according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling

member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. The seed drill (3)~~A seed distribution element (1)~~ according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

~~8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.~~

~~9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.~~

~~10.~~8. ~~A~~ kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23) by means of a suction device mounted on a bearing structure (8) of the seed drill (3) and connected to the suction chamber (17) by means of pipes,

characterized in that the kit comprises:

- the movable portion (12) pre-assembled with:

- a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

~~11~~9. A kit according to Claim ~~10~~ 8, wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

CLAIMS

1. A seed drill (3) comprising a bearing structure (8) on which a plurality of sowing elements including a frame (6) on which a seed distribution element (1) are mounted, the seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

- a seed collection chamber (15) being defined in the fixed portion (11),

- a pneumatic suction chamber (17) being defined in the movable portion (12),

- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23) by means of a suction device mounted on the bearing

structure (8) and connected to the suction chamber (17) by means of pipes,

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. The seed drill (3) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. The seed drill (3) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. The seed drill (3) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. The seed drill (3) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. The seed drill (3) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or

circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. The seed drill (3) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
- a seed collection chamber (15) being defined in the fixed portion (11),
- a pneumatic suction chamber (17) being defined in the movable portion (12),
- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),
- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and
- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of

holes (23) by means of a suction device mounted on a bearing structure (8) of the seed drill (3) and connected to the suction chamber (17) by means of pipes,

characterized in that the kit comprises:

– the movable portion (12) pre-assembled with:

– a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

9. A kit according to Claim 8, wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23) by means of a suction device mounted on a bearing structure (8) of the seed drill (3) and connected to the suction chamber (17) by means of pipes,

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is

capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23) by means of a suction device mounted on a bearing structure (8) of the seed drill (3) and connected to the suction chamber (17) by means of pipes,

characterized in that the kit comprises:

- the movable portion (12) pre-assembled with:
- a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

- a seed collection chamber (15) being defined in the fixed portion (11),

- a pneumatic suction chamber (17) being defined in the movable portion (12),

- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the

movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed

surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the kit comprises:

- the movable portion (12) pre-assembled with:

- a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

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Submission in opposition proceedings
made following summons to attend oral proceedings

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Proprietor/representative's reference	PBP11900-EP

The information given below is pertaining to the following patent in opposition proceedings:

Patent No.	EP2637492
Application No.	EP11779702.7
Date of mention of the grant in the European Patent Bulletin (Art. 97(3), Art. 99(1) EPC)	03 December 2014
Title of the invention	SEED DISTRIBUTION ELEMENT FOR PRECISION SEED DRILLS, SEED DRILL INCLUDING SAID ELEMENT
Proprietor of the patent	MASCHIO GASPARDO S.P.A.

Requests:

- Oral proceedings are hereby requested auxiliarily.
- Interpreting is requested in the following languages:
  - listening in: **English**
  - speaking in: **English**

Documents attached:

	Description of document	Original file name	Assigned file name
1	Reply to an examination report in opposition proceedings	20170824_Observations to summons.pdf	OREX3.pdf

2	Auxiliary request in opposition	Amended claims 1st aux req clean.pdf	AUXREQ-1.pdf
3	Auxiliary request in opposition	Amended claims 1st aux req marked.pdf	AUXREQ-2.pdf
4	Auxiliary request in opposition	Amended claims 2nd aux req clean.pdf	AUXREQ-3.pdf
5	Auxiliary request in opposition	Amended claims 2nd aux req marked.pdf	AUXREQ-4.pdf
6	Auxiliary request in opposition	Amended claims 3rd aux req clean.pdf	AUXREQ-5.pdf
7	Auxiliary request in opposition	Amended claims 3rd aux req marked.pdf	AUXREQ-6.pdf

Signatures

Place:	**Padova, Italy**
Date:	**24 August 2017**
Signed by:	**Davide Locas 24895**
Representative name:	**Davide LOCAS**
Capacity:	**(Representative)**

CANTALUPPI & PARTNERS

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EUROPEAN PATENT OFFICE
Bob-van-Benthem-Platz, 1
D-80469 MÜNCHEN
GERMANY

Padova, August 24, 2017

Your ref.: 11779702.7 – 1656 / 2637492
Our ref.: PBP11900-EP –DL/mg

Re: European Patent Application No. 11779702.7
Proprietor: MASCHIO GASPARDO S.P.A.

OBSERVATIONS OF THE PROPRIETOR TO THE SUMMONS TO ATTEND ORAL PROCEEDINGS PURSUANT TO R. 116 EPC

Further to the Communication of the Opposition Division dated December 21, 2016, summoning the parties to attend the Oral Proceedings and in view of the observations of the Division annexed to such Communication, in addition to the main request of maintaining the patent as granted, the following auxiliary requests are hereby submitted.

First Auxiliary Request

In case the Opposition Division does not intend to maintain the Patent in the form as granted, it is requested to maintain the Patent in amended form according to the set of amended claims herewith attached and labelled "1St Aux Req" and to reject the oppositions in their entirety.

The set of claims forming the first auxiliary request corresponds to the claims as filed. Accordingly, it appears that no comments are required for the fulfilment of the provision of art. 123(2). Furthermore, the claims has been amended by introducing a feature, therefore no doubts on the fact that the amendment does not also offend art. 123(3).

Novelty and inventive step

The same arguments in connection to the main request also applies for the present auxiliary request.

* * *

Second Auxiliary Request

In case the Opposition Division does not intend to maintain the Patent in the form according to the First Auxiliary Request on record, it is requested to maintain the Patent in amended form according to the set of amended claims herewith attached and labelled "2nd Aux Req" and to reject the oppositions in their entirety.

In the set of claims forming the second auxiliary request, independent claim 1 and claim 10 of the first auxiliary request (i.e. of the claims as filed) has been amended by introducing the feature that the pressure differential is provided *by means of a suction device mounted on a bearing structure (8) of the seed drill (3) and connected to the suction chamber (17) by means of pipes*.

Such subject matter is literally disclosed in page 4, lines 20-23 of the application as filed.

Accordingly, Art. 123(2) and 123(3) EPC are therefore not offended.

Novelty and inventive step

The same arguments in connection to the main request also applies for the present auxiliary request.

* * *

Third Auxiliary Request

In case the Opposition Division does not intend to maintain the Patent in the form according to the Second Auxiliary Request on record, it is requested to maintain the Patent in amended form according to the set of amended claims herewith attached and labelled "3rd Aux Req" and to reject the oppositions in their entirety.

In the set of claims forming the third auxiliary request, independent claim 1 corresponds to claim 9 of the second auxiliary request rewritten in independent form.

Accordingly, Art. 123(2) and 123(3) EPC are therefore not offended.

Novelty and inventive step

The same arguments in connection to the main request also applies for the present auxiliary request.

Respectfully submitted

The representative

CANTALUPPI & PARTNERS
Davide Locas

Europäisches Patentamt
European Patent Office
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Acknowledgement of receipt

We hereby acknowledge receipt of the following submission by the opponent:

Submission number	5552633
Application number	EP11779702.7
Patent number	EP2637492
Date of receipt	22 August 2017
Your reference	E 98381
Opponent	Precision Planting LLC
Title	SEED DISTRIBUTION ELEMENT FOR PRECISION SEED DRILLS, SEED DRILL INCLUDING SAID ELEMENT
Documents submitted	package-data.xml ep-oppo.pdf (2 p.) ep-opposition-data.xml OREX3.pdf\98381 EPO 22.08.2017.pdf (6 p.)
Submitted by	CN=Albrecht von Menges 23641
Method of submission	Online
Date and time receipt generated	22 August 2017, 10:04 (CEST)
Message Digest	CB:AD:62:12:92:1D:F0:BB:D6:C4:BB:9F:43:FF:6D:93:6C:9B:4E:66

Correction by the EPO of errors in debit instructions filed by eOLF
Errors in debit instructions filed by eOLF that are caused by the editing of Form 1038E entries or the continued use of outdated software (all forms) may be corrected automatically by the EPO, leaving the payment date unchanged (see decision T 152/82, OJ EPO 1984, 301 and point 6.3 ff ADA, Supplement to OJ EPO 10/2007).

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Submission in opposition proceedings

Representative:

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- representing the opponent(s):	Precision Planting LLC
Opponent/representative's reference	E 98381

The information given below is pertaining to the following patent in opposition proceedings:

Patent No.	EP2637492
Application No.	EP11779702.7
Date of mention of the grant in the European Patent Bulletin (Art. 97(3), Art. 99(1) EPC)	03 December 2014
Title of the invention	SEED DISTRIBUTION ELEMENT FOR PRECISION SEED DRILLS, SEED DRILL INCLUDING SAID ELEMENT
Proprietor of the patent	Maschio Gaspardo S.p.A.

Requests:

- Oral proceedings are hereby requested auxiliarily.
- Interpreting is requested in the following languages:
  - listening in: **English**
  - speaking in: **English**

Documents attached:

	Description of document	Original file name	Assigned file name
1	Reply to an examination report in opposition proceedings	98381 EPO 22.08.2017.pdf	OREX3.pdf

Signatures

Place:	**Hamburg**
Date:	**22 August 2017**
Signed by:	**Albrecht von Menges 23641**
Association:	**Uexküll & Stolberg Partnerschaft von Patent- und Rechtsanwälten mbB**
Representative name:	**Menges**
Capacity:	**(Representative)**

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GERMANY

By fax +49 89 23994465

Padova, August 22, 2017

Your ref.: **11779702.7 – 1656 / 2637492**
Our ref.: PBP11900-EP – DL/ms

Re: Opposition Against European Patent No. **2637492**
"Seed distribution element for precision seed drills, seed drill including said element"
Patentee: Maschio Gaspardo S.p.A.
Opponent: Precision Planting LLC

Dear Sirs,

we confirm that we would like to use the English language (speaking and listening) in the oral proceedings.

If a party will not use the English language, we ask for a translation in the English language.

Very truly yours,

CANTALUPPI & PARTNERS
Davide Locas

Maschio Gaspardo/PBP11900-EP

Duration: 22.08.2017 16:01:03 - 22.08.2017 16:01:15. This page 1 of 1 was completed at 22.08.2017 16:01:15
Received at the EPO on Aug 22, 2017 16:01:15. Page 1 of 1
Page 616 of 1596 Precision Exhibit 1005

UEXKÜLL & STOLBERG

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PARTNERSCHAFT VON PATENT- UND RECHTSANWÄLTEN mbB

Europäisches Patentamt

80298 München

Patent No.: 2 637 492

Application No.: 11779702.7

Patent Proprietor: Maschio Gaspardo S.p.A.

Opponent: Precision Planting LLC

22. 8. 2017
E 98381 Me/MJ

The following observations are submitted in the name and on behalf of Opponent, Precision Planting, in response to the preliminary opinion issued together with the summons to attend oral proceedings dated 21.12.2016:

1. Requests and Introduction:

All previous requests and objections are maintained, even if not reiterated in the present submission.

It is expected that the undersigned will represent the Opponent in the oral hearing scheduled for October 24, 2017. The undersigned will use the English language in the oral hearing and request simultaneous translation into English, in case the Patentee should intend to use a language other than English.

2. Art. 100(c)/Art. 123(2) EPC - Added Subject-Matter

As explained in the submission of 15.07.2016, the omitted feature

> *"means for generating a pressure differential between said opposing surfaces in correspondence of a segment of said circumferential crown of holes"*

is inseparably connected to the transport and release mechanism for the seeds.

The application as filed does not state, suggest, or imply that the feature at issue (transport and release mechanism) was optional, or that the feature at issue could be omitted. To the contrary, the feature at issue is essential in the light of the technical problem to be solved. Claim 1, therefore, as granted fails the essentiality test.

In this context the Opposition Division is requested to take the following further remarks into consideration:

2.1 The feature *"in correspondence of a segment of said circumferential crown of holes"* not only constitutes an essential structural specification of the shape/structural form of the suction chamber (e.g. see Figure 1; arcuate-shaped recess at 24), but also imprints the configuration and construction of other parts, in particular the sowing disc support and is thus essential and indispensible in the light of the technical problem to be solved.

The application as originally filed relates to a specific seed distributor with a pressure-release drop zone and the problem underlying the patent is aimed specifically at the

improvement of this prior art (see A1: page 3, lines 9-12: "*… to remedy all the drawbacks mentioned with reference to the prior art cited*").

The skilled person when reading the original disclosure will understand the teaching described therein as a further development of this prior art. He will also recognize that when the sowing disc of the seed distributor is rotated, it is subjected to pressure. Because of the zone with no pressure differential, the pressure acting on the sowing disc is distributed irregularly. In the area of the 'suction chamber', the sowing disc is subjected to suction (underpressure), whereas in the area where the pressure differential ceases the underpressure does not exist and the seed is dropped ('drop zone').

The varying pressure conditions on the disc significantly influence the support forces of the sowing disc. It is evident for the skilled person that the pressure difference in the 'seed drop zone' (which is underpressure-free) and the 'underpressure zone' (suction zone) causes different normal forces acting on the sowing disc. The normal forces in the underpressure zone are significantly higher than in the drop zone. The result of the different normal forces in the areas is a tilting moment acting at the disc support. This tilting moment attempts to tilt the disc relative to its axis of rotation.

These circumstances have to be considered when constructing the thrust-bearing element of the sowing disc since the thrust-bearing element has to be able to support said tilting moment. Further, the thrust-bearing element has to be configured such that it prevents tilting movements of the disc, because a tilting movement of the disc would

cause irregular loading of the seal and would have a negative effect on the wear resistance of the seal.

These technical requirements for the thrust-bearing element are acknowledged by the feature "*in correspondence of a segment of said circumferential crown of holes*" and cannot be neglected. Accordingly, the feature at issue is necessary and indispensible for defining the accurate sowing disc support to solve the problem of the prior art.

2.2 Granted claim 1 of the patent at issue covers seed distributors that are not supported by the original application.

The original application is exclusively directed to a seed distributor wherein the seed is released when a suction pressure ceases. This is evident from the discussed prior art and from original claim 1. Other transportation/releases mechanism are neither discussed nor mentioned in the application as filed. On the other hand, claim 1 as granted also includes with a different functionality of the seed distributors in comparison to those discussed in the prior art or to the embodiments the application as filed. For example, seed distributors without a "non-suction drop zone" for releasing the seed would be covered by claim 1 as granted but not by the disclosure of the application as filed. Instead of an underpressure free drop zone, extra mechanical separators for mechanically removing the seed from the sowing disc may be provided.

2.3 The above shows that omitting the feature at issue leads to a broadening of the claim and to a lack of essential information for the construction/layout of the thrust-bearing element. There is no basis in the description as filed for the broader definition of the alleged invention.

Thus, granted claim 1 violates Art. 123(2) EPC.

The above applies *mutatis mutandis* for the question on the **effective priority date** so that the divisional application of the patent in suit (D3) forms prior art according to the Art. 54(3) EPC.

3. Lack of novelty in view of D1, D4 and D5

3.1 The hub handles in D1, D4 and D5 each constitute a thrust-bearing element in the sense of claim 1 of the patent in suit. Reference in this regard is made to the arguments in the Notice of Opposition and the submission of 15.07.2016.

It is the function of the claims to define the matter for which protection is sought. There is no support for anything other than to understand the claim as a strict definition to ensure legal certainty in assessing patentability, in particular novelty and inventive step over the prior art. This aspect of examination and opposition proceedings is emphasized in the case law of the Boards of Appeal (*see Case Law of the Boards of Appeal (2016), II. A. 6.3.2; also T 1279/04*).

3.2 The handles in D1, D4 and D5 functionally match with thrust-bearing element, which is defined as follows:

> "*the thrust-bearing element is supported rotatably in the movable portion in order to withstand at least some of the axial load produced by the disk on the seal*"

A skilled person would not have had any problem to interpret the feature. The meaning is clear from the wording of

the claim alone because the required structural and functional specifications are immediately evident.

Each support preventing the disc from totally compressing the seal by providing a support surface that limits the movement of the disc relative to the seal constitutes a thrust-bearing element in line with claim 1.

The handles in D1, D4 and D5 fulfill this requirement. As already explained in detail, the handles in D1, D4 and D5 each provide a support for the disc in the horizontal direction. Without the handle, the disc would be drawn of the hub, when air in the suction chamber (located on the right side of the disc) is sucked out and the disc would be urged against the seal such as to compress it excessively.

Consequently, the support fixates the relative distance between the disc surface and the seal during operation and thus prevents further compression of the seal than desired. As described in D4, col. 5, lines 20-21, "*the handle 32 is then rotated into a position to lock the seed disc 28 on the hub 22*". Thus, the handle fixates the relative position between the disc and the seal and thereby withstands the axial loads that act in the direction of the seal.

As the above shows, function and structure of the handles in D1, D4 and D5 fall within the meaning of claim 1 of the patent in suit. Claim 1 must thus be revoked already due to lack of novelty in view of D1, D4 and D5.

Albrecht v. Menges
(Association No. 1)

Martin D. Jacob
(Association No. 1)

Europäisches Patentamt
European Patent Office
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11779702.7 - 1656 / 2637492 04.08.17

Client Database System (CDS) - clean up.

Application Nr.: 11779702.7

Following clean up action in CDS the entries concerning the **Representative for the applicant** have been amended and are now as follows:

Locas, Davide
Cantaluppi & Partners S.r.l.
Piazzetta Cappellato Pedrocchi, 18
35122 Padova
IT

Where appropriate, the European Patent Register at www.epo.org/register will be updated to show the amended details.

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21.12.10

Bitte diesen Aufkleber auf der Vorderseite der Sendung anbringen.

Locas, Davide
Cantaluppi & Partners S.r.l.
Piazzetta Cappellato Pedrocchi, 18
35122 Padova
ITALY

11779702.7 1656

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Locas, Davide
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ITALIE

Date
21.12.2016

Reference	Application No./Patent No.
PBP11900-EP	11779702.7 - 1656 / 2637492
Applicant/Proprietor	
Maschio Gaspardo S.p.A.	

EPA/EPO/OEB Formblatt/Form/Formulaire : 2310

Empfangsbescheinigung über den Zugang des vorstehend bezeichneten Schriftstücks
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With reference to the Notice in OJ EPO 7/2010, 377, you are requested to date and sign the acknowledgement of receipt and return it to the EPO **immediately**:

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JANUARY 12, 2017

Untersohrift / Signature:

CANTALUPPI & PARTNERS srl

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Duration: 20.01.2017 10:59:59 - 20.01.2017 11:00:11. This page 1 of 1 was completed at 20.01.2017 11:00:11
Received at the EPO on Jan 20, 2017 11:00:11. Page 1 of 1
Page 626 of 1596
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02. Jan. 2017

UEXKÜLL & STOLBERG
20. Dez. 2016
T:

Uexküll & Stolberg
Partnerschaft von
Patent- und Rechtsanwälten mbB
Beselerstraße 4
22607 Hamburg
ALLEMAGNE

Date: 21.12.2016

Reference	Application No./Patent No.
E 98381 OPPO 01	11779702.7 - 1656 / 2637492
Applicant/Proprietor: Maschio Gaspardo S.p.A.	

EPA/EPO/OEB Formblatt/Form/Formulaire : 2310

Empfangsbescheinigung über den Zugang des vorstehend bezeichneten Schriftstücks
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Unter Bezugnahme auf die Mitteilung im ABl EPA 7/2010, 377 wird gebeten, die Empfangsbescheinigung mit Empfangsdatum und Unterschrift zu versehen und **umgehend** an das EPA zurückzusenden:

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- **über die Online-Dienste des EPA** (als Anlage zu EPA Form 1038) / **through EPO Online Services** (as annex to EPO Form 1038) / **par les services en ligne de l'OEB** (en tant que pièce jointe au formulaire OEB 1038),
- **per Fax / by fax / par téléfax (+49 (0) 89 2399-4465 or +31 (0) 70 340-3016)**
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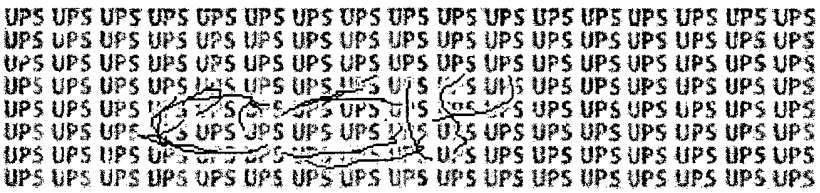
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1. In the notice of opposition received on 02.09.2015 the opponent requests revocation of the patent in its entirety based on Article 100(a) EPC in connection with Articles 52(1) and 54(1),(2),(3) EPC and Article 56 EPC and Article 100(c) EPC in connection with Article 123(2) EPC.

The following evidence has been submitted within the opposition period:

D1, US-B7 228 807; D2: EP-A-0 536 543: D3:EP-A-2 848 109; D4: US-A-4 664 290; D5: EP-A-140 699; D6: Betriebsanleitung AMAZONE Einzelkornsämaschine ED 302 ED452 ED 452-K ED602-K ED 902-K; D7: DE-T-689 16 976; D8:WO-A-96/02123, D9:Translation of the Italian priority document.

2. With letter received on 22.04.2016, the patent proprietor requests the rejection of the opposition.

3. The opponent submitted further arguments with letter received on 15.07.2016.

4. Both parties request oral proceedings.

5. The parties are thus summoned to oral proceedings in which following points will have to be discussed before reaching a decision:

5.1. Article 100(c)/Article 123(2) EPC:

It will have to be decided whether the subject matter of claim 1 extends beyond the disclosure of the application as originally filed due to the omission in claim 1 as granted of the features "wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes" which were present in originally filed claim 1, in particular in view of the Guidelines, H-V, 3.1.

In case the opposition division comes to the conclusion that the omission of the above mentioned features contravenes Article 123(2) EPC, then the patent has to be revoked on the grounds of Article 100(c) EPC in connection with Article 123(2) EPC.

In case that the opposition division comes to the conclusion that the omitted features are neither essential nor indispensable nor that modifications of the other features of the claimed subject matter are required, then the ground of opposition according to Article 100(a) EPC will have to be discussed.

5.2. Article 100 (a) EPC/Article 52(1) EPC and Article 54(1),(2) and (3) EPC:

Documents D1, D3, D4, D5 and D6 have been cited by the opponent as disclosing all features of at least claim 1.

The opponent has cited D3 as prior art according to Article 54(3) EPC. D3 is a divisional application of the patent in suit and claims the priority of 12.11.2010 and has been filed on 10.11.2011, thus it claims the same priority and filing dates as the patent in suit. The opponent argues that due to the omission of the features concerning the generating of a pressure differential, which were present in claim 1 of the application as originally filed, the claimed priority date is not valid and the effective date of the patent in suit would be the 10.11.2011, such that D3 becomes a conflicting prior art pursuant to Article 54(3) EPC. The patent proprietor contests these arguments as according to the patent proprietor the omitted features are neither essential nor indispensable nor modifications are required of the other features of the claimed subject matter. During the oral proceedings it will have to be decided if the priority of the patent in suit is valid in order to asses whether D3 forms a state of the art according to Article 54(3) EPC.

The opponent cited D6 as disclosing all features of claim 1 as granted. The patent proprietor contests the public availabilty of this document arguing that the date mentioned on the first page of D6, i.e.10.05 constitutes a copyright date which would not necessarily mean that the whole content of D6 has been made available to the public in 2005 and that this date could refer only to some part of the manual. The opponent argues that the date 10.05 is not the date of the copyright for the publication, but the issue date. However, the opponent failed to provide the necessary evidence that the numbers "10.05" relate firstly to a date and secondly that these numbers constitute the date on which the content of the manual has been made available to the public.

In case that during the oral proceedings the opposition division concludes that D6 has not been made available before the relevant date of the patent in suit, this document will not constitute prior art and will not be taken into consideration for the question of novelty.

In case that it is decided that D6 constitutes prior art made available to the public before the relevant date, then the question of novelty will have to be discussed, in particular wether D6 discloses a motor-driven transmission shaft rotated at controlled speed of a sowing disc. Furthermore, it will have to be established whether the central shaft shown in figures 227 and 228 on page 166 has sections of different diameter along its extension direction, whereby according to the opponent at least some of the load produced by the disc on the seal 2 is taken up. The opposition division notes in this context that the sections of different diameters are hardly visible on the figures and that it is up to the opponent to provide clear and unambiguous evidence for these arguments.

Concerning D1, D4 and D5 the opponent is of the opinion that each of these documents disclose a handle adapted to withstand at least some of the axial load produced by the seed disk on the seal and function thus as thrust-bearing element. The patent proprietor argues inter alia that documents D1, D4 and D5 do not disclose a thrust-bearing element as claimed in the characterizing portion of claim 1 of the opposed patent.

With respect to these documents it will consequently have to be established whether the hub handle 58 of D1 or the handle 32 of D4 or the handle 24 of D5 are thrust-bearing elements in the sense of claim 1 of the patent in suit.

In case that the opposition division concludes that the subject matter of claim 1 of the patent in suit is novel with respect to the cited prior art, then the question of inventive step will be discussed.

5.3. Article 100(a) EPC in connection with Article 56 EPC:

According to the opponent D7 represents the closest prior art, differing from the subject matter of claim 1 of the opposed patent in that it does not disclose a seal arranged in the movable portion and which is capable of sliding contact with the facing surface of the disc when the portions are closed against one another. The problem to be solved would be to provide an effective pneumatic seal between the face of the disc and the pneumatic suction chamber. D7 would already motivate the man skilled in the art to provide a seal and combined with the general knowledge, the man skilled in the art will provide a seal as claimed in order to reduce the loss of vacuum. The man skilled in the art would also consider D8, disclosing a seal 14. The patent proprietor argues that as D7 does not disclose a seal and that the problem to be solved by the patent in suit is the avoiding if excessive wear of the seal, the man skilled in the art would not be prompted to modify D7.

During the oral proceedings the question of wether the man skilled in the art starting from D7 would arrive to the claimed subject matter basing on the general knowledge or D8 without exercising an inventive step will have to be discussed.

Europäisches Patentamt
European Patent Office
Office européen des brevets

Wichtige Hinweise zur mündlichen Verhandlung

Das Europäische Patentamt verfügt über keine eigenen Dolmetscher. Diese müssen im Bedarfsfall von außerhalb, teilweise sogar aus anderen Ländern, beigezogen werden, was mit einem hohen Aufwand an Kosten und organisatorischen Vorbereitungen verbunden ist. Muss ein Verhandlungstermin kurzfristig abberaumt werden, können Kosten für bestellte Dolmetscher nicht mehr vermieden werden.

Es wird daher gebeten, eine Simultanübersetzung nur bei wirklichem Bedarf in Anspruch zu nehmen. Es wäre wünschenswert, wenn sich die Beteiligten (zweckmäßigerweise gleichzeitig mit der Terminabstimmung) auf die Benutzung einer Amtssprache einigen könnten. Bei Verständigungsschwierigkeiten sind die Mitglieder der Einspruchsabteilung bereit zu helfen.

Die von den Verfahrensbeteiligten bevorzugte (abgestimmte) Verhandlungssprache und ggf. eine notwendige Simultanübersetzung sind dem Amt möglichst vor der in Regel 4(1) EPÜ angegebenen Frist mitzuteilen.

☐ Verfahrenssprache ist **Deutsch**

Von der/dem/den Einsprechenden wurde

☐ Englisch

☐ Französisch benutzt.

Es wird um eilige Mitteilung - möglichst per Telefax an den zuständigen Formalprüfer - gebeten,

möglichst bis

Datum **22.08.2017**

1. welche Sprache(n) Sie in der mündlichen Verhandlung verwenden (**Sprechen**)
2. aus welcher Sprache Sie eine Simultanübersetzung benötigen (**Hören**).

Important information concerning oral proceedings

The European Patent Office has no interpreters of its own. When interpreters are needed they have to be brought in from outside, sometimes even from other countries, which is costly and involves considerable organisation. If oral proceedings have to be cancelled at short notice, the cost of interpreters already engaged still has to be borne.

Please therefore make use of simultaneous interpreting facilities only where strictly necessary. If possible the parties should agree on an official language for the proceedings, preferably at the time when they arrange a date. The members of the Opposition Division will be willing to help should any communication problems arise.

The EPO should be told if possible before the period mentioned in Rule 4 (1) EPC which language the parties prefer (agree on) and whether simultaneous interpreting facilities are required.

☒ Language of the proceedings is **English**

The language used by the opponent/s was

☐ German

☐ French.

Please inform us urgently - where possible by fax addressed to the formalities officer concerned -

if possible by

Date **22.08.2017**

1. which language(s) you intend to use during the oral proceedings (**Speaking**)
2. from which language you need simultaneous interpretation (**Listening**).

Très important Procédure orale

L'Office européen des brevets ne dispose pas de son propre service d'interprètes. Aussi faut-il appel le cas échéant à des interprètes de l'extérieur, qui viennent même parfois de l'étranger, ce qui occasionne de frais élevés et demande un grand travail d'organisation. Si la date d'une procédure orale doit être annulée au dernier moment, il n'est plus possible d'éviter les frais d'interprètes.

Les parties à une procédure sont donc priées de ne demander une traduction simultanée qu'en cas de réel besoin. Il serait souhaitable qu'elles puissent se mettre d'accord en même temps qu'elles conviennent de la date sur l'utilisation d'une langue officielle comme langue des débats. Si les parties éprouvent des difficultés de compréhension lors des débats, les membres de la division d'opposition sont disposés à leur prêter leur assistance.

L'Office doit être avisé si possible avant le début du délai mentionné dans la règle 4(1) CBE de la langue préférée par les parties pour le déroulement des débat (et sur laquelle elles se sont préalablement mises d'accord) et de la nécessité éventuelle d'une traduction simultanée.

☐ La langue de la procédure est le **français**

La langue utilisée par l'opposant/les opposants était

☐ l'allemand

☐ l'anglais.

Prière d'indiquer d'urgence à l'agent des formalités compétent si possible par téléfax

si possible jusqu'au

Date **22.08.2017**

1. quelle(s) langue(s) vous utiliserez au cours de la procédure orale (**pour parler**)
2. à partir de quelle langue vous aurez besoin d'une traduction simultanée (**pour écouter**).

EPA/EPO/OEB Form 2043 02.09

11779702.7

Sollten Sie Ihren Antrag auf mündliche Verhandlung zurückziehen oder zum anberaumten Verhandlungstermin nicht erscheinen wollen bzw. aus wichtigem Grund daran gehindert sein, werden Sie gebeten,

- **unverzüglich das Amt - möglichst per Telefax - davon zu benachrichtigen, wobei das Schriftstück mit einem deutlichen Vermerk "Dringend, mündliche Verhandlung am ..." oder sinngemäß gekennzeichnet sein sollte;**
- **in dringenden Fällen** (weniger als 1 Monat vor dem Verhandlungstermin) zusätzlich **auch dem/die anderen Verfahrensbeteiligten** bzw. ihre(n) Vertreter auf schnellstem Weg **direkt zu unterrichten.**

In jedem solchen Fall obliegt der Einspruchsabteilung die Entscheidung, ob die Verhandlung durchgeführt oder abberaumt wird. Es wird jedoch darauf hingewiesen, dass einem Verfahrensbeteiligten, der eine nicht rechtzeitige oder unterbliebene Benachrichtigung zu verantworten hat, die dadurch den anderen Beteiligten verursachten Kosten auferlegt werden können (Art. 104 EPÜ).

Hinweis auf Regel 4 EPÜ

Regel 4
Sprache im mündlichen Verfahren

(1) Jeder an einem mündlichen Verfahren vor dem Europäischen Patentamt Beteiligte kann sich anstelle der Verfahrenssprache einer anderen Amtssprache des Europäischen Patentamts bedienen, sofern er dies dem Europäischen Patentamt spätestens einen Monat vor dem angesetzten Termin mitgeteilt hat oder selbst für die Übersetzung in die Verfahrenssprache sorgt. Jeder Beteiligte kann sich einer Amtssprache eines Vertragsstaats bedienen, sofern er selbst für die Übersetzung in die Verfahrenssprache sorgt. Von diesen Vorschriften kann das Europäische Patentamt Ausnahmen zulassen.

Should you decide to withdraw your request for oral proceedings or not wish to attend on the date set, or if for some special reason you are unable to do so, you are requested

- **to notify the EPO immediately, where possible by fax, marking the document clearly with the words "Urgent, oral proceedings on ..." or similar;**
- **in urgent cases** (less than one month before the date set for the proceedings), additionally to **notify the other party/parties** and/or their representative(s) **direct as rapidly as possible.**

In all such cases the Opposition Division will decide whether the proceedings are to go ahead or be cancelled. You should however note that costs incurred by the other parties may be charged to a party who either fails to notify them or does not do so in good time (Article 104 EPC).

Attention is drawn to Rule 4 EPC

Rule 4
Language in oral proceedings

(1) Any party to oral proceedings before the European Patent Office may use an official language of the European Patent Office other than the language of the proceedings, if such party gives notice to the European Patent Office at least one month before the date of such oral proceedings or provides for interpretation into the language of the proceedings. Any party may use an official language of a Contracting State, if he provides for interpretation into the language of the proceedings. The European Patent Office may permit derogations from these provisions.

Si vous retirez votre requête tendant à recourir à la procédure orale ou si vous ne souhaitez pas vous présenter à la date fixée pour la procédure orale ou ne pouvez vous y présenter pour une raison sérieuse, veuillez

- **en faire avis sans retard à l'Office, si possible par téléfax, en partant sur votre communication clairement la mention "Urgent, procédure orale le ..." ou une indication similaire;**
- **dans les cas urgents** (moins d'un mois avant la date fixée pour la procédure orale) **en faire avis également directement** pas la voie la plus rapide à **l'autre/aux autres partie(s)** ou bien à son/leurs mandataire(s).

Il appartient alors à la division d'opposition de décider si la procédure orale aura lieu ou non. Il est néanmoins souligné que les frais causés aux autres parties par une partie qui est responsable de l'omission d'un tel avis ou de ce que cet avis n'a pas été fait en temps utile peuvent être mis à la charge de cette partie (art. 104 CBE).

Rappel de la Règle 4 CBE

Règle 4
Langues admissibles lors de la procédure orale

(1) Toute partie à une procédure orale devant l'Office européen des brevets peut utiliser une langue officielle de l'Office européen des brevets autre que la langue de la procédure, à condition soit d'en aviser l'Office européen des brevets un mois au moins avant la date de la procédure orale, soit d'assurer l'interprétation dans la langue de la procédure. Toute partie peut utiliser une langue officielle de l'un des Etats contractants à condition d'assurer l'interprétation dans la langue de la procédure. L'Office européen des brevets peut autoriser des dérogations aux présentes dispositions.

(2) Die Bediensteten des Europäischen Patentamts können sich im mündlichen Verfahren anstelle der Verfahrenssprache einer anderen Amtssprache des Europäischen Patentamts bedienen.

(2) In the course of oral proceedings, employees of the European Patent Office may use an official language of the European Patent Office other than the language of the proceedings.

(2) Au cours de la procédure orale, les agents de l'Office européen des brevets peuvent utiliser une langue officielle de l'Office européen des brevets autre que la langue de la procédure.

(3) In der Beweisaufnahme können sich die zu vernehmenden Beteiligten, Zeugen oder Sachverständigen, die sich in einer Amtssprache des Europäischen Patentamts oder eines Vertragsstaats nicht hinlänglich ausdrücken können, einer anderen Sprache bedienen. Erfolgt die Beweisaufnahme auf Antrag eines Beteiligten, so werden die Beteiligten, Zeugen oder Sachverständigen mit Erklärungen, die sie in einer anderen Sprache als in einer Amtssprache des Europäischen Patentamts abgeben, nur gehört, sofern dieser Beteiligte selbst für die Übersetzung in die Verfahrenssprache sorgt. Das Europäische Patentamt kann jedoch die Übersetzung in eine seiner anderen Amtssprachen zulassen.

(3) Where evidence is taken, any party, witness or expert to be heard who is unable to express himself adequately in an official language of the European Patent Office or of a Contracting State may use another language. Where evidence is taken upon request of a party, parties, witnesses or experts expressing themselves in a language other than an official language of the European Patent Office shall be heard only if that party provides for interpretation into the language of the proceedings. The European Patent Office may, however, permit interpretation into one of its other official languages.

(3) Lors de l'instruction, les parties, témoins ou experts appelés à être entendus, qui ne possèdent pas une maîtrise suffisante d'une langue officielle de l'Office européen des brevets ou d'un Etat contractant, peuvent utiliser une autre langue. Si la mesure d'instruction est ordonnée sur requête d'une partie, les parties, témoins ou experts qui s'expriment dans une langue autre qu'une langue officielle de l'Office européen des brevets ne sont entendus que si cette partie assure l'interprétation dans la langue de la procédure. L'Office européen des brevets peut toutefois autoriser l'interprétation dans l'une de ses autres langues officielles.

(4) Mit Einverständnis aller Beteiligten und des Europäischen Patentamts kann jede Sprache verwendet werden.

(4) If the parties and the European Patent Office agree, any language may be used.

(4) Sous réserve de l'accord des parties et de l'Office européen des brevets, toute langue peut être utilisée.

(5) Das Europäische Patentamt übernimmt, soweit erforderlich, auf seine Kosten die Übersetzung in die Verfahrenssprache und gegebenenfalls in seine anderen Amtssprachen, sofern ein Beteiligter nicht selbst für die Übersetzung zu sorgen hat.

(5) The European Patent Office shall, if necessary, provide at its own expense interpretation into the language of the proceedings, or, where appropriate, into its other official languages, unless such interpretation is the responsibility of one of the parties.

(5) L'Office européen des brevets assure à ses frais, en tant que de besoin, l'interprétation dans la langue de la procédure, ou, le cas échéant, dans ses autres langues officielles, à moins que cette interprétation ne doive être assurée par l'une des parties.

(6) Erklärungen von Bediensteten des Europäischen Patentamts, Beteiligten, Zeugen und Sachverständigen, die in einer Amtssprache des Europäischen Patentamts abgegeben werden, werden in dieser Sprache in die Niederschrift aufgenommen. Erklärungen in einer anderen Sprache werden in der Amtssprache aufgenommen, in die sie übersetzt worden sind. Änderungen einer europäischen Patentanmeldung oder eines europäischen Patents werden in der Verfahrenssprache in die Niederschrift aufgenommen.

(6) Statements by employees of the European Patent Office, parties, witnesses or experts, made in an official language of the European Patent Office, shall be entered in the minutes in that language. Statements made in any other language shall be entered in the official language into which they are translated. Amendments to a European patent application or European patent shall be entered in the minutes in the language of the proceedings.

(6) Les interventions des agents de l'Office européen des brevets, des parties, témoins et experts faites dans une langue officielle de l'Office européen des brevets sont consignées au procès-verbal dans cette langue. Les interventions faites dans une autre langue sont consignées dans la langue officielle dans laquelle elles sont traduites. Les modifications apportées à une demande de brevet européen ou à un brevet européen sont consignées au procès verbal dans la langue de la procédure.

Europäisches Patentamt
European Patent Office
Office européen des brevets

European Patent Office
80298 MUNICH
GERMANY

Questions about this communication ?
Contact Customer Services at www.epo.org/contact

Uexküll & Stolberg
Partnerschaft von
Patent- und Rechtsanwälten mbB
Beselerstraße 4
22607 Hamburg
ALLEMAGNE

Date
21.12.2016

Reference	Application No./Patent No.
E 98381 OPPO 01	11779702.7 - 1656 / 2637492
Applicant/Proprietor	
Maschio Gaspardo S.p.A.	

Summons to attend oral proceedings pursuant to Rule 115(1) EPC

You are hereby summoned to attend oral proceedings arranged in connection with the above-mentioned European patent.

The matters to be discussed are set out in the communication accompanying this summons (EPO Form 2906).

The oral proceedings, which will be public, will take place before the opposition division

on 24.10.17 at 09.00 hrs in Room 2450
at the EPO, Bayerstr. 34, PschorrHöfe, D-80335 München

No changes to the date of the oral proceedings can be made, except on serious grounds (see OJ EPO 1/2009, 68). If you do not appear as summoned, the oral proceedings may continue without you (R. 115(2) EPC).

Your attention is drawn to Rule 4 EPC, regarding the language of the oral proceedings, and to the Special edition No. 3 OJ EPO 2007, 128, concerning the filing of authorisations for company employees and lawyers acting as representatives before the EPO.

The final date for making written submissions and/or amendments (R. 116 EPC) is 24.08.17.

You are requested to report in good time beforehand to the porter in the EPO foyer. Room 3473 and 3474 are available as waiting rooms.

Parking is available in the underground car park, accessible only via the entrance "Grasserstrasse 2/6". On presentation of the summons to oral proceedings at one of the porters' lodges in the PschorrHöfe, the parking ticket will be revoked.

1st Examiner:
Lucchesi-Palli C

2nd Examiner:
Leblanc R

Chairman:
Baltanas Y Jorge R

For the Opposition Division

Annexes:
Confirmation of receipt (Form 2936)
Rule 4 EPC (EPC Form 2043)
Communication (EPO Form 2906)

Registered letter with advice of delivery

to EPO postal service: 14.12.16

Europäisches Patentamt
European Patent Office
Office européen des brevets

European Patent Office
80298 MUNICH
GERMANY

Questions about this communication ?
Contact Customer Services at www.epo.org/contact

Locas, Davide
Cantaluppi & Partners S.r.l.
Piazzetta Cappellato Pedrocchi, 18
35122 Padova
ITALIE

Date
21.12.2016

Reference	Application No./Patent No.
PBP11900-EP	11779702.7 - 1656 / 2637492

Applicant/Proprietor
Maschio Gaspardo S.p.A.

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Chairman:
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For the Opposition Division

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Communication (EPO Form 2906)

Registered letter with advice of delivery

to EPO postal service: 14.12.16

Europäisches Patentamt
European Patent Office
Office européen des brevets

Application No.

11779702.7

INFORMATION

The oral proceedings of: 24.10.17

Resulted in:

☐ The European patent is revoked because at least one ground for opposition prejudices the maintenance of the European patent (Art. 101(2) EPC)

☐ The European patent is revoked because, account being taken of the amendments made by the patent proprietor during opposition proceedings, the patent and the invention to which it relates were found not to meet the requirements of the EPC (Art. 101(3)(b) EPC).

☐ The opposition(s) is/are rejected (Art. 101(2) EPC).

☐ Account being taken of the amendments made by the patent proprietor during the opposition proceedings, the patent and the invention to which it relates are found to meet the requirements of European Patent Convention (Art. 101(3)(a) EPC).

☐ Amendments filed during oral proceedings are annexed.

☐ Other:

..... Date

..... Signature

NB: this form is provided for the sake of information only. The written decision prevails.

Europäisches Patentamt
European Patent Office
Office européen des brevets

European Patent Office
80298 MUNICH
GERMANY

Questions about this communication ?
Contact Customer Services at www.epo.org/contact

Locas, Davide
Cantaluppi & Partners S.r.l.
Piazzetta Cappellato Pedrocchi, 18
35122 Padova
ITALIE

Date
21.07.2016

Reference	Application No./Patent No.
PBP11900-EP	11779702.7 - 1656 / 2637492
Applicant/Proprietor	
Maschio Gaspardo S.p.A.	

BRIEF COMMUNICATION

Subject:
- ☐ Your letter of
- ☐ Our telephone conversation of
- ☐ Communication of
- ☐

Enclosure(s):
- ☐ Letter from the proprietor of the patent of
- ☒ Letter from the opponent O1 of 15.07.2016
- ☐ Copy (copies)

Communication:

☐ A letter from the opponent /proprietor was received on ..... . The documents specified as patent documents in this letter are available via the European Patent Register at **www.epo.org/register.** Should you wish to receive these documents in paper format, they will be supplied to you free of charge if specifically requested on receipt of this communication (OJ EPO 2009, 434).

☐

For the Opposition Division

Europäisches Patentamt • European Patent Office • Office européen des brevets

☐ **Registered letter**

Europäisches Patentamt
European Patent Office
Office européen des brevets

Acknowledgement of receipt

We hereby acknowledge receipt of the following submission by the opponent:

Submission number	4497401
Application number	EP11779702.7
Patent number	EP2637492
Date of receipt	15 July 2016
Your reference	E 98381
Opponent	Precision Planting LLC
Title	SEED DISTRIBUTION ELEMENT FOR PRECISION SEED DRILLS, SEED DRILL INCLUDING SAID ELEMENT
Documents submitted	package-data.xml ep-oppo.pdf (2 p.) ep-opposition-data.xml DOBS3.pdf\98381amt response to observations 15.07.2016.pdf (19 p.)
Submitted by	CN=Martin Jacob 37196
Method of submission	Online
Date and time receipt generated	15 July 2016, 14:10 (CEST)
Message Digest	C0:FF:AD:E6:42:62:2C:58:56:F0:97:34:3B:87:95:F1:77:80:B7:9A

Correction by the EPO of errors in debit instructions filed by eOLF

Errors in debit instructions filed by eOLF that are caused by the editing of Form 1038E entries or the continued use of outdated software (all forms) may be corrected automatically by the EPO, leaving the payment date unchanged (see decision T 152/82, OJ EPO 1984, 301 and point 6.3 ff ADA, Supplement to OJ EPO 10/2007).

/European Patent Office/

Europäisches Patentamt
European Patent Office
Office européen des brevets

Submission in opposition proceedings

Representative:

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Tel. +49(0)30 25901-0 | Fax -840

- representing the opponent(s):	Precision Planting LLC
Opponent/representative's reference	E 98381

The information given below is pertaining to the following patent in opposition proceedings:

Patent No.	EP2637492
Application No.	EP11779702.7
Date of mention of the grant in the European Patent Bulletin (Art. 97(3), Art. 99(1) EPC)	03 December 2014
Title of the invention	SEED DISTRIBUTION ELEMENT FOR PRECISION SEED DRILLS, SEED DRILL INCLUDING SAID ELEMENT
Proprietor of the patent	Maschio Gaspardo S.p.A.

Documents attached:

	Description of document	Original file name	Assigned file name
1	Reply from the opponent to submission of proprietor	98381amt response to observations 15.07.2016.pdf	DOBS3.pdf

Signatures

Place:	**Hamburg**
Date:	**15 July 2016**
Signed by:	**Martin Jacob 37196**
Association:	**Uexküll & Stolberg Partnerschaft von Patent- und Rechtsanwälten mbB**
Representative name:	**Martin Jacob**

Capacity: **(Representative)**

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Europäisches Patentamt
80298 München

Patent No.: 2 637 492

Application No.: 11779702.7

Patent Proprietor: Maschio Gaspardo S.p.A.

Opponent: Precision Planting LLC

15. 07. 2016
E 98381 Me/MJ

The following observations are submitted in the name and on behalf of Opponent, Precision Planting, in response to the written submission of the Patent Proprietor received by Communication of April 29, 2016

1. Art. 87 (1) EPC – Effective priority date

1.1 In the opinion of the Patent Proprietor, the omitted feature

> *"means for generating a pressure differential between said opposing surfaces in correspondence of a segment of said circumferential crown of holes"*

is neither essential for the alleged invention nor indispensable in the light of the technical problem.

The Patent Proprietor recites page 1, lines 22 to 29 of IT1-EN and states that it is clear from said paragraph that a means for producing a pressure differential is dispensable because what is really required in a seed distribution element is the presence of a pneumatic suction chamber irrespective of how the differential pressure is provided.

1.2 These arguments are unsubstantiated:

As indicated in the decision T 515/00 cited by the patent proprietor, a claim passes the priority test if its subject-matter can be derived from the previous application as a whole. If, in the description of the previous application, a distinction is made between features that are essential for the performance of the invention, and features which are not, the latter can be deleted from the subject-matter of the claim without losing the right to priority. However, this conclusion does not apply to the present case, as the corresponding requirement – distinction between essential and non-essential features – is not fulfilled by the present case.

Further, when reading the priority document the skilled person will recognize that the feature at issue cannot be omitted from the alleged invention.

In particular, the Patent Proprietor fails to take account of the fact that the feature "pressure differential" not only defines the generation of a pressure differential but also that the pressure differential is generated

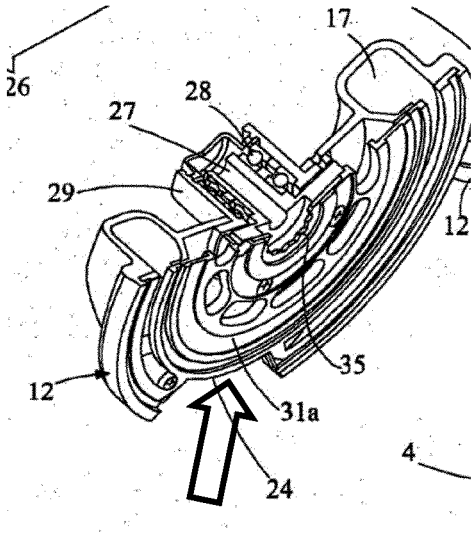
a) between the opposing sides of the sowing disc; and

b) in correspondence of a segment of said circumferential crown of holes.

The above constitutes an essential structural specification for the seed distribution element with the technical result that the pressure differential is established in the area of the holes over a certain distance. Basically, the feature at issue represents the '*transport and release mechanism for the seeds*' and stands in direct relation to the abrasion of the seal as explained in the following.

As can be taken from the description in IT1-EN, page 4, lines 10 to 21 (corresponding paragraphs in B1: [0017, 0018]), when the seed distribution element is closed, the side of the disc opposite to the suction chamber is divided into different circumferential segments. In the main segment, the disc is subjected to the aforesaid pressure differential, wherein the respective surface areas of the disc are connected through the holes 23. The main segment extends from the gate 14a (see Figure 1) to the seed fall pipe 25. In this segment, the seed adheres to the hole due to the pressure differential between the two sides of the disc and is then transported by the rotation of the sowing disc from the seed selection zone to the point at which the pressure differential ceases and the seed is released.

The below extract of Figure 1 shows that the movable portion 12 and the seal 24 are shaped such as to form an arcuate-shaped recess (indicated by arrow).



In this recess area, the suction chamber 17 is not present so that the pressure differential ceases when the disc hole with the seed reaches the recess area. This coherence is specified by the feature "*pressure differential in correspondence of a segment of said circumferential crown of holes [in the sowing disc]*". Due to the pressure differential occurring in the main segment, the disc is pressed against the seal leading to its abrasion.

The priority application thus teaches that the pressure differential/transport mechanism (and consequently the wear of the seal) is inseparably connected to the features requiring that

a) the different pressure areas are connected through the holes; and

b) the pressure differential only occurs over a segment of the disc.

In contrast, claim 1 of the opposed patent merely defines a suction chamber without any coherence to the holes in

the sowing disc where the pressure differential is actually required. Hence, claim 1 requires no connection or functional relation between the pressure differential for transporting the seeds (resulting in the abrasion of the seal) and the suction chamber.

Claim 1 merely requires that a surface of the disc delimits the suction chamber but does not define that this delimitation, for example, takes place in such way that '*in the area of the holes a pressure differential can be established on opposite sides of the holes, which then leads to the aforesaid wear effects*'. This a functional relationship is missing.

1.3 The further arguments made by the Patent Proprietor also do not support a finding to the contrary:

The Patent Proprietor argued that the presence of a suction chamber or the feature that the suction chamber is [merely] delimited by the sowing disc implicitly includes that when the suction chamber is put in a state of low pressure, the disc is pressed against the seal. However, essential features are missing which cause a pressing against the seal and resulting in the abrasion of the seal. Thus, the feature at issue cannot be omitted in the light of the function of the seed distribution element.

The pressure differential is produced by the suction device and the suction device is not 'distinct' from the seed distribution element (contrary to the allegation of the Patent Proprietor; page 3, 4th paragraph of the observations). The application as filed defines the generation of the pressure differential "*in correspondence of a segment of said circumferential crown of holes [in the sowing disc]*". This clearly is a structural requirement for the

seed distribution element, irrespective of where the under-pressure is generated or where the suction device is located.

The Patent Proprietor further argued that the invention is merely directed to limiting the operations required in order to replace the seal in a seed distribution element and that no connection between such problem and the provision of a pressure differential can be envisaged (see page 4, 4th paragraph of his observations). However, the restriction of the relevant problem to an easier assembly is inappropriate in the light of the priority document. It is emphasized that in order to validly claim the priority of a previous application, it is not only required that the solution to a given problem is the same, but also that the problem itself is the same in both applications (see T 647/97, also *Case Law of the Boards of Appeal (2013), II. D. 2.1.6*).

It is clear from page 2, lines 21 to 24 of IT1-EN that the priority application is directed to solving all the problems identified in the prior art, including the problem of the abrasion of the seal due to the pressure differential (apparently admitted by the Patent Proprietor on page 3, 1st paragraph of the observations). The abrasion/wear problem is also confirmed by page 4, lines 23 to 24 of IT1-EN [B1: par. [0018]*("To limit the wear of the seal 24, resulting from sliding against the surface of the disc, a thrust-bearing element […] is mounted on the movable portion."*). As already shown, for the problem "abrasion of the seal" the provision of the pressure differential plays a considerable role.

1.4 In the light of the above, claim 1 as granted fails the essentiality test.

The priority application directly and unambiguously teaches the skilled person that the transport mechanism for the seeds is essential for the seed distribution element. No other element provides the effect in claim 1 as granted and the feature at issue thus cannot be omitted. As explained in the Notice of Opposition, claim 1 as granted violates requirement (i) of the essentiality test.

The feature in question is also indispensible for the functioning of the invention in the light of the technical problem to be solved given that the abrasion of the seal is the result of a working transportation mechanism for the seeds. Thus, claim 1 as granted violates requirement (ii) of the essentiality test.

There are further indications that due to the removal of the pressure differential, the remaining features of the claim have to be adapted so that the technical effects of the removed feature are reintroduced (generation of pressure differential in a specific area). Thus, claim 1 as granted also violates requirement (iii) of the essentiality test.

Concluding, Claim 1 as granted extends beyond the disclosure of the priority application IT1 and is, therefore, not entitled to the priority date.

1.5 The priority document as a whole merely covers a seed distribution element with a specific transport mechanism that is based on a "*pressure differential in correspondence of a segment of said circumferential crown of holes [in the sowing disc]*".

By removing this essential feature from the claim, the opposed patent claims a subject-matter that cannot be derived from the previous application at all, because it also includes other mechanisms for transporting and releasing the seed. There is no disclosure in the previous application of how to carry out the alleged invention in this case. Claim 1 of the opposed patent is, therefore, not directed to the same invention within the meaning of Art. 87 (1) EPC.

1.6 The same arguments also apply to the subject-matter of claim 10 of the patent.

2. Art. 123 (2) EPC - Added subject-matter

2.1 For assessing a violation of Art. 123 (2) EPC, basically the same standards (essentiality test) apply as discussed with respect to the priority date.

The observations of the preceding paragraph apply *mutatis mutandis* for the question whether Art. 123 (2) EPC is violated. As shown in the previous paragraph, the pressure differential and the structural features disclosed in that context represent essential features of the claimed subject-matter. Claim 1 as granted, therefore, extends to beyond the disclosure of the application as originally filed.

2.2 The Patent Proprietor repeatedly argued that the pressure differential can be provided by a separate suction device and can, therefore be excluded from the claim. However, the argument is meaningless.

As shown in the previous paragraphs, the omitted feature group includes structural features ("*in correspondence of a segment of said circumferential crown of holes*") characterizing the seed transportation device located in the seed distributor, e.g. the accurate-shaped recess in the movable portion 12. Consequently, the observations of the Patent Proprietor do not apply.

2.3 The opinion of the Patent Proprietor that the pneumatic suction chamber is not affected in any way by how the pneumatic suction is obtained is not correct.

Again, the structural requirement of the pressure differential feature has an impact on the specific arrangement/form of the suction chamber to implement the feature "*in correspondence of a segment of said circumferential crown of holes*". Thus, the pneumatic suction chamber cannot be considered isolated from the feature

> "*means for generating a pressure differential between said opposing surfaces in correspondence of a segment of said circumferential crown of holes*".

2.4 Finally, the statement of the Patent Proprietor that the skilled person would directly and unambiguously recognize that the presence of a seed collection chamber, a pneumatic suction chamber and a sowing disc with holes between the chambers implicitly discloses a pressure differential is equally not convincing. As shown in the previous paragraph, there is no obvious structural or functional relationship between the holes and the suction chamber or with respect to a pressure differential.

2.5 **In summary**, claim 1 as granted violates Art. 123 (2) EPC and the opposed patent must be revoked already for this reason.

The same conclusion also applies in view of the subject-matter of claim 10 of the patent as granted.

3. Art. 52(1), 54(2),(3) EPC - Lack of Novelty

The subject matter claimed in the opposed patent lacks novelty in view of several prior art documents:

3.1 Lack of novelty in view of Document D3

The opposed patent is not entitled to the filing date of the first priority application, IT-1. As a consequence, D3 is prior art in accordance with Art. 54 (3) EPC.

The patent is to be revoked, because D3 clearly discloses all features of claim 1 as granted.

3.2 Lack of novelty in view of Document D1

The Patent Proprietor is of the opinion that D1 does not disclose the feature that "*the thrust-bearing element is supported rotatably in the movable portion in order to withstand at least some of the axial load produced by the disc on the seal*".

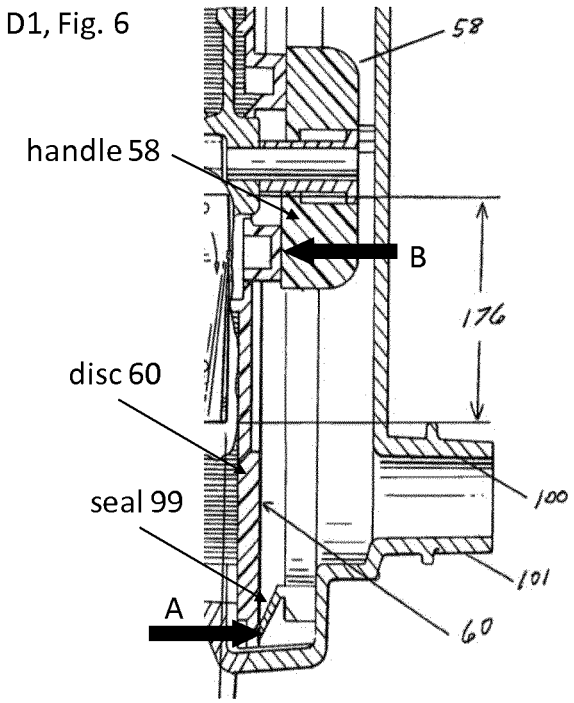
In the opinion of the Patent Proprietor, the handle is rotatably supported in the movable portion and the skilled person would never interpret claim 1 in the sense that the thrust-bearing element is arranged inside the movable portion.

The assessment of novelty as suggested by the Patent Proprietor is based on a misinterpretation of claim 1. It is common case law that in examination and opposition proceedings the value of future legal certainty is paramount. The claims define the matter for which protection is sought. There is no support for anything other than a strict definitional approach to ensure legally certainty in assessing patentability, in particular novelty and inventive step over the prior art (*see Case Law of the Boards of Appeal (2013), II. A. 6.3.2; also T 1279/04*). Thus, the assessment of claim 1 has to be based on the wording of the claim.

Claim 1 defines that the thrust-bearing element is supported rotatable in the moveable portion. The arrangement of D1 conforms to the wording of claim 1, because the handle 58 is supported by the rotatable retaining hub 56, and the location of the support is in the moveable portion. It is emphasized that claim 1 does not define that the thrust-bearing element is mounted on the movable portion, or the like. As such restriction is not defined in claim 1, the hub handle 58 is supported rotatably in the movable portion 90.

The Patent Proprietor is further of the opinion that the handle does not withstand any axial load produced by the disc on the seal. This conclusion is also incorrect. There is no question that the handle 58 retains the sowing disc 60 on the hub 56 as it locks the disc in position on the hub in the way of a fastening nut or a bayonet connector (see col. 5, lines 58-67). In order to retain the disk, it has to be capable of taking up some axial forces. The allegation that the handle is solid with the disc and the hub (since it retains the disc) and does not withstand the axial load is, therefore, without any basis.

The same applies in view of Patent Proprietor's allegation that the feature "*thrust-bearing element being supported in the movable part*" necessarily implies an interaction between the thrust-bearing element and the movable portion for that support. As one can take from the extract of Figure 6 shown below, the handle 58 and the disc 60 are two different elements, which is obvious from the different hatchings in the drawing.



As can be seen, a right-side surface of the disc 60 is in contact with a left-side surface of the handle 58 (see tip end of arrow 'B'). On the opposite side, the disc 60 is seated on the hub 56. When the disc is subjected to a suction force dragging the outer sections of the disc in the direction of the suction chamber (to the right in the direction of the movable portion), the disc begins to compress the seal in the outer sections of the movable portions.

The forces pressing against the seal are indicated with arrow 'A'. A support for these axial forces acting in the opposite direction is provided by the handle 58. The supporting forces are indicated with arrow 'B'. There is no other element to provide that function. Otherwise, the suction forces would move the disc from the hub 56 and drag the disc into the moveable portion.

Thus, it is beyond question that the handle 58 provides support for the disc in the axial direction and is, therefore, capable of taking up some of the load produced by the sowing disc.

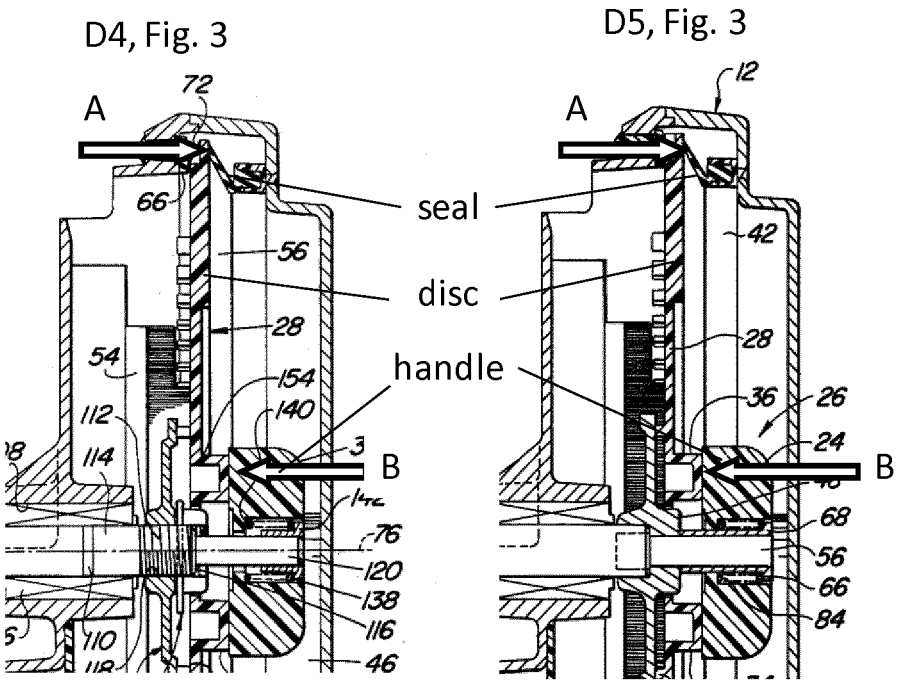
Considering the above, it shows that, in line with claim 1, the disc is rotatably supported (by hub 56 and handle 58) in the movable portion, wherein the support is capable of withstanding at least some axial load produced by the disc on the seal.

The disclosure of the remaining features has correctly not been disputed. Thus, D1 discloses all features of granted claim 1

3.3 Lack of novelty in view of Documents D4 and D5

As to documents D4 and D5, the allegation of the Patent Proprietor is the same as put forward with respect to D1.

As the below extracts of Figure 3 of D4 and Figure 3 of D5 show, both handles provide a support 'B' in the axial direction, wherein the support is capable of withstanding axial loads 'A' produced by the disc on the seal.



Thus, D4 and D5 both disclose the features of the characterizing part of granted claim 1. The anticipation of the remaining features of granted claim 1 by both documents has correctly not been disputed.

Hence, all features of claim 1 of the opposed patent are disclosed in D4 and D5. Claim 1 is therefore not novel in view of these documents.

3.4 Lack of novelty in view of Document D6

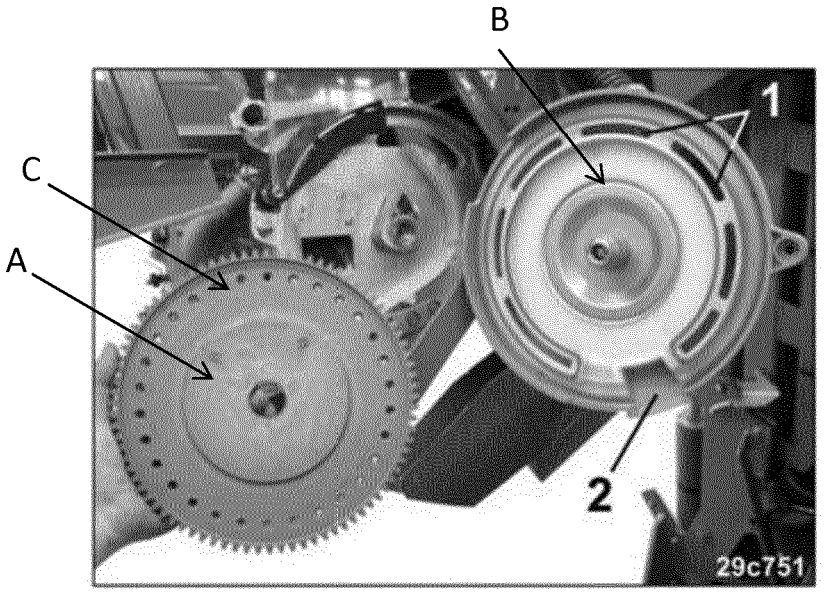
The manual D6 was available to the public prior to the priority date. Unlike estimated by the Patent Proprietor, it is not the date of the copyright that indicates the publication but the issue date which is dated 10.05 (October 2005). Even if the copyright would relate only to some parts of the manual, as deemed by the Patent Proprietor, that does not affect the issue date.

The allegation of the Patent Proprietor that D6 fails to disclose a motor-driven transmission shaft and merely shows a drive gear, is not convincing.

In supplementation to the arguments put forward in the Notice of Opposition, reference is made to Figure 39 on page 53, which shows that the drive gear engages with the toothing of the disc mounted in the fixed portion. According to page 53, 1st paragraph, the desired grain/seed spacing is set by adjusting the rotational speed of the sowing disc, wherein one can take from pages 88 to 90 that the desired grain/seed spacing is adjusted by manipulating the ratio of the transmission. Thus, the driving forces are transmitted to the sowing disc via a transmission. As Figure 39 further shows, the drive gear is compulsory rotationally supported in the seed distribution element and has an axial length. Hence, it has the same function as a transmission shaft.

Consequently, D6 discloses a sowing disc rotated by a transmission shaft within the meaning of claim 1. The observations of the Patent Proprietor in this regard are, therefore, groundless.

As to the support for the disc, the Patent Proprietor states that the disc is merely supported on the seal. As shown below in Figure 40 of D6, the central area of the movable part has a plate-like circular section 'B' projecting towards the disc.



The sowing disc has a central section, indicated with 'A' that protrudes towards the section 'B' in the movable part. On the contrary, the part of the disc where the seal is supposed to engage (section 'C') is a recessed section.

Even if there is was no axial support for the disc on the mounting shaft of the movable part, section 'A' is in consideration of the recessed section 'C' formed in such way that it cannot be ruled out that section 'A' abuts section 'B', in particular, when the seal is compressed. Thereby, the contact areas will withstand some of the axial loads.

Accordingly, D6 deprives claim 1 of novelty as well.

The arguments concerning the novelty of claim 1 apply *mutatis mutandis* for the subject-matter of claim 10, which is also not novel.

4. Art. (52), 56 EPC - Lack of inventive step

The subject matter claimed in the opposed patent lacks inventive step in view of D7 as the closest prior art:

4.1 The closest prior art for assessing inventive step is the prior art document disclosing subject matter conceived for the same purpose or aiming at the same objective as the claimed invention and having the most relevant technical features in common, i.e. requiring the minimum of structural modifications (*see Case Law of the Board of Appeal (2013), I. D. 3.1, also Guidelines for Examination at the EPO, G-VII, 5.1*).

It is not uncommon that there are several starting points for the assessment of inventive step, in particular when the skilled person can start from different documents, which might lead to the invention. It is sufficient to show, on the basis of one relevant piece of prior art in respect of at least one of these solutions, that the claimed subject-matter lacks an inventive step. In such a situation, there is no need to discuss which document is "closest" to the invention; the only relevant question is whether the document used is a feasible starting point for assessing inventive step. This is valid even if the problem identified in a problem-and-solution approach may be different from the one identified by the applicant/Patent Proprietor (see *Guidelines for Examination at the EPO, G-VII, 5.1 with reference to T 967/97, T 558/00, T 21/08, T 308/09 and T 1289/09*).

4.2 Taking D7 as closest prior art in line with the above principles, it shows that D7 merely differs from claim 1 of the opposed patent in that no seal is disclosed in the movable portion that is capable of sliding contact with

the facing surface of the disc when the portions are closed against each other.

4.3 The objective technical problem underlying the opposed patent resides in providing an effective pneumatic seal between the face of the disc and the pneumatic suction chamber (see B1, column 1, lines 28 to 31).

4.4 The alleged solution is provided by claim 1.

However, the solution is rendered obvious by D7 in combination with the technical skills of the skilled person or in combination with D8, which discloses a seal arranged in sliding contact with a seed selection disc. Reference is this regard is made the arguments put forward in the Notice of Opposition.

The result of the combination is a seed distribution element within the meaning of claim 1 of the opposed patent. Claim 1 as granted, therefore, lacks an inventive step

The arguments concerning the inventive step of claim 1 apply *mutatis mutandis* for the subject-matter of claim 10, which is also not inventive.

5. Conclusion

As shown above in detail, the opposed patent does not validly claim the priority of IT1.

Further, the subject-matter of the opposed patent extends beyond the content of the application as filed, is not new and does not involve an inventive step.

In view of the above findings, the request for revocation of the opposed patent in its entirety is fully substantiated.

The request for oral proceedings in accordance with Article 116 EPC is also maintained.

Albrecht v. Menges
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Martin D. Jacob
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Date: 29.04.2016

Reference	Application No./Patent No.
E 98381 OPPO 01	11779702.7 - 1656 / 2637492
Applicant/Proprietor: Maschio Gaspardo S.p.A.	

BRIEF COMMUNICATION

Subject:
- ☐ Your letter of
- ☐ Our telephone conversation of
- ☐ Communication of
- ☐

Enclosure(s):
- ☒ Letter from the proprietor of the patent of 22.04.2016
- ☐ Letter from the opponent of
- ☐ Copy (copies)

Communication:

☐ A letter from the opponent /proprietor was received on ..... . The documents specified as patent documents in this letter are available via the European Patent Register at **www.epo.org/register.** Should you wish to receive these documents in paper format, they will be supplied to you free of charge if specifically requested on receipt of this communication (OJ EPO 2009, 434).

☐

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Date
26.04.2016

Reference	Application No./Patent No.
PBP11900-EP	11779702.7 - 1656 / 2637492
Applicant/Proprietor	
Maschio Gaspardo S.p.A.	

BRIEF COMMUNICATION

Subject:
- ☐ Your letter of
- ☐ Our telephone conversation of
- ☐ Communication of
- ☐

Enclosure(s):
- ☐ Letter from the proprietor of the patent of
- ☒ Letter from the opponent O1 of 31.03.2016
- ☒ Copy (copies) EPO Form 2575 of 26.04.2016

Communication:

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Date
26.04.2016

Reference	Application No./Patent No.
E 98381 OPPO 01	11779702.7 - 1656 / 2637492
Applicant/Proprietor	
Maschio Gaspardo S.p.A.	

Communication of amended entries in the Register of European Patents

It is confirmed that, according to the request dated 31.03.2016

1. ☐ the name
   ☐ the address
   ☐ of the (co-)applicant / patentee,
   ☐ of the opponent

   as from , has/have been amended as follows:

2. ☐ the appointment of a representative
   ☐ the authorisation
   ☐ the withdrawal from representation
   ☒ the change of name of the association

   has/have been registered as from 01.04.2016 .

Enclosure(s):

For the Opposition Division / For the Legal Division *)

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*) See note.

Note
This communication is issued by/for the department with whom responsibility lies. The Legal Division is responsible for the registration of transfers, changes of name (Articles 71, 72 and 74 EPC and Rules 22 and 85 EPC) as well as for the rectification of the designation of the inventor (Rule 21 EPC) (see Decision of the President of the EPO, OJ EPO 2013, 600). In all other cases, the Opposition Division is responsible.

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Acknowledgement of receipt

We hereby acknowledge receipt of the following submission by the proprietor:

Submission number	4290559
Application number	EP11779702.7
Patent number	EP2637492
Date of receipt	22 April 2016
Your reference	PBP11900-EP
Proprietor	Maschio Gaspardo S.p.A.
Title	SEED DISTRIBUTION ELEMENT FOR PRECISION SEED DRILLS, SEED DRILL INCLUDING SAID ELEMENT.
Documents submitted	package-data.xml ep-oppo.pdf (2 p.)
	ep-opposition-data.xml OBSO3.pdf\Observation of the proprietor.pdf (10 p.)
Submitted by	CN=Davide Locas 24895
Method of submission	Online
Date and time receipt generated	22 April 2016, 18:20 (CEST)
Message Digest	7C:64:AC:58:88:2C:20:CB:EB:E8:2F:09:14:B9:33:B5:69:95:05:09

Correction by the EPO of errors in debit instructions filed by eOLF

Errors in debit instructions filed by eOLF that are caused by the editing of Form 1038E entries or the continued use of outdated software (all forms) may be corrected automatically by the EPO, leaving the payment date unchanged (see decision T 152/82, OJ EPO 1984, 301 and point 6.3 ff ADA, Supplement to OJ EPO 10/2007).

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Submission in opposition proceedings

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- representing the proprietor(s):	Maschio Gaspardo S.p.A.
Proprietor/representative's reference	PBP11900-EP

The information given below is pertaining to the following patent in opposition proceedings:

Patent No.	EP2637492
Application No.	EP11779702.7
Date of mention of the grant in the European Patent Bulletin (Art. 97(3), Art. 99(1) EPC)	03 December 2014
Title of the invention	SEED DISTRIBUTION ELEMENT FOR PRECISION SEED DRILLS, SEED DRILL INCLUDING SAID ELEMENT.
Proprietor of the patent	Maschio Gaspardo S.p.A.

Requests:

- Oral proceedings are hereby requested auxiliarily.
- Interpreting is requested in the following languages:
  - listening in: **English**
  - speaking in: **English**

Documents attached:

	Description of document	Original file name	Assigned file name
1	Reply of the patent proprietor to the notice(s) of opposition	Observation of the proprietor.pdf	OBSO3.pdf

Signatures

Place:	**Padova - ITALY**
Date:	**22 April 2016**
Signed by:	**Davide Locas 24895**
Representative name:	**Davide LOCAS**
Capacity:	**(Representative)**

OBSERVATIONS OF THE PROPRIETOR TO THE NOTICE OF OPPOSITION

Further to the Communication of the Opposition Division dated October 12, 2015 the following observations to the Notice of Opposition filed by Precision Planting LLC against European Patent n. 2330080 (in the following "the Patent") are hereby submitted.

Requests

It is requested to maintain the Patent as granted.

As an auxiliary request, should the Opposition Division, at the end of the written proceedings, be intended to revoke the Patent, oral proceedings under Art. 116 are requested.

Grounds of Opposition

Revocation of the Patent has been requested by the Opponent on the basis of Articles 100a (lack of novelty and inventive step) and 100c (extension beyond the content of the application as filed).
Priority of claim 1 has also being objected by the Opponent, arguing that such claim is only entitled to the filing date of the European Patent Application.

Priority

According to the Opponent's opinion, the Patent at issue would not be entitled to the right of priority since the feature of comprising:
means for producing a pressure differential between the opposed surfaces in the region of a circumferential segment of the ring of holes
would be omitted in claim 1 as granted of the Patent.
According to well established case law, omission of a feature does not affect the validity of priority if the omitted features cannot be considered as essential from the priority document. To this regard,

it should be also noted that the mere fact that a feature is present in the independent claim does not make it essential (as stated in T 515/00 - the skilled person would not have reason to assume that they were essential merely because they were present in claim 1 of the priority document).

As a matter of fact, nowhere in the description of the priority document such means are described in detail, and no passage cannot even suggest that they are essential.

The arguments of the Opponent are based on a single passage of a paragraph rather than the latter considered in the whole, in which it is actually stated that:

For the correct functioning of such distributors it is necessary to ensure an effective pneumatic seal between the face of the disc that is subjected to suction and a seal which delimits the pneumatic suction chamber. The suction effect itself effects a substantial compression of the disc against the seal. If on the one hand this ensures adequate adherence of the seal to the disc surface which is subjected to negative pressure, on the other hand it involves severe abrasion of the seal which limits the effective service life thereof. It is therefore necessary periodically to replace the seal in order to prevent sowing errors arising from insufficient depressurization of the suction chamber.

Therefore it is not correct to affirm that the feature of comprising means for producing a pressure differential is indispensable for the function of the invention in light of the technical problem.

In fact, the person skilled in the would directly and unambiguously recognize that what is really required in a seed distribution element is the presence of a pneumatic suction chamber irrespective on how the differential of pressure is provided.

As a matter of fact it is absolutely clear that the problem of abrasion of the seal is connected to the presence of the pneumatic suction chamber (which is both present in claim 1 of the Patent and in the priority document), as indicated also in the previously cited paragraph of the priority document.

To this regard, it seems also appropriate to recall that in the cited paragraph explicit reference is made to the pneumatic suction chamber and not to any *means for producing a pressure differential*.

In conclusion, irrespective of the different wording, since all essential features are present both in claim 1 of the Patent and it accordingly it should be concluded that both the Patent and the priority document relate to the same invention, thus fulfilling the condition for a valid priority claim.

It should be also noted that the priority document clearly states that a the pressure differential is produced by a suction device (which would be directly and unambiguously recognized by the skilled person as the means for producing a pressure differential) that is not part of the seed distribution element. In fact, the suction device is clearly represented in Fig. 2 with the reference number 9 as a distinct element from the seed distributors.

Therefore, the person skilled in the art would never recognize as essential a feature comprising components which are not part the claimed invention.

It is also evident that the same arguments also apply to claim 10 of the Patent.

Extension of subject matter

According to the Opponent's opinion, the omission in claim 1 of the feature that *a pressure differential is provided between the opposed*

surfaces in the region of a circumferential segment of the ring of holes (23) would not fulfil the requirements of Art. 123(2).

According to the Guidelines, H-V, 3.1, and to well established case law, the removal of a feature from a claim does not violate Art. 123(2) if the skilled person would directly and unambiguously recognise that:

(i) the feature was not explained as essential in the disclosure;
(ii) the feature is not, as such, indispensable for the function of the invention in the light of the technical problem the invention serves to solve; and
(iii) the replacement or removal requires no real modification of other features to compensate for the change.

In the present case, no element in the description could make the skilled person believe that the presence of the pressure differential is essential for the reason already explained in the previous paragraphs. Furthermore, since the invention relates to the technical problem of limiting the operations required in order to replace the seal in a seed distribution element, no connection between such problem and the provision of a pressure differential can be envisaged.

Also, a person skilled in the art is well aware that the pressure differential can be provided (as typically occurs) by a suction device which not part of the seed distribution element per se and, accordingly, it can be surely excluded that the removal of the feature in issue requires any modification to the structure of the seed distribution element. In particular, the pneumatic suction chamber is not affected in any way by how the pneumatic suction is obtained. Also, the person skilled in the art would directly and unambiguously recognize that it is implicitly disclosed that a pressure differential is provided – during operation of the distribution element - by the presence of a seed collection chamber,

a pneumatic suction chamber and a sowing disc with holes interposed between the chambers.

It is evident that the same arguments also apply to claim 10 of the Patent.

Non-patent literature cited by the Opponent

With respect to document D6 and to their relevance in connection to the assessment of inventive step, it should be stressed out the fact that the opponent did not provide specific details of what was made available to the public and when.

The mere fact that document D6 reports a copyright date of 2005 does not necessarily means that the whole document has been drafted in 2005 or any case that its whole content has been made available to public in 2005.

As a matter of fact the copyright date could refer only to some part of the information in the manual, e.g. being the date of first issue of the manual, which that can be amended in the form presented by the Opponent only successively.

Since only the Opponent had access to the information relating to D6, only a "complete chain of proof" - which is lacking in the present case - would suffice to establish that the manual actually forms part of the prior art.

Therefore, the Opponent failed to prove beyond any reasonable doubt that document D6 was available to the public before the priority date of the Patent (or even its filing date).

Accordingly, document D6 should be disregarded in the evaluation of novelty and inventiveness of the Patent.

Novelty

Contrarily to the Opponent's opinion Document D1 does not discloses the feature that the *thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24)*.

More precisely, in D1 comprises a handle 58 attached to a distal end of the retaining hub for retaining the seed disc. As stated in col. 5, lines 64-66 the handle is rotatable between a first position for receiving or removing a seed disc and a second position for removably retaining the disc.

Therefore, the handle of D1 cannot be considered a thrust-bearing element supported rotatably in the movable portion in order to withstand at least some of the axial load produced by the disc on the seal.

As a matter of fact, irrespective of the interpretation of the feature *supported in*, contrarily to the Opponent's opinion, the handle does not withstand any of the axial load produced by the disc on the seal. In fact, the handle is solid with the disc and the hub (since it retains the disc) and accordingly it does not withstand the load produced by the disc on the seal.

In any case, the person skilled in art would never interpret claim 1 in the sense that the thrust-bearing element is merely arranged inside the movable portion.

Claim 1 recited that the *thrust-bearing element is supported rotatably in the movable portion in order to withstand at least some of the axial load produced by the disc on the seal*.

It is therefore clear that the feature of being rotatably supported in the movable portion and the feature of withstanding some load are

link, therefore suggesting an interaction between the movable portion and the thrust-bearing element. On contrary, by interpreting the claim in the sense that the thrust-bearing in merely arranged inside the movable portion, no link would exist between the load withstanding feature and support in the movable portion.

This is also clear by considering document D1 in which the feature of being rotatably supported in the movable portion and the alleged feature of being capable of withstanding some load and not linked in any way.

Basically, the Opponent interpreted claim 1 such as it recites:
the thrust-bearing element is supported rotatably in the movable portion; and
the thrust-bearing element withstand at least some of the axial load produced by the disc on the seal
which is obviously not the case of the Patent in issue.

In conclusion the person skilled in art would interpret claim 1 by considering that the feature of withstanding some load is achieved by the fact of the thrust-bearing element being supported in the movable part. This necessarily implies an interaction between the thrust-bearing element and the movable part, such as being mounted on the movable portion, as e.g. specified at the end of par. [0018] of the Patent.

Similar considerations also applies to document D4, D5 comprising a handle retaining the disc.

With reference to D6, notwithstanding the lack of proofs of its availability, it should be first of all noted that it does not discloses a motor-driven transmission shaft rotated at controlled speed a sowing disc.

It can be clearly seen from e.g. Fig. 39 in page 53 that the sowing disc is toothed and it is driven by a gear provided in the fixed portion.

Furthermore document D6 fails to disclose any thrust-bearing element withstand at least some of the axial load produced by the disc on the seal.

As it can be clearly seen in page 53, Fig. 40 the sowing disc is provided with a hole having a cylindrical surface (i.e. not having any locking element such as a seat for a key) in the centre for supporting it in the shaft. By comparing Fig. 39 and Fig. 40 a person skilled in the art would deduct that the sowing disc can freely rotate and slide on the shaft.

Therefore, the only element on which the faces of the sowing disc can rest during rotation is the seal. This is also confirmed by the fact the seal appears clearly projection in Fig. 40, as confirmed by the shadow projected therefrom. On the contrary the central portion on which the shaft is provided appears the farthest away from the disc. Therefore, the load is entirely withstood by the seal.

This is opposite from what it is stated by the Opponent according to whom one of the transition between two sections of different diameter takes up at least some of the load. Nevertheless no element suggests that any of this transition interacts with the movable portion in order to withstand some load.

In any case, this is neither explicitly nor implicitly disclosed in D6 and accordingly the subject matter of claim 1 should be considered new over D6.

As per document D3, since the claim 1 is entitled to the right of priority, it does not represent a prior art document according to art. 54(3).

Inventive step

According to the Guidelines and to the case law the first step for the assessment of the inventive step is the identification of the closest prior art.

The Opponent does not contest the fact that D1 can be considered the closest prior art (see page 12 of the Notice of Opposition) but fails to explain why D7 can be considered the closest prior art in their inventive step attacks.

As a matter of fact D7 would never represent the closest prior art for the present invention since it fails to disclose a seal and, on the contrary, the Patent is directed to problem of avoiding excessive wear of the seal.

In any case, a person skilled in the art would never be prompted to modify the seed distributor of D7 by including a seal in order to reduce the wear therefore. As a matter of fact, no wear of the seal can occur if the seal is not even present and therefore the person skilled in the art would not be prompted to introduce such modification in D7 either by considering the common general knowledge or by the disclosure of D8.

In conclusion, the subject matter of claim 1 of the opposed patent involves an inventive step.

Dependent claims

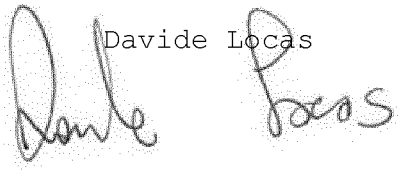
With reference to dependent claims 2 to 11, as they incorporate the subject matter of independent claim 1, they are also to be regarded novel and involving an inventive step.

Conclusions

In view of the arguments set forth above, it is believed that the Patent has not been amended beyond the content of the application as filed and that the invention as claimed is new and inventive over the cited prior art.
Therefore we request that the Patent be maintained.

The representative

CANTALUPPI & PARTNERS
Davide Locas



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European Patent Office
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11779702.7 - 1656 / 2637492 13.04.16

Client Database System (CDS) - clean up.

Application Nr.: 11779702.7

Following clean up action in CDS the entries concerning the **Representative for the opponent (association) (01)** have been amended and are now as follows:

Where appropriate, the European Patent Register at www.epo.org/register will be updated to show the amended details.

Questions about this communication? Contact Customer Services at www.epo.org/contact.

Europäisches Patentamt
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Antrag auf Änderung eines Zusammenschlusses von zugelassenen Vertretern

Europäisches Patentamt München
04. April 2016
Dir. 5.2.3

vorbehaltlich der Eingangskontrolle nach Regel 35(2) EPÜ eingegangen am
01. April 2016
82 EPO - Munich

Europäisches Patentamt
Direktion 5.2.3 – Rechtsabteilung
80298 München
DEUTSCHLAND

Name des Zusammenschlusses

Uexküll & Stolberg Patentanwälte

Registriernummer

1

Anschrift

Beselerstraße 4
22607 Hamburg

I. Antrag auf Änderung der Zusammensetzung

☐ Wir beantragen die Registrierung der Änderung der Mitgliederzusammensetzung des Zusammenschlusses zum Zeitpunkt des Eingangs dieses Antrags beim EPA oder zu einem späteren Datum, nämlich

Datum

Eintritt von (ggf. siehe Zusatzblatt)

Name	*Vorname*	*Vertreternummer*	*Unterschrift*	*Datum*

Austritt von (ggf. siehe Zusatzblatt)

Name	*Vorname*	*Vertreternummer*	*Unterschrift*	*Datum*

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Name	*Vorname*	*Vertreternummer*	*Unterschrift*	*Datum*

EPA 52305 12.12

II. Antrag auf Änderung des Namens

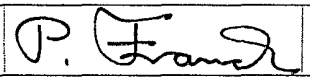
☒ Wir beantragen die Registrierung der Änderung des Namens des Zusammenschlusses zum Zeitpunkt des Eingangs dieses Antrags beim EPA oder zu einem späteren Datum, nämlich

Datum

Der neue Name lautet

Uexküll & Stolberg Partnerschaft von Patent- und Rechtsanwälten mbB

☒ Bestätigung durch mindestens ein Mitglied des Zusammenschlusses (ggf. siehe Zusatzblatt)

Name	*Vorname*	*Vertreternummer*	*Unterschrift*	*Datum*
Franck	Peter	00059660		31.03.2016

III. Antrag auf Änderung der Anschrift

☐ Wir beantragen die Registrierung der Änderung der Anschrift des Zusammenschlusses zum Zeitpunkt des Eingangs dieses Antrags beim EPA oder zu einem späteren Datum, nämlich

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Die neue Anschrift lautet

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Name	*Vorname*	*Vertreternummer*	*Unterschrift*	*Datum*

IV. Anzahl der Anlagen (z. B. Zusatzblatt für weitere Mitglieder) ☐

EPA 52305 12.12

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European Patent Office
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UEXKÜLL & STOLBERG
Patentanwälte
Beselerstrasse 4
22607 Hamburg
ALLEMAGNE

Date
18.02.2016

Reference	Application No./Patent No.
E 98381 OPPO 01	11779702.7 - 1656 / 2637492
Applicant/Proprietor	
Maschio Gaspardo S.p.A.	

BRIEF COMMUNICATION

Subject:
- ☐ Your letter of
- ☐ Our telephone conversation of
- ☐ Communication of
- ☐

Enclosure(s):
- ☐ Letter from the proprietor of the patent of
- ☐ Letter from the opponent of
- ☒ Copy (copies) EPO Form 2944C of 18.2.2016

Communication:

☐ A letter from the opponent /proprietor was received on ..... . The documents specified as patent documents in this letter are available via the European Patent Register at **www.epo.org/register.** Should you wish to receive these documents in paper format, they will be supplied to you free of charge if specifically requested on receipt of this communication (OJ EPO 2009, 434).

☐

For the Opposition Division

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☐ **Registered letter**

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European Patent Office
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Locas, Davide
Cantaluppi & Partners S.r.l.
Piazzetta Cappellato Pedrocchi, 18
35122 Padova
ITALIE

Date
18.02.2016

Reference	Application No./Patent No.
PBP11900-EP	11779702.7 - 1656 / 2637492
Applicant/Proprietor	
Maschio Gaspardo S.p.A.	

Extension of time limit pursuant to Rule 132 EPC

Opposition procedure

With reference to your request, the time limit for replying to the communication dated 12.10.2015 . . . has been extended

by 2 months

to a total of 6 months

from the date of notification of the above-mentioned communication.

Please note: To the extent that your request exceeded the above extension, your request has been refused.

Note:
The granting of extensions to time limits is governed by the Implementing Regulations to the EPC and the Guidelines for Examination in the EPO, E-VII, 1.6. A request for extension, which would result in the total period set exceeding six months, must be reasoned and supported by evidence.

If no reply to the communication is received in due time, the procedure will be continued. Attention is drawn to Article 114(2) EPC.

For the Opposition Division

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CANTALUPPI & PARTNERS
PROPRIETA' INDUSTRIALE
INTELLECTUAL PROPERTY

PADOVA – ROMA – MILANO – BRESCIA

Stefano Cantaluppi
Barbara Saguatti
Stefano Fabris
Carlo Susanetto
Mario Leone
Marco Spadaro
Eva Camparelli
Caroline Côme
Domenico Martinelli
Sara Morabito
Arianna Benetiin
Beatrice Finizia
Davide Locas
Luisa Curràdo
Mónica Faia
Emanuela Rota
Valeria Ghirardi
Marco Prendin

In cooperation with
MÜLLER &
SCHUBERT
Munich – Berlin

EUROPEAN PATENT OFFICE
Erhardtstrasse, 27
D-80469 MÜNCHEN
GERMANY

By fax

Padova, 12 February 2016

Your ref.: EP 2637492
Our ref.: PBP11900-EP DL/ms (mg)

Re: European Patent No. 2637492
European Patent Application No. 11779702.7
Applicant: MASCHIO GASPARDO S.p.A.

The undersigned hereby requests two months extension of the term for responding to the communication issued in connection with the above identified patent on 12.10.2015.

Yours faithfully,

CANTALUPPI & PARTNERS
Davide Locas

MASCHIO GASPARDO\PBP11900-EP-OPPOSIZIONE\20160212 Fax a EPO - RICH PROROGA

Duration: 12.02.2016 15:24:16 - 12.02.2016 15:24:30. This page 1 of 1 was completed at 12.02.2016 15:24:30
Received at the EPO on Feb 12, 2016 15:24:30. Page 1 of 1
Page 683 of 1596 Precision Exhibit 1005

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Questions about this communication ?
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Locas, Davide
Cantaluppi & Partners S.r.l.
Piazzetta Cappellato Pedrocchi, 18
35122 Padova
ITALIE

Date
12.10.2015

Reference	Application No./Patent No.
PBP11900-EP	11779702.7 - 1656 / 2637492
Applicant/Proprietor	
Maschio Gaspardo S.p.A.	

Communication of notices of opposition (R. 79(1) EPC)

Notice of opposition has been filed within the opposition period by:

01.
Precision Planting LLC
23207 Townline Road
Tremont, IL 61568
ETATS-UNIS D'AMERIQUE

The notice of opposition indicated above has already been communicated to you.

You are requested to file your observations within a period of **four months** from notification of this communication.

You may also file amendments, where appropriate, to the description, claims and drawings within the period specified. One set of these documents is to be filed.

If you introduced documents which have not yet been mentioned during the proceedings, your attention is drawn to Rule 83 EPC.

Enclosures:

For the Opposition Division

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Registered letter
EPO Form 2317A 12.07 (02/10/15) OBSO

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UEXKÜLL & STOLBERG
Patentanwälte
Beselerstrasse 4
22607 Hamburg
ALLEMAGNE

Date
12.10.2015

Reference	Application No./Patent No.
E 98381 OPPO 01	11779702.7 - 1656 / 2637492
Applicant/Proprietor	
Maschio Gaspardo S.p.A.	

Communication of further notices of opposition pursuant to Rule 79(2) EPC

No further opposition has been filed.

If oral proceedings are to take place, parties are advised to check the electronic file via the European Patent Register at **www.epo.org/register** in advance of the hearing to ensure that they are in possession of all relevant documents. (OJ EPO 2009, 434)

A copy of the communication pursuant to Rule 79(1) EPC sent to the proprietor of the patent is enclosed for your information.

The patent proprietor's (proprietors') observations on the notice of opposition to the above-mentioned patent will be communicated to the opponent without delay. A time limit for reply will be fixed if the Opposition Division considers this expedient.

If no reply to a communication is received within the time limit set, the proceedings will be continued. Your attention is drawn to Article 114(2) EPC.

For the Opposition Division

Enclosures: copy of the communication pursuant to Rule 79(1) EPC (Form 2317A)

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European Patent Office
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European Patent Office
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Questions about this communication ?
Contact Customer Services at www.epo.org/contact

Locas, Davide
Cantaluppi & Partners S.r.l.
Piazzetta Cappellato Pedrocchi, 18
35122 Padova
ITALIE

Date
11-09-2015

Reference	Application No./Patent No.
PBP11900-EP	11779702.7 - 1656 / 2637492
Applicant/Proprietor	
Maschio Gaspardo S.p.A.	

BRIEF COMMUNICATION

Subject:
- ☐ Your letter of
- ☐ Our telephone conversation of
- ☐ Communication of
- ☐

Enclosure(s):
- ☐ Letter from the proprietor of the patent of
- ☒ Letter from the opponent O1 of 03.09.2015
- ☒ Copy (copies) EPO Form 2911O dated 09.09.2015

Communication:

☐ A letter from the opponent /proprietor was received on ..... . The documents specified as patent documents in this letter are available via the European Patent Register at **www.epo.org/register.** Should you wish to receive these documents in paper format, they will be supplied to you free of charge if specifically requested on receipt of this communication (OJ EPO 2009, 434).

☐

For the Opposition Division

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☒ **Registered letter**

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Locas, Davide
Cantaluppi & Partners S.r.l.
Piazzetta Cappellato Pedrocchi, 18
35122 Padova
ITALIE

Date
10-09-2015

Reference	Application No./Patent No.
PBP11900-EP	11779702.7 - 1656 / 2637492
Applicant/Proprietor	
Maschio Gaspardo S.p.A.	

Communication of a notice of opposition

You are hereby informed of a notice of opposition to the European patent specified above (see attached copy in the enclosure). The documents specified as patent documents in the notice of opposition are available for inspection via the European Patent Register at **www.epo.org/register**. Should you wish to receive these documents in paper format, they will be supplied to you free of charge if specifically requested on receipt of this communication (see OJ EPO 2009, 434).

If oral proceedings are to take place, parties are advised to check the electronic file via European Patent Register in advance of the hearing to ensure they are in possession of all relevant documents.

An invitation to file observations and to file amendments, where appropriate, to the description, claims and drawings (R. 79(1) EPC) will be issued separately.

The period within which such observations may be filed will not be fixed until the following conditions are met:

(a) the opposition period has expired;

(b) the notice of opposition has been examined for certain formal requirements (R. 77 EPC).

For the Opposition Division

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Enclosure: Notice of opposition O1: Precision Planting LLC & enclosures (D6 & IT1-EN)

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UEXKÜLL & STOLBERG
Patentanwälte
Beselerstrasse 4
22607 Hamburg
ALLEMAGNE

Date: 09.09.2015

Reference	Application No./Patent No.
E 98381 OPPO 01	11779702.7 - 1656 / 2637492
Applicant/Proprietor: Maschio Gaspardo S.p.A.	

BRIEF COMMUNICATION

Subject:
- [X] Your letter of 03.09.2015 corrected version of notice of opposition filed on behalf of Precision Planting LLC
- [ ] Our telephone conversation of
- [ ] Communication of

The opponent, Precision Planting LLC, obtained the status of an opponent against the above-mentioned European patent with the first filng of the opposition on 02.09.2015. In that version, the opponent's name was not entirely clear, because Precision Planting LLC was mentioned on F.2300 and in the text on page 1 of the enclosed arguments, but on top of that first page of the arguments another name (Monsanto International SARL) was indicated.

The second notice of opposition filed on behalf of Precision Planting LLC on 03.09.2015 is not regarded as a new opposition, because an opponent's status can be obtained only once by the same opponent (T9/oo and T966/02), but as a corrected version, in which the opponent's name, Precision Planting, is mentioned on EPO Form 2300 and in the text and also on top of the first page of the arguments. The corrected version was filed within the opposition period. Therefore the correction under Rule 139 EPC is allowable, as the opponent's name has been entirely clarifed before expiry of the opposition period.

For the payment of the opposition fee, two debit orders were filed, one on 02.09.2015, the second on 03.09.2015. The opponent in his letter of 03.09.2015 requested the refund of the opposition fee paid on 02.09.2015. The Treasury and Accounts Department of the EPO has been informed that the opposition fee is to be debited only once, based on the debit of 02.09.2015, the date on which the opponent's status was acquired. In case the second debit order was already executed, the opposition fee paid on 03.09.2015 will be refunded to the opponent's representative, because the second payment has no legal basis.

For the Opposition Division

Europäisches Patentamt • European Patent Office • Office européen des brevets

[X] **Registered letter**

Europäisches Patentamt
European Patent Office
Office européen des brevets

Acknowledgement of receipt

We hereby acknowledge receipt of the Notice of Opposition:

Submission number	3742691
Application number	EP11779702.7
Patent number	EP2637492
Date of receipt	03 September 2015
Your reference	E 98381
Opponent	Precision Planting LLC
Title	SEED DISTRIBUTION ELEMENT FOR PRECISION SEED DRILLS, SEED DRILL INCLUDING SAID ELEMENT

Documents submitted

package-data.xml	ep-opposition-data.xml
ep-oppo.pdf (5 p.)	OPPO.pdf\98381 EPO Notice of Opposition.pdf (38 p.)
Published-Evidence-1.pdf\D1_US_07228807_B1.pdf (15 p.)	Published-Evidence-2.pdf\D2_EP_00536543_A1.pdf (9 p.)
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Title	SEED DISTRIBUTION ELEMENT FOR PRECISION SEED DRILLS, SEED DRILL INCLUDING SAID ELEMENT
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Opponent/representative's reference	E 98381

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Proprietor of the patent	Maschio Gaspardo S.p.A.

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- Oral proceedings are hereby requested auxiliarily.

Documents attached:

	Description of document	Original file name	Assigned file name
1	Any annexes (other than citation) to an opposition letter - <other document>	98381 EPO further submission 03.09.pdf	OTHER-1.pdf

Signatures

Place: **Hamburg**

Date:	03 September 2015
Signed by:	Malte Frese 41443
Association:	Uexküll & Stolberg
Representative name:	Malte Frese
Capacity:	(Representative)

Betriebsanleitung

AMAZONE

Einzelkorn-Sämaschine

ED 302 ED 452
ED 452-K ED 602-K ED 902-K



MG 1234
BAH0002 10.05
Printed in Germany

Lesen und beachten Sie diese Betriebsanleitung vor der ersten Inbetriebnahme! Für künftige Verwendung aufbewahren!

D A CH

ES DARF NICHT

unbequem und überflüssig erscheinen, die Gebrauchs-Anweisung zu lesen und sich danach zu richten; denn es genügt nicht, von anderen zu hören und zu sehen, dass eine Maschine gut sei, sie daraufhin zu kaufen und zu glauben, es gehe nun alles von selbst. Der Betreffende würde alsdann nicht nur sich selbst Schaden zufügen, sondern auch den Fehler begehen, die Ursache eines etwaigen Misserfolges auf die Maschine anstatt auf sich zu schieben. Um des guten Erfolges sicher zu sein, muss man in den Geist der Sache eindringen, bzw. sich über den Zweck einer jeden Einrichtung an der Maschine unterrichten und sich in der Handhabung Übung verschaffen. Dann erst wird man sowohl mit der Maschine als auch mit sich selbst zufrieden sein. Das zu erreichen, ist der Zweck dieser Gebrauchs-Anweisung.

Leipzig-Plagwitz 1872. Rud. Sark.

Identifikationsdaten

Hersteller:	**AMAZONEN-WERKE** H. DREYER GmbH & Co. KG
Maschinen-Ident-Nr.:	
Typ:	**ED**
Zulässiger Systemdruck bar:	Maximal 200 bar
Baujahr:	
Werk:	
Grundgewicht kg:	
Zulässiges Gesamtgewicht kg:	
Maximale Zuladung kg:	

Hersteller-Anschrift

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Ersatzteil-Bestellung

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E-mail: et@amazone.de

Ersatzteil-Katalog-Online: www.amazone.de

Bei der Bestellung von Ersatzteilen bitte immer die Maschinen-Nummer Ihrer Maschine angeben.

Formales zur Betriebsanleitung

Dokumenten-Nummer:	MG 1234
Erstelldatum:	10.05

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Vorwort

Sehr geehrter Kunde,

Sie haben sich für eines unserer Qualitätsprodukte aus der umfangreichen Produktpalette der AMAZONEN-WERKE, H. DREYER GmbH & Co. KG entschieden. Wir danken Ihnen für das in uns gesetzte Vertrauen.

Stellen Sie bitte beim Empfang der Maschine fest, ob Transportschäden aufgetreten sind oder Teile fehlen! Prüfen Sie die Vollständigkeit der gelieferten Maschine einschließlich der bestellten Sonderausstattungen anhand des Lieferscheins. Nur sofortige Reklamation führt zum Schadenersatz!

Lesen und beachten Sie vor der ersten Inbetriebnahme diese Betriebsanleitung, insbesondere die Sicherheitshinweise. Nach dem sorgfältigen Lesen können Sie die Vorteile Ihrer neuerworbenen Maschine voll nutzen.

Stellen Sie bitte sicher, dass alle Bediener der Maschine diese Betriebsanleitung lesen, bevor die Maschine von ihnen in Betrieb genommen wird.

Bei eventuellen Fragen oder Problemen, lesen Sie bitte in dieser Betriebsanleitung nach oder rufen Sie uns einfach an.

Regelmäßige Wartung und rechtzeitiger Austausch von verschlissenen bzw. beschädigten Teilen erhöht die Lebenserwartung Ihrer Maschine.

Benutzer-Beurteilung

Sehr geehrte Leserin, sehr geehrter Leser,

unsere Betriebsanleitungen werden regelmäßig aktualisiert. Mit Ihren Verbesserungsvorschlägen helfen Sie mit, eine immer benutzerfreundlichere Betriebsanleitung zu gestalten. Senden Sie uns ihre Vorschläge bitte per Fax.

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1 Benutzerhinweise

Das Kapitel Benutzerhinweise liefert Informationen zum Umgang mit der Betriebsanleitung.

1.1 Zweck des Dokumentes

Die hier vorliegende Betriebsanleitung

- beschreibt die Bedienung und die Wartung für die Maschine
- gibt wichtige Hinweise für einen sicherheitsgerechten und effizienten Umgang mit der Maschine
- ist Bestandteil der Maschine und immer an der Maschine bzw. im Zugfahrzeug mitzuführen
- für künftige Verwendung aufbewahren.

1.2 Ortsangaben in der Betriebsanleitung

Alle Richtungsangaben in dieser Betriebsanleitung sind immer in Fahrtrichtung gesehen.

1.3 Verwendete Darstellungen

Handlungsanweisungen und Reaktionen

Vom Bediener auszuführende Tätigkeiten sind als nummerierte Handlungsanweisungen dargestellt. Halten Sie die Reihenfolge der vorgegebenen Handlungsanweisungen ein. Die Reaktion auf die jeweilige Handlungsanweisung ist gegebenenfalls durch einen Pfeil markiert. Beispiel:

1. Handlungsanweisung 1

→ Reaktion der Maschine auf Handlungsanweisung 1

2. Handlungsanweisung 2

Aufzählungen

Aufzählungen ohne zwingende Reihenfolge sind als Liste mit Aufzählungspunkten dargestellt. Beispiel:

- Punkt 1
- Punkt 2

Positionszahlen in Abbildungen

Ziffern in runden Klammer verweisen auf Positionszahlen in Abbildungen. Die erste Ziffer verweist auf die Abbildung, die zweite Ziffer auf die Positionszahl in der Abbildung.

Beispiel (Fig. 3/6):

- Figur 3
- Position 6.

2 Allgemeine Sicherheitshinweise

Dieses Kapitel enthält wichtige Hinweise, um die Maschine sicherheitsgerecht zu betreiben.

2.1 Verpflichtungen und Haftung

Hinweise in der Betriebsanleitung beachten

Die Kenntnis der grundlegenden Sicherheitshinweise und der Sicherheitsvorschriften ist Grundvoraussetzung für den sicherheitsgerechten Umgang und den störungsfreien Betrieb der Maschine.

Verpflichtung des Betreibers

Der Betreiber verpflichtet sich, nur Personen mit/an der Maschine arbeiten zu lassen, die

- mit den grundlegenden Vorschriften über Arbeitssicherheit und Unfallverhütung vertraut sind
- in die Arbeiten mit/an der Maschine eingewiesen sind
- diese Betriebsanleitung gelesen und verstanden haben.

Der Betreiber verpflichtet sich

- alle Warnbildzeichen an der Maschine in lesbarem Zustand zu halten
- beschädigte Warnbildzeichen zu erneuern.

Verpflichtung des Bedieners

Alle Personen, die mit Arbeiten mit/an der Maschine beauftragt sind, verpflichten sich, vor Arbeitsbeginn

- die grundlegenden Vorschriften über Arbeitssicherheit und Unfallverhütung zu beachten
- das Kapitel "Allgemeine Sicherheitshinweise" in dieser Betriebsanleitung zu lesen und zu beachten
- das Kapitel "Warnbildzeichen und sonstige Kennzeichnungen an der Maschine", Seite 17 in dieser Betriebsanleitung zu lesen und die Sicherheitsanweisungen der Warnbildzeichen beim Maschinenbetrieb zu befolgen
- Offene Fragen richten Sie bitte an den Hersteller.

Page 703 of 1596 Precision Exhibit 1005

Gefahren im Umgang mit der Maschine

Die Maschine ist gebaut nach dem Stand der Technik und den anerkannten sicherheitstechnischen Regeln. Dennoch können bei der Verwendung der Maschine Gefahren und Beeinträchtigungen entstehen

- für Leib und Leben der Bediener oder Dritter
- für die Maschine selbst
- an anderen Sachwerten.

Benutzen Sie die Maschine nur

- für die bestimmungsgemäße Verwendung
- in sicherheitstechnisch einwandfreiem Zustand.

Beseitigen Sie umgehend Störungen, die die Sicherheit beeinträchtigen können.

Gewährleistung und Haftung

Grundsätzlich gelten unsere "Allgemeinen Verkaufs- und Lieferbedingungen". Diese stehen dem Betreiber spätestens seit Vertragsabschluß zur Verfügung. Gewährleistungs- und Haftungsansprüche bei Personen- und Sachschäden sind ausgeschlossen, wenn sie auf eine oder mehrere der folgenden Ursachen zurückzuführen sind:

- nicht bestimmungsgemäße Verwendung der Maschine
- unsachgemäßes Montieren, Inbetriebnehmen, Bedienen und Warten der Maschine
- Betreiben der Maschine mit defekten Sicherheitseinrichtungen oder nicht ordnungsgemäß angebrachten oder nicht funktionsfähigen Sicherheits- und Schutzvorrichtungen
- Nichtbeachten der Hinweise in der Betriebsanleitung bezüglich Inbetriebnahme, Betrieb, und Wartung
- eigenmächtige bauliche Veränderungen an der Maschine
- mangelhafte Überwachung von Maschinenteilen, die einem Verschleiß unterliegen
- unsachgemäß durchgeführte Reparaturen
- Katastrophenfälle durch Fremdkörpereinwirkung und höhere Gewalt.

2.2 Darstellung von Sicherheits-Symbolen

Gekennzeichnet sind Sicherheitshinweise durch das dreieckige Sicherheits-Symbol und dem vorstehenden Signalwort. Das Signalwort (Gefahr, Warnung, Vorsicht) beschreibt die Schwere der drohenden Gefahr und hat folgende Bedeutung:



Gefahr!

<u>Unmittelbar</u> drohende Gefahr für das Leben und die Gesundheit von Personen (schwere Verletzungen oder Tod).

Das Nichtbeachten dieser Hinweise hat schwere gesundheitsschädliche Auswirkungen zur Folge, bis hin zu lebensgefährlichen Verletzungen.



Warnung!

<u>Möglicherweise</u> drohende Gefahr für das Leben und die Gesundheit von Personen.

Das Nichtbeachten dieser Hinweise kann schwere gesundheitsschädliche Auswirkungen zur Folge haben, bis hin zu lebensgefährlichen Verletzungen.



Vorsicht!

<u>Möglicherweise</u> gefährliche Situation (leichte Verletzungen oder Sachschäden).

Das Nichtbeachten dieser Hinweise kann leichte Verletzungen zur Folge haben oder zu Sachbeschädigungen führen.



Wichtig!

Verpflichtung zu einem besonderen Verhalten oder einer Tätigkeit für den sachgerechten Umgang mit der Maschine.

Das Nichtbeachten dieser Hinweise kann zu Störungen an der Maschine oder in der Umgebung führen.



Hinweis!

Anwendungs-Tipps und besonders nützliche Informationen.

Diese Hinweise helfen Ihnen, alle Funktionen an Ihrer Maschine optimal zu nutzen.

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2.3 Organisatorische Maßnahmen

Der Betreiber muss die erforderlichen persönlichen Schutzausrüstungen bereitstellen, wie z.B.:

- Schutzbrille
- Sicherheitsschuhe
- Schutzanzug
- Hautschutzmittel, etc.



Wichtig!

Die Betriebsanleitung

- **immer am Einsatzort der Maschine aufbewahren!**
- **muss jederzeit für Bediener und Wartungspersonal frei zugänglich sein!**

Überprüfen Sie regelmäßig alle vorhandenen Sicherheitseinrichtungen!

2.4 Sicherheits- und Schutzeinrichtungen

Vor jeder Inbetriebnahme der Maschine müssen alle Sicherheits- und Schutzeinrichtungen sachgerecht angebracht und funktionsfähig sein. Alle Sicherheits- und Schutzeinrichtungen regelmäßig prüfen.

Fehlerhafte Sicherheitseinrichtungen

Fehlerhafte oder demontierte Sicherheits- und Schutzeinrichtungen können zu gefährlichen Situationen führen.

2.5 Informelle Sicherheitsmaßnahmen

Berücksichtigen Sie neben allen Sicherheitshinweisen in dieser Betriebsanleitung die allgemeingültigen, nationalen Regelungen zur Unfallverhütung und zum Umweltschutz.

Beachten Sie beim Verkehr auf öffentlichen Straßen und Wegen die gesetzlichen Straßenverkehrsvorschriften.

2.6 Ausbildung der Personen

Nur geschulte und eingewiesene Personen dürfen mit / an der Maschine arbeiten. Klar festzulegen sind die Zuständigkeiten der Personen für das Bedienen und Warten.

Eine anzulernende Person darf nur unter Aufsicht einer erfahrenen Person mit / an der Maschine arbeiten.

Personen / Tätigkeit	Für die Tätigkeit speziell ausgebildete Person	Unterwiesener Bediener	Personen mit fachspezifischer Ausbildung (Fachwerkstatt*)
Verladen/Transport	X	X	X
Inbetriebnahme	--	X	--
Einrichten, Rüsten	--	--	X
Betrieb	--	X	--
Wartung	--	--	X
Störungssuche und -beseitigung	X	--	X
Entsorgung	X	--	--

Legende: X..erlaubt --..nicht erlaubt

*) Alle Wartungs- und Reparaturarbeiten müssen von einer Fachwerkstatt ausgeführt werden, wenn sie mit dem Zusatz "Fachwerkstatt" gekennzeichnet sind. Das Personal einer Fachwerkstatt verfügt über erforderliche Kenntnisse sowie geeignete Hilfsmittel (Werkzeuge, Hebe- und Abstützvorrichtungen) zur sach- und sicherheitsgerechten Ausführung dieser Wartungs- und Reparaturarbeiten.

2.7 Sicherheitsmaßnahmen im Normalbetrieb

Betreiben Sie die Maschine nur, wenn alle Sicherheits- und Schutzeinrichtungen voll funktionsfähig sind.

Überprüfen Sie die Maschine mindestens einmal pro Tag auf äußerlich erkennbare Schäden und Funktionsfähigkeit der Sicherheits- und Schutzeinrichtungen.

2.8 Gefahren durch Restenergie

Beachten Sie das Auftreten mechanischer, hydraulischer, pneumatischer und elektrischer/elektronischer Restenergien an der Maschine.

Treffen Sie hierbei entsprechende Maßnahmen bei der Einweisung des Bedienpersonals. Detaillierte Hinweise werden nochmals in den jeweiligen Kapiteln dieser Betriebsanleitung gegeben.

2.9 Wartung und Instandhaltung, Störungsbeseitigung

Führen Sie vorgeschriebene Einstell-, Wartungs- und Inspektionsarbeiten fristgemäß durch.

Sichern Sie alle Betriebsmedien wie Druckluft und Hydraulik gegen unbeabsichtigte Inbetriebnahme.

Befestigen und sichern Sie größere Baugruppen beim Austausch sorgfältig an Hebezeugen.

Kontrollieren Sie gelöste Schraubverbindungen auf festen Sitz. Nach Beendigung der Wartungsarbeiten Sicherheitseinrichtungen auf Funktion überprüfen.

2.10 Bauliche Veränderungen

Ohne Genehmigung der **AMAZONEN-WERKE** dürfen Sie keine Veränderungen sowie An- oder Umbauten an der Maschine vornehmen. Dies gilt auch für das Schweißen an tragenden Teilen.

Alle An- oder Umbau-Maßnahmen bedürfen einer schriftlichen Genehmigung der **AMAZONEN-WERKE**. Verwenden Sie nur die von den **AMAZONEN-WERKEN** freigegebenen Umbau- und Zubehörteile, damit z. B. die Betriebserlaubnis nach nationalen und internationalen Vorschriften ihre Gültigkeit behält.

Fahrzeuge mit einer behördlichen Betriebserlaubnis oder mit einem Fahrzeug verbundene Einrichtungen und Ausrüstungen mit einer gültigen Betriebserlaubnis oder Genehmigung für den Straßenverkehr nach den Straßenverkehrsvorschriften müssen sich in dem durch die Erlaubnis oder Genehmigung bestimmten Zustand befinden.



Wichtig!

Grundsätzlich verboten ist

- **das Bohren am Rahmen bzw. Fahrgestell.**
- **das Aufbohren bestehender Löcher am Rahmen bzw. Fahrgestell.**
- **das Schweißen an tragenden Teilen.**

2.10.1 Ersatz- und Verschleißteile sowie Hilfsstoffe

Tauschen Sie Maschinenteile in nicht einwandfreiem Zustand sofort aus.

Verwenden Sie nur Original-**AMAZONE**-Ersatz- und Verschleißteile oder die von den **AMAZONEN-WERKEN** freigegebenen Teile, damit die Betriebserlaubnis nach nationalen und internationalen Vorschriften ihre Gültigkeit behält. Bei Einsatz von Ersatz- und Verschleißteilen von Drittherstellern ist nicht gewährleistet, dass sie beanspruchungs- und sicherheitsgerecht konstruiert und gefertigt sind.

Die **AMAZONEN-WERKE** übernehmen keine Haftung für Schäden aus der Verwendung von nicht freigegebenen Ersatz- und Verschleißteilen oder Hilfsstoffen.

2.11 Reinigen und Entsorgen

Verwendete Stoffe und Materialien sachgerecht handhaben und entsorgen, insbesondere

- bei Arbeiten an Schmiersystemen und -einrichtungen
- beim Reinigen mit Lösungsmitteln.

2.12 Arbeitsplatz des Bedieners

Bedienen darf die Maschine ausschließlich nur eine Person vom Fahrersitz des Traktors.

2.13 Warnbildzeichen und sonstige Kennzeichnungen an der Maschine

Wichtig!

Halten Sie alle Warnbildzeichen der Maschine immer sauber und in gut lesbarem Zustand! Erneuern Sie unlesbare Warnbildzeichen. Fordern Sie die Warnbildzeichen anhand der Bestell-Nummer (z.B. MD 075) beim Händler an.

Warnbildzeichen - Aufbau

Warnbildzeichen kennzeichnen Gefahrenbereiche an der Maschine und warnen vor Restgefahren. In diesen Bereichen sind permanent gegenwärtige oder unerwartet auftretende Gefährdungen vorhanden.

Ein Warnbildzeichen besteht aus 2 Feldern:



Feld 1

zeigt die bildhafte Gefahrenbeschreibung umgeben von einem dreieckigen Sicherheits-Symbol.

Feld 2

zeigt die bildhafte Anweisung zur Gefahrenvermeidung.

Warnbildzeichen – Erläuterung

Die Spalte **Bestell-Nummer und Erläuterung** liefert die Beschreibung zum nebenstehenden Warnbildzeichen. Die Beschreibung der Warnbildzeichen ist immer gleich und nennt in der folgenden Reihenfolge:

1. Die Gefahrenbeschreibung.

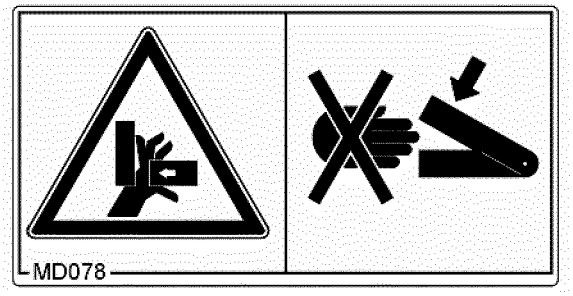
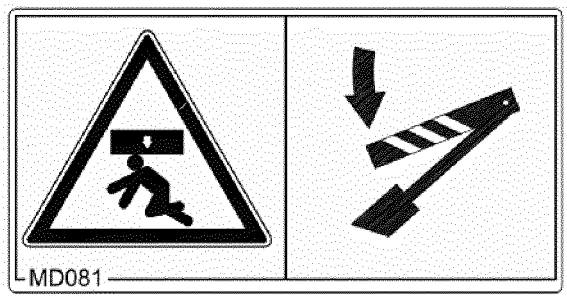
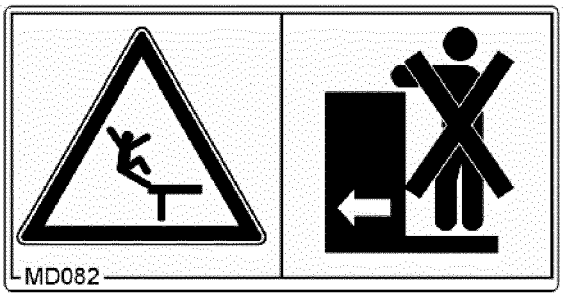
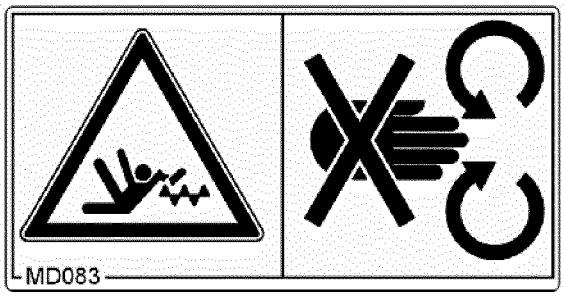
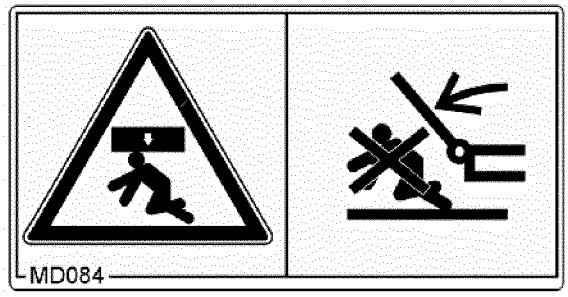
   Zum Beispiel: Gefährdung durch Schneiden oder Abschneiden!

2. Die Folgen bei Missachtung der Anweisung(en) zur Gefahrenvermeidung.

   Zum Beispiel: Verursacht schwere Verletzungen an Finger oder Hand.

3. Die Anweisung(en) zur Gefahrenvermeidung.

   Zum Beispiel: Berühren Sie Maschinenteile nur dann, wenn sie vollständig zum Stillstand gekommen sind.

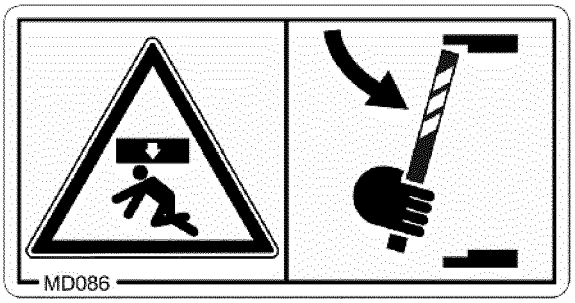
Bestell-Nummer und Erläuterung	Warnbildzeichen
MD 078 Quetschgefahr! Verursacht schwere Verletzungen an Finger oder Hand. Greifen Sie niemals in den Quetschgefahrenbereich, solange sich dort Maschinenteile bewegen können.	
MD 081 Quetschgefahr! Verursacht schwere Verletzungen am gesamten Körper bis hin zum Tod. Sichern Sie den Hubzylinder angehobener Maschinenteile gegen unbeabsichtigtes Absenken, bevor Sie sich unter angehobenen Maschinenteilen aufhalten. Benutzen Sie hierzu die mechanische Hubzylinder-Abstützung oder die hydraulische Absperreinrichtung	
MD 082 Sturzgefahr von Personen! Verursacht schwere Verletzungen am gesamten Körper. Verboten ist die Mitfahrt von Personen auf der Maschine und/oder das Besteigen von laufenden Maschinen. Dies Verbot gilt auch für Maschinen mit Trittflächen oder Plattformen.	
MD 083 Gefährdung durch Einziehen oder Fangen! Verursacht schwere Verletzungen an Arm oder oberen Torso. Öffnen oder entfernen Sie niemals Schutzeinrichtungen von Förderschnecken, solange der Traktormotor bei angeschlossener Gelenkwelle / gekuppeltem Hydraulikantrieb läuft.	
MD 084 Quetschgefahr! Verursacht schwere Verletzungen am gesamten Körper bis hin zum Tod. Verboten ist der Aufenthalt von Personen im Schwenkbereich von Maschinenteilen.	

MD 086

Quetschgefahr!

Verursacht schwere Verletzungen am gesamten Körper bis hin zum Tod.

Sichern Sie angehobene Maschinenteile gegen unbeabsichtigtes Absenken, bevor Sie sich unter angehobenen Maschinenteilen aufhalten. Benutzen Sie hierzu die mechanische Abstützung oder die hydraulische Absperreinrichtung.

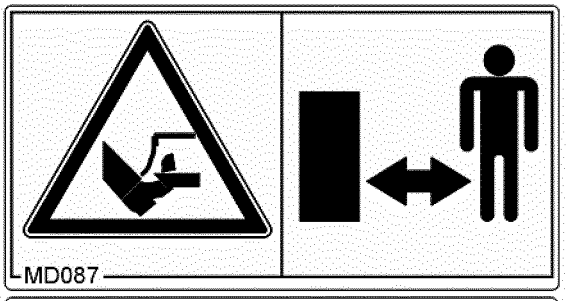


MD 087

Gefährdung durch Schneiden oder Abschneiden!

Verursacht schwere Verletzungen an Zehen oder Fuß.

Halten Sie einen ausreichenden Sicherheitsabstand zur Maschine, solange der Traktormotor bei angeschlossener Gelenkwelle läuft.

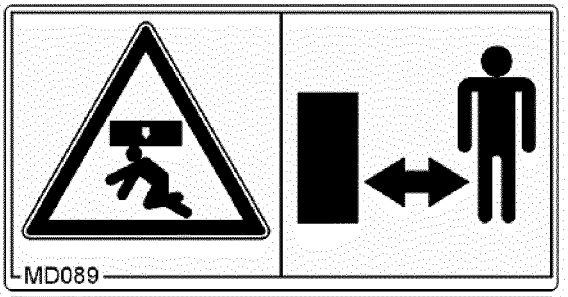


MD 089

Quetschgefahr!

Verursacht schwere Verletzungen am gesamten Körper bis hin zum Tod.

Halten Sie einen ausreichenden Sicherheitsabstand zu angehobenen, ungesicherten Maschinen.

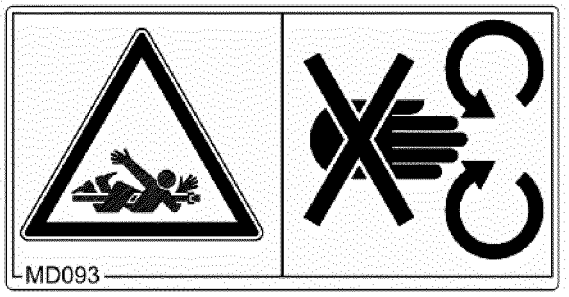


MD 093

Gefährdung durch Erfassen oder Aufwickeln!

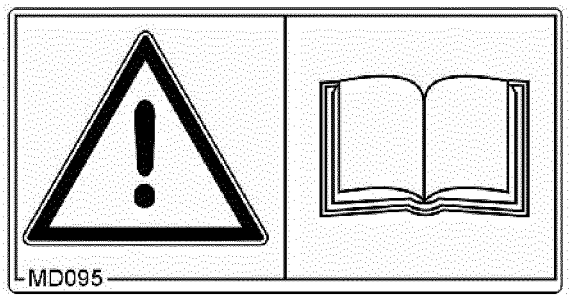
Verursacht schwere Verletzungen am gesamten Körper bis hin zum Tod.

- Halten Sie einen ausreichenden Sicherheitsabstand zur Gelenkwelle, solange der Traktormotor bei angeschlossener Gelenkwelle läuft.
- Öffnen oder entfernen Sie niemals Schutzeinrichtungen von Antriebswellen, solange der Traktormotor bei angeschlossener Gelenkwelle / gekuppeltem Hydraulikantrieb läuft.



MD 095

Lesen und beachten Sie die Betriebsanleitung und Sicherheitshinweise, bevor Sie die Maschine in Betrieb nehmen!



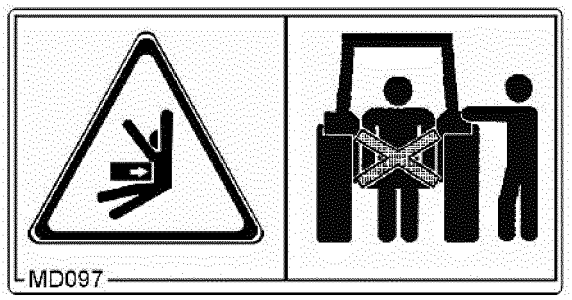
MD 097

Quetschgefahr!

Verursacht schwere Verletzungen am Torso bis hin zum Tod.

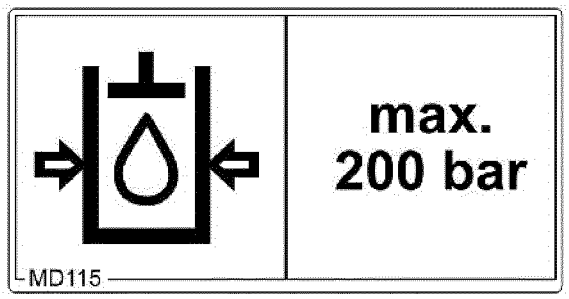
Bleiben Sie bei Betätigung des Krafthebers außerhalb des Hubbereichs der Dreipunktaufhängung.

Verboten ist der Aufenthalt von Personen im Hubbereich der Dreipunkt-Aufhängung bei Betätigung des Dreipunkt-Hubwerkes!



MD 115

Maximaler Hydrauliköl-Betriebsdruck 200 bar.



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2.13.1 Platzierung der Warnbildzeichen und sonstigen Kennzeichnungen

Warnbildzeichen

Die folgenden Abbildungen zeigen die Anordnung der Warnbildzeichen an der Maschine.

Einzelkorn-Sämaschine ED 302

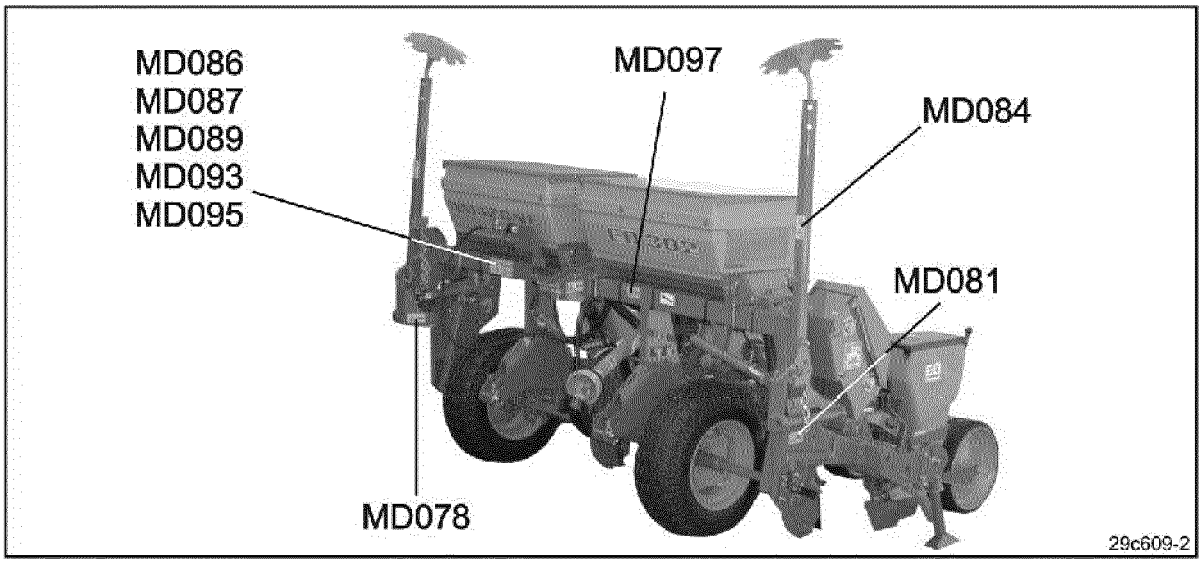


Fig. 1



Fig. 2

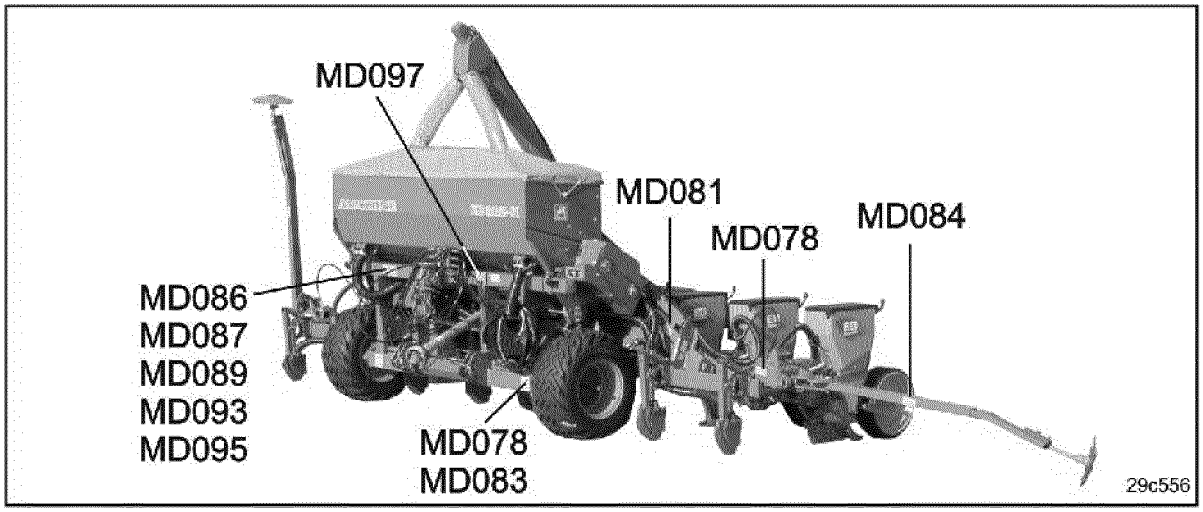

MD097
MD081
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MD084
MD086
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MD083
29c556

Fig. 3

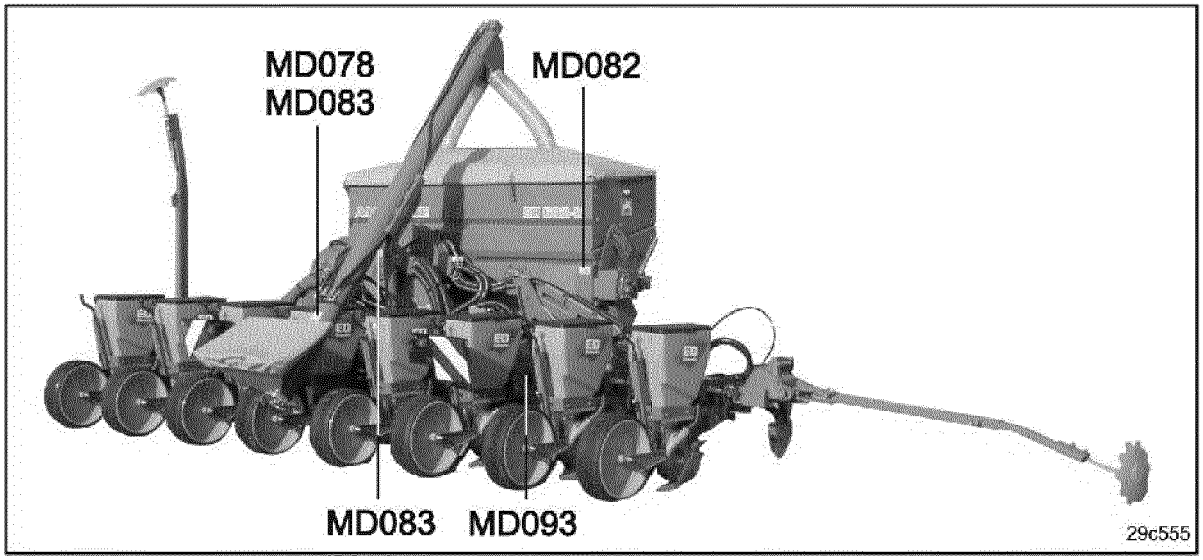

MD078
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MD082
MD083
MD093
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Fig. 4

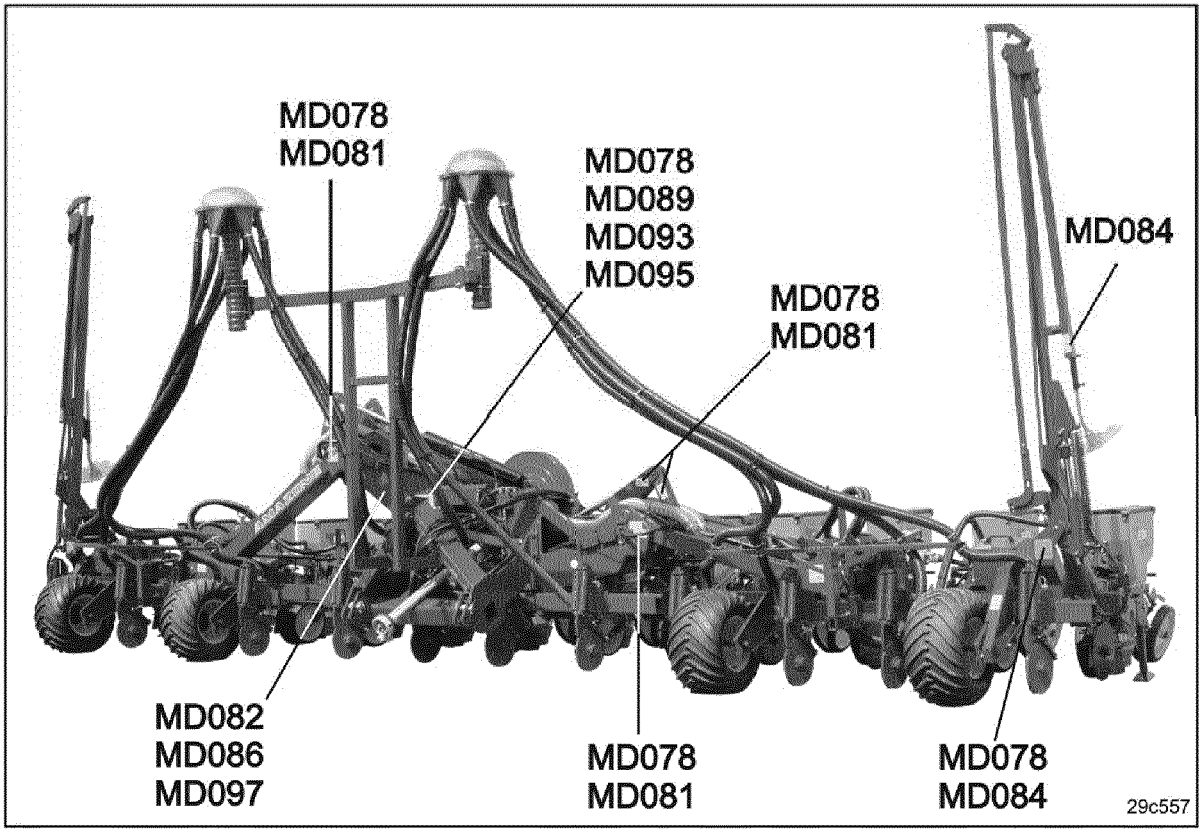

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Fig. 5

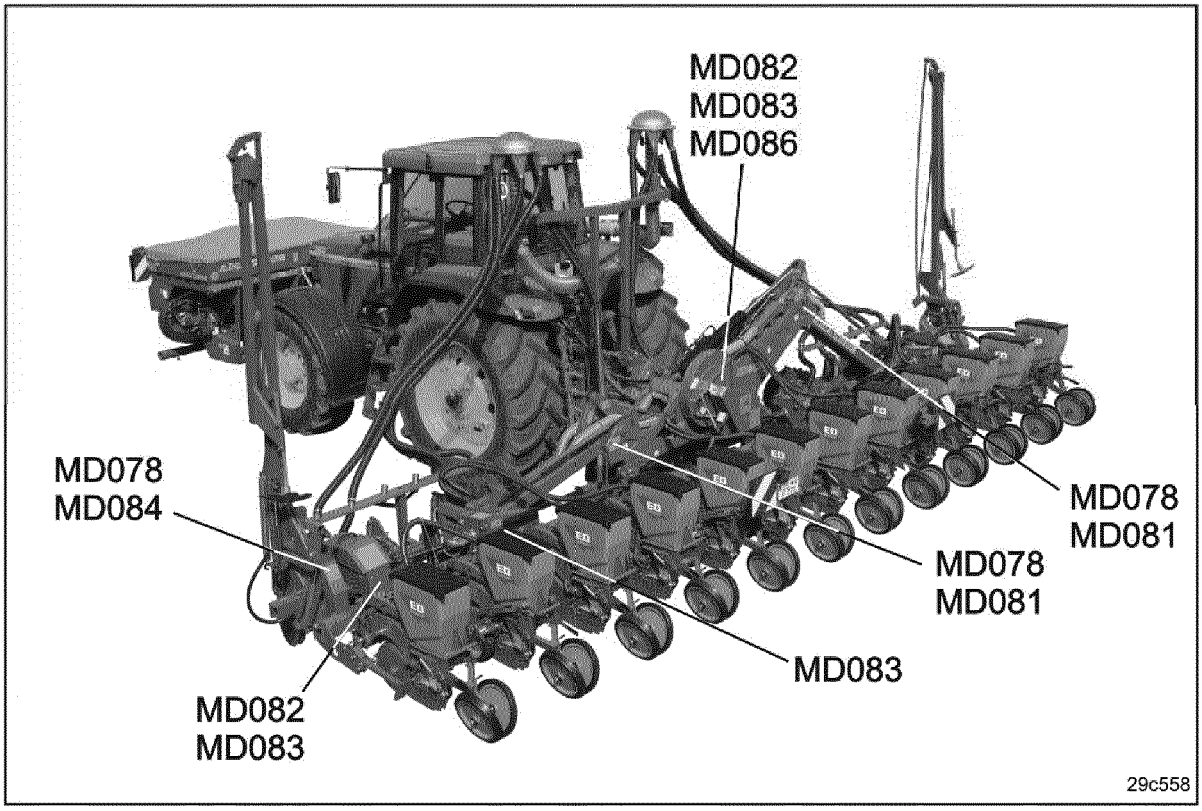

MD082
MD083
MD086
MD078
MD084
MD078
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MD081
MD083
MD082
MD083
29c558

Fig. 6

2.14 Gefahren bei Nichtbeachtung der Sicherheitshinweise

Die Nichtbeachtung der Sicherheitshinweise

- kann sowohl eine Gefährdung für Personen als auch für Umwelt und Maschine zur Folge haben
- kann zum Verlust jeglicher Schadenersatzansprüche führen.

Im Einzelnen kann die Nichtbeachtung der Sicherheitshinweise beispielsweise folgende Gefährdungen nach sich ziehen:

- Gefährdung von Personen durch nicht abgesicherte Arbeitsbereiche
- Versagen wichtiger Funktionen der Maschine
- Versagen vorgeschriebener Methoden zur Wartung und Instandhaltung
- Gefährdung von Personen durch mechanische und chemische Einwirkungen
- Gefährdung der Umwelt durch Leckage von Hydrauliköl.

2.15 Sicherheitsbewusstes Arbeiten

Neben den Sicherheitshinweisen dieser Betriebsanleitung sind die nationalen, allgemeingültigen Arbeitsschutz- und Unfallverhütungsvorschriften bindend.

Befolgen Sie die auf den Warnbildzeichen aufgeführten Anweisungen zur Gefahrenvermeidung.

Halten Sie bei Verkehr auf öffentlichen Straßen und Wegen die jeweiligen gesetzlichen Straßenverkehrsvorschriften ein.

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2.16 Sicherheitshinweise für den Bediener



Warnung!

Überprüfen Sie vor jeder Inbetriebnahme die Maschine und den Traktor auf Verkehrs- und Betriebssicherheit!

2.16.1 Allgemeine Sicherheits- und Unfallverhütungshinweise

- Beachten Sie neben diesen Hinweisen auch die allgemein gültigen nationalen Sicherheits- und Unfallverhütungsvorschriften!
- Die an der Maschine angebrachten Warnbildzeichen und sonstigen Kennzeichnungen geben wichtige Hinweise für den gefahrlosen Betrieb der Maschine. Die Beachtung dieser Hinweise dient Ihrer Sicherheit!
- Kontrollieren Sie vor dem Anfahren und vor der Inbetriebnahme den Nahbereich der Maschine (Kinder)! Auf ausreichende Sicht achten!
- Verboten sind das Mitfahren und der Transport auf der Maschine!

An- und Abkuppeln der Maschine

- Sie dürfen die Maschine nur mit einem Traktor kuppeln und transportieren, wenn der Traktor die leistungsmäßigen Voraussetzungen erfüllt!
- Beim Ankuppeln von Maschinen an die Traktor-Dreipunkt-Hydraulik müssen die Anbaukategorien von Traktor und Maschine unbedingt übereinstimmen!
- Durch das Ankuppeln von Maschinen im Front- und/oder Heckanbau eines Traktors dürfen nicht überschritten werden
  - o das zulässige Traktor-Gesamtgewicht
  - o die zulässigen Traktor-Achslasten
  - o die zulässigen Reifentragfähigkeiten der Traktor-Reifen
- Sichern Sie den Traktor und die Maschine gegen unbeabsichtigte Fortbewegung, bevor Sie die Maschine an- oder abkuppeln!
- Verboten ist der Aufenthalt von Personen zwischen der zukuppelnden Maschine und dem Traktor; während der Traktor an die Maschine heranfährt!

  Anwesende Helfer dürfen sich nur als Einweiser neben den Fahrzeugen betätigen und erst bei Stillstand zwischen die Fahrzeuge treten.
- Sichern Sie den Bedienungshebel der Traktor-Hydraulik in der Position, in der unbeabsichtigtes Heben oder Senken ausgeschlossen ist, bevor Sie die Maschine an die Traktor-Dreipunkt-Hydraulik anbauen oder von der Traktor-Dreipunkt-Hydraulik abbauen!
- Bringen Sie beim An- und Abkuppeln von Maschinen die Abstützeinrichtungen (falls vorgesehen) in die jeweilige Stellung (Standsicherheit)!
- Bei der Betätigung von Abstützeinrichtungen besteht Verletzungsgefahr durch Quetsch- und Scherstellen!
- Seien Sie beim An- und Abkuppeln von Maschinen an oder vom

Traktor besonders vorsichtig! Zwischen dem Traktor und der Maschine gibt es Quetsch- und Scherstellen im Bereich der Kuppelstelle!

- Verboten ist der Aufenthalt von Personen zwischen Traktor und Maschine bei Betätigung der Dreipunkt-Hydraulik!
- Kuppeln Sie die Maschine vorschriftsmäßig an die vorgeschriebenen Vorrichtungen!
- Auslöseseile für Schnellkupplungen müssen lose hängen und dürfen in der Tieflage nicht selbst auslösen!
- Stellen Sie abgekuppelte Maschinen immer standsicher ab!

Einsatz der Maschine

- Machen Sie sich vor Arbeitsbeginn vertraut mit allen Einrichtungen und Betätigungselementen der Maschine sowie mit deren Funktionen. Während des Arbeitseinsatzes ist es dazu zu spät!
- Tragen Sie eng anliegende Kleidung! Locker getragene Kleidung erhöht die Gefährdung durch Erfassen oder Aufwickeln an Antriebswellen!
- Nehmen Sie die Maschine nur in Betrieb, wenn alle Schutzvorrichtungen angebracht und in Schutzstellung sind!
- Beachten Sie die maximale Zuladung der angebauten / angehängten Maschine und die zulässigen Achs- und Stützlasten des Traktors! Fahren Sie gegebenenfalls nur mit teilbefülltem Vorratsbehälter.
- Verboten ist der Aufenthalt von Personen im Arbeitsbereich der Maschine!
- Verboten ist der Aufenthalt von Personen im Dreh- und Schwenkbereich der Maschine!
- An fremdkraftbetätigten Maschinenteilen (z.B. hydraulisch) befinden sich Quetsch- und Scherstellen!
- Sie dürfen fremdkraftbetätigte Maschinenteile nur betätigen, wenn Personen einen ausreichenden Sicherheitsabstand zur Maschine einhalten!
- Bevor Sie den Traktor verlassen müssen Sie
  - o die Maschine auf dem Boden absetzen
  - o den Traktormotor abstellen
  - o den Zündschlüssel abziehen

Transportieren der Maschine

- Beachten Sie bei Benutzung öffentlicher Verkehrswege die jeweiligen nationalen Straßenverkehrsvorschriften!
- Achten Sie immer auf eine ausreichende Lenk- und Bremsfähigkeit des Traktors!

  An einen Traktor angebaute oder angehängte Maschinen und Front- oder Heckgewichte beeinflussen das Fahrverhalten sowie die Lenk- und Bremsfähigkeit des Traktors.
- Verwenden Sie gegebenenfalls Frontgewichte!

  Die Traktor-Vorderachse muss immer mit mindestens 20% des

Traktor-Leergewichtes belastet sein, damit eine ausreichende Lenkfähigkeit gewährleistet ist.

- Befestigen Sie Front- oder Heckgewichte immer vorschriftsmäßig an den dafür vorgesehenen Befestigungspunkten!
- Beachten Sie die maximale Nutzlast der angebauten / angehängten Maschine und die zulässigen Achs- und Stützlasten des Traktors!
- Der Traktor muss die vorgeschriebene Bremsverzögerung für den beladenen Zug (Traktor plus angebaute / angehängte Maschine) sichern!
- Prüfen Sie die Bremswirkung vor Fahrtantritt!
- Berücksichtigen Sie bei Kurvenfahrten mit angebauter oder angehängter Maschine die weite Ausladung und die Schwungmasse der Maschine!
- Achten Sie vor Transportfahrten auf eine ausreichende seitliche Arretierung der Traktor-Unterlenker, wenn die Maschine in der Dreipunkt-Hydraulik bzw. den Unterlenkern des Traktors befestigt ist!
- Bringen Sie vor Transportfahrten alle schwenkbaren Maschinenteile in Transportstellung!
- Sichern Sie vor Transportfahrten schwenkbare Maschinenteile in Transportstellung gegen gefahrbringende Lageveränderungen. Benutzen Sie hierzu die dafür vorgesehenen Transportsicherungen!
- Verriegeln Sie vor Transportfahrten den Bedienungshebel des Dreipunkt-Hydraulik gegen unbeabsichtigtes Heben oder Senken der angebauten oder angehängten Maschine!
- Überprüfen Sie vor Transportfahrten, ob die erforderliche Transportausrüstung korrekt an der Maschine montiert ist, wie z. B. Beleuchtung, Warneinrichtungen und Schutzeinrichtungen!
- Passen Sie Ihre Fahrgeschwindigkeit den jeweils vorherrschenden Bedingungen an!
- Schalten Sie vor Bergabfahrten in einen niedrigeren Gang!
- Schalten Sie die Einzelradbremsung vor Transportfahrten grundsätzlich aus (Pedale verriegeln)!

2.16.2 Hydraulik-Anlage

- Die Hydraulikanlage steht unter hohem Druck!
- Achten Sie auf korrektes Anschließen der Hydraulikschlauch-Leitungen!
- Achten Sie beim Anschließen der Hydraulikschlauch-Leitungen darauf, dass die Hydraulik-Anlage sowohl traktor- als auch maschinenseitig drucklos ist!
- Es ist Verboten, Steuergeräte auf dem Traktor zu blockieren, wenn über diese Steuergeräte hydraulische Funktionen direkt ausgeführt werden, z. B. Klapp-, Schwenk- und Schiebevorgänge. Die jeweilige Hydraulik-Funktion muss automatisch stoppen, wenn das entsprechende Steuergerät losgelassen wird.
- Vor Arbeiten an der Hydraulik-Anlage
  - Maschine absetzen
  - Hydraulik-Anlage drucklos machen
  - Traktormotor abstellen
- Lassen Sie Hydraulikschlauch-Leitungen mindestens einmal jährlich durch einen Sachkundigen auf ihren arbeitssicheren Zustand prüfen! Tauschen Sie Hydraulikschlauch-Leitungen bei Beschädigungen und Alterung aus! Verwenden Sie nur Original-**AMAZONE** Hydraulikschlauch-Leitungen!
- Die Verwendungsdauer der Hydraulikschlauch-Leitungen sollte sechs Jahre nicht überschreiten, einschließlich einer eventuellen Lagerzeit von höchstens zwei Jahren. Auch bei sachgemäßer Lagerung und zulässiger Beanspruchung unterliegen Schläuche und Schlauchverbindungen einer natürlichen Alterung, dadurch ist ihre Lagerzeit und Verwendungsdauer begrenzt. Abweichend hiervon kann die Verwendungsdauer entsprechend den Erfahrungswerten, insbesondere unter Berücksichtigung des Gefährdungspotentials, festgelegt werden. Für Schläuche und Schlauchleitungen aus Thermoplasten können andere Richtwerte maßgebend sein.
- Infektionsgefahr! Unter hohem Druck austretende Flüssigkeiten (Hydrauliköl) können die Haut durchdringen und schwere Verletzungen verursachen! Suchen Sie bei Verletzungen sofort einen Arzt auf!
- Verwenden Sie bei der Suche nach Leckstellen geeignete Hilfsmittel, wegen der möglichen schweren Verletzungsgefahr!

2.16.3 Elektrische Anlage

- Bei Arbeiten an der elektrischen Anlage grundsätzlich Batterie (Minuspol) abklemmen!
- Verwenden Sie nur die vorgeschriebenen Sicherungen. Bei Verwendung zu starker Sicherungen wird die elektrische Anlage zerstört - Brandgefahr!
- Achten Sie auf richtiges Anschließen der Batterie - zuerst den Pluspol und dann den Minuspol anklemmen! Beim Abklemmen zuerst den Minuspol und dann den Pluspol abklemmen!
- Versehen Sie den Pluspol der Batterie immer mit der vorgesehenen Abdeckung. Bei Masseschluss besteht Explosionsgefahr!

- Explosionsgefahr! Vermeiden Sie Funkenbildung und offene Flammen in der Nähe der Batterie!
- Die Maschine kann mit elektronischen Komponenten und Bauteilen ausgestattet werden, deren Funktion durch elektromagnetische Aussendungen anderer Geräte beeinflusst werden kann. Solche Beeinflussungen können zu Gefährdungen von Personen führen, wenn die folgenden Sicherheitshinweise nicht befolgt werden.
  - Bei einer nachträglichen Installation von elektrischen Geräten und/oder Komponenten an der Maschine, mit Anschluss an das Bordnetz, muss der Benutzer eigenverantwortlich prüfen, ob die Installation Störungen der Fahrzeugelektronik oder anderer Komponenten verursacht.
  - Achten Sie darauf, dass die nachträglich installierten elektrischen und elektronischen Bauteile der EMV-Richtlinie 89/336/EWG in der jeweils geltenden Fassung entsprechen und das CE-Kennzeichen tragen.

2.16.4 Wartung, Instandsetzung und Pflege

- Führen Sie Wartungs-, Instandsetzungs- und Reinigungsarbeiten grundsätzlich nur durch bei
  - ausgeschaltetem Antrieb
  - stillstehendem Traktormotor
  - abgezogenem Zündschlüssel
  - vom Bordcomputer abgezogenen Maschinenstecker
- Muttern und Schrauben regelmäßig auf festen Sitz prüfen und gegebenenfalls nachziehen!
- Sichern Sie die angehobene Maschine bzw. angehobene Maschinenteile gegen unbeabsichtigtes Absenken, bevor Sie Wartungs-, Instandsetzungs- und Reinigungsarbeiten vornehmen!
- Benutzen Sie beim Auswechseln von Arbeitswerkzeugen mit Schneiden geeignetes Werkzeug und Handschuhe!
- Entsorgen Sie Öle, Fette und Filter ordnungsgemäß!
- Klemmen Sie das Kabel an Generator und Batterie des Traktors ab, bevor Sie elektrische Schweißarbeiten an Traktor und angebauten Maschinen ausführen!
- Ersatzteile müssen mindestens den festgelegten technischen Anforderungen der **AMAZONEN-WERKE** entsprechen! Dies ist gegeben bei Verwendung von Original-**AMAZONE**-Ersatzteilen!

2.16.5 Angebaute Arbeitsgeräte

- Beim Anbau müssen die Anbaukategorien von Traktor und Maschine unbedingt übereinstimmen oder abgestimmt werden!
- Hersteller-Vorschriften beachten!
- Vor dem An- und Abbau von Maschinen an die Dreipunktaufhängung Bedienungseinrichtung in die Stellung bringen, bei der unbeabsichtigtes Heben oder Senken ausgeschlossen sind!
- Im Bereich des Dreipunktgestänges besteht Verletzungsgefahr durch Quetsch- oder Scherstellen!
- Die Außenbedienung für die Traktorunterlenker dürfen nicht betätigt werden! Traktorunterlenker nur von der Traktorkabine aus betätigen!
- Die Maschine darf nur mit den dafür vorgesehenen Traktoren transportiert und gefahren werden!
- Beim An- und Abkuppeln von Geräten an den Traktor besteht Verletzungsgefahr!
- Bei Betätigung der Außenbedienung für den Dreipunktanbau nicht zwischen Fahrzeug und Maschine treten!
- Bei der Betätigung von Stützeinrichtungen Gefahr durch Quetsch- und Scherstellen!
- Durch den Anbau von Geräten im Front- und/oder Heckanbau eines Traktors darf nicht überschritten werden
  - das zulässige Traktor-Gesamtgewicht
  - die zulässigen Traktor-Achslasten
  - die zulässigen Reifentragfähigkeiten der Traktor-Reifen.
- Maximale Nutzlast des angebauten Gerätes und die zulässigen Achslasten des Traktors beachten!
- Vor dem Transport der Maschine immer auf ausreichende seitliche Arretierung der Traktorunterlenker achten!
- Bei Straßenfahrt muss der Bedienungshebel der Traktorunterlenker gegen Senken verriegelt sein!
- Alle Einrichtungen vor Straßenfahrt in Transportstellung bringen!
- An einen Traktor angebaute Geräte und Ballastgewichte beeinflussen das Fahrverhalten sowie die Lenk- und Bremsfähigkeit des Traktors!
- Die Traktor-Vorderachse muss immer mit mindestens 20% des Traktor-Leergewichtes belastet sein, damit eine ausreichende Lenkfähigkeit gewährleistet ist. Gegebenenfalls Frontgewichte verwenden!
- Instandsetzungs-, Wartungs- und Reinigungsarbeiten und die Beseitigung von Funktionsstörungen grundsätzlich nur bei abgezogenem Zündschlüssel durchführen!
- Schutzeinrichtungen angebracht lassen und immer in Schutzstellung bringen!

2.16.6 Zapfwellen-Betrieb

- Verwenden dürfen Sie nur die von den AMAZONEN-WERKEN vorgeschriebenen, mit vorschriftsmäßigen Schutzvorrichtungen ausgestatteten Gelenkwellen!
- Beachten Sie auch die Betriebsanleitung des Gelenkwellen-Herstellers!
- Schutzrohr und Schutztrichter der Gelenkwelle müssen unbeschädigt sowie das Schutzschild der Traktor- und Maschinen-Zapfwelle müssen angebracht sein und sich in einem ordnungsgemäßen Zustand befinden!
- Verboten ist das Arbeiten mit beschädigten Schutzvorrichtungen!
- Sie dürfen den An- und Abbau der Gelenkwelle nur vornehmen bei
  - bei ausgeschalteter Zapfwelle
  - abgeschaltetem Traktormotor
  - abgezogenem Zündschlüssel
- Achten Sie immer auf die richtige Montage und Sicherung der Gelenkwelle!
- Beim Einsatz von Weitwinkel-Gelenkwellen das Weitwinkelgelenk immer am Drehpunkt zwischen Traktor und Maschine anbringen!
- Sichern Sie den Gelenkwellenschutz durch Einhängen der Kette(n) gegen Mitlaufen!
- Achten Sie bei Gelenkwellen auf die vorgeschriebenen Rohrüberdeckungen in Transport- und Arbeitsstellung! (Beachten Sie die Bedienungsanleitung des Gelenkwellenherstellers!)
- Beachten Sie bei Kurvenfahrten die zulässige Abwinklung und den Schiebeweg der Gelenkwelle!
- Kontrollieren Sie vor dem Einschalten der Zapfwelle ob
  - sich Personen im Gefahrenbereich der Maschine befinden
  - die gewählte Zapfwellendrehzahl des Traktors mit der zulässigen Antriebs-Drehzahl der Maschine übereinstimmt
- Bei Arbeiten mit der Zapfwelle darf sich keine Person
  - im Bereich der drehenden Zapf- oder Gelenkwelle aufhalten
  - im Gefahrenbereich der Maschine aufhalten
- Schalten Sie die Zapfwelle niemals bei abgeschaltetem Traktormotor ein!
- Schalten Sie die Zapfwelle immer ab, wenn zu große Abwinkelungen auftreten oder sie nicht benötigt wird!
- Achtung! Nach dem Abschalten der Zapfwelle besteht Verletzungsgefahr durch die nachlaufende Schwungmasse rotierender Maschinenteile!

  Während dieser Zeit nicht zu nahe an die Maschine herantreten! Erst wenn alle Maschinenteile vollständig zum Stillstand gekommen sind, dürfen Sie an der Maschine arbeiten!
- Sie dürfen zapfwellengetriebene Maschinen oder Gelenkwellen nur reinigen, schmieren oder einstellen, bei

- bei abgeschalteter Zapfwelle
- abgeschaltetem Traktormotor
- abgezogenem Zündschlüssel

- Legen Sie die abgekuppelte Gelenkwelle auf die vorgesehene Halterung ab!
- Stecken Sie nach Abbau der Gelenkwelle die Schutzhülle auf den Zapfwellenstummel!
- Beachten Sie bei Verwendung der wegabhängigen Zapfwelle, dass die Zapfwellen-Drehzahl fahrgeschwindigkeitsabhängig ist und die Drehrichtung sich bei Rückwärtsfahrt umkehrt!

2.16.7 Sämaschinen-Betrieb

- Während der Abdrehprobe auf Gefahrenstellen durch rotierende und oszillierende Maschinenteile achten!
- Plattform nur zum Befüllen betreten.
  Während des Betriebes ist das Mitfahren verboten!
- Beim Straßentransport sind die Spurscheiben des Fahrgassen-Markier-Gerätes zu entfernen!
- Beim Befüllen des Saatgut-Behälters Hinweise des Geräteherstellers beachten!
- Spuranreißer (bauartbedingt) in Transportstellung verriegeln!
- Keine Teile in den Saatgut-Behälter legen!
- Zulässige Füllmenge beachten!

3 Ver- und Entladen

Gefahr!

Nicht unter der mit einem Kran angehobenen Maschine aufhalten.

3.1 Verladen der Einzelkorn-Sämaschinen ED 302 und ED 452

Die Einzelkorn-Sämaschinen ED 302 und ED 452 mit einem Kran (Fig. 7) verladen.

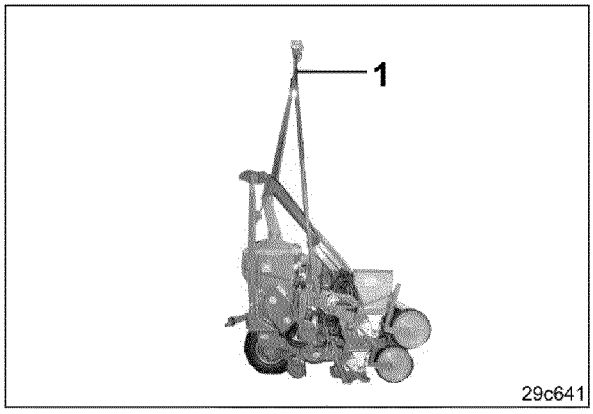


Fig. 7

Die Transportseile (Fig. 8/1) beidseitig an den Halterungen der Spuranreißer und der Abstellstützen befestigen.

Die Maschine vorschriftsmäßig auf dem Transportfahrzeug sichern.

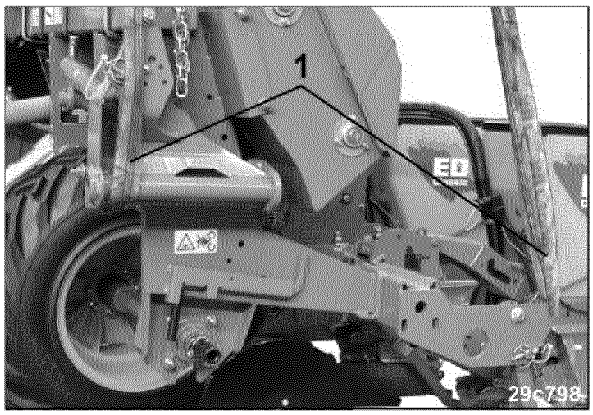


Fig. 8

3.2 Verladen der Einzelkorn-Sämaschine ED 452-K und ED 602-K

Die Einzelkorn-Sämaschinen ED 452-K und ED 602-K einklappen und mit einem Kran verladen.

Die Transportseile (Fig. 9/1) an den Ösen der Maschine befestigen.

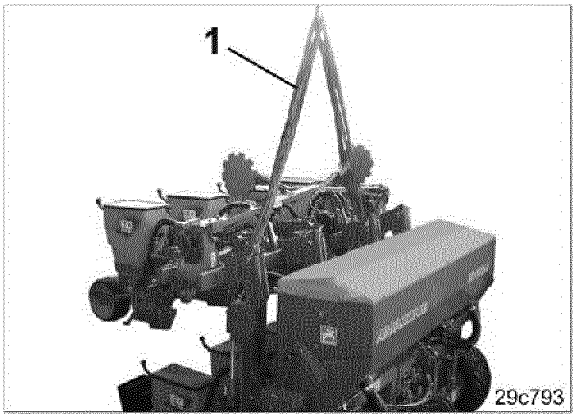


Fig. 9

Die Ösen sind gekennzeichnet mit dem Aufkleber (Fig. 10).

Die Maschine vorschriftsmäßig auf dem Transportfahrzeug sichern.

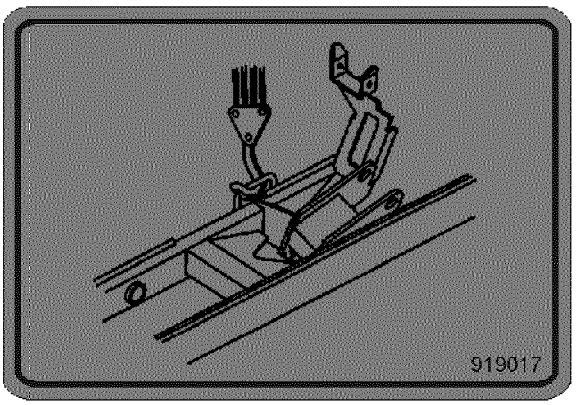


Fig. 10

3.3 Verladen der Einzelkorn-Sämaschine ED 902-K



Gefahr!

- **Kuppeln Sie die Maschine vorschriftsmäßig an den Traktor, bevor Sie die Maschine auf ein Transportfahrzeug verladen oder von einem Transportfahrzeug entladen!**
- **Sie dürfen die Maschine zum Ent- und Verladen nur mit einem Traktor kuppeln und transportieren, wenn der Traktor die leistungsmäßigen Voraussetzungen erfüllt!**

Zum Verladen, die ausgeklappte Einzelkorn-Sämaschine ED 902-K im Dreipunkt mit einem ausreichend dimensionierten Traktor oder Gabelstapler aufnehmen.

Erforderlich ist die Ausrüstung des Gabelstaplers mit Anlenkpunkten zum Kuppeln der Maschine.

Die Maschine ankuppeln (siehe Kapitel „Maschine an- und abkuppeln“, Seite 77). Die Versorgungsleitungen und die Gelenkwelle nicht anschließen.

Beim Be- und Entladen ist ein Einweiser erforderlich.

Die Maschine vorschriftsmäßig auf dem Transportfahrzeug sichern.

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4 Produktbeschreibung

Dieses Kapitel

- gibt einen umfassenden Überblick über den Aufbau der Maschine
- liefert die Benennungen der einzelnen Baugruppen und Stellteile.

Lesen Sie dieses Kapitel möglichst direkt an der Maschine. So machen Sie sich optimal vertraut mit der Maschine.

4.1 Übersicht – Baugruppen

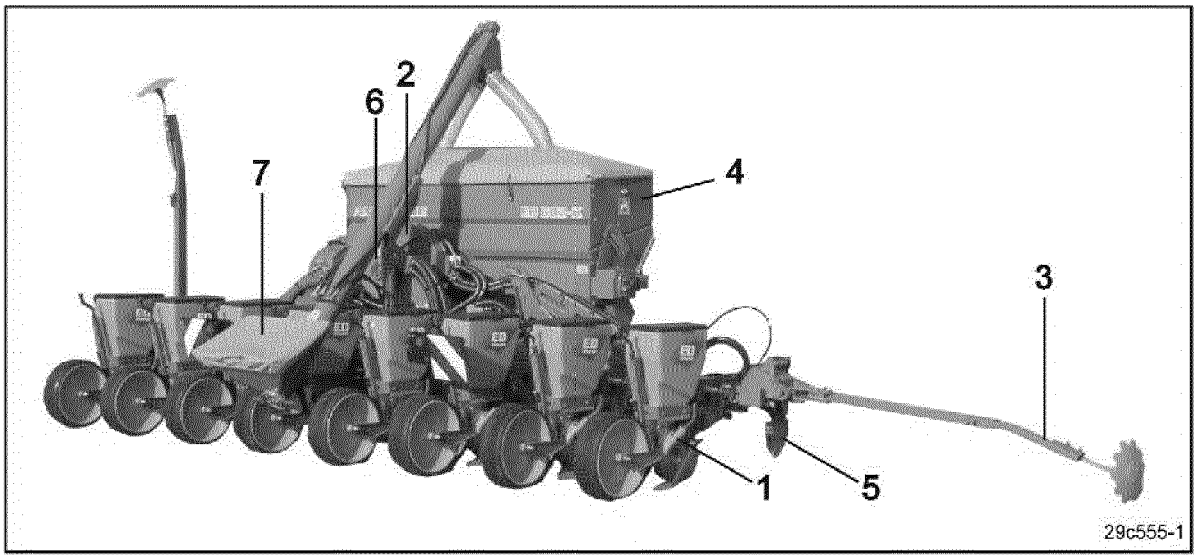


Fig. 11

Fig. 11/...

(1) Säaggregat
(2) Saugluft-Gebläse
(3) Spuranreißer
(4) 900- / 1100-Liter Dünger-Vorratsbehälter (Option)
(5) Dünger-Schar (Option)
(6) Druckluft-Gebläse (Option)
(7) Dünger-Befüllschnecke (Option)

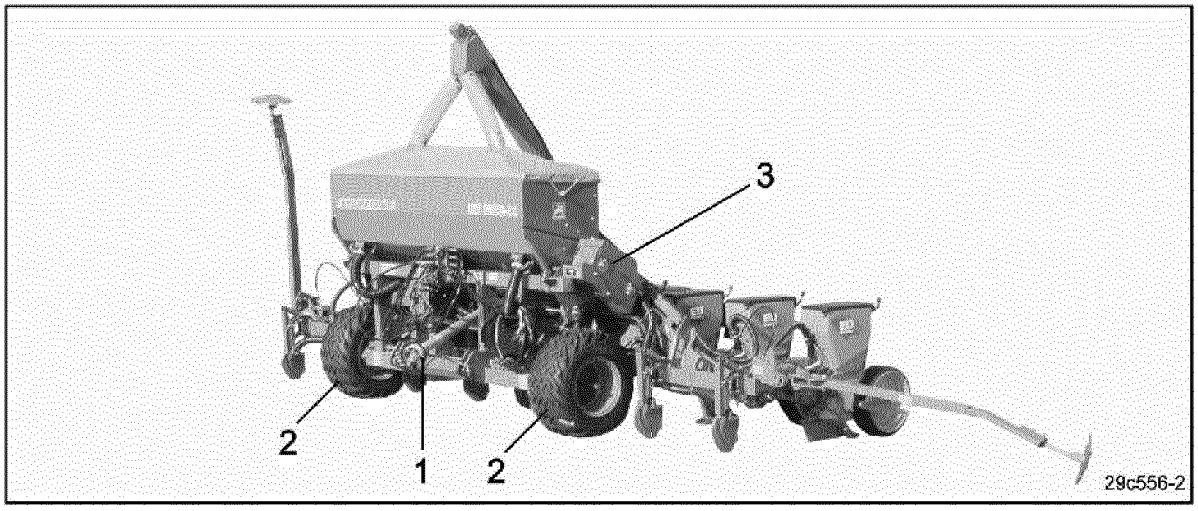


Fig. 12

Fig. 12/...

(1) Gelenkwelle für Gebläse-Antrieb

(2) Antriebsräder

(3) Verstellgetriebe

Classic-Säaggregat

Fig. 13/...

(1) Saatgut-Vorratsbehälter

(2) Einstellung Saatgutablagetiefe

(3) Sägehäuse

(4) Säschar

(5) Walkgummireifen

(6) Zustreicher vorlaufend

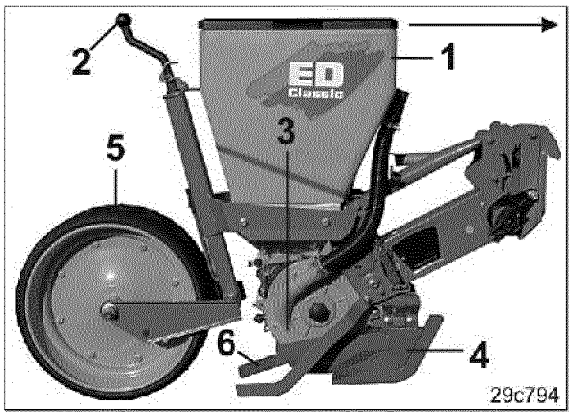


Fig. 13

Contour-Säaggregat

Fig. 14/...

(1) Saatgut-Vorratsbehälter

(2) Einstellung Saatgutablagetiefe

(3) Sägehäuse

(4) Säschar

(5) Druckrolle, vorlaufend

(6) V-Druckrolle

(7) Klutenräumer (Option)

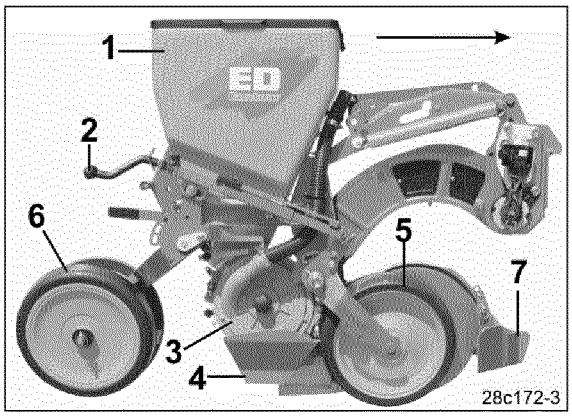


Fig. 14

Fig. 15/...

(1) 2 x 220-Liter Dünger-Vorratsbehälter (Option)

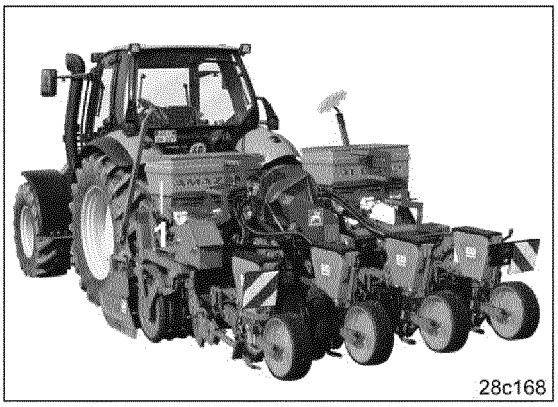


Fig. 15

Fig. 16/...

(1) Fronttank (Dünger)

(2) Spornrad

(3) Dosierer

(4) Injektorschleuse

(5) Gebläse

(6) Auffangbehälter zur Abdrehprobe

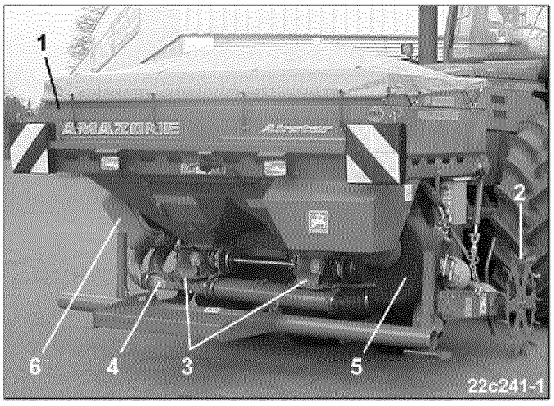


Fig. 16

Fig. 17

Bedienterminal-AMASCAN+ (Option)

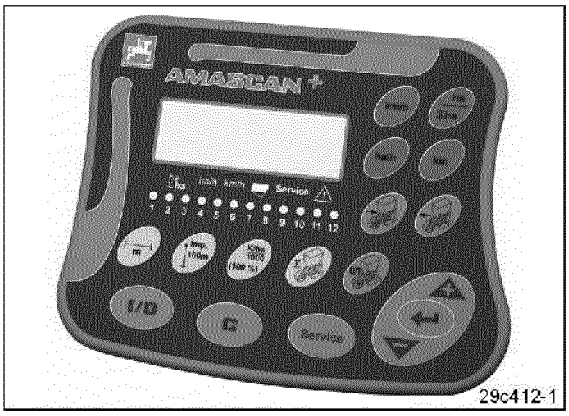


Fig. 17

Fig. 18

Bedienterminal **AMASCAN-PROFI** (Option)

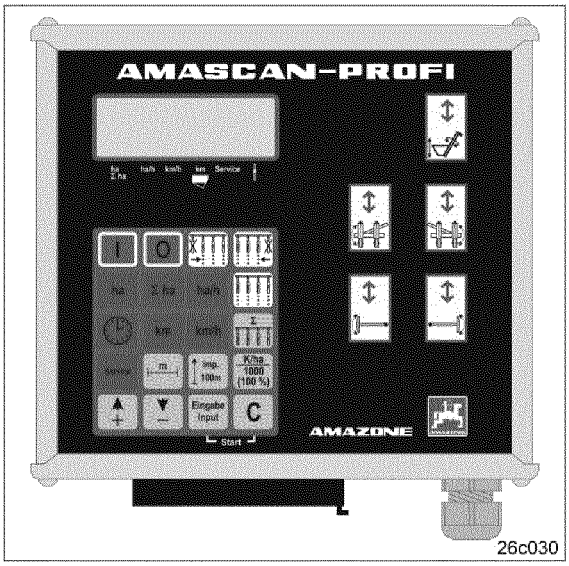


Fig. 18

Fig. 19

Bedienterminal **ED-CONTROL** (Option)

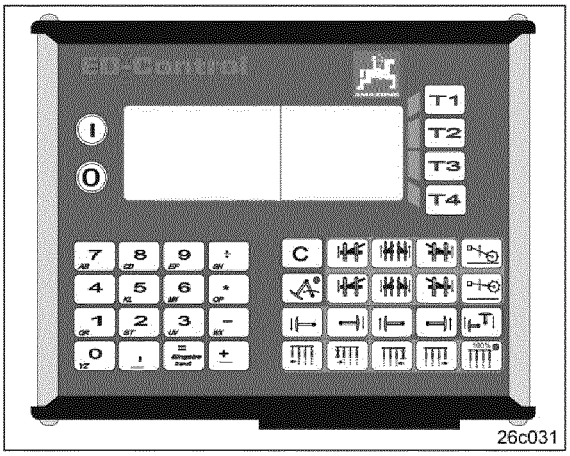


Fig. 19

4.2 Übersicht – Versorgungsleitungen zwischen Traktor und Maschine

Hydraulische Anschlüsse

Traktor-Steuergeräte*	Funktion
Traktor-Steuergerät 1	Spuranreißerbetätigung
Traktor-Steuergerät 2	Auslegerklappung, links (ED 02-K)
Traktor-Steuergerät 3**	Auslegerklappung, rechts (ED 02-K)
Traktor-Steuergerät 4	Hydraulikmotor Befüllschnecke (Option)
Traktor-Steuergerät 5	Gebläse-Hydraulikmotor (Option)
Traktor-Steuergerät 6	Spornradanhebung (Fronttank)

* Ausführung der Steuergeräte, siehe Kap. 7.1.1.1, Seite 80

** nicht erforderlich bei ED 902-K. Die Auslegerklappungen erfolgt mit dem Traktor-Steuergerät 2.

Hydraulische Anschlüsse für Maschinen mit Profischaltung (Option)

Traktor-Steuergeräte*	Funktion
Traktor-Steuergerät 1 (optional mit Load-Sensing-Funktion)	• Spuranreißerbetätigung • Auslegerklappung, links (ED 02-K) • Auslegerklappung, rechts (ED 02-K) • Hydraulikmotor Befüllschnecke (Option) • Spornradanhebung, Fronttank (nur in Verbindung mit **ED-Control**)
Traktor-Steuergerät 2	Gebläse-Hydraulikmotor (Option)
Traktor-Steuergerät 3	Spornradanhebung (Fronttank)

* Ausführung der Steuergeräte, siehe Kap. 7.1.1.3, Seite 82

Elektrische Anschlüsse

Elektrische Anschlüsse	Funktion
Stecker (7-polig)	Beleuchtungsanlage (Option) für Straßenverkehrslichtanlage

4.3 Verkehrstechnische Ausrüstung (Option)

Fig. 20/...

(1) 2 Schlussleuchten

(2) 2 Bremsleuchten

(3) 2 Fahrtrichtungsanzeiger

(4) 2 rote Rückstrahler
(rund, recht- oder dreieckig)

(5) 1 Kennzeichenhalter mit Beleuchtung

(6) 2 nach hinten gerichtete Warntafeln.

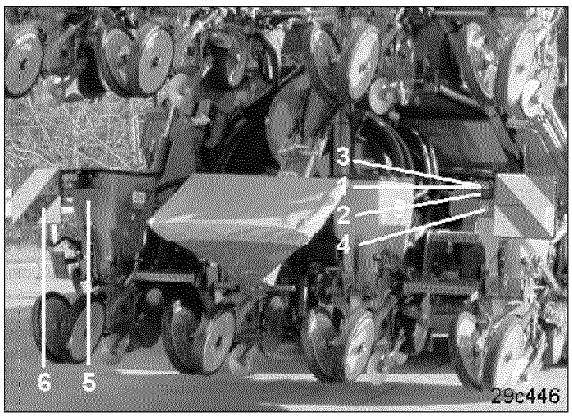


Fig. 20

Fig. 21/...

(1) 2 nach vorne gerichtete
Begrenzungsleuchten

(2) 2 nach vorne gerichtete Warntafeln.



Fig. 21

4.4 Bestimmungsgemäße Verwendung

Die Einzelkorn-Sämaschine ED

- ist gebaut zum Dosieren und Ausbringen bestimmter handelsüblicher Saatgüter und Düngersorten
- wird über den Dreipunktanschluss an einen Traktor angekuppelt und von einer Bedienungsperson bedient.

Befahren werden können Hanglagen in

- Schicht-Linie

  Fahrtrichtung nach links 10 %

  Fahrtrichtung nach rechts 10 %.
- Fall-Linie

  hang aufwärts 10 %

  hang abwärts 10 %.

Zur bestimmungsgemäßen Verwendung gehört auch:

- das Beachten aller Hinweise dieser Betriebsanleitung
- die Einhaltung der Inspektions- und Wartungsarbeiten
- die ausschließliche Verwendung von Original-**AMAZONE**-Ersatzteilen.

Andere Verwendungen als oben aufgeführt sind verboten und gelten als nicht bestimmungsgemäß.

Für Schäden aus nicht bestimmungsgemäßer Verwendung

- trägt der Betreiber die alleinige Verantwortung
- übernehmen die **AMAZONEN-WERKE** keinerlei Haftung.

4.5 Gefahrenbereiche

In den Gefahrenbereichen an der Maschine sind permanent gegenwärtige oder unerwartet auftretende Gefährdungen vorhanden. Warnbildzeichen kennzeichnen diese Gefahrenbereiche und warnen vor Restgefahren, die konstruktiv nicht zu beseitigen sind. Hier gelten spezielle Sicherheitsvorschriften. Hierzu siehe Kapitel "Allgemeine Sicherheitshinweise", Seite 25.

Gefahrenbereiche bestehen:

- zwischen Traktor und Maschine, insbesondere beim An- und Abkuppeln und beim Beladen der Saatgut und Dünger-Vorratsbehälter
- im Bereich beweglicher Bauteile
- durch das Besteigen der Maschine
- im Schwenkbereich der Spuranreißer
- im Schwenkbereich der Maschinen-Ausleger
- unter angehobenen, nicht gesicherten Maschinen und Maschinenteilen
- beim Aus- und Einklappen der Maschinen-Ausleger im Bereich von Freilandleitungen.

4.6 Konformität

	Richtlinien- / Normen-Bezeichnung
Die Maschine erfüllt die:	• Maschinen-Richtlinie 98/37/EG • EMV-Richtlinie 89/336/EWG

4.7 Typenschild und CE-Kennzeichnung

Die folgenden Abbildungen zeigen die Anordnung vom Typenschild und der CE-Kennzeichnung.

Das Typenschild (Fig. 22) sowie die CE-Kennzeichnung befinden sich, wie unten dargestellt, an der Maschine.

Auf dem Typenschild sind angegeben:

- Masch.-Ident-Nr.
- Typ
- Zul. Gesamtgewicht kg
- Baujahr
- Grundgewicht kg
- Werk.



Fig. 22

Die CE-Kennzeichnung (Fig. 23) an der Maschine signalisiert die Einhaltung der Bestimmungen der gültigen EU-Richtlinien.

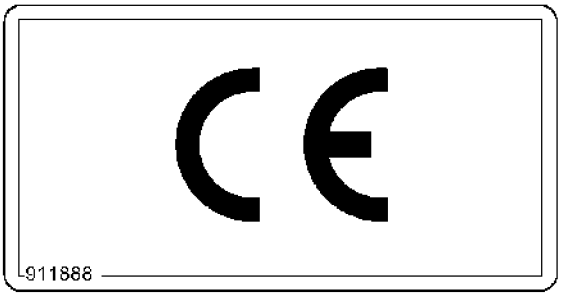


Fig. 23

ED 302, ED 452 (-K):

Befestigung des Typenschildes und der CE-Kennzeichnung (Fig. 24) oberhalb der Gelenkwellenauflage.

ED 602-K:

Befestigung des Typenschildes und der CE-Kennzeichnung (Fig. 25) am Verstellgetriebe.

ED 902-K:

Befestigung des Typenschildes und der CE-Kennzeichnung (Fig. 26) an der Gebläsekonsole.



Fig. 24

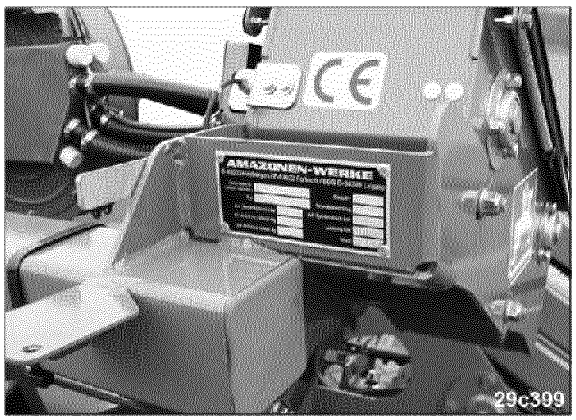


Fig. 25

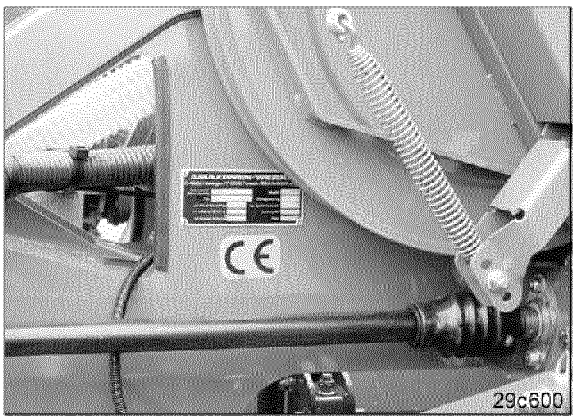


Fig. 26

4.8 Technische Daten

Einzelkorn-Sämaschine		ED 302		ED 452		ED 452-K	
Säaggregate		Classic	Contour	Classic	Contour	Classic	Contour
Mögliche Bereifungen		10.0/75-15 oder 31x15,5/15					
Transportbreite (siehe auch Tabelle, Seite 55)	[m]	3,00		4,00		3,00	3,00
Transportlänge	[m]	2,40		2,40		2,80	
Anzahl der Säaggregate in Standardausführung (Reihenabstand 75cm)		4		6			
max. Anzahl der Säaggregate ohne/mit Unterfußdüngung		10/6	6/6	12/6	9/6	7/6	
Antrieb		Kettenradgetriebe 54 Stufen					
Kornabstand (siehe auch Tabellen, Seite 57)	[cm]	3,1 bis 86,9 abhängig von der verwendeten Vereinzelungsscheibe					
Gebläseantrieb		Gelenkwelle mit Freilauf Gelenkwellendrehzahl 540 U/min., 710 U/min. oder 1000 U/min., wahlweise hydraulischer Antrieb					
Vereinzelungsscheiben		Kunststoffvereinzelungsscheiben für Mais, Bohnen, Erbsen, Sojabohnen, Sonnenblumen, usw.					
Düngerbehälterinhalt	[l]	2 x 220		2 x 220 / 900			
Einfüllhöhe Düngerbehälter	[m]	1,60		1,60 / 1,68			
Leergewicht ohne Reihendüngerstreuer ab	[kg]	662	798	824	1028	903	1107
Leergewicht mit Reihendüngerstreuer ab	[kg]	814	986	1021	1225	1100	1350

Technische Daten zur Berechnung der Traktorgewichte und Traktorachslasten (siehe Seite 69)		Gesamtgewicht G_H	Abstand d
ED 302 ohne Dünger-Vorratsbehälter	4-reihig Classic	802 kg	885 mm
	4-reihig Contour	942 kg	1076 mm
	10-reihig Classic	1372 kg	1070 mm
	6-reihig Contour	1202 kg	1180 mm
ED 302 mit 2 x 220-Liter Dünger-Vorratsbehälter	4-reihig Classic	1422 kg	745 mm
	4-reihig Contour	1602 kg	899 mm
	6-reihig Classic	1642 kg	824 mm
	6-reihig Contour	1912 kg	1006 mm
ED 452 ohne Dünger-Vorratsbehälter	6-reihig Classic	1034 kg	950 mm
	6-reihig Contour	1244 kg	1157 mm
	10-reihig Classic	1414 kg	1052 mm
	9-reihig Contour	1634 kg	1252 mm
ED 452 mit 2 x 220-Liter Dünger-Vorratsbehälter	6-reihig Classic	1684 kg	815 mm
	6-reihig Contour	1954 kg	995 mm
ED 452 mit 900-Liter Dünger-Vorratsbehälter	6-reihig Classic	2260 kg	731 mm
	6-reihig Contour	2530 kg	878 mm
ED 452-K ohne Dünger-Vorratsbehälter	6-reihig Classic	1113 kg	917 mm
	6-reihig Contour	1323 kg	1117 mm
	7-reihig Classic	1208 kg	950 mm
	7-reihig Contour	1453 kg	1156 mm
ED 452-K mit 2 x 220-Liter Dünger-Vorratsbehälter	6-reihig Classic	1763 kg	800 mm
	6-reihig Contour	2033 kg	975 mm
ED 452-K mit 900-Liter Dünger-Vorratsbehälter	6-reihig Classic	2339 kg	722 mm
	6-reihig Contour	2609 kg	866 mm

Einzelkorn-Sämaschine		ED 602-K		ED 902-K	
Säaggregate		Classic	Contour	Classic	Contour
Mögliche Bereifungen		31x15,5/15		26x12,0/12	
Transportbreite (siehe auch Tabelle, Seite 55)	[m]	3,05		3,05 [3]	
Transportlänge	[m]	2,90		2,75 [4]	
Anzahl der Säaggregate in Standardausführung (Reihenabstand 75cm)		8		12	
max. Anzahl der Säaggregate ohne/mit Unterfußdüngung		12/8-12 [1]		18/18 [1]	
Antrieb		Kettenradgetriebe 54 Stufen (Serie)		Kettenradgetriebe Antrieb über 2 Getriebe	
Kornabstand (siehe auch Tabellen, Seite 57)	[cm]	3,1 – 86,9 (abhängig von der Vereinzelungsscheibe)			
Gebläseantrieb		Gelenkwelle mit Freilauf Gelenkwellendrehzahl 540 U/min., 710 U/min. oder 1000 U/min., wahlweise hydraulischer Antrieb.			
Vereinzelungsscheiben		Kunststoffvereinzelungsscheiben für Mais, Bohnen, Erbsen, Sojabohnen, Sonnenblumen, usw.			
Düngerbehälterinhalt	[l]	1100		1500 [2]	
Leergewicht ohne Reihendüngerstreuer ab	[kg]	1337	1606	2975	3312
Leergewicht mit Reihendüngerstreuer ab	[kg]	1697	2112	3227	3564
Leergewicht Fronttank	[kg]	640			

[1] nur in Verbindung mit Fronttank
[2] Fronttank FRS 203
[3] als 18-reihige Ausführung mit Unterfußdüngung 3,15 m Transportbreite
[4] Unterfußdüngung nur in Verbindung mit Fronttank möglich.

Technische Daten zur Berechnung der Traktorgewichte und Traktorachslasten (siehe Seite 69)		Gesamtgewicht G_H	Abstand d
ED 602-K ohne Dünger-Vorratsbehälter	8-reihig Classic	1617 kg	881 mm
	8-reihig Contour	1897 kg	1072 mm
	12-reihig Classic	1997 kg	967 mm
	12-reihig Contour	2417kg	1177 mm
ED 602-K mit 1100-Liter Dünger-Vorratsbehälter	8-reihig Classic	3127 kg	722 mm
	8-reihig Contour	3487 kg	865 mm
ED 602-K mit Reihendünger-Anbausatz für Fronttank	12-reihig Classic	2422 kg	945 mm
	12-reihig Contour	2962 kg	1158 mm
ED 902-K ohne Reihendünger-Anbausatz	12-reihig Classic	2975 kg	850 mm
	12-reihig Contour	3312 kg	900 mm
	18-reihig Classic	3335 kg	950 mm
	18-reihig Contour	3880 kg	1000 mm
ED 902-K mit Reihendünger-Anbausatz für Fronttank	12-reihig Classic	3227 kg	800 mm
	12-reihig Contour	3564 kg	850 mm
	18-reihig Classic	3780 kg	900 mm
	18-reihig Contour	4490 kg	950 mm
Technische Daten zur Berechnung der Traktorgewichte und Traktorachslasten (siehe Seite 69)		**Gesamtgewicht G_V**	**Abstand a_2**
• **Fronttank FRS 103 (ohne Aufsatz)** • **Fronttank FRS 203(ohne Aufsatz)**		2150 kg	0,9 m
• **Fronttank FPS 103 (ohne Aufsatz)** • **Fronttank FPS 203(ohne Aufsatz)**		2675 kg	0,85 m

4.9 Erforderliche Traktor-Ausstattung

Der Traktor muss die leistungsmäßigen Voraussetzungen erfüllen und mit den erforderlichen Hydraulik-, Elektro- und Druckluftanschlüssen ausgerüstet sein um mit der Maschine arbeiten zu können.

Traktor-Motorleistung

	ohne Dünger-Vorratsbehälter	mit Dünger-Vorratsbehälter
ED 302	ab 44 kW (60 PS)	ab 55 kW (75 PS)
ED 452, ED452-K	ab 55 kW (75 PS)	ab 66 kW (90 PS)
ED 602-K	ab 66 kW (90 PS)	ab 88 kW (120 PS)
ED 902-K	ab 132 kW (180 PS)	ab 176 kW (240 PS)

Elektrik

Batterie-Spannung:	12 V (Volt)
Steckdose für Beleuchtung:	7-polig

Hydraulik

Maximaler Betriebsdruck: 200 bar

Traktor-Pumpenleistung:

- 20 l/min. bei 150 bar
  - o ohne hydr. Gebläseantrieb
  - o ohne Befüllschnecke
- 45 l/min. bei 150 bar
  - o mit hydr. Gebläseantrieb
  - o mit Befüllschnecke.

Hydrauliköl der Maschine: Getriebe-/Hydrauliköl Utto SAE 80W API GL4

Das Hydraulik-/Getriebeöl der Maschine ist für die kombinierten Hydraulik-/Getriebeöl-Kreisläufe aller gängigen Traktorfabrikate geeignet.

Traktor-Steuergerät 1:	einfach wirkend	(Spuranreißerbetätigung)
Traktor-Steuergerät 2:	doppelt wirkend	(Auslegerklappung, links [ED 02-K])
Traktor-Steuergerät 3*:	doppelt wirkend	(Auslegerklappung, rechts [ED 02-K])
Traktor-Steuergerät 4:	einfach wirkend	(Hydraulikmotor Befüllschnecke [Option])
Traktor-Steuergerät 5:	siehe Kapitel 7.1.1.1	(Gebläse-Hydraulikmotor [Option])
Traktor-Steuergerät 6:	doppelt wirkend	(Spornradanhebung [Fronttank])

* nicht erforderlich bei ED 902-K. Die Auslegerklappungen erfolgt mit dem Traktor-Steuergerät 2



Hinweis!

Erforderliche Traktor-Steuergräte für Maschinen mit Profischaltung (Option), siehe Kapitel 7.1.1.3, Seite 82.



Wichtig!

Kontrollieren Sie die Verträglichkeit der Hydrauliköle, bevor Sie die Maschine an Ihre Traktor-Hydraulikanlage anschließen.

Mineralöle und Bioöle nicht mischen!



Warnung!

Es ist Verboten, die Steuergeräte 1, 2, 3 und 6 auf dem Traktor zu blockieren. Die jeweilige Hydraulik-Funktion muss automatisch stoppen, wenn das entsprechende Steuergerät losgelassen wird.

4.10 Angaben zur Geräuschentwicklung

Der arbeitsplatzbezogene Emissionswert (Schalldruckpegel) beträgt 74 dB(A), gemessen im Betriebszustand bei geschlossener Kabine am Ohr des Traktorfahrers.

Messgerät: OPTAC SLM 5.

Die Höhe des Schalldruckpegels ist im wesentlichen vom verwendeten Fahrzeug abhängig.

5 Aufbau und Funktion

Das folgende Kapitel informiert Sie über den Aufbau der Maschine und die Funktionen der einzelnen Bauteile.

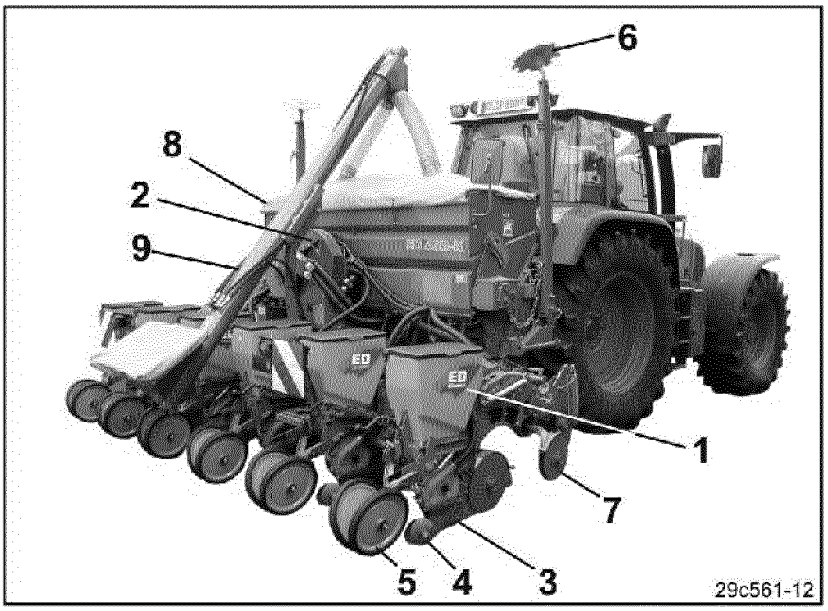


Fig. 27

Einzelkorn-Sämaschinen legen die Saatgutkörner einzeln in gleichmäßig einstellbaren Abständen im Boden ab. In jeder Reihe arbeitet ein Säaggregat mit eigenem Saatgut-Vorratsbehälter (Fig. 27/1).

Das Saatgut wird an den Bohrungen der rotierenden Vereinzelungsscheiben angesaugt. Ein Saugluft-Gebläse (Fig. 27/2) erzeugt den erforderlichen Unterdruck. Am tiefsten Punkt der Vereinzelungsscheibe bricht der Unterdruck ab und das Saatgut-Korn fällt in die vom Säschar (Fig. 27/3) gezogene Saatfurche.

Nach der Aussaat wird das Saatgut von den Zustreichern (Fig. 27/4) und den Andruckrollen (Fig. 27/5) gleichmäßig mit Erde bedeckt und angedrückt.

Die Antriebsräder der Einzelkorn-Sämaschine treiben die Vereinzelungsscheiben an. Die Drehzahl der Vereinzelungsscheiben wird am Verstellgetriebe und am Sekundärgetriebe eingestellt. Getriebe-Drehzahländerungen bewirken Abstandsänderungen der Körner im Boden. Einzelne Säaggregate können elektronisch abgeschaltet werden, z.B. mit dem Bordcomputer **AMASCAN+** (Option).

Das Saugluft-Gebläse (Fig. 27/2) wird über die Zapfwelle oder von einem Hydraulikmotor angetrieben.

Spuranreißer (Fig. 27/6) markieren die Feldanschlussfahrt entweder in Traktormitte oder in der Traktorspur (außer ED 302 und ED 902-K).

Zur Unterfußdüngung (Option) sind Einzelkorn-Sämaschinen mit Düngerscharen (Fig. 27/7) ausgestattet, die den Dünger in der Regel 6 cm (einstellbar) neben den Säscharen (Fig. 27/3) im Boden ablegen.

Die Düngerablagetiefe ist einstellbar. Der Dünger wird im Dünger-Vorratsbehälter (Fig. 27/8) oder im Fronttank mitgeführt.

Mit der Befüllschnecke (Fig. 27/9, Option) werden die Dünger-Vorratsbehälter bequem befüllt.

5.1 Classic-Säaggregat

Das Classic-Säaggregat wird eingesetzt zur Aussaat auf gepflügten Böden.

Saatgüter, die mit dem Classic-Säaggregat ausgebracht werden:

- Mais
- Bohnen
- Sonnenblumen
- Erbsen
- Baumwolle
- Sorghum

Die Saatgutablagetiefe wird mit einer Kurbel (Fig. 28/1) eingestellt.

Die maximale Saatgutablagetiefe beträgt 10 cm.

Der nachlaufende Walkgummireifen (Fig. 28/2)

- führt das Säaggregat in der Tiefe
- drückt die Saatfurche an.

Wird die gewünschte Ablagetiefe nicht erreicht, kann das Säaggregat durch Federdruckbelastung (Fig. 28/3) zusätzlich belastet werden.

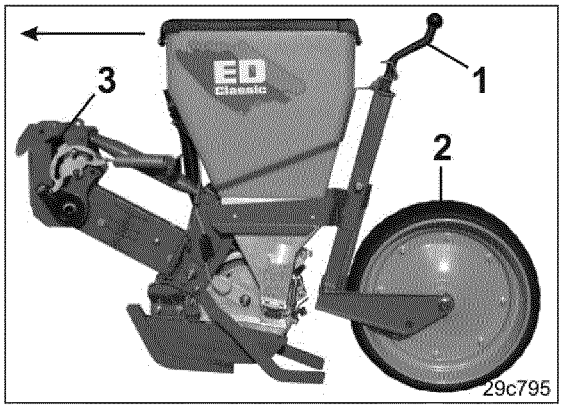


Fig. 28

Die einstellbaren, vorlaufenden Zustreicher (Fig. 29/1) schließen die Säfurche.

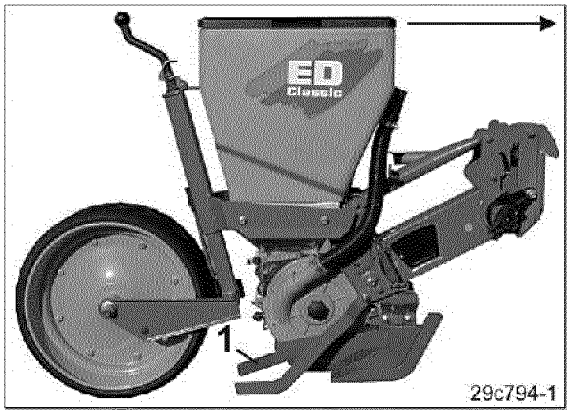


Fig. 29

5.2 Contour-Säaggregat

Aussaat-Verfahren mit dem Contour-Säaggregat:

- Pflugsaat
- Mulchsaat

Saatgüter, die mit dem Contour-Säaggregat ausgebracht werden:

- Mais
- Bohnen
- Sonnenblumen
- Erbsen
- Baumwolle
- Sorghum
- Zuckerrüben
- Rüben
- Wassermelonen
- Raps

Das Contour-Säaggregat stützt sich ab auf der vorlaufenden, einseitig angeordneten Druckrolle (Fig. 30/1) und der nachlaufenden V-Druckrolle (Fig. 30/2).

Die Druckrollen sind über die Tiefeneinstellspindel (Fig. 30/3) miteinander verbunden und bilden ein Längstandem.

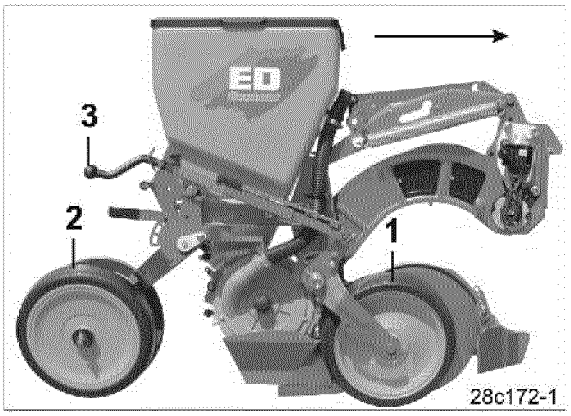


Fig. 30

Das Contour-Säaggregat passt sich dem Verlauf der Oberfläche an (Fig. 31).

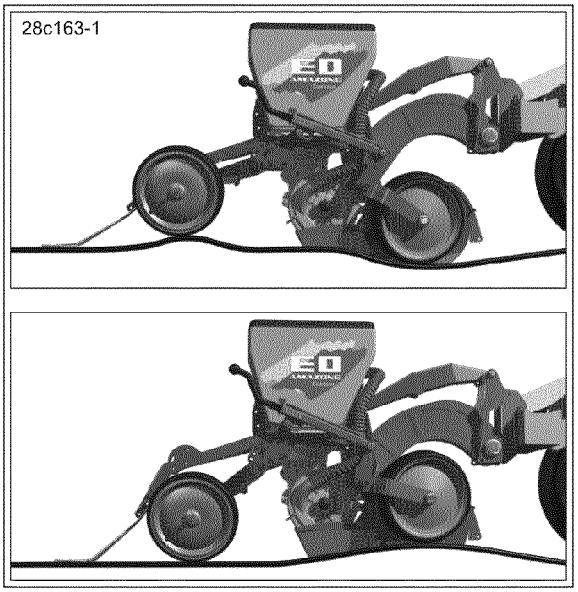


Fig. 31

Die großen Doppelscheiben (Fig. 32/1) räumen auf Feldern mit organischer Masse die Pflanzenreste vor dem Säschar (Fig. 32/2).

Die Gummi-V-Druckrolle (Fig. 32/3) und die Super-V-Druckrolle eignet sich zur Pflug- und Mulchsaat.

Die Gummi-V-Druckrolle

- hält in Verbindung mit der vorderen Andruckrolle die Saatgutablagetiefe ein
- schließt die Saatfurche
- drückt die Saatfurche an.

Die Super-V-Druckrolle (Option)

- erhöht den Bodenandruck neben der Saatfurche durch ein besonderes Gummiprofil mit integriertem Drahtseil.

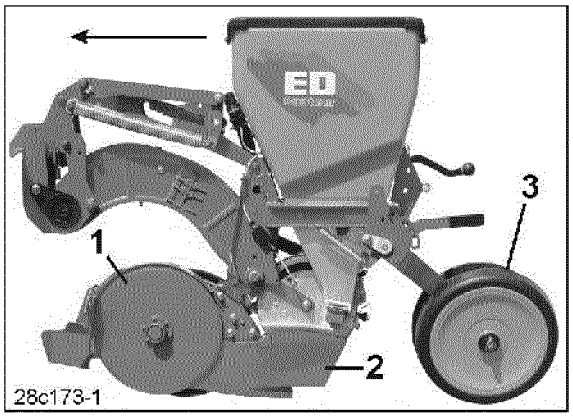


Fig. 32

Die Saatgutablagetiefe wird mit einer Spindel (Fig. 33/1) eingestellt und an einer Skala (Fig. 33/2) angezeigt. Der Skalenwert ist ein relativer Wert, der zum einfachen Einstellen der anderen Aggregate dient.

Die maximale Saatgutablagetiefe beträgt 12 cm.

Die Säaggregate einer Maschine sind aufeinander abgestimmt. Der an einem Säaggregat ermittelte Skalenwert (Fig. 33/2) kann auf alle anderen Säaggregate übertragen werden.

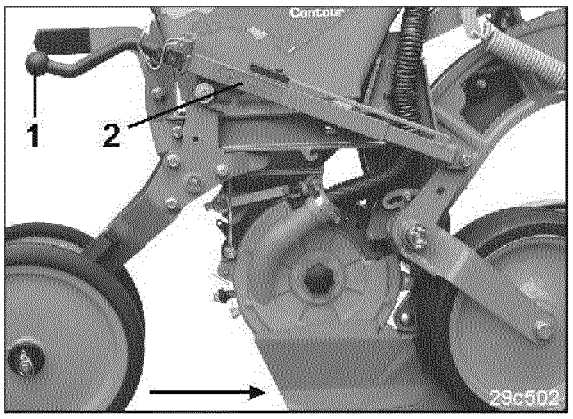


Fig. 33

Wird die gewünschte Ablagetiefe nicht erreicht, kann das Säaggregat durch Federverstellung (Fig. 34/1) zusätzlich belastet werden.

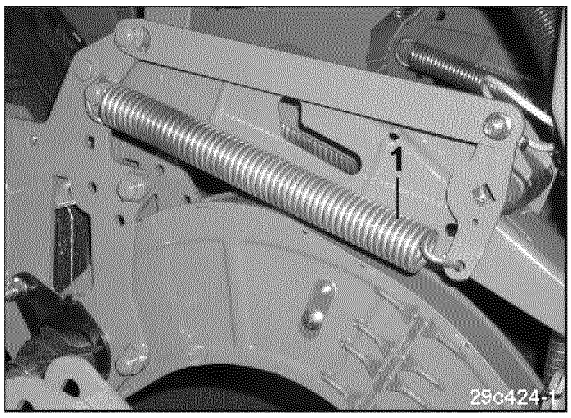


Fig. 34

Die Klutenräumer (Fig. 35/1) ermöglichen den ruhigen Lauf der Säaggregate auf Böden mit groben Oberflächenstrukturen.

Die Klutenräumer nicht zu tief abstecken. Die Klutenräumer sollten nur die groben Kluten zur Seite räumen. Eine vollständige Erdbewegung durch die Klutenräumer führt zu Nachteilen beim Schließen der Saatfurchen.

Bei ungleichmäßiger Ablagetiefe die Klutenräumer im Verstellsegment ein Loch tiefer abstecken und die Ablagetiefe erneut prüfen.

Klutenräumer ganz oben abstecken, wenn sie nicht benötigt werden.

Die einstellbaren, vorlaufenden Zustreicher (Fig. 35/2) schließen die Säfurche. Sie eignen sich zur Einsaat in die Pflugfurche.

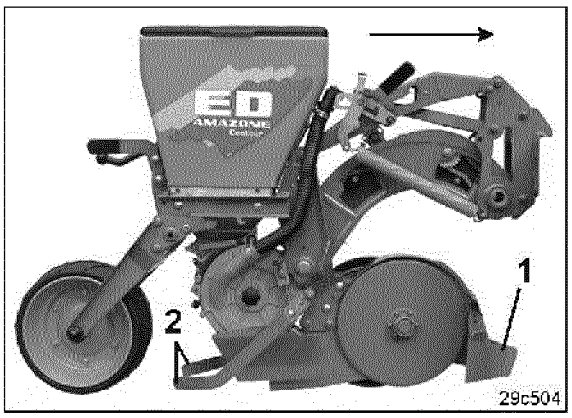


Fig. 35

Scheibenzustreicher (Option, Fig. 36/1) schließen die Säfurche und sind sowohl nach dem Pflug als auch zur Einsaat in Mulch geeignet.

Die nachlaufenden Rollen schließen die Saatfurche und drücken den Boden an.

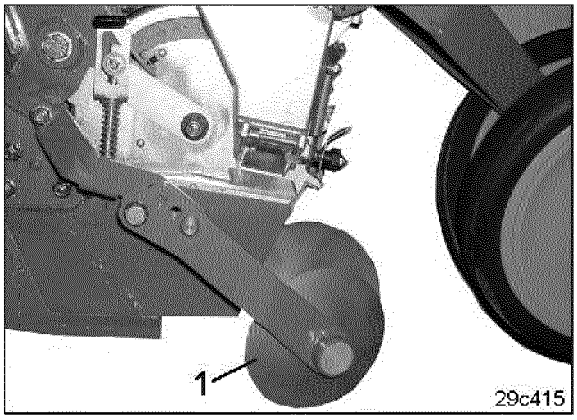


Fig. 36

Die Zwischenandruckrolle (Option) kommt bei kleinen Saatgütern zum Einsatz.

Die Zwischenandruckrolle (Fig. 37/1) drückt das Saatgut an. Auf Grund des besseren Bodenschlusses steht mehr Feuchtigkeit zum Keimen zur Verfügung.

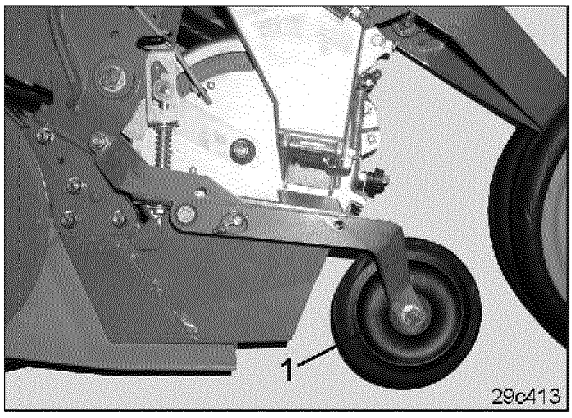


Fig. 37

5.3 Saatgut-Dosierung

Gewünscht wird die Aussaat einer bestimmten Anzahl „Körner pro m^2“ oder „Körner pro ha“ bei eingestelltem Reihenabstand.

Daraus errechnet sich der erforderliche Kornabstand, der durch Drehzahländerung der Vereinzelungsscheiben eingestellt wird

- im Verstellgetriebe (Fig. 38/1) in 18 Stufen
- im Sekundärgetriebe (Fig. 38/2) in 3 Stufen.

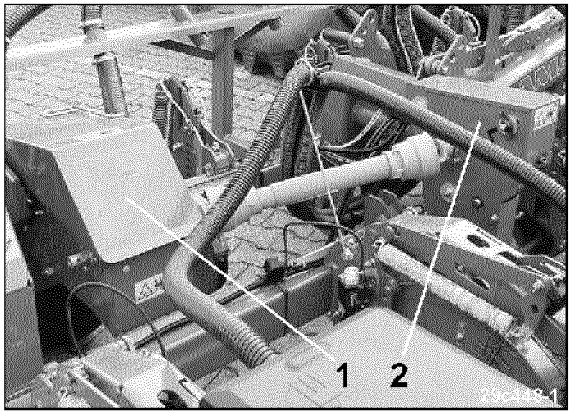


Fig. 38

Das Saatgut rutscht aus dem Saatgut-Behälter durch die Zulauföffnung (Fig. 39/1) in den Saatgut-Vorrats-Bereich (Fig. 39/2) der Vereinzelungsscheibe.

Der Saatgut-Vorrats-Bereich darf weder überlaufen noch zu wenig Saatgut beinhalten.

Mit der Reduzierklappe (Fig. 39/3) wird die richtige Öffnungsgröße eingestellt.

Ein Gebläse erzeugt den Unterdruck hinter den Bohrungen (Fig. 39/4) der sich drehenden Vereinzelungsscheibe. Die Körner aus dem Saatgut-Vorrats-Bereich werden an die Bohrungen (Fig. 39/4) gesaugt.

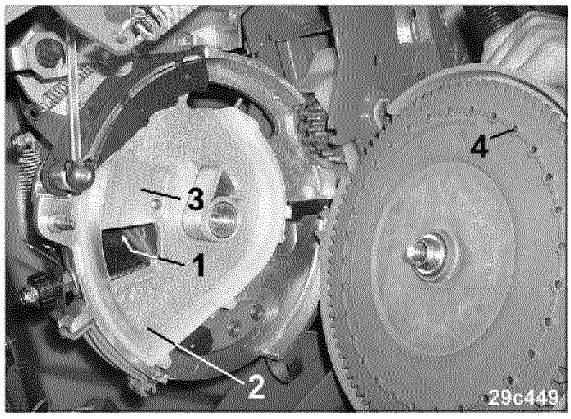


Fig. 39

Die Luft verlässt das Sägehäuse durch die Schlitze (Fig. 40/1) der Saugniere.

Am tiefsten Punkt (Fig. 40/2) der Vereinzelungsscheibe bricht der Unterdruck ab und das Korn fällt in die vom Säschar gezogene Saatfurche.

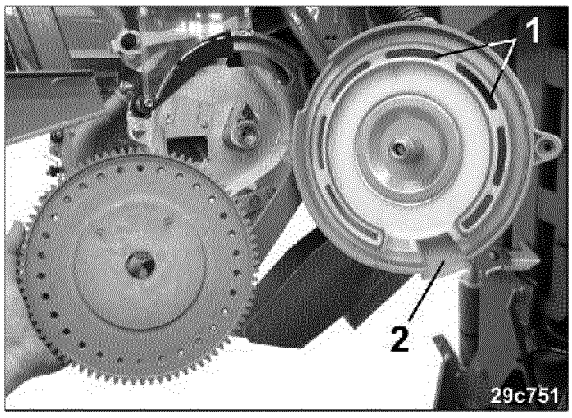


Fig. 40

Ein Auswerfer (Fig. 41/1) löst ggf. Bruchkörner, die die Bohrungen der Vereinzelungsscheibe verstopfen könnten.

Werden mehrere Saatgut-Körner gleichzeitig an eine Bohrung angesaugt, löst ein in 5 Positionen einstellbarer Abstreifer (Fig. 41/2) die überzähligen Saatgut-Körner schonend ab, die dann zurück in den Saatgut-Vorrats-Bereich (Fig. 41/3) fallen.

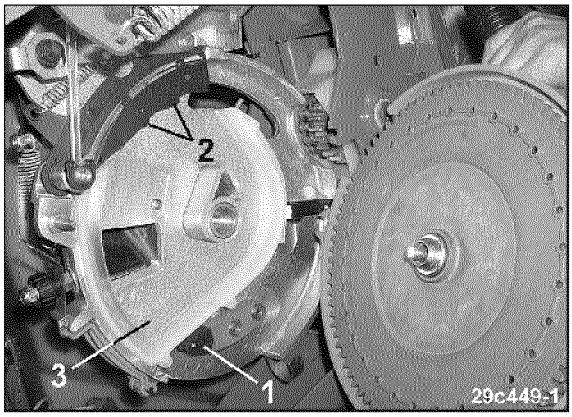


Fig. 41

Das Saugluft-Gebläse (Fig. 42/1) erzeugt den Unterdruck, der die Saatgut-Körner an die Bohrungen der Vereinzelungsscheiben saugt.

Angetrieben wird das Saugluft-Gebläse

- von der Traktor-Zapfwelle oder
- von einem Hydraulik-Motor.

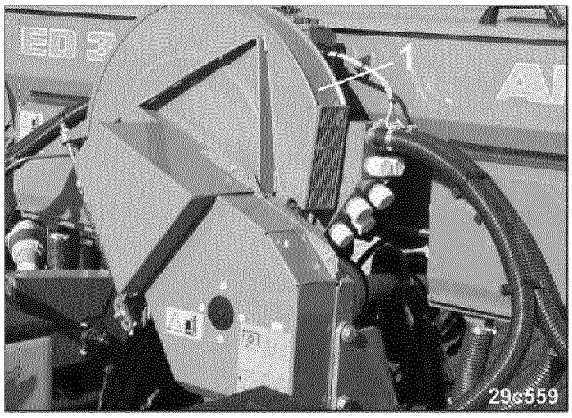


Fig. 42

Den Unterdruck zeigt ein Manometer (Fig. 43/1) in der Traktorkabine an.

Eine Drehzahländerung des Saugluft-Gebläses bewirkt eine Veränderung des Unterdruckes.

Die erforderliche Gebläsedrehzahl anhand des Manometers einstellen.

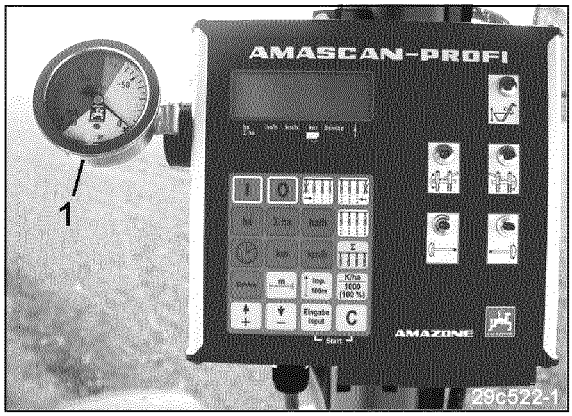


Fig. 43

Die Bohrungen der Vereinzelungsscheiben (Fig. 44) stehen in Relation zu den Saatguteigenschaften (Größe, Form und Gewicht). Die Vereinzelungsscheiben sind entsprechend zu wechseln.

Die Kennzeichnung der Vereinzelungsscheiben gibt die Anzahl der Bohrungen, den Bohrungs-Durchmesser und die Farbe der Vereinzelungsscheibe an, z.B. 30/5,0 grün:

30 Bohrungen / Durchmesser 5,0 mm, Farbe grün.

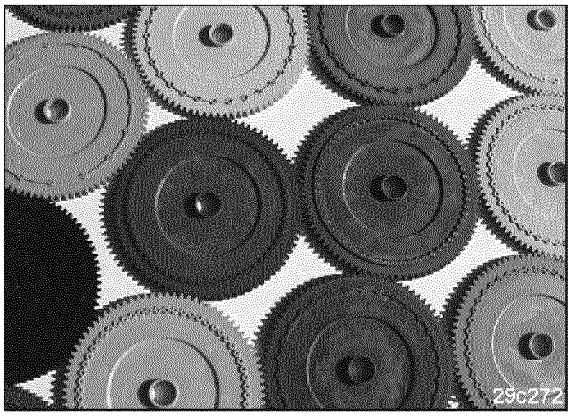


Fig. 44

5.4 Einstellbare Reihenabstände

Reihen-zahl	x	Reihen-abstand	mit Classic-Säaggregaten				mit Contour-Säaggregaten			
			Anzahl der Sä-aggregate	Reihendün-gung mög-lich	Arbeits-breite (m)	Transport-breite (m)	Anzahl der Säaggre-gate	Reihen-düngung möglich	Arbeits-breite (m)	Transport-breite (m)
ED 302										
4	x	70	4	Ja	2,80	3,00	2 rechts / 2 links	Ja	2,80	3,00
4	x	75	4	Ja	3,00	3,00	2 rechts / 2 links	Ja	3,00	3,00
4	x	80	4	Ja	3,20	3,00	2 rechts / 2 links	Ja	3,20	3,00
5	x	60	5	Ja	3.00	3,00	3 rechts / 2 links	Ja	3.00	3,00
6	x	45	6	Ja	2,70	3,00	3 rechts / 3 links	Ja	2,70	3,00
6	x	50	6	Ja	3,00	3,00	3 rechts / 3 links	Ja	3,00	3,00
7	x	45	7	Nein	3,15	3,00	4 rechts / 3 links	Nein	3,15	3,00
8	x	40	8	Nein	3,20	3,00	4 rechts / 3 links	Nein	3,20	3,00
10	x	30	10	Nein	3,00	3,00				
ED 452										
6	x	70	6	Ja	4,20	4,00	3 rechts / 3 links	Ja	4,20	4,00
6	x	75	6	Ja	4,50	4,00	3 rechts / 3 links	Ja	4,50	4,00
6	x	80	6	Ja	4,80	4,25	3 rechts / 3 links	Ja	4,80	4,25
7	x	60	7	Nein	4,20	4,00	4 rechts / 3 links	Nein	4,20	4,00
8	x	50	8	Nein	4,00	4,00	4 rechts / 4 links	Nein	4,00	4,00
9	x	45	9	Nein	4,05	4,00	5 rechts / 4 links	Nein	4,05	4,00
10	x	40	10	Nein	4,00	4,00				
ED 452-K										
6	x	70	6	Ja	4,20	3,00	3 rechts / 3 links	Ja	4,20	3,00
6	x	75	6	Ja	4,50	3,00	3 rechts / 3 links	Ja	4,50	3,00
6	x	80	6	Ja	4,80	3,00	3 rechts / 3 links	Ja	4,80	3,00
7	x	60	7	Nein	4,20	3,00	4 rechts / 3 links	Nein	4,20	3,00
ED 602-K										
8	x	70	8	mit Fronttank	5,60	3,05	4 rechts / 4 links	mit Fronttank	5,60	3,05
8	x	75	8	Ja	6,00	3,05	4 rechts / 4 links	Ja	6,00	3,05
8	x	80	8	Ja	6,40	3,12	4 rechts / 4 links	Ja	6,40	3,12
9	x	60	9	Nein	5,40	3,05	5 rechts / 4 links	Nein	5,40	3,05
12	x	45	12	mit Fronttank	5,40	3,15	6 rechts / 6 links	mit Fronttank	5,40	3,15
12	x	45	12	Nein	5,40	3,05	6 rechts / 6 links	mit Fronttank	5,40	3,05
12	x	50	12	mit Fronttank	6,00	3,15	6 rechts / 6 links	Nein	6,00	3,15
12	x	50	12	Nein	6,00	3,05	6 rechts / 6 links	Nein	6,00	3,05
ED 902-K										
12	x	70	12	mit Fronttank	8,40	3,05	6 rechts / 6 links	mit Fronttank	8,40	3,05
12	x	75	12	mit Fronttank	9,00	3,05	6 rechts / 6 links	mit Fronttank	9,00	3,05
12	x	80	12	mit Fronttank	9,60	3,05	6 rechts / 6 links	mit Fronttank	9,60	3,05
15	x	60	15	Nein	9,00	3,05	8 rechts / 7 links	Nein	9,00	3,05
18	x	45	18	mit Fronttank	8,10	3,15	9 rechts / 9 links	mit Fronttank	8,10	3,15
18	x	45	18	Nein	8,10	3,05	9 rechts / 9 links	Nein	8,10	3,05
18	x	50	18	mit Fronttank	9,00	3,15	9 rechts / 9 links	mit Fronttank	9,00	3,15
18	x	50	18	Nein	9,00	3,05	9 rechts / 9 links	Nein	9,00	3,05

Fig. 45

5.5 Kornabstand

Gewünscht wird die Aussaat einer bestimmten Anzahl „Körner pro m^2„ bzw. „Körner pro Hektar“ bei eingestelltem Reihenabstand und vorgegebener Vereinzelungsscheibe.

5.5.1 Kornabstand (tabellarisch)

Entnehmen Sie den erforderlichen Kornabstand den Tabellen, ab Seite 57.

Beispiel:

Vereinzelungsscheiben: 30 Bohrungen

Reihenabstand: 75 cm

Gewünschte Anzahl Körner pro Hektar: 95000

Die Beispielwerte (schwarz unterlegt) in Tabelle (Fig. 46) aufsuchen und den Kornabstand 13,9 cm ablesen.

Vereinzelungsscheiben mit 30 Bohrungen

	Korn-abstand a (cm)	Körner/m	Reihenabstand 80 cm	75 cm	70 cm	60 cm	50 cm	45 cm	37,5 cm	30 cm
			Körnerzahl pro Hektar							
Y	6,1	16,4	204918	218579	234204	273224	327869	364299	437158	546448
	6,6	15,2	189394	202020	216462	252525	303030	336700	404040	505051
	7,1	14,1	176056	187793	201218	234742	281690	312989	375586	469484
	7,5	13,3	166667	177778	190487	222222	266667	296296	355556	444444
	8,0	12,5	156250	166667	178581	208333	250000	277778	333334	416667
	8,5	11,8	147059	156863	168077	196078	235294	261438	313726	392157
	8,7	11,5	143678	153257	164213	191571	229885	255428	306514	383142
	9,3	10,8	134409	143369	153618	179211	215054	238949	286738	358423
	10,0	10,0	125000	133333	142864	166667	200000	222222	266666	333333
	10,7	9,3	116822	124611	133519	155763	186916	207684	249222	311526
	11,3	8,8	110619	117994	126429	147493	176991	196657	235988	294985
	12,0	8,3	104167	111111	119054	138889	166667	185185	222222	277778
	12,2	8,2	102459	109290	117103	136612	163934	182149	218580	273224
	13,1	7,6	95420	101781	109057	127226	152672	169635	203562	254453
	13,9	7,2	89928	95923	102780	119904	143885	159872	191846	239808
	14,8	6,8	84459	90090	96530	112613	135135	150150	180180	225225
	15,7	6,4	79618	84926	90997	106157	127389	141543	169852	212314

Fig. 46

Vereinzelungsscheiben mit 15 Bohrungen

	Korn-abstand a (cm)	Körner/m	Reihenabstand							
			80 cm	75 cm	70 cm	60 cm	50 cm	45 cm	37,5 cm	30 cm
			Körnerzahl pro Hektar							
Y	12,2	8,2	102459	109290	117103	136612	163934	182149	218580	273224
	13,2	7,6	94697	101010	108231	126263	151515	168350	202020	252525
	14,2	7,0	88028	93897	100609	117371	140845	156495	187794	234742
	15,0	6,7	83333	88889	95243	111111	133333	148148	177778	222222
	16,0	6,3	78125	83333	89290	104167	125000	138889	166666	208333
	17,0	5,9	73529	78431	84038	98039	117647	130719	156862	196078
	17,2	5,8	72674	77519	83061	96899	116279	129199	155038	193798
	18,6	5,4	67204	71685	76809	89606	107527	119474	143370	179211
	20,0	5,0	62500	66667	71433	83333	100000	111111	133334	166667
	21,4	4,7	58411	62305	66759	77882	93458	103842	124610	155763
	22,6	4,4	55310	58997	63214	73746	88496	98328	117994	147493
	24,0	4,2	52083	55556	59527	69444	83333	92593	111112	138889
	24,4	4,1	51230	54645	58551	68306	81967	91075	109290	136612
	26,2	3,8	47710	50891	54529	63613	76336	84818	101782	127226
	27,8	3,6	44964	47962	51391	59952	71942	79936	95924	119904
	29,6	3,4	42230	45045	48265	56306	67568	75075	90090	112613
	31,4	3,2	39809	42463	45499	53079	63694	70771	84926	106157
X	21,0	4,8	59524	63492	68031	79365	95238	105820	126984	158730
	22,6	4,4	55310	58997	63214	73746	88496	98328	117994	147493
	24,2	4,1	51653	55096	59035	68871	82645	91827	110192	137741
	25,8	3,9	48450	51680	55374	64599	77519	86133	103360	129199
	27,4	3,6	45620	48662	52141	60827	72993	81103	97324	121655
	29,0	3,4	43103	45977	49264	57471	68966	76628	91954	114943
	29,6	3,4	42230	45045	48265	56306	67568	75075	90090	112613
	32,0	3,1	39063	41667	44646	52083	62500	69444	83334	104167
	34,2	2,9	36550	38986	41773	48733	58480	64977	77972	97466
	36,6	2,7	34153	36430	39034	45537	54645	60716	72860	91075
	38,4	2,6	32552	34722	37204	43403	52083	57870	69444	86806
	41,0	2,4	30488	32520	34845	40650	48780	54201	65040	81301
	41,8	2,4	29904	31898	34178	39872	47847	53163	63796	79745
	44,8	2,2	27902	29762	31890	37202	44643	49603	59524	74405
	47,8	2,1	26151	27894	29888	34868	41841	46490	55788	69735
	50,8	2,0	24606	26247	28123	32808	39370	43745	52494	65617
	53,8	1,9	23234	24783	26555	30979	37175	41305	49566	61958
Z	33,9	3,0	36857	39315	42125	49143	58973	65524	78630	98287
	36,6	2,8	34197	36477	39085	45597	54716	60796	72954	91195
	39,0	2,5	32050	34187	36631	42734	51280	56978	68374	85467
	41,6	2,4	30020	32021	34310	40026	48032	53369	64042	80053
	44,3	2,2	28232	30114	32267	37642	45170	50189	60228	75284
	46,9	2,1	26644	28421	30453	35525	42631	47367	56842	71050
	47,9	2,1	26119	27861	29853	34826	41791	46435	55722	69652
	51,6	1,9	24213	25827	27673	32284	38741	43046	51654	64568
	55,2	1,8	22643	24152	25879	30190	36229	40254	48304	60381
	59,2	1,7	21128	22537	24148	28171	33806	37562	45074	56343
	62,7	1,6	19923	21251	22770	26564	31877	35419	42502	53128
	66,1	1,5	18901	20161	21602	25202	30242	33603	40322	50403
	67,5	1,5	18532	19767	21180	24709	29651	32946	39534	49418
	72,4	1,4	17277	18429	19746	23036	27644	30715	36858	46072
	77,2	1,3	16182	17260	18494	21575	25890	28767	34520	43150
	82,0	1,2	15252	16269	17432	20335	24403	27114	32538	40670
	86,9	1,2	14391	15350	16447	19189	23026	25584	30700	38376

Vereinzelungsscheiben mit 30 Bohrungen

	Korn-abstand a (cm)	Körner/m	Reihenabstand							
			80 cm	75 cm	70 cm	60 cm	50 cm	45 cm	37,5 cm	30 cm
			Körnerzahl pro Hektar							
Y	6,1	16,4	204918	218579	234204	273224	327869	364299	437158	546448
	6,6	15,2	189394	202020	216462	252525	303030	336700	404040	505051
	7,1	14,1	176056	187793	201218	234742	281690	312989	375586	469484
	7,5	13,3	166667	177778	190487	222222	266667	296296	355556	444444
	8,0	12,5	156250	166667	178581	208333	250000	277778	333334	416667
	8,5	11,8	147059	156863	168077	196078	235294	261438	313726	392157
	8,7	11,5	143678	153257	164213	191571	229885	255428	306514	383142
	9,3	10,8	134409	143369	153618	179211	215054	238949	286738	358423
	10,0	10,0	125000	133333	142864	166667	200000	222222	266666	333333
	10,7	9,3	116822	124611	133519	155763	186916	207684	249222	311526
	11,3	8,8	110619	117994	126429	147493	176991	196657	235988	294985
	12,0	8,3	104167	111111	119054	138889	166667	185185	222222	277778
	12,2	8,2	102459	109290	117103	136612	163934	182149	218580	273224
	13,1	7,6	95420	101781	109057	127226	152672	169635	203562	254453
	13,9	7,2	89928	95923	102780	119904	143885	159872	191846	239808
	14,8	6,8	84459	90090	96530	112613	135135	150150	180180	225225
	15,7	6,4	79618	84926	90997	106157	127389	141543	169852	212314
X	10,5	9,5	119048	126984	136062	158730	190476	211640	253968	317460
	11,3	8,8	110619	117994	126429	147493	176991	196657	235988	294985
	12,1	8,3	103306	110193	118070	137741	165289	183655	220386	275482
	12,9	7,8	96899	103359	110748	129199	155039	172265	206718	258398
	13,7	7,3	91241	97324	104281	121655	145985	162206	194648	243309
	14,5	6,9	86207	91954	98527	114943	137931	153257	183908	229885
	14,8	6,8	84459	90090	96530	112613	135135	150150	180180	225225
	16,0	6,3	78125	83333	89290	104167	125000	138889	166666	208333
	17,1	5,8	73099	77973	83547	97466	116959	129955	155946	194932
	18,3	5,5	68306	72860	78068	91075	109290	121433	145720	182149
	19,4	5,2	64433	68729	73642	85911	103093	114548	137458	171821
	20,5	4,9	60976	65041	69691	81301	97561	108401	130082	162602
	20,9	4,8	59809	63796	68357	79745	95694	106326	127592	159490
	22,4	4,5	55804	59524	63779	74405	89286	99206	119048	148810
	23,9	4,2	52301	55788	59776	69735	83682	92980	111576	139470
	25,4	3,9	49213	52493	56246	65617	78740	87489	104986	131234
	26,9	3,7	46468	49566	53109	61958	74349	82610	99132	123916
Z	17,0	5,9	73715	78630	84251	98287	117944	131050	157260	196574
	18,3	5,5	68396	72956	78171	91195	109433	121593	145912	182388
	19,5	5,1	64100	68373	73261	85467	102560	113956	136746	170934
	20,8	4,8	60040	64042	68620	80053	96064	106737	128084	160106
	22,1	4,6	56462	60227	64532	75284	90340	100379	120454	150567
	23,5	4,2	53288	56841	60904	71050	85261	94735	113682	142102
	23,9	4,1	52240	55721	59704	69652	83583	92870	111442	139305
	25,8	3,8	48426	51655	55348	64568	77482	86091	103310	129137
	27,6	3,6	45286	48305	51758	60381	72457	80508	96610	120763
	29,6	3,4	42257	45074	48296	56343	67611	75123	90148	112686
	31,4	3,2	39847	42502	45540	53128	63754	70837	85004	106256
	33,1	3,0	37803	40323	43206	50403	60484	67205	80646	100807
	33,7	3,0	37063	39535	42361	49418	59302	65890	79070	98836
	36,2	2,8	34554	36857	39492	46072	55286	61429	73714	92145
	38,6	2,5	32363	34520	36988	43150	51780	57534	69040	86301
	41,0	2,4	30503	32536	34862	40670	48805	54228	65072	81341
	43,4	2,3	28783	30702	32897	38376	46052	51169	61404	76754

Vereinzelungsscheiben mit 45 Bohrungen

	Korn-abstand a (cm)	Körner/m	Reihenabstand							
			80 cm	75 cm	70 cm	60 cm	50 cm	45 cm	37,5 cm	30 cm
			Körnerzahl pro Hektar							
Y	4,1	24,4	304878	325203	348450	406504	487805	542005	650406	813008
	4,4	22,7	284091	303030	324692	378788	454545	505051	606060	757576
	4,7	21,3	265957	283688	303968	354610	425532	472813	567376	709220
	5,0	20,0	250000	266667	285730	333333	400000	444444	533334	666667
	5,3	18,9	235849	251572	269556	314465	377358	419287	503144	628931
	5,6	17,9	223214	238095	255115	297619	357143	396825	476190	595238
	5,7	17,5	219298	233918	250640	292398	350877	389864	467836	584795
	6,2	16,1	201613	215054	230427	268817	322581	358423	430108	537634
	6,6	15,2	189394	202020	216462	252525	303030	336700	404040	505051
	7,1	14,1	176056	187793	201218	234742	281690	312989	375586	469484
	7,6	13,2	164474	175439	187980	219298	263158	292398	350878	438596
	8,0	12,5	156250	166667	178581	208333	250000	277778	333334	416667
	8,2	12,2	152439	162602	174226	203252	243902	271003	325204	406504
	8,7	11,5	143678	153257	164213	191571	229885	255428	306514	383142
	9,3	10,8	134409	143369	153618	179211	215054	238949	286738	358423
	9,9	10,1	126263	134680	144308	168350	202020	224467	269360	336700
	10,4	9,6	120192	128205	137370	160256	192308	213675	256410	320513
X	7,0	14,3	178571	190476	204092	238095	285714	317460	380952	476190
	7,5	13,3	166667	177778	190487	222222	266667	296296	355556	444444
	8,1	12,3	154321	164609	176376	205761	246914	274348	329218	411523
	8,6	11,6	145349	155039	166122	193798	232558	258398	310078	387597
	9,1	11,0	137363	146520	156994	183150	219780	244200	293040	366300
	9,7	10,3	128866	137457	147283	171821	206186	229095	274914	343643
	9,9	10,1	126263	134680	144308	168350	202020	224467	269360	336700
	10,7	9,3	116822	124611	133519	155763	186916	207684	249222	311526
	11,4	8,8	109649	116959	125320	146199	175439	194932	233918	292398
	12,2	8,2	102459	109290	117103	136612	163934	182149	218580	273224
	12,9	7,8	96899	103359	110748	129199	155039	172265	206718	258398
	13,7	7,3	91241	97324	104281	121655	145985	162206	194648	243309
	13,9	7,2	89928	95923	102780	119904	143885	159872	191846	239808
	14,9	6,7	83893	89485	95882	111857	134228	149142	178970	223714
	15,9	6,3	78616	83857	89852	104822	125786	139762	167714	209644
	16,9	5,9	73964	78895	84535	98619	118343	131492	157790	197239
	17,9	5,6	69832	74488	79813	93110	111732	124146	148976	186220
Z	11,3	8,8	110573	117944	126375	147431	176917	196574	235888	294861
	12,2	8,3	102858	109716	117559	137145	164574	182859	219432	274289
	13,1	7,6	95459	101822	109101	127278	152734	169704	203644	254556
	13,6	7,3	92145	98287	105313	122859	147431	163812	196574	245717
	14,7	6,8	85056	90726	97212	113409	136090	151211	181452	226816
	15,6	6,4	79932	85261	91356	106577	127892	142102	170522	213152
	16,0	6,3	78051	83255	89207	104068	124882	138758	166510	208137
	17,2	5,8	72507	77341	82870	96676	116011	128901	154682	193351
	18,4	5,4	68045	72581	77770	90726	108872	120969	145162	181453
	19,7	5,1	63487	67719	72560	84649	101579	112865	135438	169299
	20,8	4,8	60040	64042	68620	80053	96064	106737	128084	160106
	22,1	4,6	56462	60227	64532	75284	90340	100379	120454	150567
	22,4	4,5	55751	59467	63718	74335	89202	99113	118934	148669
	24,0	4,1	52035	55504	59472	69379	83255	92505	111008	138758
	25,7	3,9	48604	51844	55550	64805	77765	86406	103688	129609
	27,3	3,6	45754	48805	52294	61005	73207	81341	97610	122012
	28,9	3,5	43221	46102	49398	57628	69154	76837	92204	115256

Vereinzelungsscheiben mit 60 Bohrungen

	Korn-abstand a (cm)	Körner/m	Reihenabstand							
			80 cm	75 cm	70 cm	60 cm	50 cm	45 cm	37,5 cm	30 cm
			Körnerzahl pro Hektar							
Y	3,1	32,8	409836	437158	468409	546448	655738	728597	874316	1092896
	3,3	30,3	378788	404040	432923	505051	606061	673401	808080	1010101
	3,6	28,2	352113	375587	402436	469484	563380	625978	751174	938967
	3,8	26,7	333333	355556	380973	444444	533333	592593	711112	888889
	4,0	25,0	312500	333333	357162	416667	500000	555556	666666	833333
	4,3	23,5	294118	313725	336152	392157	470588	522876	627450	784314
	4,4	23,0	287356	306513	328424	383142	459770	510856	613026	766284
	4,7	21,5	268817	286738	307236	358423	430108	477897	573476	716846
	5,0	20,0	250000	266667	285730	333333	400000	444444	533334	666667
	5,4	18,7	233645	249221	267037	311526	373832	415369	498442	623053
	5,7	17,7	221239	235988	252858	294985	353982	393314	471976	589971
	6,0	16,7	208333	222222	238108	277778	333333	370370	444444	555556
	6,1	16,4	204918	218579	234204	273224	327869	364299	437158	546448
	6,6	15,3	190840	203562	218114	254453	305344	339271	407124	508906
	7,0	14,4	179856	191847	205561	239808	287770	319744	383694	479616
	7,4	13,5	168919	180180	193060	225225	270270	300300	360360	450450
	7,9	12,7	159236	169851	181993	212314	254777	283086	339702	424628
X	5,3	19,0	238095	253968	272123	317460	380952	423280	507936	634921
	5,7	17,7	221239	235988	252858	294985	353982	393314	471976	589971
	6,1	16,5	206612	220386	236141	275482	330579	367309	440772	550964
	6,5	15,5	193798	206718	221495	258398	310078	344531	413436	516796
	6,9	14,6	182482	194647	208562	243309	291971	324412	389294	486618
	7,3	13,8	172414	183908	197055	229885	275862	306513	367816	459770
	7,4	13,5	168919	180180	193060	225225	270270	300300	360360	450450
	8,0	12,5	156250	166667	178581	208333	250000	277778	333334	416667
	8,6	11,7	146199	155945	167093	194932	233918	259909	311890	389864
	9,2	10,9	136612	145719	156136	182149	218579	242866	291438	364299
	9,7	10,3	128866	137457	147283	171821	206186	229095	274914	343643
	10,3	9,8	121951	130081	139380	162602	195122	216802	260162	325203
	10,5	9,6	119617	127592	136713	159490	191388	212653	255184	318979
	11,2	8,9	111607	119048	127558	148810	178571	198413	238096	297619
	12,0	8,4	104603	111576	119552	139470	167364	185960	223152	278940
	12,7	7,9	98425	104987	112492	131234	157480	174978	209974	262467
	13,5	7,4	92937	99133	106220	123916	148699	165221	198266	247831
Z	8,5	11,8	147431	157259	168501	196574	235889	262099	314518	393148
	9,1	10,9	136791	145911	156342	182388	218866	243184	291822	364777
	9,8	10,2	127584	136090	145819	170112	204135	226816	272180	340225
	10,5	9,6	119539	127507	136622	159384	191261	212512	255014	318768
	11,1	9,0	112447	119943	128517	149929	179916	199906	239886	299859
	11,8	8,5	106150	113227	121321	141533	169840	188711	226454	283067
	12,0	8,4	104478	111444	119411	139305	167165	185739	222888	278609
	12,9	7,7	96852	103309	110694	129137	154963	172182	206618	258273
	13,8	7,2	90264	96281	103164	120352	144421	160469	192562	240703
	14,8	6,8	84515	90149	96593	112686	135223	150248	180298	225371
	15,7	6,4	79453	84750	90808	105938	127125	141251	169500	211876
	16,6	6,1	75391	80417	86166	100521	120625	134028	160834	201042
	16,9	5,9	74127	79069	84721	98836	118604	131781	158138	197673
	18,1	5,5	69108	73715	78985	92145	110573	122859	147430	184288
	19,3	5,2	64726	69041	73976	86301	103561	115068	138082	172602
	21,5	4,7	58197	62077	66515	77595	93114	103460	124154	155190
	21,9	4,6	57193	61005	65366	76257	91509	101676	122010	152514

Vereinzelungsscheiben mit 90 Bohrungen

	Korn-abstand a (cm)	Körner/m	Reihenabstand							
			80 cm	75 cm	70 cm	60 cm	50 cm	45 cm	37,5 cm	30 cm
			Körnerzahl pro Hektar							
Y	2,1	48,8	609756	650407	696902	813008	975610	1084011	1300814	1626016
	2,2	45,5	568182	606061	649386	757576	909091	1010101	1212122	1515152
	2,4	42,6	531915	567376	607935	709220	851064	945626	1134752	1418440
	2,5	40,0	500000	533333	571459	666667	800000	888889	1066666	1333333
	2,7	37,7	471698	503145	539113	628931	754717	838574	1006290	1257862
	2,8	35,7	446429	476190	510231	595238	714286	793651	952380	1190476
	2,9	35,1	438596	467836	501280	584795	701754	779727	935672	1169591
	3,1	32,3	403226	430108	460855	537634	645161	716846	860216	1075269
	3,3	30,3	378788	404040	432923	505051	606061	673401	808080	1010101
	3,6	28,2	352113	375587	402436	469484	563380	625978	751174	938967
	3,8	26,3	328947	350877	375960	438596	526316	584795	701754	877193
	4,0	25,0	312500	333333	357162	416667	500000	555556	666666	833333
	4,1	24,4	304878	325203	348450	406504	487805	542005	650406	813008
	4,4	23,0	287356	306513	328424	383142	459770	510856	613026	766284
	4,7	21,5	268817	286738	307236	358423	430108	477897	573476	716846
	5,0	20,2	252525	269360	288615	336700	404040	448934	538720	673401
	5,2	19,2	240385	256410	274740	320513	384615	427350	512820	641026
X	3,5	28,6	357143	380952	408185	476190	571429	634921	761904	952381
	3,8	26,7	333333	355556	380973	444444	533333	592593	711112	888889
	4,1	24,7	308642	329218	352752	411523	493827	548697	658436	823045
	4,3	23,3	290698	310078	332244	387597	465116	516796	620156	775194
	4,5	22,1	276243	294659	315723	368324	441989	491099	589318	736648
	4,9	20,6	257732	274914	294567	343643	412371	458190	549828	687285
	5,0	20,2	252525	269360	288615	336700	404040	448934	538720	673401
	5,4	18,7	233645	249221	267037	311526	373832	415369	498442	623053
	5,7	17,5	219298	233918	250640	292398	350877	389864	467836	584795
	6,1	16,4	204918	218579	234204	273224	327869	364299	437158	546448
	6,5	15,5	193798	206718	221495	258398	310078	344531	413436	516796
	6,9	14,6	182482	194647	208562	243309	291971	324412	389294	486618
	7,0	14,4	179856	191847	205561	239808	287770	319744	383694	479616
	7,5	13,4	167785	178971	191765	223714	268456	298285	357942	447427
	8,0	12,6	157233	167715	179704	209644	251572	279525	335430	419287
	8,5	11,8	147929	157791	169071	197239	236686	262985	315582	394477
	9,0	11,2	139665	148976	159626	186220	223464	248293	297952	372439
Z	5,7	17,7	221145	235889	252752	294861	353833	393148	471778	589723
	6,1	16,5	205717	219431	235117	274289	329148	365720	438862	548579
	6,6	15,3	190917	203646	218204	254556	305468	339408	407292	509112
	6,8	14,8	184288	196574	210626	245717	294861	327623	393148	491435
	7,3	13,6	170112	181453	194424	226816	272179	302421	362906	453632
	7,8	12,7	159864	170523	182713	213152	255783	284204	341046	426305
	8,0	12,5	156103	166510	178413	208137	249765	277516	333020	416275
	8,7	11,6	145014	154681	165739	193351	232022	257802	309362	386703
	9,2	10,9	136090	145162	155539	181453	217743	241937	290324	362906
	9,9	10,2	126973	135439	145121	169299	203158	225731	270878	338596
	10,5	9,6	120079	128085	137241	160106	192126	213474	256170	320211
	11,1	9,0	112926	120454	129065	150567	180681	200756	240908	301135
	11,2	8,9	111502	118936	127438	148669	178403	198226	237872	297339
	12,1	8,3	104068	111006	118941	138758	166510	185011	222012	277516
	12,9	7,7	97207	103687	111099	129609	155531	172812	207374	259218
	13,7	7,3	91509	97609	104587	122012	146414	162682	195218	244023
	14,5	6,9	86441	92204	98795	115256	138306	153673	184408	230510

5.5.2 Kornabstand (rechnerisch)

$$\text{Kornabstand a [cm]} = \frac{100}{\text{Körner pro m}^2 \text{ x Reihenabstand [m]}}$$

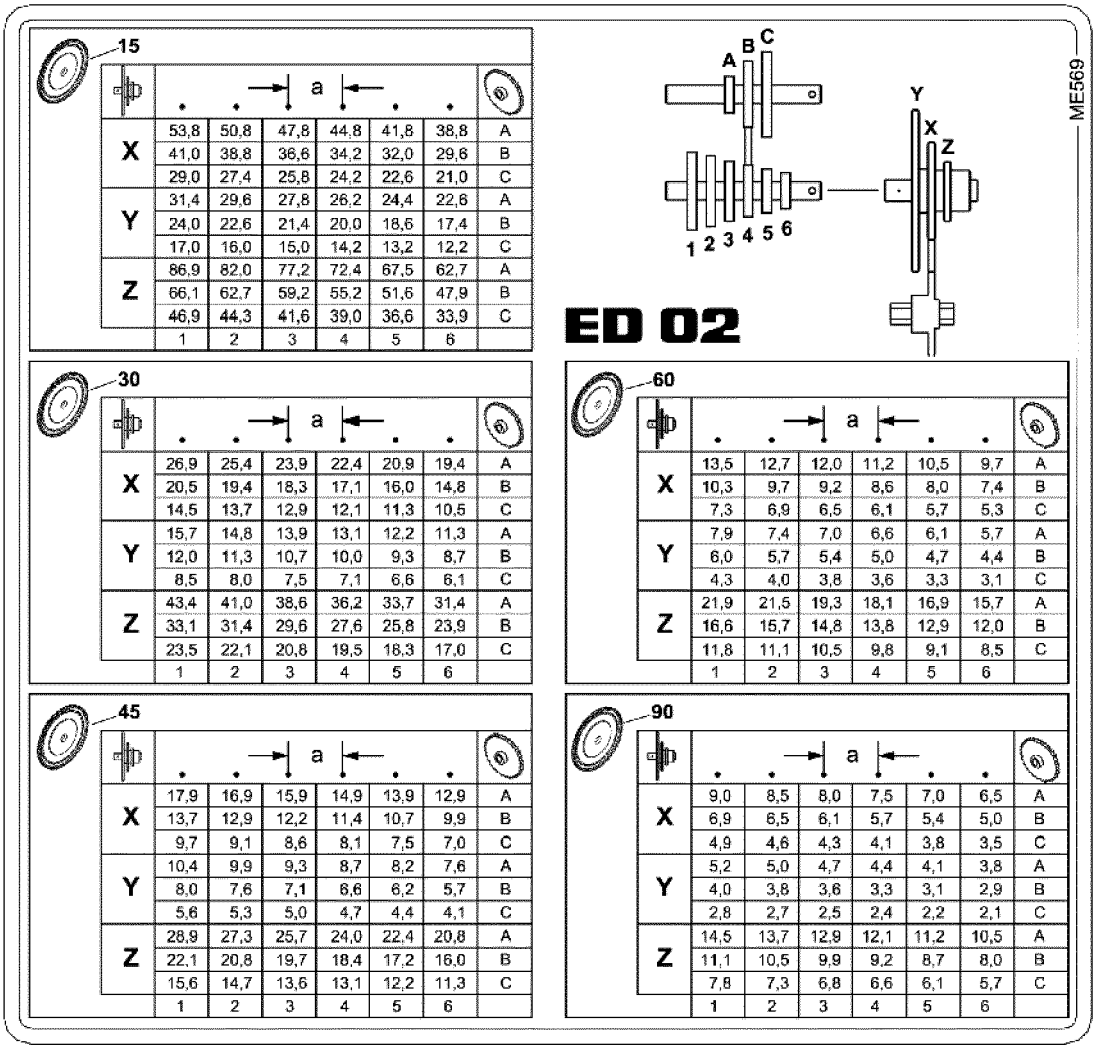
Beispiel:

Anzahl der Bohrungen der Vereinzelungsscheiben:	30 Bohrungen
Gewünschte Anzahl „Körnerzahl pro Hektar“:	95000 Körner/ha (= 9,5 Körner pro m²)
Gewählter Reihenabstand:	0,75 m

$$\text{Kornabstand a [cm]} = \frac{100}{9{,}5 \text{ x } 0{,}75 \text{ [m]}} = 14{,}04 \text{ cm}$$

Mit den Werten (30 Bohrungen/14,04 cm) in die Tabelle (Fig. 47) gehen und den nächstliegenden Wert entnehmen:
Kornabstand a = 13,9 cm.

5.5.3 Kettenradpaarungen ermitteln für die Verstell- und Sekundärgetriebe



15							
X	53,8	50,8	47,8	44,8	41,8	38,8	A
	41,0	38,8	36,6	34,2	32,0	29,6	B
	29,0	27,4	25,8	24,2	22,6	21,0	C
Y	31,4	29,6	27,8	26,2	24,4	22,6	A
	24,0	22,6	21,4	20,0	18,6	17,4	B
	17,0	16,0	15,0	14,2	13,2	12,2	C
Z	86,9	82,0	77,2	72,4	67,5	62,7	A
	66,1	62,7	59,2	55,2	51,6	47,9	B
	46,9	44,3	41,6	39,0	36,6	33,9	C
	1	2	3	4	5	6	

30							
X	26,9	25,4	23,9	22,4	20,9	19,4	A
	20,5	19,4	18,3	17,1	16,0	14,8	B
	14,5	13,7	12,9	12,1	11,3	10,5	C
Y	15,7	14,8	13,9	13,1	12,2	11,3	A
	12,0	11,3	10,7	10,0	9,3	8,7	B
	8,5	8,0	7,5	7,1	6,6	6,1	C
Z	43,4	41,0	38,6	36,2	33,7	31,4	A
	33,1	31,4	29,6	27,6	25,8	23,9	B
	23,5	22,1	20,8	19,5	18,3	17,0	C
	1	2	3	4	5	6	

60							
X	13,5	12,7	12,0	11,2	10,5	9,7	A
	10,3	9,7	9,2	8,6	8,0	7,4	B
	7,3	6,9	6,5	6,1	5,7	5,3	C
Y	7,9	7,4	7,0	6,6	6,1	5,7	A
	6,0	5,7	5,4	5,0	4,7	4,4	B
	4,3	4,0	3,8	3,6	3,3	3,1	C
Z	21,9	21,5	19,3	18,1	16,9	15,7	A
	16,6	15,7	14,8	13,8	12,9	12,0	B
	11,8	11,1	10,5	9,8	9,1	8,5	C
	1	2	3	4	5	6	

45							
X	17,9	16,9	15,9	14,9	13,9	12,9	A
	13,7	12,9	12,2	11,4	10,7	9,9	B
	9,7	9,1	8,6	8,1	7,5	7,0	C
Y	10,4	9,9	9,3	8,7	8,2	7,6	A
	8,0	7,6	7,1	6,6	6,2	5,7	B
	5,6	5,3	5,0	4,7	4,4	4,1	C
Z	28,9	27,3	25,7	24,0	22,4	20,8	A
	22,1	20,8	19,7	18,4	17,2	16,0	B
	15,6	14,7	13,6	13,1	12,2	11,3	C
	1	2	3	4	5	6	

90							
X	9,0	8,5	8,0	7,5	7,0	6,5	A
	6,9	6,5	6,1	5,7	5,4	5,0	B
	4,9	4,6	4,3	4,1	3,8	3,5	C
Y	5,2	5,0	4,7	4,4	4,1	3,8	A
	4,0	3,8	3,6	3,3	3,1	2,9	B
	2,8	2,7	2,5	2,4	2,2	2,1	C
Z	14,5	13,7	12,9	12,1	11,2	10,5	A
	11,1	10,5	9,9	9,2	8,7	8,0	B
	7,8	7,3	6,8	6,6	6,1	5,7	C
	1	2	3	4	5	6	

Fig. 47

Beispiel:

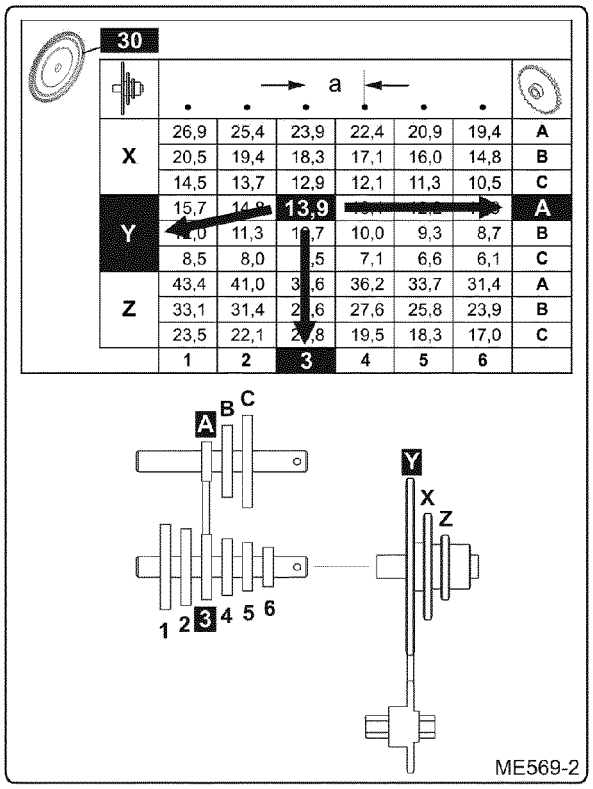
Vereinzelungsscheiben: 30 Bohrungen

Kornabstand a: 13,9 cm

Der Tabelle (Fig. 48) entnehmen:

Kettenradpaarung im Verstellgetriebe: A – 3

Kettenradpaarung im Sekundärgetriebe: Y



X	26,9	25,4	23,9	22,4	20,9	19,4	A
	20,5	19,4	18,3	17,1	16,0	14,8	B
	14,5	13,7	12,9	12,1	11,3	10,5	C
Y	15,7	14,9	13,9	13,0	12,2	11,3	A
	12,0	11,3	10,7	10,0	9,3	8,7	B
	8,5	8,0	7,5	7,1	6,6	6,1	C
Z	43,4	41,0	38,6	36,2	33,7	31,4	A
	33,1	31,4	29,6	27,6	25,8	23,9	B
	23,5	22,1	20,8	19,5	18,3	17,0	C
	1	2	3	4	5	6	

Fig. 48

5.6 Spuranreißer

Die hydraulisch betätigten Spuranreißer (Fig. 49) greifen abwechselnd rechts und links neben der Maschine in den Boden ein.

Hierbei erzeugt der aktive Spuranreißer eine Markierung. Diese Markierung dient dem Traktorfahrer als Orientierungshilfe zum korrekten Anschlussfahren nach dem Wenden am Vorgewende.

Nach dem Wenden fährt der Traktorfahrer bei der Anschlussfahrt entweder mittig über die Markierung oder mit dem Vorderreifen auf der Markierung.

Einstellbar ist

- die Länge der Spuranreißer
- die Arbeitsintensität der Spuranreißer, je nach Bodenart.



Fig. 49

5.7 Spurlockerer (Option)

Die Ausführung der Spurlockerer (Option) ist abhängig vom Maschinentyp und Einsatzgebiet.

Die Spurlockerer (Fig. 50) sind horizontal und vertikal einstellbar.

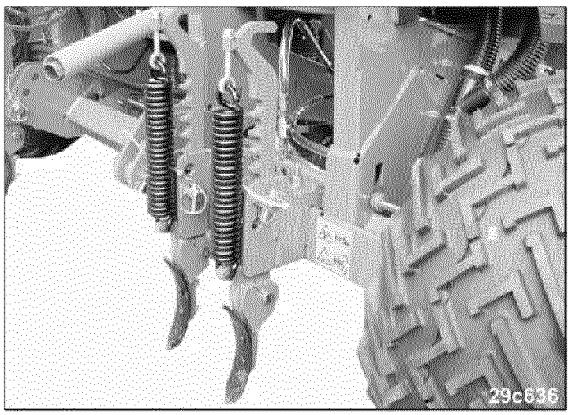


Fig. 50

5.8 Unterfußdüngung (Option)

5.8.1 Düngerschare

Die Düngerablagetiefe und der Abstand der Düngerschare zum Säschar ist einstellbar.

Hindernissen weichen die Düngerschare aus.

Die Schlepp-Düngerschare (Fig. 51) kommen zum Einsatz

- auf gepflügten Böden.

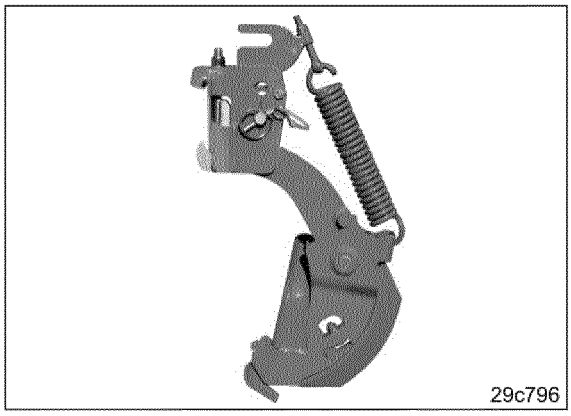


Fig. 51

Die Einscheiben-Düngerschare (Fig. 52) kommen zum Einsatz

- auf gepflügten Böden
- bei Mulchsaaten.

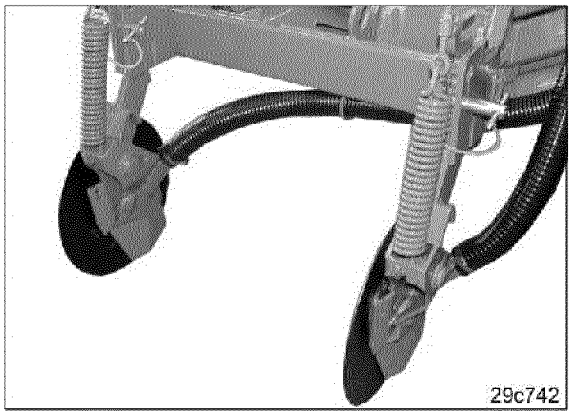


Fig. 52

5.9 Elektronische Überwachung und Bedienung (Option)

Elektronisch überwacht und bedient wird die Einzelkorn-Sämaschine von einem Bordcomputer (Option). Für die unterschiedlichen Anforderungen stehen drei Bordcomputer zur Auswahl:

- **AMASCAN+**
- **AMASCAN-PROFI**
- **ED-CONTROL**.

Die Anzeige und Betätigung erfolgt am Bedienterminal in der Traktorkabine.

5.9.1 AMASCAN+

Der **AMASCAN+**

- überwacht die Vereinzelung.
  Akustische und optische Fehlermeldung.
- zeigt die „Anzahl der Körner pro Hektar".
  Akustische und optische Fehlermeldung bei Abweichung vom Sollwert.
- Servicefunktion zum Testen der Optogeberfunktion.
- schaltet den Antrieb einzelner Säaggregate ab (Teilbreitenschaltung).
  Erforderliche Ausrüstung: Säaggregate mit elektrischer Abschaltung (Option).
- gibt Alarm (Option)
  - o bei Unterschreitung der Mindest-Füllmenge im 900 / 1100 Liter Dünger-Vorratsbehälter und im Fronttank.
  - o bei Stillstand der Dosierräder im 900 / 1100 Liter Dünger-Vorratsbehälter und im Fronttank.

  Erforderliche Ausrüstung:
  Behälterüberwachung (Option).
- zeigt die Arbeitsgeschwindigkeit [km/h] an.

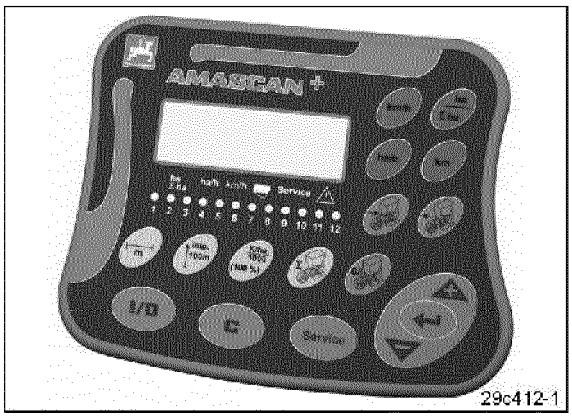


Fig. 53

Der AMASCAN+ speichert

- die bearbeitete Fläche [ha]
- die zurückgelegte Wegstrecke [km]
- die Flächenleistung [ha/h]
- die bearbeitete Gesamtfläche [ha].

5.9.2 AMASCAN-PROFI

Der **AMASCAN-PROFI** integriert die Funktionen des **AMASCAN+** und beinhaltet zusätzlich nachfolgend aufgeführte Funktionen:

- klappt die Säaggregat-Ausleger getrennt ein und aus
- klappt die Spuranreißer getrennt ein- und aus
- schaltet die Befüllschnecke ein- und aus
- speichert die Arbeitszeit [h].

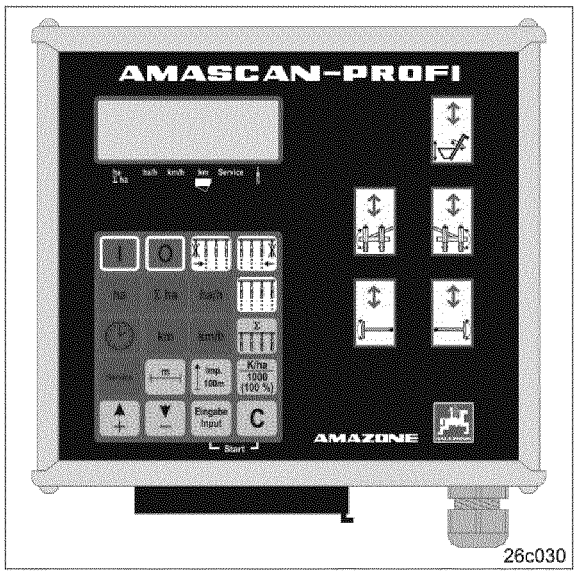


Fig. 54

5.9.3 ED-CONTROL

Der **ED-CONTROL** integriert die Funktionen des **AMASCAN-PROFI** und beinhaltet zusätzlich nachfolgend aufgeführte Funktionen:

- speichert 12 Aufträge
- schaltet automatisch den Antrieb einzelner Säaggregate ab zum Anlegen von Fahrgassen in bestimmten Rhythmen. Erforderliche Ausrüstung: Säaggregate mit elektrischer Abschaltung (Option).
- beinhaltet die Wechselautomatik für Spuranreißer am Vorgewende
- senkt/hebt das Spornrad (Fronttank).



Fig. 55

6 Inbetriebnahme

In diesem Kapitel erhalten Sie Informationen zur Inbetriebnahme Ihrer Maschine.



Gefahr!

- **Vor Inbetriebnahme der Maschine muss der Bediener die Betriebsanleitung gelesen und verstanden haben.**
- **Beachten Sie das Kapitel "Sicherheitshinweise für den Bediener", ab Seite 25 beim**
  - **An- und Abkuppeln der Maschine**
  - **Transportieren der Maschine**
  - **Einsatz der Maschine**
- **Achten Sie immer auf eine ausreichende Lenk- und Bremsfähigkeit des Traktors!**
- **Verwenden Sie gegebenenfalls Ballastgewichte!**
- **Durch das Ankuppeln von Maschinen im Front- und/oder Heckanbau eines Traktors dürfen nicht überschritten werden**
  - **das zulässige Traktor-Gesamtgewicht**
  - **die zulässigen Traktor-Achslasten**
  - **die zulässigen Reifentragfähigkeiten der Traktor-Reifen**
- **Bevor Sie die Kombination Traktor/Maschine in Betrieb nehmen, müssen Sie zunächst für die leere und dann für befüllte Maschine die tatsächlichen Werte sorgfältig ermitteln für:**
  - **das Traktor-Gesamtgewicht**
  - **die Traktor-Achslasten**
  - **die Reifentragfähigkeiten**
  - **die Mindest-Ballastierung**

  (durch Berechnung oder durch Wiegen der Traktor-Maschinen-Kombination)

  Hierzu siehe Kapitel "Berechnung der tatsächlichen Werte für Traktor-Gesamtgewicht, Traktor-Achslasten und Reifentragfähigkeiten, sowie der erforderlichen Mindest-Ballastierung", Seite 69.
- **Der Traktor muss die vorgeschriebene Bremsverzögerung für die Kombination Traktor und Maschine sichern.**
- **Traktor und Maschine müssen den Vorschriften der nationalen Straßenverkehrsvorschriften entsprechen.**
- **Fahrzeughalter wie auch Fahrzeugführer sind für Einhaltung der gesetzlichen Bestimmungen der nationalen Straßenverkehrsvorschriften verantwortlich.**
- **Beachten Sie die maximale Zuladung der angebauten / angehängten Maschine und die zulässigen Achs- und Stützlasten des Traktors. Fahren Sie gegebenenfalls nur mit teilbefülltem Vorratsbehälter.**
- **Verriegeln Sie vor Transportfahrten den Bedienungshebel der Dreipunkt-Hydraulik gegen unbeabsichtigtes Heben oder Senken der angebauten oder angehängten Maschine.**

6.1 Erst-Inbetriebnahme

6.1.1 Berechnung der tatsächlichen Werte für Traktor-Gesamtgewicht, Traktor-Achslasten und Reifentragfähigkeiten, sowie der erforderlichen Mindest-Ballastierung

6.1.1.1 Benötigte Daten für die Berechnung

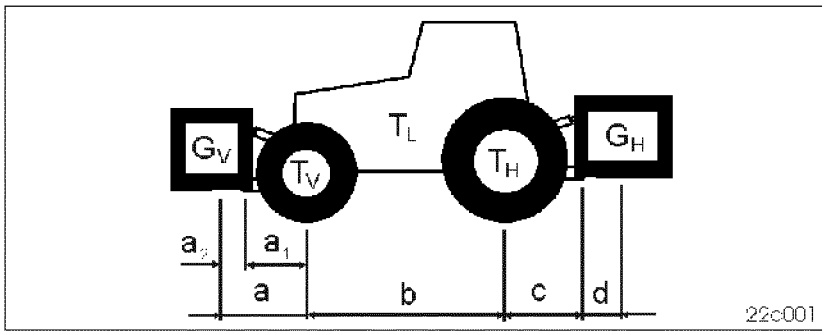


Fig. 56

T_L	[kg]	Traktor-Leergewicht	siehe Traktor Betriebsanleitung oder Fahrzeugschein
T_V	[kg]	Vorderachslast des leeren Traktors	
T_H	[kg]	Hinterachslast des leeren Traktors	
G_H	[kg]	Gesamtgewicht Heckanbau-Maschine oder Heckgewicht	siehe technische Daten Maschine oder Heckgewicht
G_V	[kg]	Gesamtgewicht Frontanbau-Maschine oder Frontgewicht	siehe technische Daten Frontanbau-Maschine oder Frontgewicht
a	[m]	Abstand zwischen Schwerpunkt Frontanbau-Maschine oder Frontgewicht und Mitte Vorderachse (Summe $a_1 + a_2$)	siehe technische Daten Traktor und Frontanbau-Maschine oder Frontgewicht oder Abmessen
a_1	[m]	Abstand Mitte Vorderachse bis Mitte Unterlenker-Anschluss	siehe Traktor Betriebsanleitung oder Abmessen
a_2	[m]	Abstand Mitte Unterlenker-Anschlusspunkt bis Schwerpunkt Frontanbau-Maschine oder Frontgewicht (Schwerpunkts-Abstand)	siehe technische Daten Frontanbau-Maschine oder Frontgewicht oder Abmessen
b	[m]	Traktor-Radstand	siehe Traktor Betriebsanleitung oder Fahrzeugschein oder Abmessen
c	[m]	Abstand zwischen Mitte Hinterachse und Mitte Unterlenker-Anschluss	siehe Traktor Betriebsanleitung oder Fahrzeugschein oder Abmessen
d	[m]	Abstand zwischen Mitte Unterlenker-Anschlusspunkt und Schwerpunkt Heckanbau-Maschine oder Heckgewicht (Schwerpunkts-Abstand)	siehe technische Daten Maschine

6.1.1.2 Berechnung der erforderlichen Mindest-Ballastierung vorne $G_{V\,min}$ des Traktors zur Gewährleistung der Lenkfähigkeit

$$G_{V\ \min} = \frac{G_H \bullet (c+d) - T_V \bullet b + 0{,}2 \bullet T_L \bullet b}{a+b}$$

Tragen Sie den Zahlenwert für die berechnete Mindest-Ballastierung $G_{V\,min}$, die an der Frontseite des Traktors benötigt wird, in die Tabelle (Seite 71) ein.

6.1.1.3 Berechnung der tatsächlichen Vorderachslast des Traktors $T_{V\,tat}$

$$T_{V\ tat} = \frac{G_V \bullet (a+b) + T_V \bullet b - G_H \bullet (c+d)}{b}$$

Tragen Sie den Zahlenwert für die berechnete tatsächliche Vorderachslast und die in der Traktor-Betriebsanleitung angegebene zulässige Traktor-Vorderachslast in die Tabelle (Seite 71) ein.

6.1.1.4 Berechnung des tatsächlichen Gesamtgewichtes der Kombination Traktor und Maschine

$$G_{tat} = G_V + T_L + G_H$$

Tragen Sie den Zahlenwert für das berechnete tatsächliche Gesamtgewicht und das in der Traktor-Betriebsanleitung angegebene zulässige Traktor-Gesamtgewicht in die Tabelle (Seite 71) ein.

6.1.1.5 Berechnung der tatsächlichen Hinterachslast des Traktors $T_{H\,tat}$

$$T_{H\ tat} = G_{tat} - T_{V\ tat}$$

Tragen Sie den Zahlenwert für die berechnete tatsächliche Hinterachslast und die in der Traktor-Betriebsanleitung angegebene zulässige Traktor-Hinterachslast in die Tabelle (Seite 71) ein.

6.1.1.6 Reifentragfähigkeit der Traktor-Bereifung

Tragen Sie den doppelten Wert (zwei Reifen) der zulässigen Reifentragfähigkeit (siehe z.B. Unterlagen der Reifenhersteller) in die Tabelle (Seite 71) ein.

6.1.1.7 Tabelle

	Tatsächlicher Wert laut Berechnung		Zulässiger Wert laut Traktor-Betriebsanleitung		Doppelte zulässige Reifentragfähigkeit (zwei Reifen)
Mindest-Ballastierung Front / Heck	/ kg		--		--
Gesamtgewicht	kg	≤	kg		--
Vorderachslast	kg	≤	kg	≤	kg
Hinterachslast	kg	≤	kg	≤	kg



Hinweis!

Entnehmen Sie dem Fahrzeugschein Ihres Traktors die zulässigen Werte für Traktor-Gesamtgewicht, Achslasten und Reifentragfähigkeiten.



Gefahr!

- **Die tatsächlichen, berechneten Werte müssen kleiner oder gleich (≤) den zulässigen Werten sein!**
- **Verboten ist das Ankuppeln der Maschine an den für die Berechnung zugrunde gelegten Traktor, wenn**
  - **o auch nur einer der tatsächlich, berechneten Werte größer ist als der zulässige Wert.**
  - **o an dem Traktor nicht ein Frontgewicht (falls erforderlich) für die erforderliche Mindest-Ballastierung vorne ($G_{V\,min}$) befestigt ist.**



Wichtig!

- **Ballastieren Sie Ihren Traktor mit einem Front- oder Heckgewicht, wenn die Traktor-Achslast nur auf einer Achse überschritten ist.**
- **Sonderfälle:**
  - **o Erreichen Sie durch das Gewicht der Frontanbau-Maschine (G_V) nicht die erforderliche Mindest-Ballastierung vorne ($G_{V\,min}$), müssen Sie zusätzlich zu der Frontanbau-Maschine Zusatzgewichte verwenden!**
  - **o Erreichen Sie durch das Gewicht der Heckanbau-Maschine (G_H) nicht die erforderliche Mindest-Ballastierung hinten ($G_{H\,min}$), müssen Sie zusätzlich zur Heckanbau-Maschine Zusatzgewichte verwenden!**

6.1.2 Gelenkwelle an den Traktor anpassen

Wichtig!

Die Gelenkwellenlänge beim ersten Ankuppeln an den Traktor und beim Traktortyp-Wechsel anpassen. Beachten Sie hierzu die Betriebsanleitung des Gelenkwellen-Herstellers.

Gefahr!

An- und Abbau der Gelenkwelle nur bei ausgeschalteter Zapfwelle, angezogener Handbremse, abgeschaltetem Motor und abgezogenem Zündschlüssel.

Die Gelenkwellenhälften auf die Zapfwellenanschlüsse von Traktor und Maschine in der vorgeschriebenen Einbaurichtung (siehe Symbol auf der Gelenkwelle) aufstecken, die Gelenkwellenrohre aber nicht ineinander stecken.

Fig. 57/…

(1) Durch Nebeneinanderhalten der beiden Gelenkwellenrohre prüfen, ob die Gelenkwellenrohre in jeder Stellung mindestens A = 185 mm ineinander greifen.

(2) In zusammengeschobener Stellung dürfen die Gelenkwellenrohre nicht gegen die Gabeln der Kreuzgelenke stoßen. Ein Sicherheitsabstand von mind. 10 mm ist einzuhalten.

(3) Zur Längenanpassung Gelenkwellenhälften in kürzester Betriebsstellung nebeneinander halten und anzeichnen.

(4) Innen- und Außenschutzrohr gleichmäßig kürzen.

(5) Inneres und äußeres Schiebeprofil um gleiche Länge wie Schutzrohr kürzen.

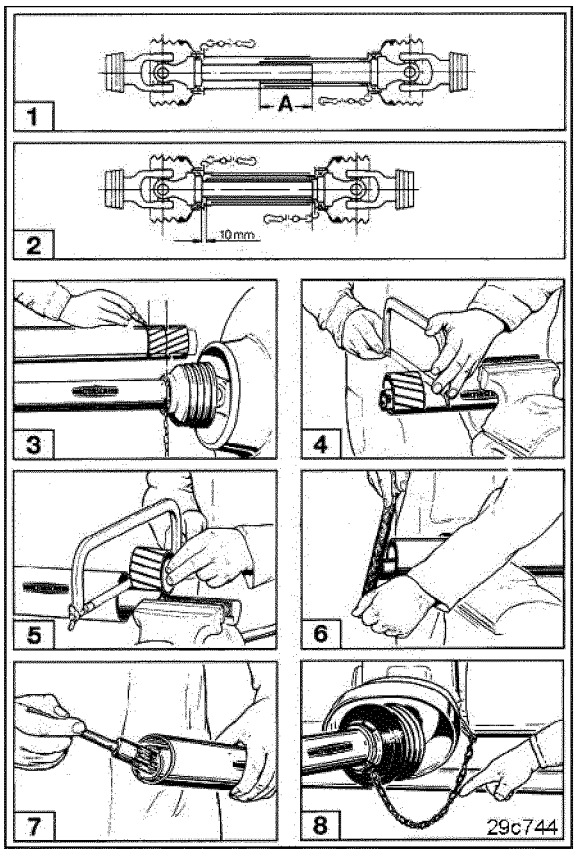


Fig. 57

(6) Trennkanten abrunden und Späne sorgfältig entfernen.

(7) Schiebeprofile einfetten und ineinander schieben.

(8) Die Schutzrohre der Gelenkwelle sind mit Halteketten versehen, die an Traktor und Maschine zu befestigen sind. Die Sicherungsketten verhindern das Mitdrehen der Schutzrohre bei laufender Gelenkwelle. Halteketten so an den vorgesehenen Bohrungen einhängen, dass ausreichender Schwenkbereich der Gelenkwelle in allen Betriebsstellungen gewährleistet ist und die Schutzrohre während des Betriebes nicht mitdrehen.

6.1.3 Montagevorschrift Anschluss hydr. Gebläseantrieb (Option)

Die Druckleitung (Fig. 58/4) an ein einfach- oder doppeltwirkendes Traktor-Steuergerät mit Vorrang anschließen.

Die Rücklaufleitung (Fig. 58/5) nur an einem drucklosen Traktor-Anschluss anschließen mit direktem Zugang zum Hydrauliköltank. Die Rücklaufleitung nicht an einem Traktor-Steuergerät anschließen. Der Staudruck darf 10 bar nicht überschreiten.

Zur Installation der Traktor-Rücklaufleitung, nur Rohre DN 16, z.B. Ø 20 x 2,0 mm verwenden mit kurzem Rücklaufweg zum Hydrauliköltank.

Fig. 58/..

(A) maschinenseitig

(B) traktorseitig

(1) Traktor-Steuergerät mit Vorrang, einfach- oder doppeltwirkend

(2) Gebläse-Hydraulikmotor

(3) Stromregelventil der Maschine

(4) Hydraulikschlauch Druckleitung (Kennzeichnung: 1 Kabelbinder rot)

(5) Hydraulikschlauch Rücklaufleitung mit großer Steckkupplung (Kennzeichnung: 2 Kabelbinder rot)

(6) Traktor-Hydraulikpumpe

(7) Ölfilter, traktorseitig

(8) Traktor-Hydrauliköltank

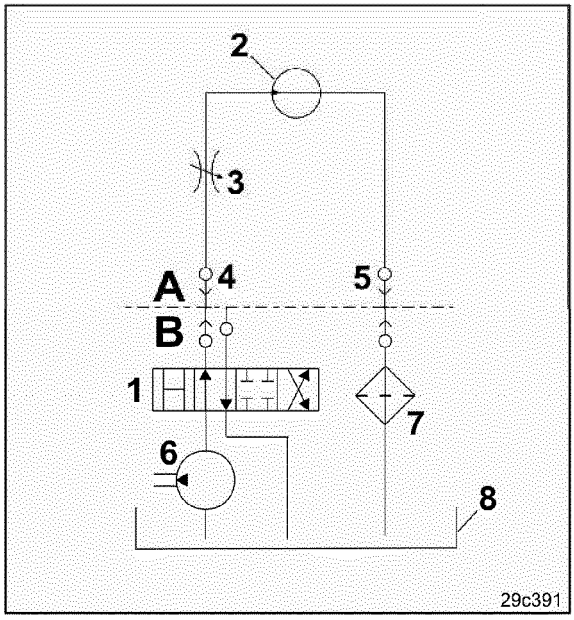


Fig. 58

Hinweis!

Das Hydrauliköl darf sich nicht zu stark erwärmen.

Große Ölfördermengen in Verbindung mit kleinen Öltanks fördern die schnelle Erwärmung des Hydrauliköles. Das Fassungsvermögen des Traktor-Öltanks (Fig. 58/8) sollte mindestens die doppelte Ölfördermenge beinhalten. Bei zu starker Erwärmung des Hydrauliköles ist der Einbau eines Ölkühlers in einer Fachwerkstatt erforderlich.

Soll ein zweiter Hydraulikmotor neben dem Gebläse-Hydraulikmotor angetrieben werden, müssen beide Motoren parallel geschaltet werden. Werden beide Motoren in Reihe geschaltet, wird der zulässige Öldruck von 10 bar hinter dem ersten Motor immer überschritten.

6.1.4 Montagevorschrift Profischaltung (Option)

Ohne „LS-Betrieb“:

- Anschluss der Druckleitung (Fig. 59/2) an ein einfach- oder doppeltwirkendes Traktor-Steuergerät mit Vorrang.

Mit „LS-Betrieb“:

- Anschluss der LS-Druckleitung
- Anschluss der LS-Steuerleitung.

Mit und ohne „LS-Betrieb“:

- Anschluss der Rücklaufleitung (Fig. 59/3) an einen drucklosen Traktor-Anschluss mit direktem Zugang zum Hydrauliköltank. Die Rücklaufleitung nicht an einem Traktor-Steuergerät anschließen. Der Staudruck darf 10 bar nicht überschreiten.

  Zur Installation der Traktor-Rücklaufleitung, nur Rohre DN 16, z.B. Ø 20 x 2,0 mm verwenden mit kurzem Rücklaufweg zum Hydraulikölтank.

Fig. 59/...

(A) maschinenseitig

(B) traktorseitig

(1) Traktor-Steuergerät mit Vorrang, einfach- oder doppeltwirkend

2. Hydraulikschlauch Druckleitung (Kennzeichnung: 1 Kabelbinder rot)

(3) Hydraulikschlauch Rücklaufleitung mit großer Steckkupplung (Kennzeichnung: 2 Kabelbinder rot)

(4) Ölfilter, maschinenseitig

(5) Traktor-Hydraulikpumpe

(6) Ölfilter, traktorseitig

(7) Traktor-Hydraulikөltank

(8) Elektr.-hydr. Steuerblock (Profischaltung)

(9) Ventil (Ausleger links klappen)

(10) Ventil (Ausleger rechts klappen)

(11) Ventil (Spuranreißer-Betätigung)

(12) Ventil (Option, Befüllschnecke ein- ausschalten)

(13) Ventil (Option, Spornrad-Betätigung, nur in Verbindung mit **ED-Control**).

(LS) Anschluss Load-Sensing-Steuerleitung (Option)

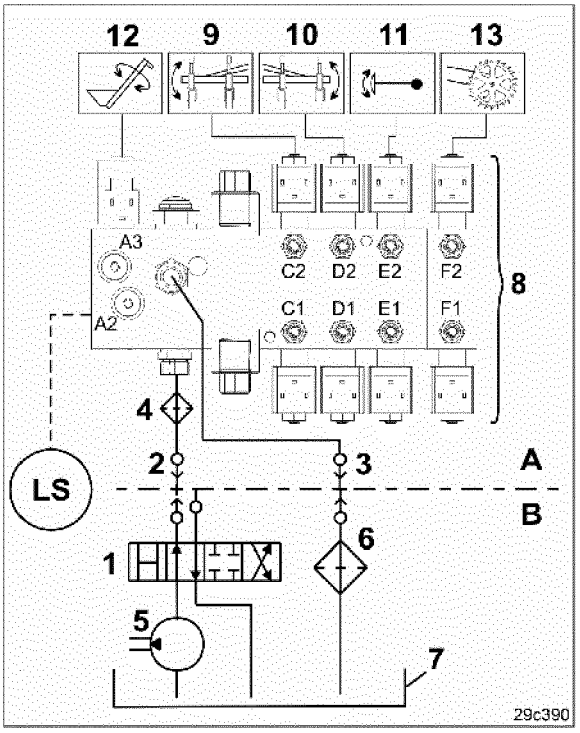


Fig. 59

Profischaltungen mit Load-Sensing-Funktion sind gekennzeichnet mit dem Aufkleber „LS“ (Fig. 60/1).

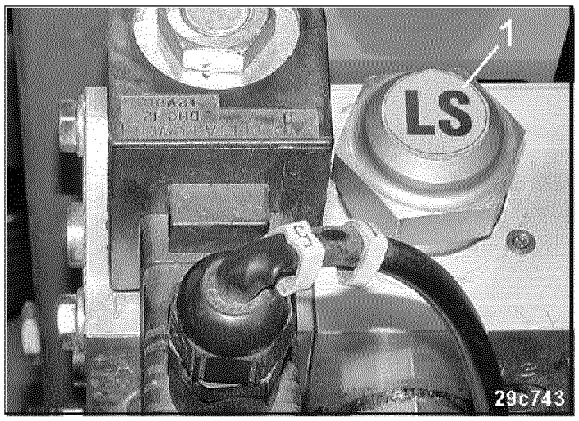


Fig. 60

6.1.5 Erstmontage des Bedienterminals (Option)

Die Erstmontage des Bedienterminals (Fig. 61) in der Traktor-Kabine entnehmen Sie der entsprechenden Betriebsanleitung.

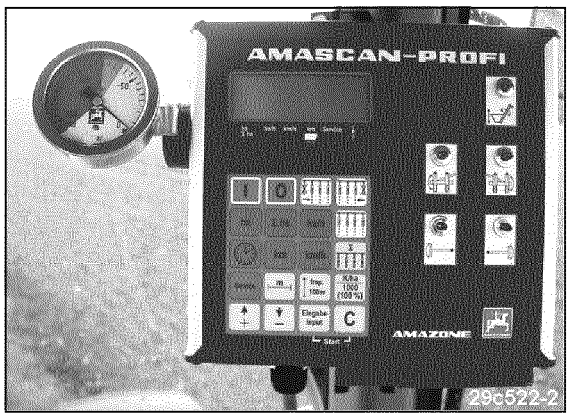


Fig. 61

6.1.6 Erstmontage des Klutenräumers (Option, Contour-Säaggregat)

1. Den Führungsbolzen (Fig. 62/1) anschrauben.

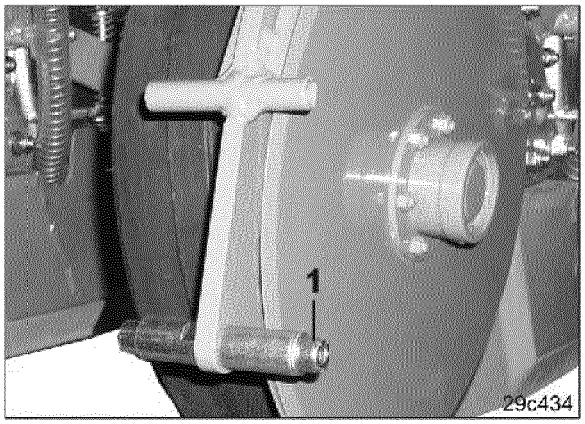


Fig. 62

2. Den Klutenräumer (Fig. 63/1) am Führungsbolzen (Fig. 62/1) einhängen, mit einem Bolzen (Fig. 63/2) abstecken und mit einem Klappstecker sichern.

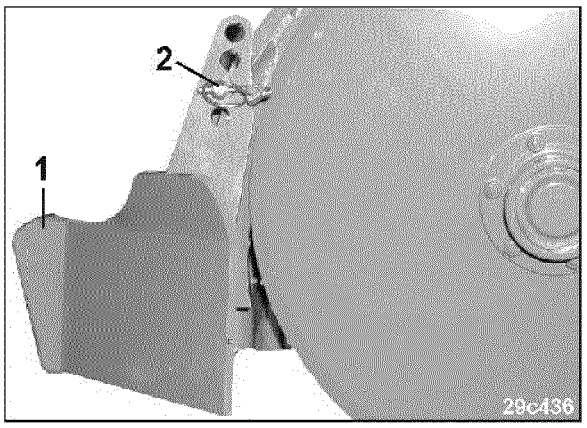


Fig. 63

6.1.7 Erstmontage der Abstellvorrichtung ED 902-K (Option)

Erstmontage der Abstellvorrichtung:

1. Zwei Trägerrohren (Fig. 64/1) mit dem Abstandshalter (Fig. 64/2) und der Zapfenkonsole (Fig. 64/3) abstecken.
2. Die Bauteile mit vier Klappsteckern (Fig. 64/4) befestigen.

Die Sicherungsstrebe (Fig. 64/5) sichert die Maschine später gegen Umfallen.

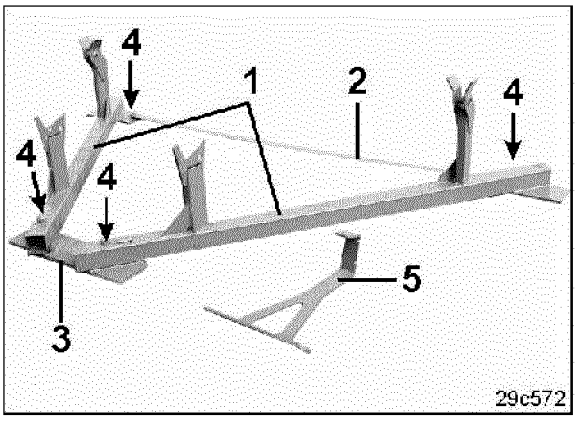


Fig. 64

7 Maschine an- und abkuppeln

Gefahr!

- **Sie dürfen die Maschine nur mit einem Traktor kuppeln und transportieren, wenn der Traktor die leistungsmäßigen Voraussetzungen erfüllt!**
- **Beim Ankuppeln der Maschine an die Traktor-Dreipunkt-Hydraulik müssen die Anbaukategorien von Traktor und Maschine unbedingt übereinstimmen!**
- **Verwenden Sie beim Kuppeln von Traktor und Maschine die dafür vorgesehenen Vorrichtungen bestimmungsgemäß!**
- **Verboten ist der Aufenthalt von Personen zwischen der zu kuppelnden Maschine und dem Traktor während der Traktor an die Maschine heranfährt!**

  Anwesende Helfer dürfen sich nur als Einweiser neben den Fahrzeugen betätigen und erst bei Stillstand zwischen die Fahrzeuge treten.
- **Beachten Sie beim An- und Abkuppeln von Maschinen das Kapitel "Sicherheitshinweise für den Bediener", Seite 25.**

Den Fronttank (Fig. 65) am Traktor anhand der Fronttank-Betriebsanleitung an- und abkuppeln.

Wichtig!

Leitende Verbindung des Fronttank-Kabelbaums (Maschinenstecker) zur Traktormasse herstellen (Gefahr statischer Aufladung).

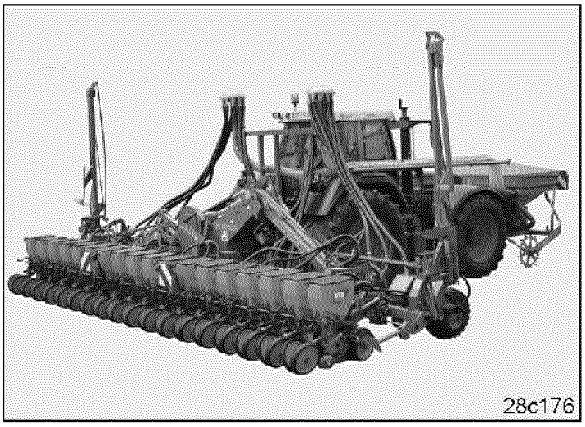


Fig. 65

7.1 Maschine ankuppeln

1. Zapfwellenanschlüsse maschinen- und traktorseitig reinigen und einfetten.
2. Die mit einem Freilauf (Fig. 66/1) ausgestattete Gelenkwellenhälfte auf den Zapfwellenanschluss der Maschine aufstecken und vorschriftsmäßig sichern (siehe Betriebsanleitung des Gelenkwellenherstellers). Verwenden Sie nur die zugelassene Walterscheid Gelenkwelle
   - o W2200, 1210 mm 1 3/8, 6-teilig mit Freilauf (Fig. 66/1) oder
   - o W2200, 1610 mm 8x32x38 mit Freilauf (für Traktoren russischer Bauart).

   Der Freilauf ermöglicht das Nachlaufen des Gebläses beim Abschalten der Gelenkwelle.

   In Fahrtrichtung gesehen dreht die Gelenkwelle rechts herum (Uhrzeigersinn).
3. Gelenkwelle auf der Gelenkwellenauflage (Fig. 66/2) abstützen.

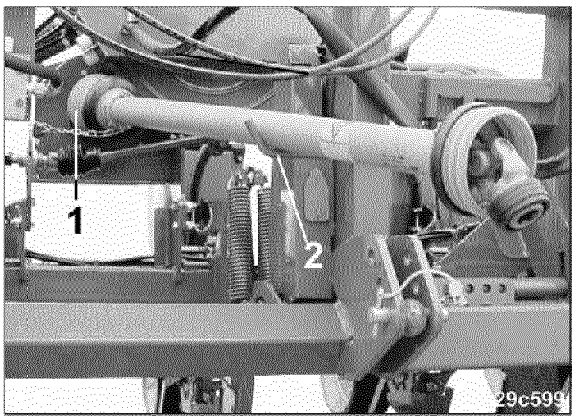


Fig. 66

4. Die mit Klappsteckern gesicherten Bolzen der Unter- und Oberlenker sind je nach Traktortyp (siehe Traktor-Betriebsanleitung) mit Fangkugeln auszurüsten. Die Maschine ist ausgerüstet mit Unter- und Oberlenkerbolzen
   - o Kat. II (alle Typen, außer ED 902-K)
   - o Kat. III (nur ED 902-K).
5. Die Traktorunterlenker-Sicherung öffnen, d.h. sie muss kuppelbereit sein.
6. Traktor vorsichtig zurücksetzen.
7. Traktorunterlenker und Maschine kuppeln.
8. Kontrollieren, ob die Sicherung der Traktorunterlenker-Arretierung geschlossen und gesichert ist (siehe Traktor Betriebsanleitung).

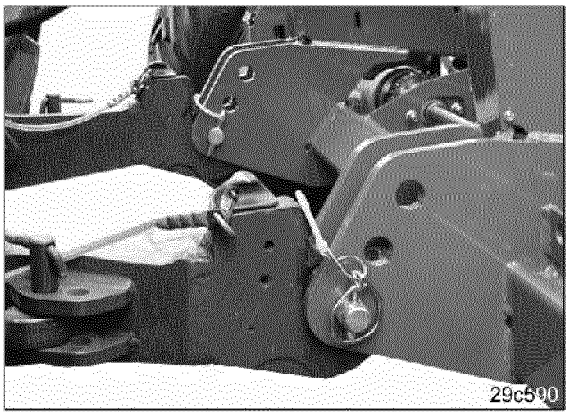


Fig. 67

Wichtig!

Die Traktor-Unterlenker müssen vertikal pendeln können.

9. Traktor-Oberlenker (Fig. 68/1) anschließen.
10. Zapfwelle ausschalten, Handbremse anziehen, Motor abschalten und Zündschlüssel abziehen.
11. Den Oberlenker gegen Verdrehen sichern (siehe Traktor-Betriebsanleitung).

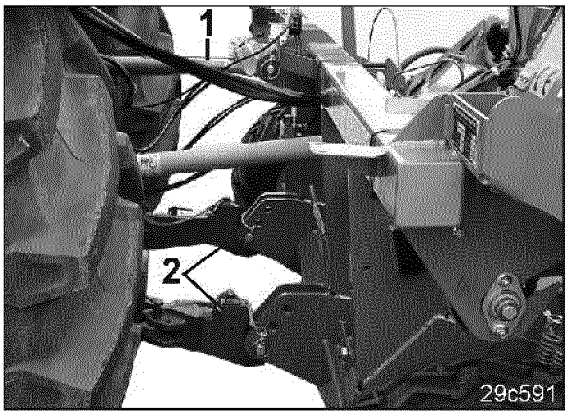


Fig. 68

12. Die Gelenkwellenhälfte auf den Zapfwellenanschluss des Traktors aufstecken und vorschriftsmäßig sichern.
13. Die Sicherungsketten (Fig. 69/1) der Gelenkwellen-Schutzrohre befestigen
    - o an der Maschine (siehe Fig. 69)
    - o am Traktor.
14. Die an der Gelenkwelle befestigten Montagehinweise des Gelenkwellenherstellers befolgen.

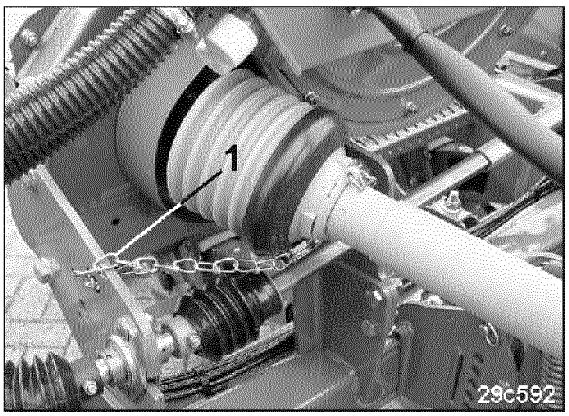


Fig. 69

Gefahr!

An- und Abbau der Gelenkwelle nur bei ausgeschalteter Zapfwelle, angezogener Handbremse, abgeschaltetem Motor und abgezogenem Zündschlüssel.

Wenn Sie sich in einer rotierenden Welle verfangen, kann dies schwere Verletzungen oder den Tod hervorrufen.

Immer auf die richtige Montage und Sicherung der Gelenkwelle achten.

15. Hydraulikanschlüsse herstellen (siehe Kapitel 7.1.1 bis Kapitel 7.1.1.3, ab Seite 80).
16. Stromanschlüsse herstellen (siehe Kapitel „Stromanschlüsse herstellen“, Seite 83).
17. Weitere Anschlüsse und Einstellungen (siehe ab Kapitel 7.1.3).

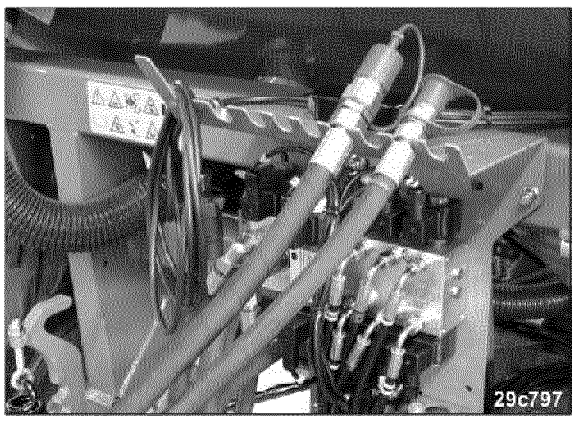


Fig. 70



Wichtig!

Den Verlauf der Versorgungsleitungen kontrollieren.

Die Versorgungsleitungen

- **müssen allen Bewegungen bei Kurvenfahrten ohne Spannung, Knickung oder Reibung leicht nachgeben**
- **dürfen nicht an Fremdteilen scheuern.**

7.1.1 Hydraulikanschlüsse



Wichtig!

Hydraulikkupplungen säubern vor dem Anschließen am Traktor.

Geringe Verschmutzungen durch Partikel im Hydrauliköl können zum Ausfall der Hydraulik führen.

Den Fronttank anhand der Fronttank-Betriebsanleitung anschließen.

7.1.1.1 Hydraulikanschlüsse

Traktoranschluss				Funktion
Steuergerät		Anschluss	Kennzeichnung	
1	einfach wirkend	Vorlauf	1 Kabelbinder gelb	Spuranreißerbetätigung

Traktoranschluss				Funktion
Steuergerät		Anschluss	Kennzeichnung	
2	doppelt wirkend	Vorlauf	1 Kabelbinder grün	Auslegerklappung links
		Rücklauf	2 Kabelbinder grün	

Traktoranschluss				Funktion
Steuergerät		Anschluss	Kennzeichnung	
3*	doppelt wirkend	Vorlauf	1 Kabelbinder blau	Auslegerklappung rechts
		Rücklauf	2 Kabelbinder blau	

* nicht erforderlich bei ED 902-K. Die Auslegerklappungen erfolgt mit dem Traktor-Steuergerät 2

Traktoranschluss				Funktion
Steuergerät		Anschluss	Kennzeichnung	
4	einfach wirkend	Vorlauf	1 Kabelbinder natur	Hydraulikmotor Befüllschnecke
		Rücklauf	2 Kabelbinder natur	

Traktor mit Konstantdruck-Hydrauliksystemen sind zum Betrieb von Hydraulikmotoren nur bedingt ausgelegt. Die Empfehlungen des Traktorherstellers beachten.

Traktoranschluss				Funktion
Steuergerät		Anschluss	Kennzeichnung	
5	einfach wirkend	Vorlauf: Druckleitung mit Vorrang*	1 Kabelbinder rot	Gebläse-Hydraulikmotor
		Rücklauf: druckfreie Leitung*	2 Kabelbinder rot	

* Montagevorschrift beachten [siehe Kapitel „Montagevorschrift Anschluss hydr. Gebläseantrieb (Option)“, Seite 73].

Front-Traktoranschluss				Funktion
Steuergerät		Anschluss	Kennzeichnung	
6	doppelt wirkend	Vorlauf	1 Kabelbinder natur	Spornradanhebung Fronttank
		Rücklauf	2 Kabelbinder natur	

7.1.1.2 Ein Steuergerät für zwei Maschinenfunktionen (Schalteinheit, Option)

Stehen weniger Traktor-Steuergeräte zur Verfügung als benötigt, kann ein Traktor-Steuergerät mit zwei Maschinenfunktionen belegt werden.

Eine der beiden gewünschten Funktionen zuerst mit dem Hebel (Fig. 71/A) anwählen und danach mit dem Traktor-Steuergerät betätigen.

Die Funktion bei Hebelstellung „A“ und „B“ prüfen vor Inbetriebnahme.

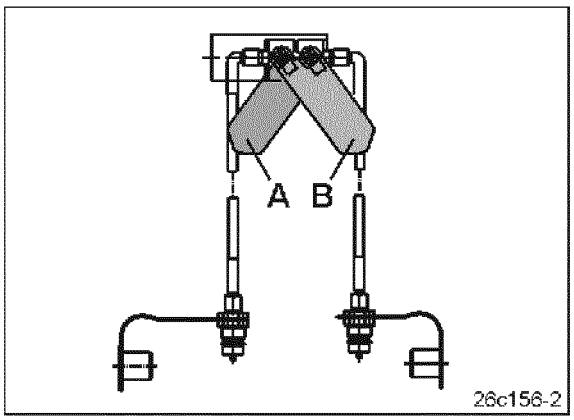


Fig. 71

Gefahr!

Verwechslungsgefahr der Funktionen! Vor dem Betätigen des Traktor-Steuergerätes die Hebelstellung der Schalteinheit (Fig. 71) prüfen.

7.1.1.3 Hydraulikanschluss Profischaltung

Profischaltung ohne Load-Sensing-Funktion

Traktoranschluss				Funktion
Steuergerät		Anschluss	Kennzeichnung	
1	einfach wirkend	Vorlauf: Druckleitung mit Vorrang*	1 Kabelbinder rot	Profischaltung ohne Load-Sensing-Funktion
		Rücklauf: druckfreie Tankleitung*	2 Kabelbinder rot	

* Montagevorschrift beachten [siehe Kapitel „Montagevorschrift Profischaltung (Option)“, Seite 74].

Traktoranschluss				Funktion
Steuergerät		Anschluss	Kennzeichnung	
2	einfach wirkend	Vorlauf: Druckleitung mit Vorrang**	1 Kabelbinder rot	Gebläse-Hydraulikmotor
		Rücklauf: druckfreie Tankleitung**	2 Kabelbinder rot	

** Montagevorschrift beachten [siehe Kapitel „Montagevorschrift Anschluss hydr. Gebläseantrieb (Option)“, Seite 73].

Front-Traktoranschluss***				Funktion
Steuergerät		Anschluss	Kennzeichnung	
3	doppelt wirkend	Vorlauf	1 Kabelbinder natur	Spornradanhebung Fronttank
		Rücklauf	2 Kabelbinder natur	

*** nicht erforderlich in Verbindung mit **ED-Control**.

Profischaltung mit Load-Sensing-Funktion

Traktoranschluss				Funktion
Steuergerät		Anschluss	Kennzeichnung	
1	„LS“	Vorlauf: LS-Druckleitung	1 Kabelbinder rot	Profischaltung mit Load-Sensing-Funktion
		Rücklauf: druckfreie Tankleitung	2 Kabelbinder rot	
		LS-Steuerleitung	_	

Erforderliche Steuergeräte 2 und 3, siehe Profischaltung ohne Load-Sensing-Funktion

7.1.2 Stromanschlüsse herstellen

Anschluss/Funktion
Stecker (7-polig) für Straßenverkehrslichtanlage (Option)
Maschinenstecker (Option) **AMASCAN+**
Maschinenstecker (Option) **AMASCAN-PROFI**
Maschinenstecker (Option) **ED-CONTROL**

7.1.3 Manometer anschließen

Das Manometer (Fig. 72/1) am Schlauch (Fig. 72/2) anschließen.

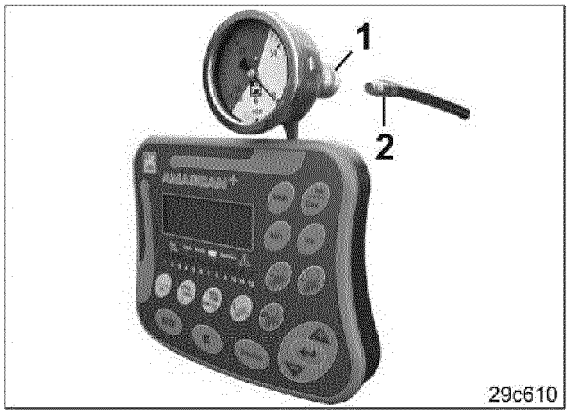


Fig. 72

7.1.4 Abstützung (alle Typen, außer eingeklappte ED 902-K)

Gefahr!

Die Maschine nur auf waagerechtem, festen Untergrund abstellen.

Vor dem Abstecken der Stützfüße, Handbremse anziehen, Traktormotor abstellen und Zündschlüssel abziehen.

Wichtig!

Die eingeklappte ED 902-K nur auf der Abstellvorrichtung abstellen (siehe „Abstellen der eingeklappten ED 902-K auf der Abstellvorrichtung“, Seite 86)

Abgestellt stützt sich die Maschine auf zwei Stützfüßen ab.

Stützstellung:

Den Stützfuß (Fig. 73/1) mit einem Bolzen (Fig. 73/2) abstecken und mit einem Federstecker sichern.

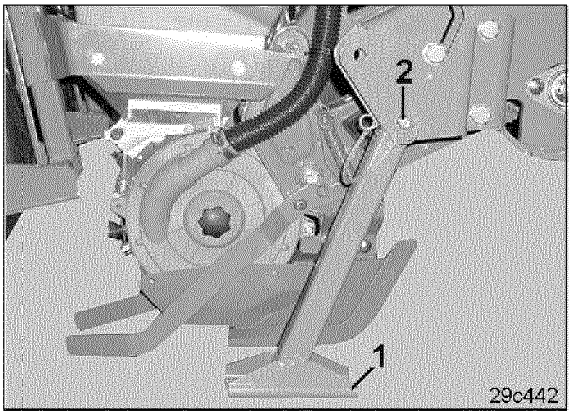


Fig. 73

Transportstellung:

Den Stützfuß (Fig. 74/1) mit einem Bolzen (Fig. 74/2) abstecken und mit einem Federstecker sichern.

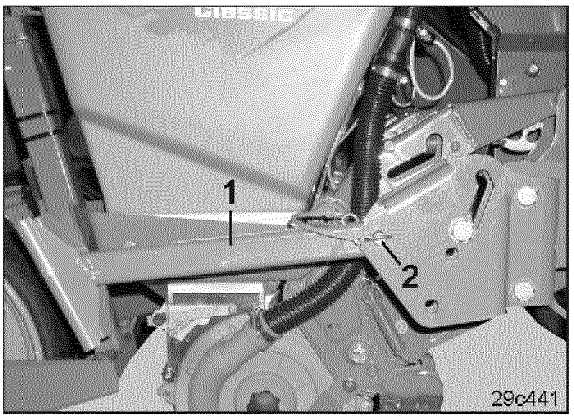


Fig. 74

7.2 Maschine abkuppeln



Warnung!

Die Maschine bzw. die Abstellvorrichtung auf waagerechtem, festen Untergrund abstellen.

Maschine abkuppeln:

1. Bedienterminal (falls vorhanden) ausschalten.
2. ED 902-K (eingeklappt) auf der Abstellvorrichtung abstellen (siehe Kapitel „Abstellen der eingeklappten ED 902-K auf der Abstellvorrichtung“, Seite 86).
3. Stützfüße in Stützstellung bringen [siehe Kapitel „Abstützung (alle Typen, außer eingeklappte ED 902-K)“, Seite 83] und die Maschine abstellen.
4. Traktor-Hydrauliksystem drucklos machen.
5. Gelenkwelle ausschalten, Handbremse anziehen, Traktormotor abstellen und Zündschlüssel abziehen.
6. Versorgungsleitungen entkuppeln.
7. Traktorseitige Gelenkwellenhälfte abkuppeln. Die Gelenkwelle auf der Gelenkwellenauflage (Fig. 66/2) ablegen.
8. Traktor Ober- und Unterlenker abkuppeln.
9. Den Traktor vorziehen.



Gefahr!

Beim Vorziehen des Traktors darf sich keine Person zwischen Traktor und Maschine aufhalten!

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7.2.1 Abstellen der eingeklappten ED 902-K auf der Abstellvorrichtung

1. Die Abstellvorrichtung (Fig. 75) auf waagerechtem, festen Untergrund abstellen.
2. Die ED 902-K auf der Abstellvorrichtung absetzen und zwar
   - o vorne in der Aufnahme (Fig. 76/1)
   - o hinten in der Aufnahme (Fig. 77/1).

Gefahr!

Maschine nur mit leerem Vorratsbehälter abstellen!

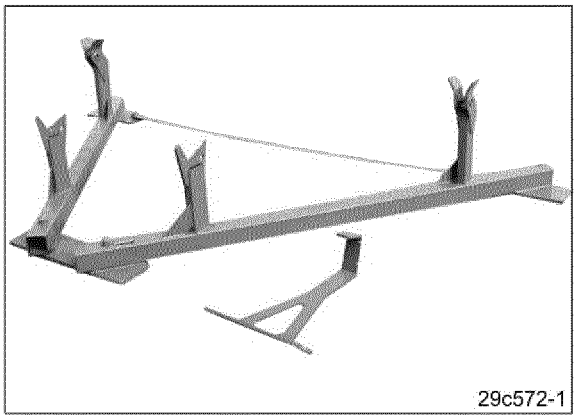


Fig. 75

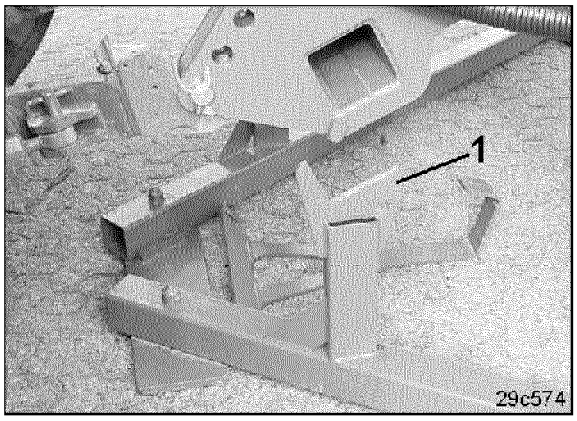


Fig. 76

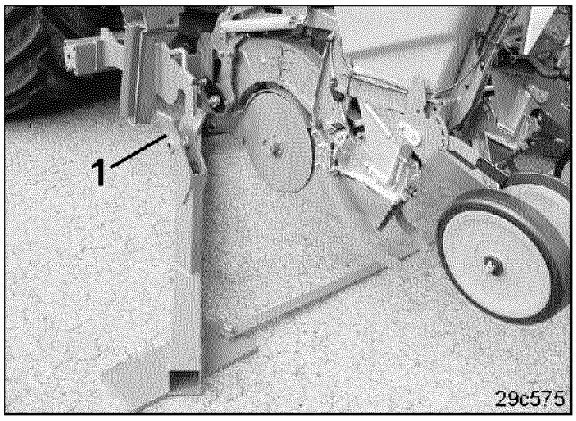


Fig. 77

3. Die Sicherungsstrebe (Fig. 78/1) am Maschinenrahmen einhängen.
4. Die Sicherungsstrebe mit zwei Klappsteckern (Fig. 78/2) befestigen.
   Die Sicherungsstrebe sichert die Maschine gegen Umfallen.

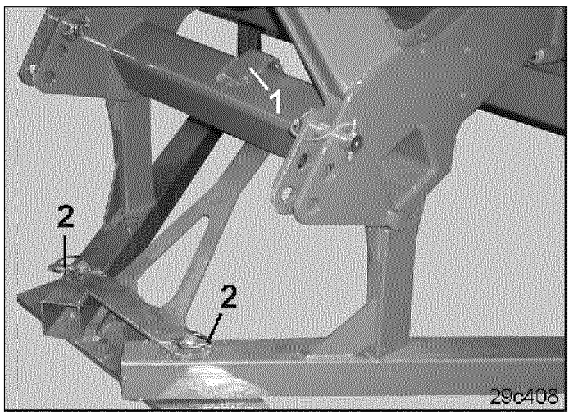


Fig. 78

Gefahr!

- **Vor dem Abkuppeln vom Traktor, die Maschine mit der Sicherungsstrebe (Fig. 78/1) an der Abstellvorrichtung befestigen**
- **Maschine am Traktor ankuppeln vor dem Entfernen der Sicherungsstrebe (Fig. 78/1).**

8 Einstellungen

8.1 Reihenabstand einstellen

1. Schrauben (Fig. 79/1) und Muttern (Fig. 79/2) lösen.
2. Maschine anheben und durch geeignete Abstützung sichern.
3. Die Säaggregate auf den gewünschten Reihenabstand einstellen durch Verschieben der Säaggregate auf der Klemmschiene (Fig. 79/3).

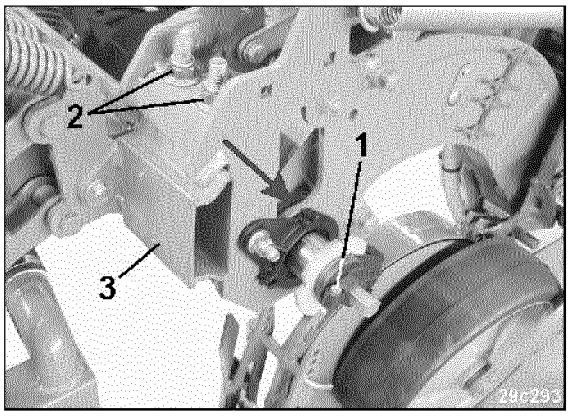


Fig. 79

Wichtig!

Die Muttern (Fig. 79/2) nach zwei Betriebsstunden auf festen Sitz überprüfen.

8.2 Säaggregate abschalten

Hinweis!

Die Düngerzufuhr (falls vorhanden) zu den dazugehörigen Düngerscharen unterbrechen.

8.2.1 Säaggregate mechanisch abschalten

1. Scherstift (Fig. 80/1) mit einer Zange aus der Kupplung herausziehen.
2. Den Scherstift bei Nichtgebrauch in die Bohrung (Fig. 80/2) im Kupplungsflansch stecken.

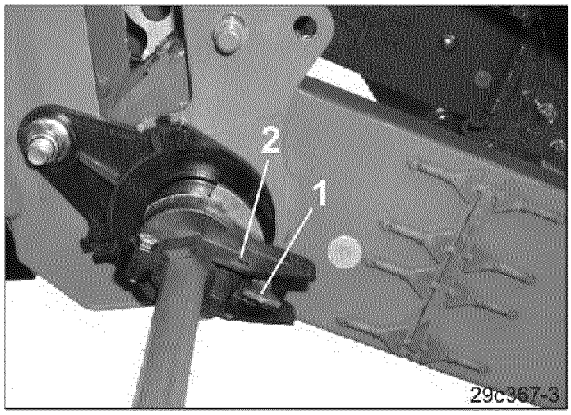


Fig. 80

8.2.2 Säaggregate elektronisch abschalten (Option)

Säaggregate elektronisch abschalten am Bedienterminal von **AMASCAN+**, **AMASCAN-PROFI** oder dem **ED-CONTROL**. Eine genaue Beschreibung der entsprechenden Betriebsanleitung entnehmen.

8.3 Kornabstand einstellen im Verstellgetriebe

Einzelkorn-Sämaschinen sind ausgestattet

- bis 6 m Arbeitsbreite
  - o mit einem Verstellgetriebe
- mit 9 m Arbeitsbreite
  - o mit zwei Verstellgetrieben (Fig. 81/1) (immer gleiche Einstellungen bei beiden Getrieben vornehmen).

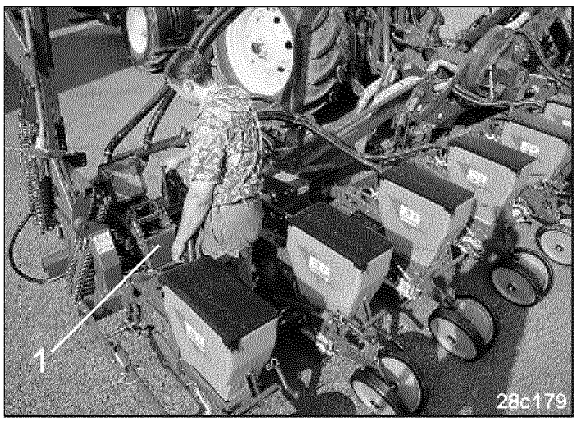


Fig. 81

Kettenradpaarung einstellen im Verstellgetriebe:

1. Haken (Fig. 82/1) aus der Halterung herausnehmen.

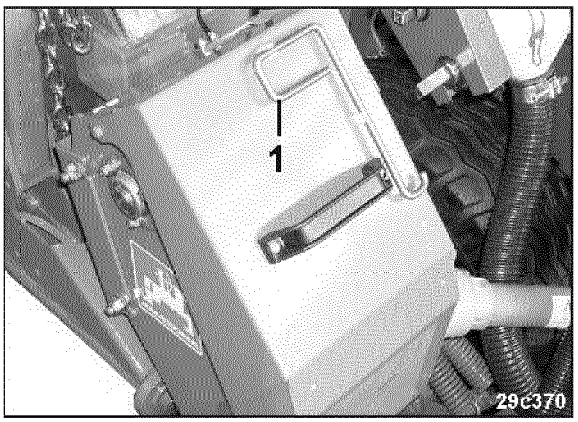


Fig. 82

2. Getriebedeckel öffnen.



Fig. 83

3. Die Abdrehkurbel (Fig. 84/1) in den Kettenspanner des Verstellgetriebes stecken.

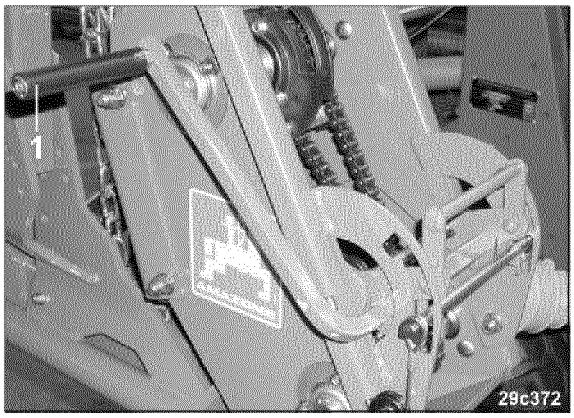


Fig. 84

Den Kettenspanner mit der Abdrehkurbel (Fig. 85) entspannen.

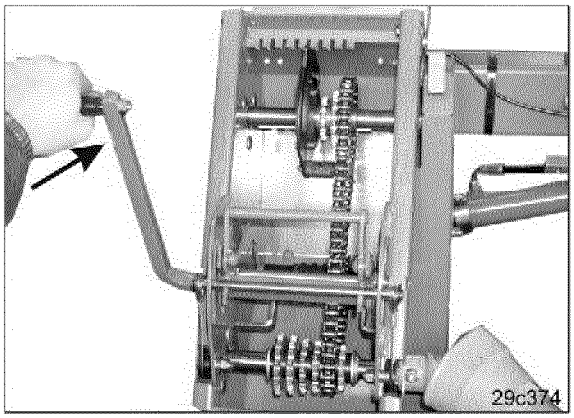


Fig. 85

Vorsicht!

Der Federdruck, der auf die Abdrehkurbel wirkt, ist sehr groß.

4. Die Abdrehkurbel (Fig. 85) so weit drücken, bis der Bolzen (Fig. 86/1) in der Aussparung (Fig. 86/2) einrastet.
5. Die Schwinge (Fig. 86/3) ggf. aushängen, um mehr Kettenlänge zum Verstellen zu erhalten.

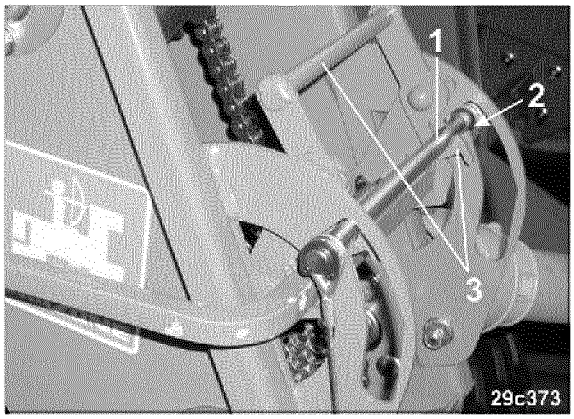


Fig. 86

6. Die Rollenkette (Fig. 87/7) mit Hilfe des Hakens (Fig. 82/1) auf die richtigen Kettenräder legen.

   Einstellwerte, siehe Kapitel „Kettenradpaarungen ermitteln für die Verstell- und Sekundärgetriebe“, Seite 62.

Beispiel:

Kettenradpaarung A – 3.

Die Rollenkette umschließt das Kettenrad (Fig. 87/A) und das Kettenrad (Fig. 87/3).

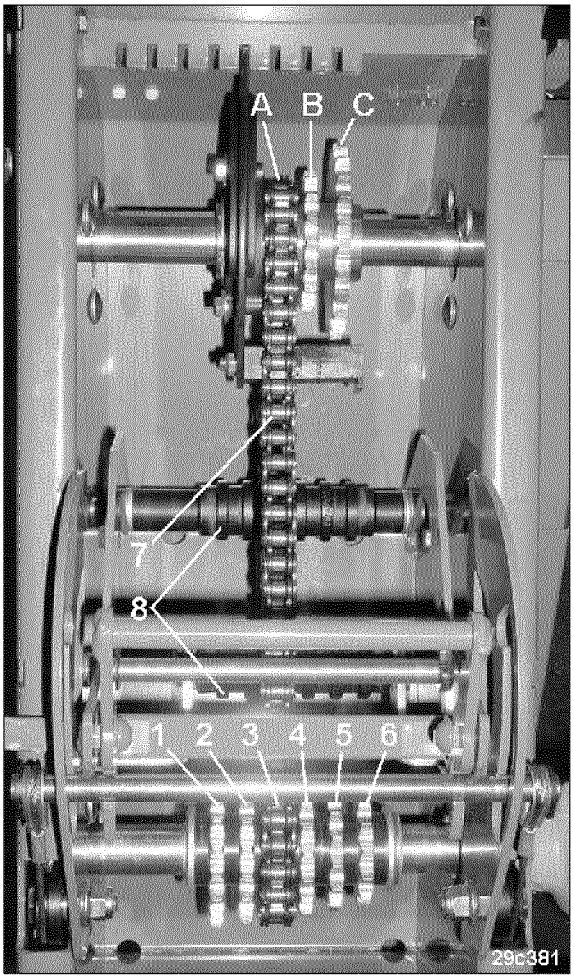


Fig. 87

Rollenkette auf eines der Kettenrädern „A”, „B” oder „C” legen:

7. Die Sicherungsscheibe (Fig. 88/1) gegen die Fahrtrichtung drehen. Der Kunststoffklotz (Fig. 88/2) hebt die Rollenkette vom Kettenrad ab.
8. Die Rollenkette auf das richtige Kettenrad legen.
9. Die Sicherungsscheibe (Fig. 88/1) soweit verschieben, bis die Rollenkette fluchtet und zurück in die axiale Sicherung drehen.

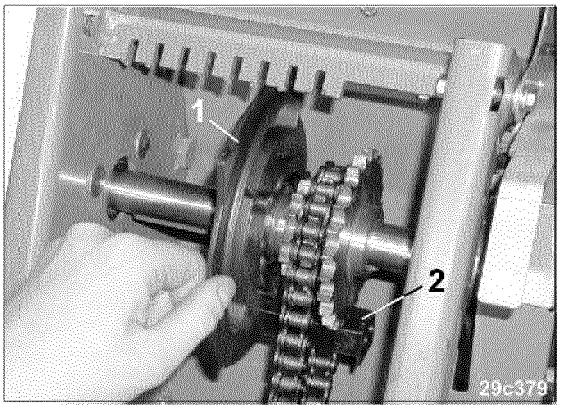


Fig. 88

Wichtig!

Die Rollenkette muss fluchten und auf den Führungen der beiden Rollen (Fig. 87/8) laufen.

Falls erforderlich die Kettenräder A bis C, wie in Figur (Fig. 88) gezeigt, auf der Welle verschieben.

10. Die Abdrehkurbel und die Klinke gleichzeitig in Pfeilrichtung (Fig. 89) drücken.

    Mit der Klinke den Bolzen aus den Aussparungen (Fig. 86/2) heraushebeln und den Federdruck mit der Abdrehkurbel entspannen.

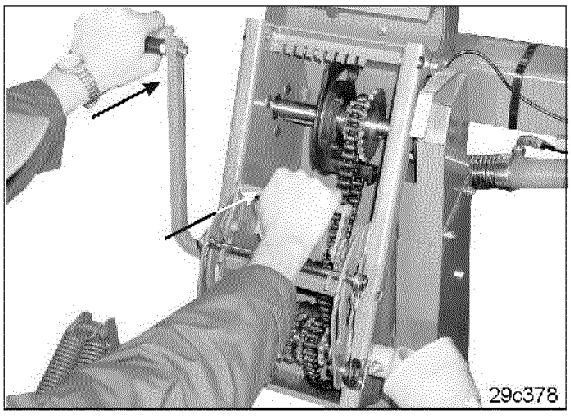


Fig. 89

Vorsicht!

Der große Federdruck wirkt unmittelbar nach dem Lösen des Bolzens auf die Abdrehkurbel.

11. Die Abdrehkurbel in die Transporthalterung stecken.
12. Den Getriebedeckel (Fig. 83) schließen.
13. Den Haken (Fig. 82) auf dem Getriebedeckel befestigen.

Wichtig!

Das Fluchten nach dem Spannen der Rollenkette prüfen.

8.4 Kornabstand einstellen im Sekundärgetriebe

Einzelkorn-Sämaschinen sind ausgestattet

- bis 6 m Arbeitsbreite
  - o mit einem Sekundärgetriebe (Fig. 90/1)
- mit 9 m Arbeitsbreite
  - o mit zwei Sekundärgetrieben (immer gleiche Einstellungen bei beiden Getrieben vornehmen).

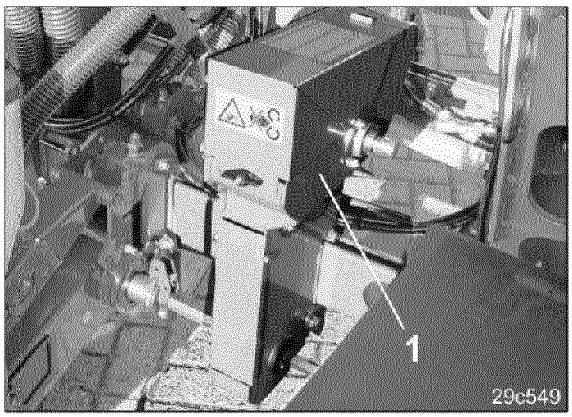


Fig. 90

Kettenradpaarung einstellen im Sekundärgetriebe:

1. Flügelmutter (Fig. 91/1) lösen.
2. Den Getriebedeckel (Fig. 91/2) entfernen.

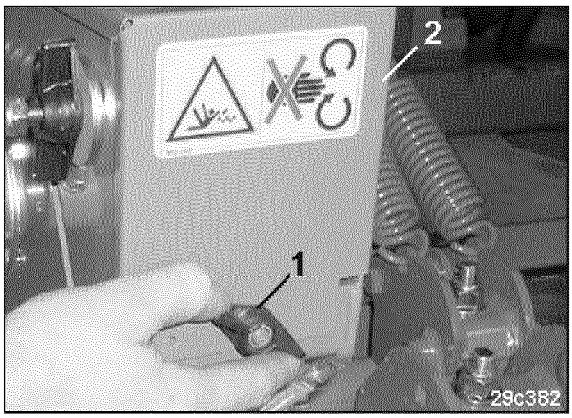


Fig. 91

3. Den Hebel (Fig. 92/1) in die Nut (Fig. 92/2) einrasten. Dadurch entspannt die Rollenkette.

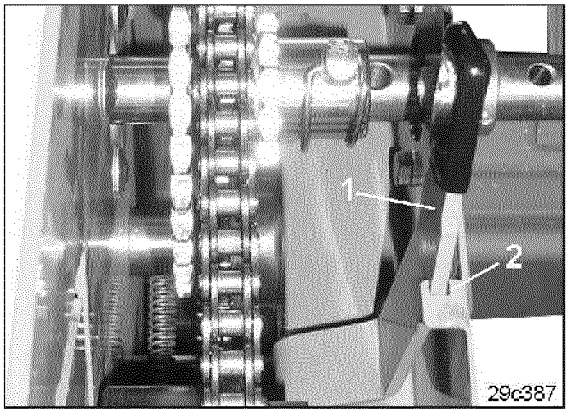


Fig. 92

4. Die Flügelmutter (Fig. 93/1) lösen und den Kettenspanner in der Kulisse in Pfeilrichtung verschieben.

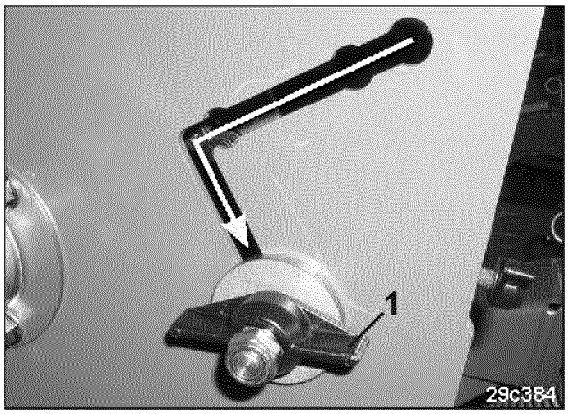


Fig. 93

5. Mit dem Haken (Fig. 82/1) die Rollenkette (Fig. 94) auf das richtige Kettenrad (X, Y oder Z) legen.
   Einstellwerte, siehe Kapitel „Kettenradpaarungen ermitteln für die Verstell- und Sekundärgetriebe“, Seite 62.
6. Verschieben Sie das Kettenrad entsprechend, wenn die Rollenkette nicht fluchtet. Nach jeder Verstellung das Kettenrad axial mit einem Klappstecker (Fig. 94/1) sichern.

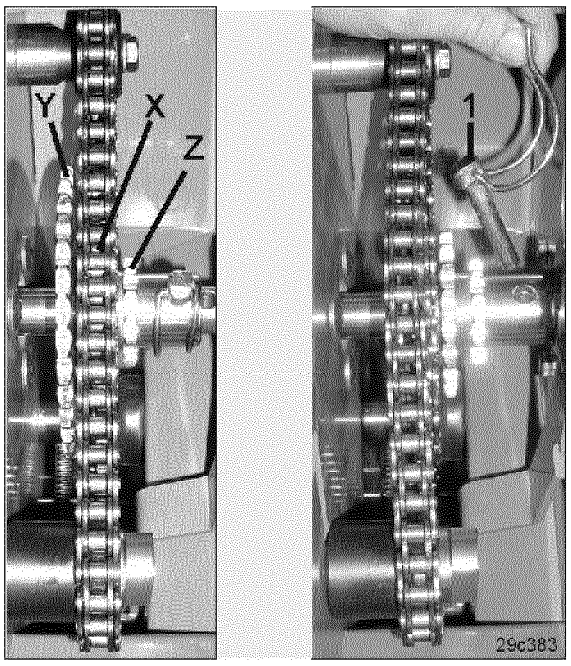


Fig. 94

7. Rollenkette spannen.
   Dazu die Flügelmutter bis zum Anschlag in Pfeilrichtung und anschließend zurück zur nächste Aussparung (Fig. 95/1) schieben. Den Kettenspanner in der Aussparung einrasten lassen.
8. Flügelmutter festziehen.
9. Den Hebel (Fig. 92/1) aus der Nut (Fig. 92/2) lösen.
10. Den Getriebedeckel schließen und mit der Flügelmutter (Fig. 91/1) befestigen.

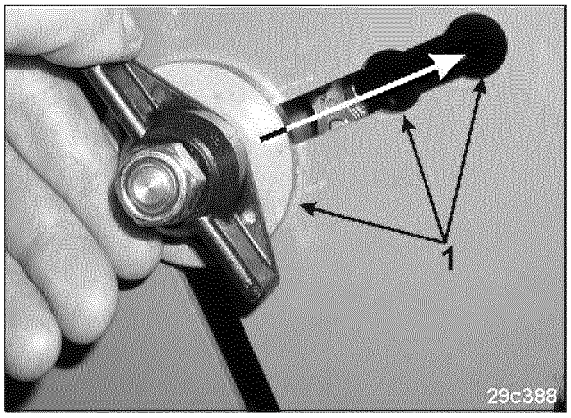


Fig. 95

8.5 Säaggregate auf das Saatgut abstimmen

Säaggregat-Einstelldaten

Saatgut	Tausend-Korn Gewicht TKG	Vereinzelungsscheibe			Auswerfer		Position		Säaggregat
		Bezeichnung	Farbe	Bestell-Nr.	Farbe	Bestell-Nr.	Abstreifer	Reduzier-klappe	
Mais	< 220 g (11 kg / 50000 K)	30/5	grün	910777	schwarz	926240	1/2	2	Classic- und Contour
	220 bis 250 g (11 bis 12,5 kg / 50000 K)	30/5	grün	910777	schwarz	926240	2/3	2	
	250 bis 280 g (12,5 bis 14 kg / 50000 K)	30/5	grün	910777	schwarz	926240	3	2	
	280 bis 320 g (14 bis 16,0 kg / 50000 K)	30/5	grün	910777	schwarz	926240	4/5	1	
	> 320 g	30/5,8	natur	910790	schwarz	926240	3/4	1	
Erbsen		60/5	dunkel-grau	924211	schwarz	926240	3	2	
Bohnen	< 400 g						5	2	
Ackerbohnen		45/6	rot	910792	schwarz	926240	5	1	
kleine Bohnen		60/2,5	schwarz	924213	schwarz	926240	2	1	
Sonnenblumen	< 70 g	30/2,2	blau	918860	gelb	926241	1	2	
	70 g bis 95 g	30/2,5	braun	910794	schwarz	926240	1	2	
	> 95 g	30/3	pink	927123	schwarz	926240	1	2	
Sojabohnen		60/4	orange	924212	schwarz	926240	3	2	
Baumwolle		60/3,2	hellgrün	915673	schwarz	926240	3	2	
Sorghum		60/2,2	bordeaux	918477	gelb	926241	1	2	
Zuckerrüben (pilliert)	< 70 g	30/2,2	blau	918860	gelb	926241	3	3	Contour
Zuckerrüben (pilliert)	> 70 g	15/2,2	türkis	920048	gelb	926241	3	3	
Rüben (nackt)		30/1,8	gelb	920049	gelb	926241	1	2	
Wassermelonen									
Raps		90/1,24	weiß	920051	rot	925912	3	3	

Wichtig!

Die Tabellenwerte (oben) sind Richtwerte, die sich durch Kornform und Korngröße ändern können.

8.5.1 Vereinzelungsscheibe und Auswerfer wechseln, Abstreifer und Reduzierklappe einstellen

Hinweis!

Die Vereinzelungsscheibe ist im Sägehäusefenster (Fig. 103) sichtbar.

Die Abstreifer-Positionen 1 bis 5 sind an der Hebelstellung (Fig. 96/A) zu erkennen. Zum Verstellen des Hebels das Säaggregat nicht öffnen.

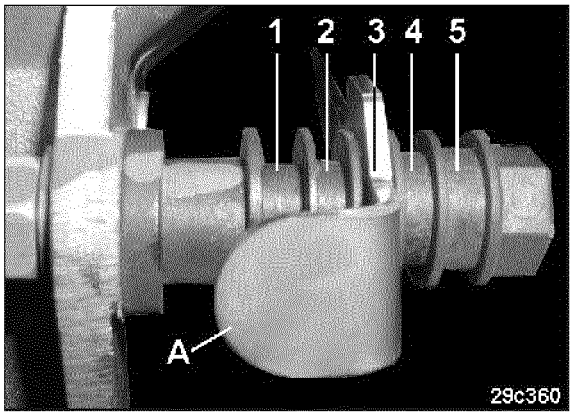


Fig. 96

Vereinzelungsscheibe und Auswerfer austauschen, Reduzierklappe einstellen:

1. Maschine anheben und durch geeignete Abstützung sichern.
2. Mutter (Fig. 97/1) lösen.
3. Das Säschar (Fig. 97/2) nach unten schwenken.
4. Mutter (Fig. 97/3) lösen.

Gefahr!

Maschine mit geeigneter Stütze gegen unbeabsichtigtes Absenken sichern!

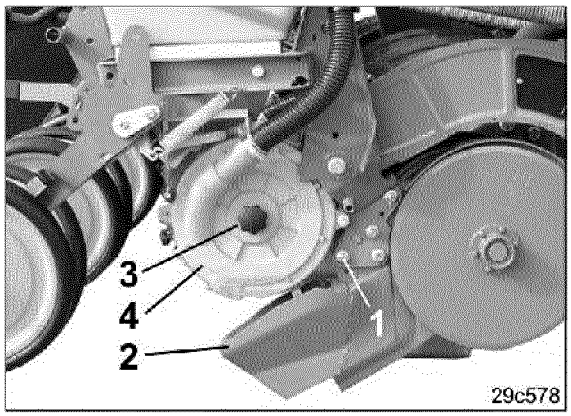


Fig. 97

5. Den Saugdeckel (Fig. 97/4) mit der Vereinzelungsscheibe (Fig. 98/1) vom Sägehäuse abziehen.
6. Die Vereinzelungsscheibe ggf. wechseln.

Wichtig!

Die Noppen (Fig. 98/2) zeigen zum Sägehäuse, nicht zum Saugdeckel.

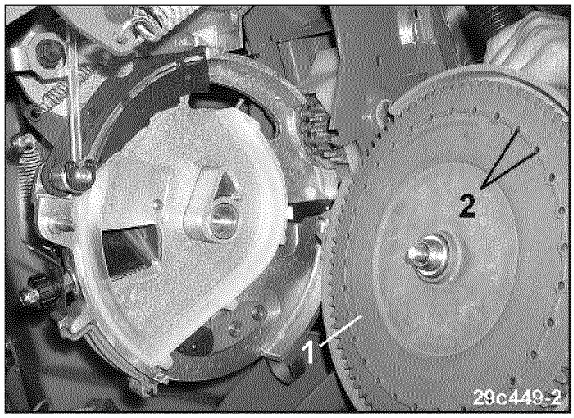


Fig. 98

7. Den Auswerfer (Fig. 99/1) ggf. wechseln.

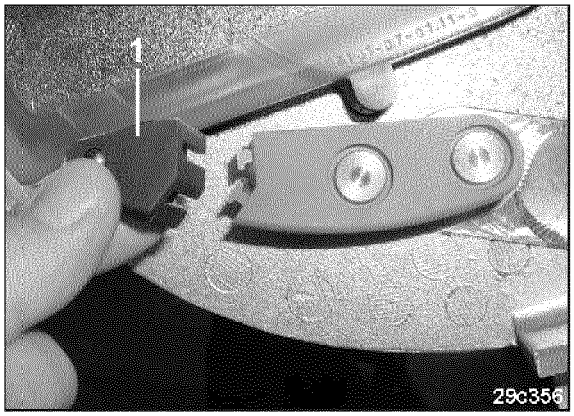


Fig. 99

8. Die Reduzierklappen-Position (Fig. 100/2) der Reduzierklappe (Fig. 100/1) ggf. ändern.

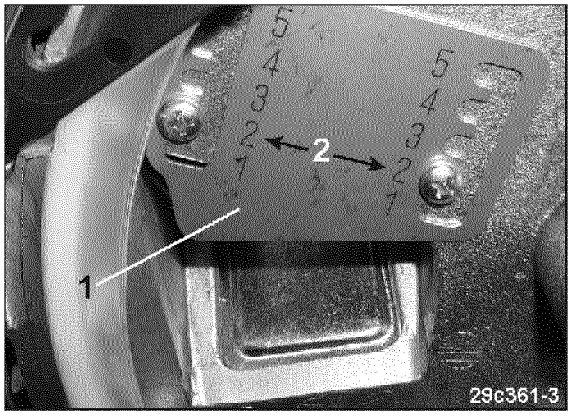


Fig. 100

9. Den Saugdeckel (Fig. 101/1) schließen.
10. Die Mutter (Fig. 101/2) handfest anziehen.
11. Das Schar (Fig. 101/3) nach oben schwenken.
12. Die Mutter (Fig. 101/4) festziehen.

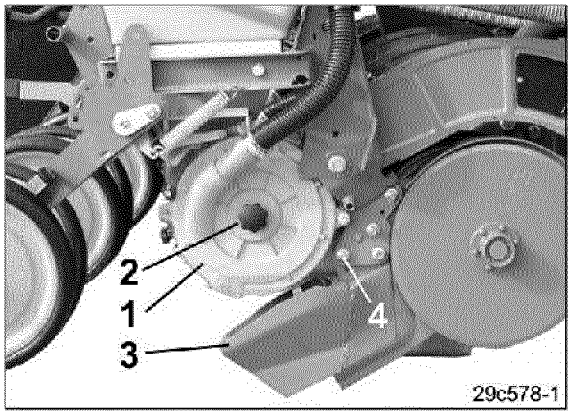


Fig. 101

13. Am Hebel (Fig. 102/1) vorsichtig ziehen und prüfen, ob der Hebel nach dem Auslenken in seine Ausgangsposition zurückkehrt.
14. Einstellung des ersten Säaggregates kontrollieren (siehe Kapitel „Abstreifer-Position und Reduzierklappen-Position kontrollieren“, Seite 97).
15. Alle Säaggregate auf die Werte des ersten Säaggregates einstellen.

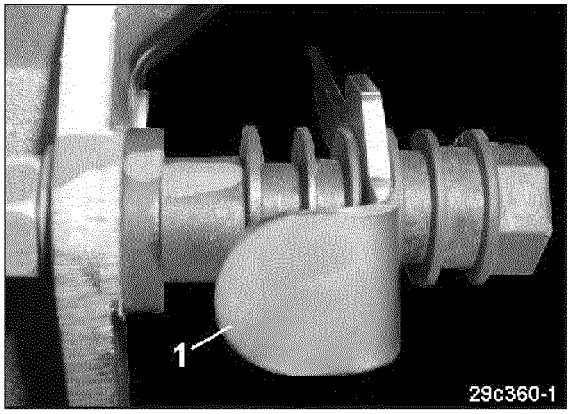


Fig. 102

8.5.2 Abstreifer-Position und Reduzierklappen-Position kontrollieren

1. Saatgut-Behälter befüllen (siehe Kapitel „Saatgut-Behälter befüllen“, Seite 98).
2. Das Gebläse einschalten (siehe Kapitel „Gebläse-Drehzahl“, Seite 100).
3. Das Antriebsrad (Fig. 180) und damit die Vereinzelungsscheiben mit der Abdrehkurbel drehen.
4. Eine zweite Person prüft, ob jede Bohrung (Fig. 103/1) mit einem Korn belegt ist.

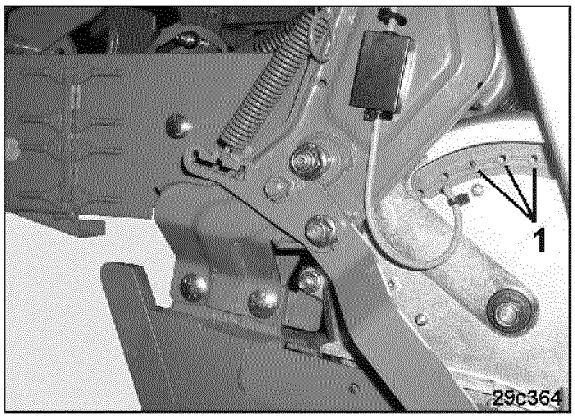


Fig. 103

5. Bei Fehlstellen den Hebel (Fig. 104/A) des Abstreifers in eine Rille mit höherer Nummer stellen.
   Bei Doppelbelegung den Hebel (Fig. 104/A) in eine Rille mit niedrigerer Nummer stellen.

   Fehlstellen können auch auftreten, wenn die Reduzierklappe (Fig. 105/2) falsch eingestellt ist und zu wenig Saatgut nachfließt.

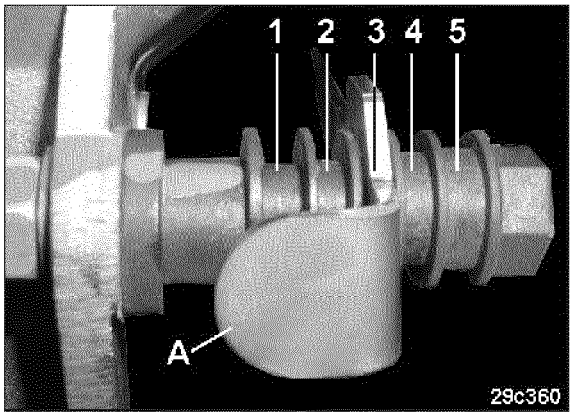


Fig. 104

6. Fehlen Körner bei richtiger Abstreifereinstellung an den Bohrungen der Vereinzelungsscheibe, die Öffnung vergrößern durch Verstellen der Reduzierklappe (Fig. 105/1) auf die nächst niedrigere Positionszahl.

   Tritt Saatgut aus der Gehäuseöffnung (Fig. 103) aus, die Zulauföffnung verkleinern durch Verstellen der Reduzierklappe auf die nächst höhere Positionszahl.

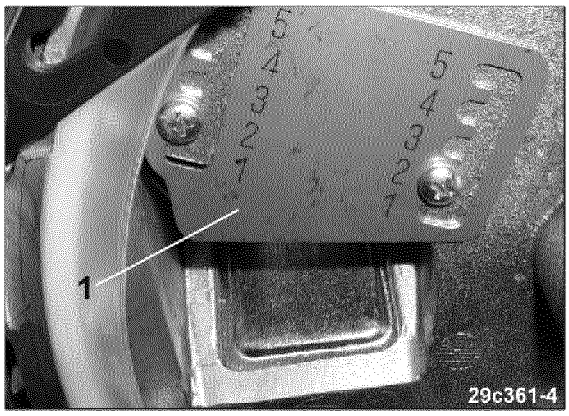


Fig. 105

Wichtig!

Der federbelastete Hebel (Fig. 104/A) muss leichtgängig sein und nach dem Auslenken in seine Ausgangsposition zurückkehren.

Hinweis!

Die Einstellungen auf dem Feld nach kurzer Fahrstrecke kontrollieren.

Doppelbelegung und Fehlstellen können von einer Person durch Freilegen des Saatgutes auf dem Feld ermittelt werden. Fehlstellen werden angezeigt vom AMASCAN+, AMASCAN-PROFI und ED-CONTROL.

8.6 Saatgut-Behälter befüllen und entleeren

8.6.1 Saatgut-Behälter befüllen

Wichtig!

- **Fremdteile aus den Saatgut-Behältern entfernen.**
- **Kein feuchtes oder klebriges Saatgut in die Saatgut-Behälter füllen.**
- **Kommt es durch Kornform und Beizung zur Brückenbildung kann die Gleitfähigkeit des Saatgutes durch Beigabe von etwa 200g Talkum auf 100 kg Saatgut verbessert werden.**

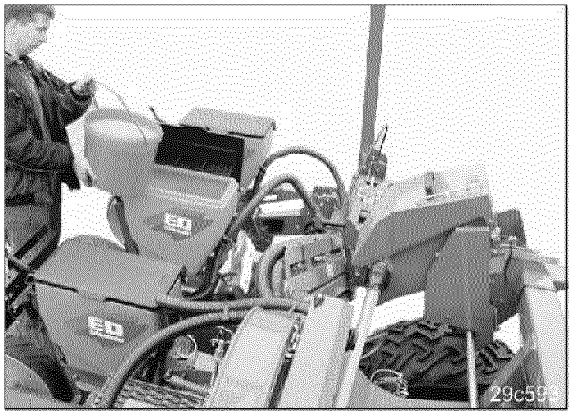


Fig. 106

8.6.2 Saatgut-Behälter und Sägehäuse entleeren

1. Die Maschine soweit anheben, bis die Säschare vom Boden freikommen.
2. Klappstecker und Bolzen (Fig. 107/1) entfernen und die Zwischenandruckrolle (Option) nach unten schwenken.

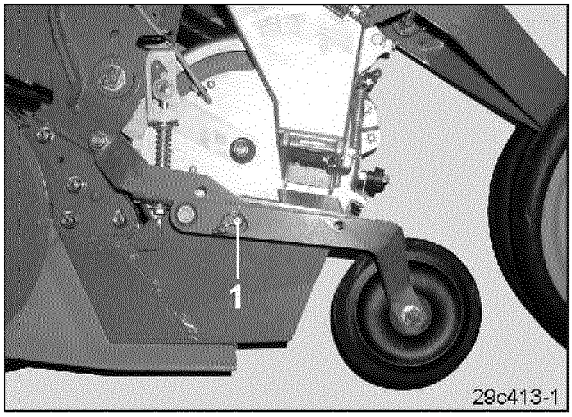


Fig. 107

3. Einen geeigneten Auffangbehälter (Fig. 108/1) unter das Säaggregat stellen.
4. Die federbelastete Klappe (Fig. 108/2) öffnen und den Saatgut-Behälter entleeren.
5. Die Klappe (Fig. 108/2) schließen.

Warnung!

Die federbelastete Klappe (Fig. 108/2) nur an der Lasche (Fig. 108/3) anfassen, sonst besteht Verletzungsgefahr beim Zuschlagen der Klappe.

Niemals mit der Hand zwischen Klappe und Sägehause fassen.

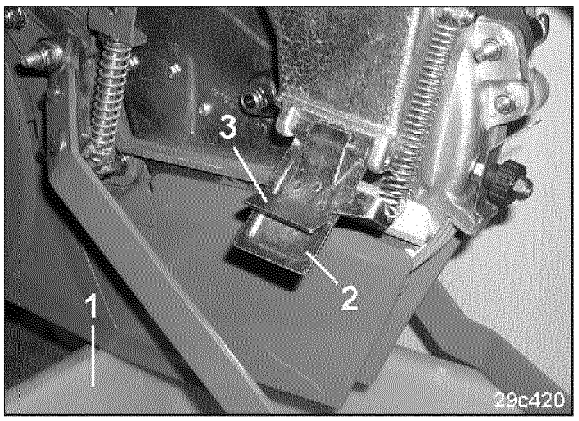


Fig. 108

Zur vollständigen Entleerung des Sägehäuses:

6. Die Mutter (Fig. 109/1) lösen.
7. Die Feder (Fig. 109/2) zur Seite schwenken.
8. Die Restentleerungsklappe (Fig. 109/3) öffnen und das Sägehäuse entleeren.
9. Die Restentleerungsklappe schließen und mit der Feder arretieren.
10. Die Mutter festziehen.

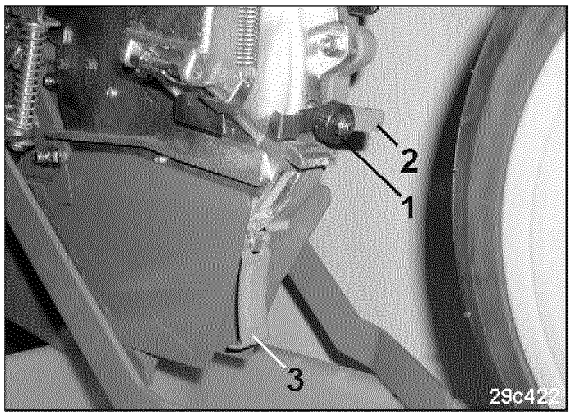


Fig. 109

8.7 Säscharspitzen

Beim Wechsel von der Maissaat zur Rübensaat sind die Säscharspitzen am Contour-Säaggregat auszutauschen (siehe Kapitel „Säscharspitzen prüfen/austauschen“, Seite 167). Die erforderlichen Säscharspitzen der Tabelle (unten) entnehmen.

Mais-Säscharspitze (für Classic- und Contour-Säaggregat)	**Rüben-Säscharspitze (für Contour-Säaggregat)**
Mais	Zuckerrüben
Bohnen	Rüben
Sonnenblumen	Wassermelonen
Erbsen	Raps
Baumwolle	
Sorghum	

8.8 Gebläse-Drehzahl

Ein Manometer (Fig. 110/1) in der Traktorkabine zeigt den Unterdruck des Saugluft-Gebläses an.

Die Gebläse-Drehzahl des Saugluft-Gebläses ist richtig eingestellt, wenn der Zeiger des Manometers mittig im grünen Skalenbereich (Fig. 110/2), d.h. zwischen 65 und 80 mbar steht.

Die Einstellung der Gebläse-Drehzahl erfolgt

- mit Zapfwellen-Antrieb (siehe Kapitel „Zapfwellen-Gebläseantrieb“, Seite 101)
- mit hydr. Antrieb (siehe Kapitel „Hydraulischer Gebläseantrieb“, Seite 101).

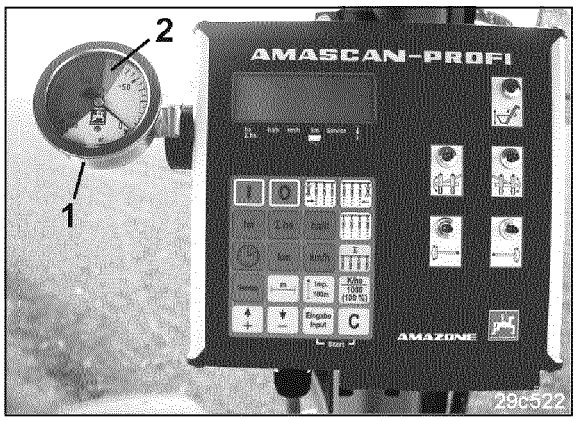


Fig. 110

Wichtig!

Auf die vorschriftsmäßige Gebläse-Drehzahl im grünen Skalenbereich achten,

- **zur Vermeidung von Doppelbelegung / Fehlstellen des Saatgutes an den Vereinzelungsscheiben**
- **zur Vermeidung von erhöhtem Verschleiß am Gebläse.**

Wichtig!

Beim Einsatz der roten Vereinzelungsscheibe für Ackerbohnen (siehe Tabelle, Seite 94) die Gebläse-Drehzahl soweit erhöhen, bis der Zeiger des Manometers (Fig. 110) unmittelbar vor dem roten Bereich steht.

Wichtig!

Hinweise zur Einstellung der Gebläse-Drehzahl am Fronttank, (siehe Kapitel „Gebläse-Drehzahl einstellen am Fronttank“, Seite 103).

Das Druckluft-Gebläse und das Saugluft-Gebläse haben die gleiche Drehzahl.

Das Manometer (Fig. 110) zeigt den Unterdruck des Saugluft-Gebläses an.

Bei richtig eingestellter Drehzahl des Saugluft-Gebläses kann der Luftdruck des Druckluft-Gebläses zu groß sein. Der Dünger wird dann aus der Düngerfurche herausgeblasen.

Die Lufteinlass-Öffnung des Druckluft-Gebläses mit dem Schieber (Fig. 111/1)

- verkleinern zur Reduzierung des Luftdruckes
- vergrößern zum Erhöhen des Luftdruckes.

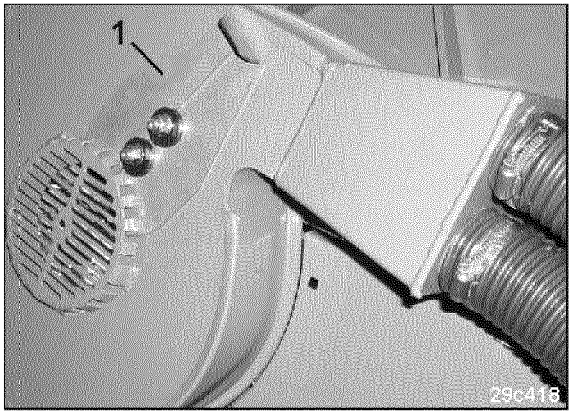


Fig. 111

Page 793 of 1596 Precision Exhibit 1005

8.8.1 Zapfwellen-Gebläseantrieb

Der Gebläseantrieb ist eingestellt nach Ihren Bestellangaben, z.B. auf 1000 U/min. Traktor-Zapfwellen-Drehzahl. Ein Aufkleber (Fig. 112) am Gebläsegehäuse markiert die zulässige Traktor-Zapfwellen-Drehzahl.

Bei Einhaltung der zulässigen Traktor-Zapfwellen-Drehzahl steht der Zeiger des Manometers während der Arbeit im grünen Skalenbereich (Fig. 110/2).

Kleine Korrekturen können durch geringfügiges Verstellen der Traktor-Zapfwellen-Drehzahl vorgenommen werden.

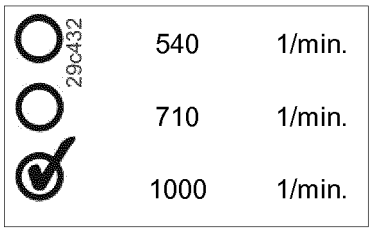


Fig. 112

8.8.2 Hydraulischer Gebläseantrieb

Die Gebläse können von einem Hydraulikmotor (Fig. 113) angetrieben werden.

Die Gebläse-Drehzahl anhand des Manometers (Fig. 110) einstellen, wahlweise

- am Stromregelventil (falls vorhanden) des Traktors (siehe Kapitel „Gebläse-Drehzahl einstellen am Stromregelventil des Traktors“, Seite 102)
- am Stromregelventil der Maschine (siehe Kapitel „Gebläse-Drehzahl einstellen am Stromregelventil der Maschine“, Seite 102).

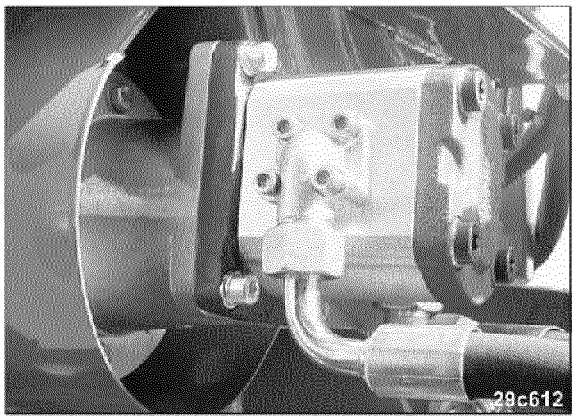


Fig. 113

Hinweis!

Nur Traktoren mit Load-Sensing-Sytem oder separatem Ölkreislauf sind geeignet, das Gebläse hydraulisch anzutreiben. Andere Traktoren müssen in der Regel zuerst das Gebläse abstellen, damit sie die Maschine am Feldende anheben können.

Hinweis!

Die Gebläse-Drehzahl verändert sich so lange, bis das Hydrauliköl seine Betriebstemperatur erreicht hat.

Bei der Erstinbetriebnahme die Gebläse-Drehzahl bis zum Erreichen der Betriebstemperatur korrigieren.

Wird das Gebläse nach längerer Stillstandszeit erneut in Betrieb genommen, wird die eingestellte Gebläse-Drehzahl erst erreicht, wenn sich das Hydrauliköl auf Betriebstemperatur erwärmt hat.

8.8.2.1 Gebläse-Drehzahl einstellen am Stromregelventil des Traktors

1. Alle Saatgut-Vorratsbehälter befüllen.
2. Kontermutter (Fig. 114/1) lösen.
3. Das Handrad (Fig. 114/2) schließen (rechts herumdrehen) und anschließend 1/2 Umdrehung öffnen damit die Ölfördermenge möglichst gering ist. Größere Ölfördermengen als unbedingt erforderlich sind zu vermeiden.
4. Handrad mit der Kontermutter (Fig. 114/1) sichern.
5. Traktormotor starten und mit erhöhter Drehzahl betreiben.
6. Das Antriebsrad mit der Abdrehkurbel solange drehen, bis alle Bohrungen der Vereinzelungsscheiben mit Saatgut-Körnern belegt sind (siehe Kapitel „Abstreifer-Position und Reduzierklappen-Position kontrollieren“, Seite 97).
7. Die Gebläse-Drehzahl anhand des Manometers (Fig. 110) einstellen am Stromregelventil des Traktors.

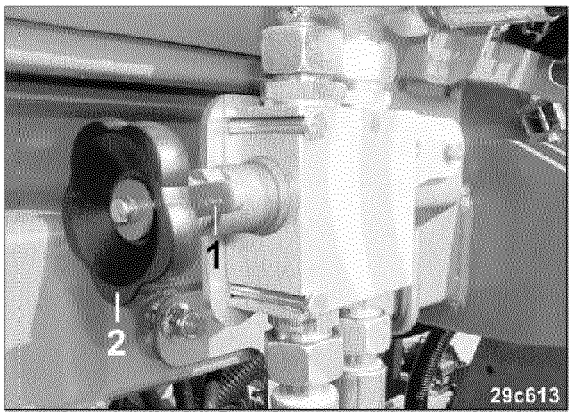


Fig. 114

8.8.2.2 Gebläse-Drehzahl einstellen am Stromregelventil der Maschine

Die Gebläse-Drehzahl nur dann am Stromregelventil der Maschine einstellen, wenn der Traktor über kein Stromregelventil verfügt.

Gebläse-Drehzahl einstellen am Stromregelventil der Maschine:

1. Alle Saatgut-Vorratsbehälter befüllen.
2. Traktormotor starten und mit erhöhter Drehzahl betreiben.
3. Kontermutter (Fig. 115/1) lösen.
4. Das Antriebsrad mit der Abdrehkurbel solange drehen, bis alle Bohrungen der Vereinzelungsscheiben mit Saatgut-Körnern belegt sind.
5. Handrad (Fig. 115/2) solange drehen, bis der Zeiger des Manometers (Fig. 110) im grünen Bereich steht.
6. Handrad mit der Kontermutter (Fig. 115/1) sichern.

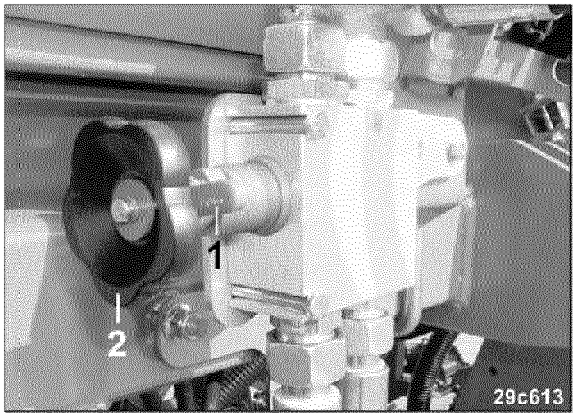


Fig. 115

8.8.2.3 Gebläse-Drehzahl einstellen am Fronttank

Kombinationen mit Fronttank haben zwei Gebläse

- das Saugluftgebläse an der Einzelkorn-Sämaschine
- das Druckluftgebläse am Fronttank.

Die Gebläse-Drehzahl des Saugluftgebläses einstellen (siehe Kapitel „Gebläse-Drehzahl“, Seite 100.)

Die Gebläse-Drehzahl des Druckluftgebläses einstellen am Fronttank anhand der Fronttank-Betriebsanleitung.

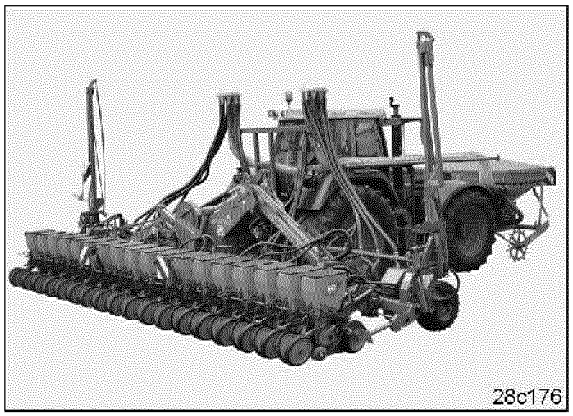


Fig. 116

Wichtig!

Gebläse-Drehzahlen des Druckluftgebläses am Fronttank:

Mindest-Gebläse-Drehzahl: 3500 U/min.
Max. Gebläse-Drehzahl: 4000 U/min.

8.9 Spuranreißer einstellen

Gefahr!

Der Aufenthalt im Schwenkbereich der Spuranreißer ist verboten.

Spuranreißer-Einstellungen nur vornehmen bei angezogener Handbremse, abgeschaltetem Motor und abgezogenem Zündschlüssel.

8.9.1 Spuranreißerlänge berechnen zum Markieren einer Spur in Traktormitte

Berechnung der Spuranreißerlänge A (Fig. 117), gemessen von Maschinenmitte bis zur Aufstandsfläche der Spuranreißerscheibe am Boden entspricht der Arbeitsbreite.

Spuranreißerlänge A	=	Reihenabstand R [cm] x Anzahl der Säaggregate

Beispiel:

Reihenabstand R: .....45 cm

Anzahl der Säaggregate:.....7

Spuranreißerlänge A = 45 cm x 7

Spuranreißerlänge A = 315 cm

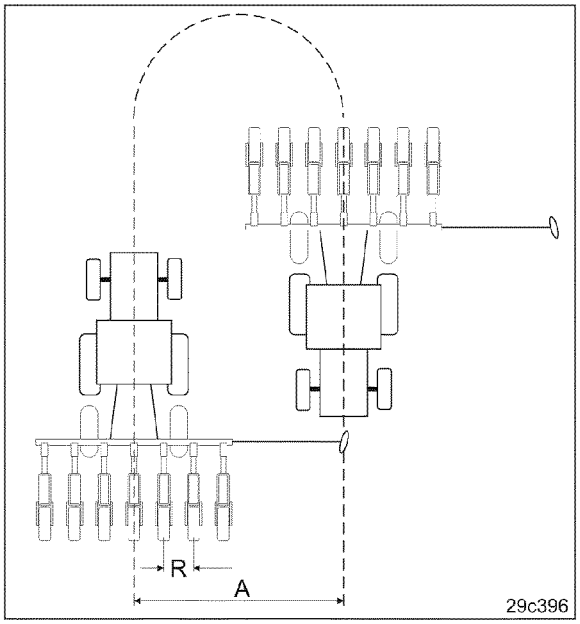


Fig. 117

8.9.2 Spuranreißerlänge berechnen zum Markieren einer Spur in der Traktorspur

Berechnung der Spuranreißerlänge A (Fig. 118), gemessen von Maschinenmitte bis zur Aufstandsfläche der Spuranreißerscheibe am Boden bei symmetrischer Anordnung der Schare.

$$\text{Spuranreißerlänge A} = \text{Reihenabstand R [cm] x Anzahl der Säaggregate} \cdot \frac{\text{Traktorspur S [cm]}}{200}$$

Beispiel:

Reihenabstand R: ..... 45 cm

Anzahl der Säaggregate: 7

Traktorspurbreite S: ..... 150 cm

$$\text{Spuranreißerlänge A} = 45 \times 7 \frac{150}{200}$$

Spuranreißerlänge A = 236 cm

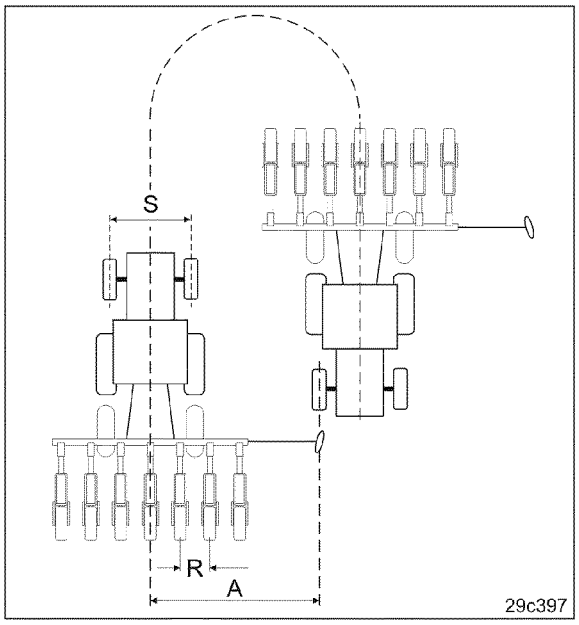


Fig. 118

8.9.3 Arbeitsintensität der Spuranreißer einstellen

1. Die Arbeitsintensität der Spuranreißer durch Verdrehen der Spuranreißerscheibe (Fig. 119/1) einstellen.

   Die Spuranreißerscheibe steht auf leichten Böden etwa parallel zur Fahrtrichtung und auf schweren Böden mehr auf Griff.

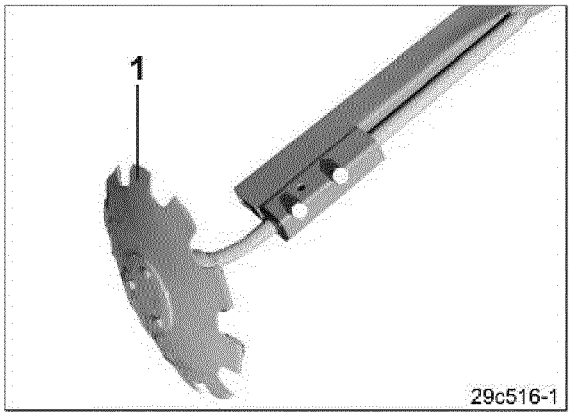


Fig. 119

8.9.4 Spuranreißer einstellen (ED 302)

Die Spuranreißer der ED 302 markieren eine Spur in Traktormitte.

Spuranreißerlänge einstellen:

1. Maschine auf dem Feld abstellen.
2. Spuranreißer entsichern (siehe Kapitel „Transportsicherung der Spuranreißer (ED 302 und ED 452 [-K])“, Seite 147).
3. Spuranreißer ausklappen (siehe Kapitel „Spuranreißer-Betätigung“, Seite 149).
4. Handbremse anziehen, Traktormotor abstellen und Zündschlüssel abziehen.
5. Zwei Schrauben (Fig. 120/1) lösen.
6. Spuranreißerlänge auf Länge „A“ (siehe Kapitel „Spuranreißerlänge berechnen zum Markieren einer Spur in Traktormitte“, Seite 104) einstellen.
7. Schrauben (Fig. 120/1) festziehen.
8. Die Arbeitstiefe der Spuranreißerscheiben auf ca. 5 cm begrenzen durch Umstecken der Kette (Fig. 121/1).
9. Kette mit einem Klappstecker (Fig. 121/2) sichern.

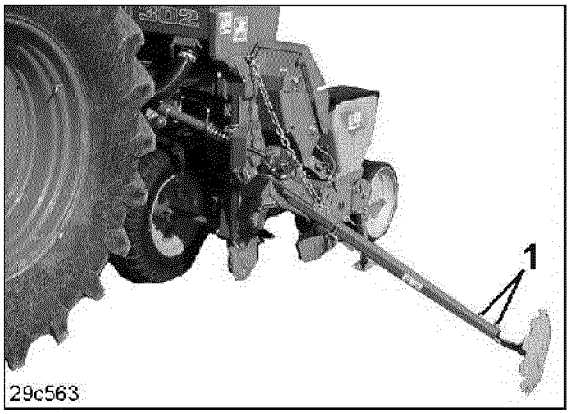


Fig. 120

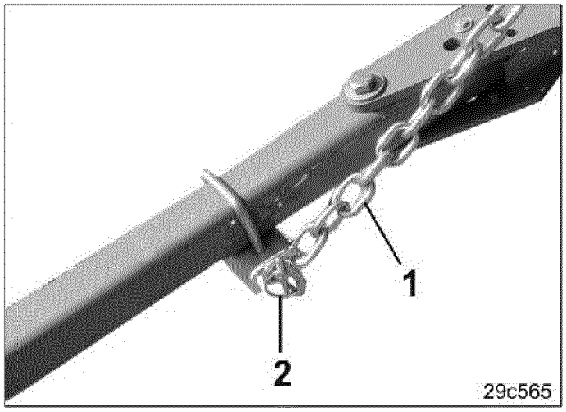


Fig. 121

8.9.5 Spuranreißer einstellen (ED 452 [-K])

Die Spuranreißer der ED 452 [-K] markieren eine Spur in Traktormitte oder in der Traktorspur.

Spuranreißerlänge einstellen:

1. Maschine auf dem Feld abstellen.
2. Spuranreißer entsichern (siehe Kapitel „Transportsicherung der Spuranreißer (ED 302 und ED 452 [-K])“, Seite 147).
3. Spuranreißer ausklappen (siehe Kapitel „Spuranreißer-Betätigung“, Seite 149).
4. Handbremse anziehen, Traktormotor abstellen und Zündschlüssel abziehen.

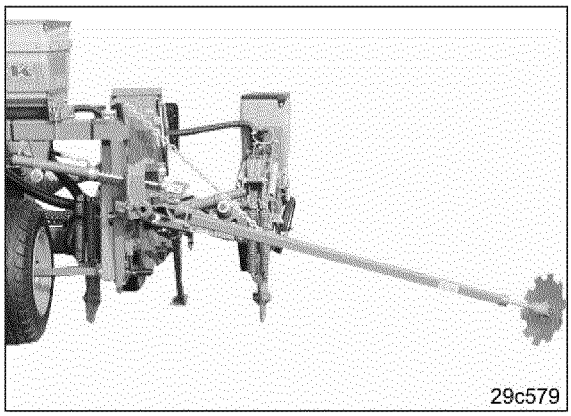


Fig. 122

5. Den federbelasteten Bolzen (Fig. 123/1) ziehen, zur Seite schwenken und arretieren.
6. Das Auslegerrohr (Fig. 123/2) bis zur ersten oder zweiten Bohrung herausziehen.

Stellung des Auslegerrohres (Fig. 123/2):

erste Bohrung: Anreißen in der Traktorspur

zweite Bohrung: Anreißen in Traktormitte.

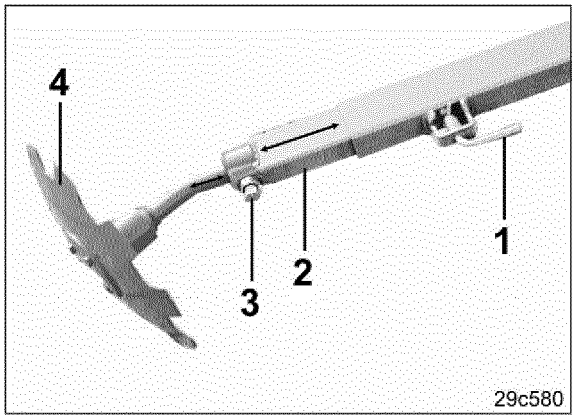


Fig. 123

7. Das Auslegerrohr (Fig. 123/2) mit dem Bolzen (Fig. 123/1) sichern.
8. Schraube (Fig. 123/3) lösen.
9. Spuranreißerlänge auf Länge „A“ einstellen
   - siehe Kapitel „Spuranreißerlänge berechnen zum Markieren einer Spur in Traktormitte“, Seite 104
   - siehe Kapitel „Spuranreißerlänge berechnen zum Markieren einer Spur in der Traktorspur“, Seite 104.
10. Schraube (Fig. 123/3) festziehen.
11. Die Arbeitstiefe der Spuranreißerscheiben auf ca. 5 cm begrenzen durch Umhängen der Kette (Fig. 124/1).
12. Kette mit einem Klappstecker (Fig. 124/2) sichern.

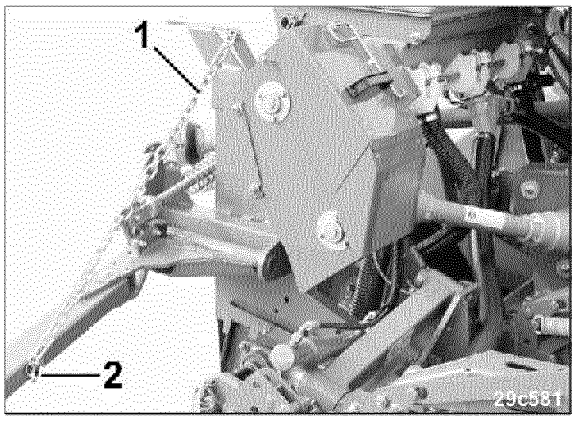


Fig. 124

8.9.6 Spuranreißer einstellen (ED 602-K)

Die Spuranreißer der ED 602-K markieren eine Spur in Traktormitte oder in der Traktorspur.

Spuranreißerlänge einstellen:

1. Maschine auf dem Feld abstellen.
2. Spuranreißer ausklappen (siehe Kapitel „Spuranreißer-Betätigung“, Seite 149).
3. Handbremse anziehen, Traktormotor abstellen und Zündschlüssel abziehen.

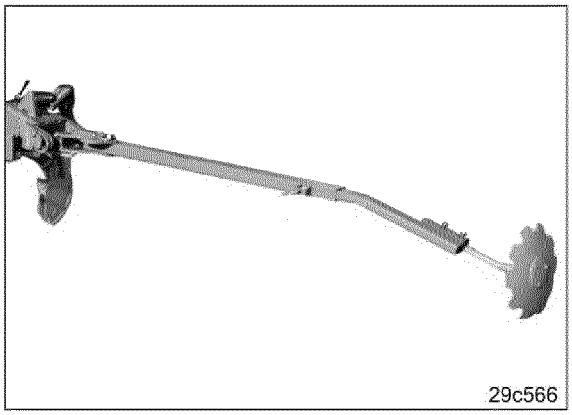


Fig. 125

4. Den federbelasteten Bolzen (Fig. 126/1) ziehen, zur Seite schwenken und arretieren.
5. Das Auslegerrohr (Fig. 126/2) bis zur ersten oder zweiten Bohrung herausziehen.

Stellung des Auslegerrohres (Fig. 126/2):

erste Bohrung: Anreißen in der Traktorspur

zweite Bohrung: Anreißen in Traktormitte.

6. Das Auslegerrohr (Fig. 126/2) mit dem federbelasteten Bolzen (Fig. 126/1) sichern.

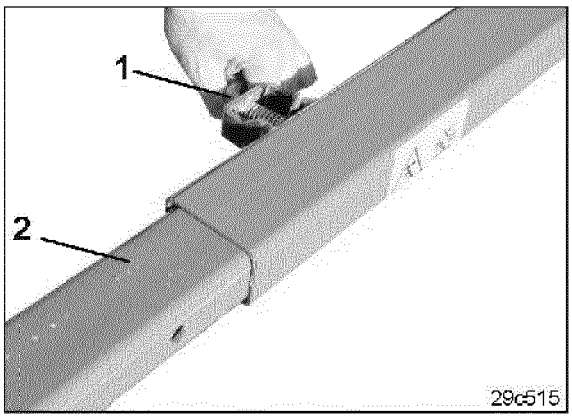


Fig. 126

7. Schrauben (Fig. 127/1) lösen.
8. Spuranreißerlänge auf Länge „A“ einstellen
   - siehe Kapitel „Spuranreißerlänge berechnen zum Markieren einer Spur in Traktormitte“, Seite 104
   - siehe Kapitel „Spuranreißerlänge berechnen zum Markieren einer Spur in der Traktorspur“, Seite 104.
9. Schrauben (Fig. 127/1) festziehen.

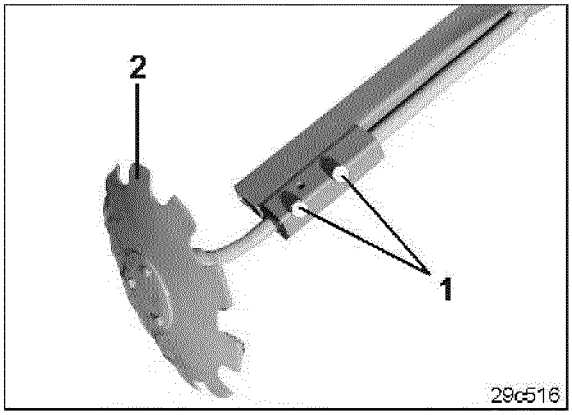


Fig. 127

10. Spannschloss-Kontermutter (Fig. 128/1) lösen.
11. Spannschloss soweit verstellen, bis die Spuranreißerscheibe (Fig. 127/2) den Boden berührt.
12. Spannschloss um eine Umdrehung kürzen, damit die Arbeitstiefe der Spuranreißerscheibe begrenzt wird auf ca. 5 cm.
13. Spannschloss-Kontermutter (Fig. 128/1) festziehen.

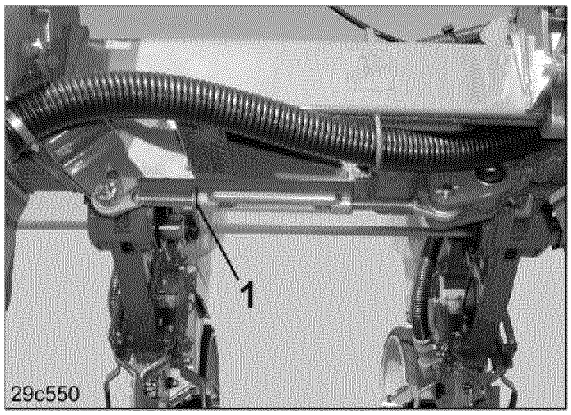


Fig. 128

8.9.7 Spuranreißer einstellen (ED 902-K)

Die Spuranreißer der ED 902-K markieren eine Spur in Traktormitte.

Spuranreißerlänge einstellen:

1. Maschine auf dem Feld abstellen.
2. Spuranreißer ausklappen (siehe Kapitel „Spuranreißer-Betätigung“, Seite 149).
3. Handbremse anziehen, Traktormotor abstellen und Zündschlüssel abziehen.
4. Schrauben (Fig. 129/1) lösen.
5. Spuranreißerlänge auf Länge „A“ einstellen (siehe Kapitel „Spuranreißerlänge berechnen zum Markieren einer Spur in Traktormitte“, Seite 104).
6. Schrauben (Fig. 129/1) festziehen.

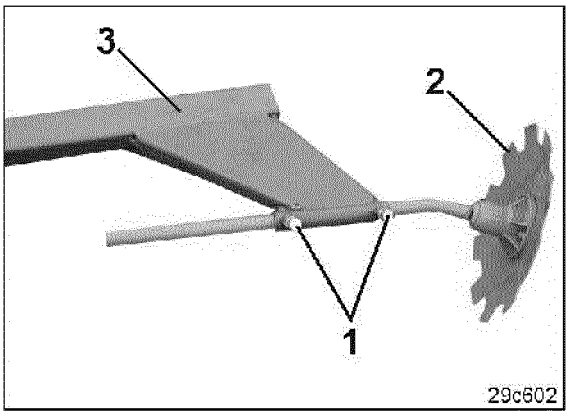


Fig. 129

7. Muttern (Fig. 130/1) lösen.
8. Strebe (Fig. 130/2) so verstellen, das die Arbeitstiefe der Spuranreißerscheibe auf ca. 5 cm begrenzt ist.
9. Muttern (Fig. 130/1) festziehen.

Hinweis!

Mit 8,1 m Arbeitsbreite kurze Endausleger (Fig. 129/3) montieren (siehe Kapitel „Kurze Endausleger montieren“, Seite 110).

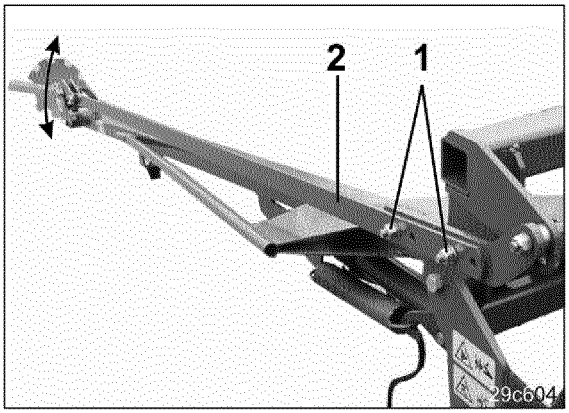


Fig. 130

8.9.7.1 Kurze Endausleger montieren

1. Kurze Endausleger (Fig. 129/3) montieren.
2. Muttern (Fig. 131/1) lösen.
3. Strebe (Fig. 131/2) in Mittelstellung stellen.
4. Muttern (Fig. 131/1) festziehen.

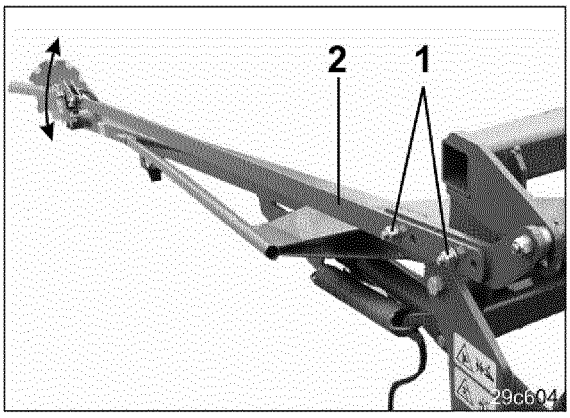


Fig. 131

5. Spuranreißerlänge einstellen [siehe Kapitel „Spuranreißer einstellen (ED 902-K)“, Seite 109].
6. Kontermutter (Fig. 132/1) lösen.
7. Anschlagmutter (Fig. 132/2) solange verdrehen bis die Arbeitstiefe der Spuranreißerscheibe (Fig. 129/2) auf ca. 5 cm begrenzt ist.
8. Kontermutter (Fig. 132/1) festziehen.

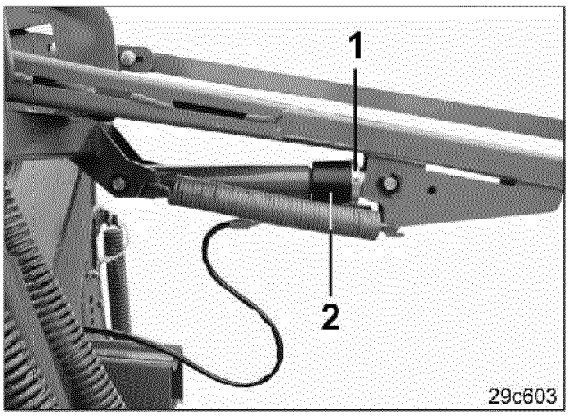


Fig. 132

8.10 Spurlockerer einstellen

Wichtig!

Die Spurlockerer erst auf dem Feld in Arbeitsstellung bringen und nach der Arbeit ganz oben befestigen, um Beschädigungen beim Abstellen der Maschine zu vermeiden.

Gefahr!

Traktor-Zapfwelle abschalten, Handbremse anziehen, Traktormotor abstellen und Zündschlüssel abziehen.

Vor dem Verschieben des Spurlockerers

- horizontal: Mutter (Fig. 133/1) lösen
- vertikal: Schraube (Fig. 133/2) lösen.

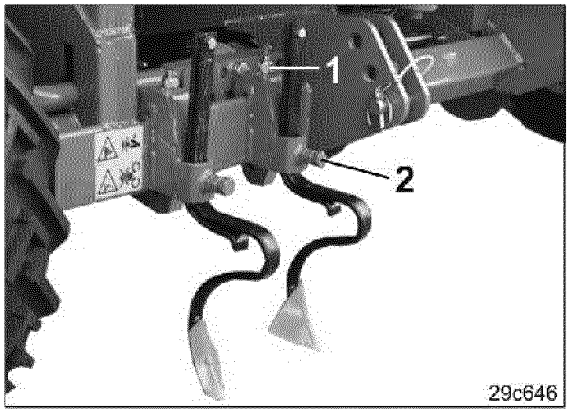


Fig. 133

Vor dem Verschieben des Spurlockerers

- horizontal: Mutter (Fig. 134/1) lösen
- vertikal: Klappstecker und Bolzen (Fig. 134/2) lösen.

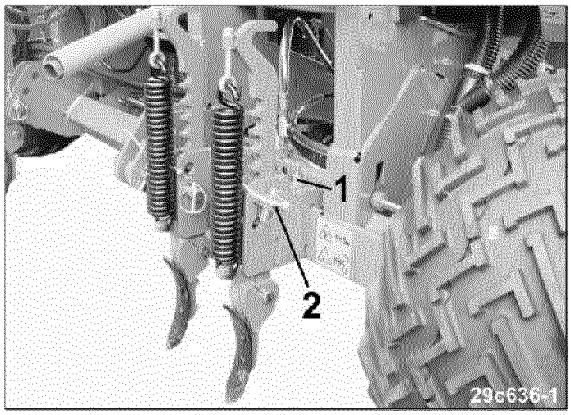


Fig. 134

Mutter (Fig. 135/1) lösen vor dem horizontalen und vertikalen Verschieben des Spurlockerers.

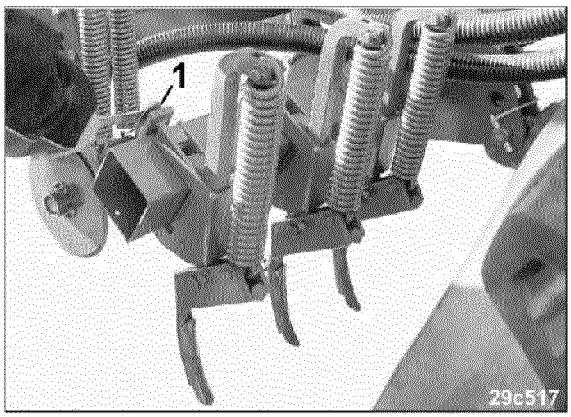


Fig. 135

8.11 Saatgutablagetiefe einstellen (Classic-Säaggregat)

1. Maschine auf dem Feld in Arbeitsstellung bringen (siehe Kapitel „Einsatz der Maschine“, Seite 146).

Wichtig!

Den Saatgut-Behälterdeckel waagerecht stellen durch Verlängern oder Verkürzen des Oberlenkers.

2. Den Federbügel (Fig. 136/1) lösen. Der Federbügel sichert die Spindel (Fig. 136/2) gegen Verdrehung.
3. Mit der Spindel (Fig. 136/2) die gewünschte Ablagetiefe einstellen.

Spindelverstellung

Drehung nach rechts: Arbeitstiefe verringern

Drehung nach links: Arbeitstiefe vergrößern.

4. Die Spindel (Fig. 136/2) mit dem Bügel (Fig. 136/1) gegen Verdrehung sichern.

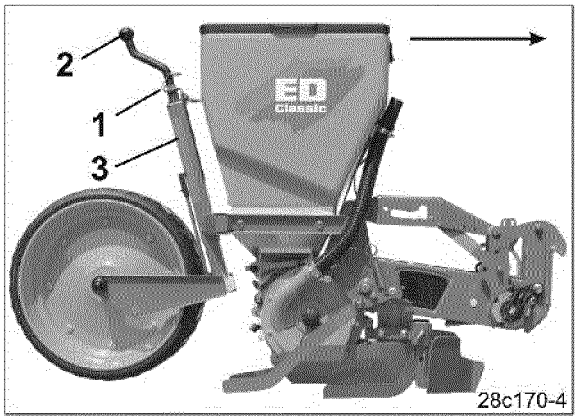


Fig. 136

5. Ablagetiefe des ersten Säaggregates prüfen (siehe Kapitel „Saatgutablagetiefe und Kornabstand kontrollieren“, Seite 118) und bei Bedarf korrigieren.

   Die maximale Ablagetiefe beträgt 10 cm.

   Wird die gewünschte Saatgutablagetiefe nicht erreicht, verstellen Sie das auf die Säschare wirkende Säaggregat-Gewicht (Belastung) [siehe Kapitel „Belastungsstufe einstellen (Classic-Säaggregat)“, Seite 113].
6. Die Belastungsstufe und die Spindelstellung des ersten Säaggregates an allen Säaggregaten einstellen. Die Spindelstellung an der Skala (Fig. 136/3) ablesen.
7. Abschließende Prüfung der Ablagetiefe aller Säaggregate (siehe Kapitel „Saatgutablagetiefe und Kornabstand kontrollieren“, Seite 118).

8.11.1 Belastungsstufe einstellen (Classic-Säaggregat)

1. Die Maschine im Traktor-Dreipunkt soweit anheben, bis die Säaggregate vom Boden freikommen.
2. Den Hebel (Fig. 137) gut festhalten und in eine der 4 Hebelstellungen (Belastungsstufen) einrasten.

Hebelstellung (Fig. 137/...)

(1) = Entlastung

(2) = neutral

(3) = 50% Belastung

(4) = 100% Belastung.

Vorsicht!

Verletzungsgefahr beim Entspannen des mit Federdruck belasteten Hebels (Fig. 137).

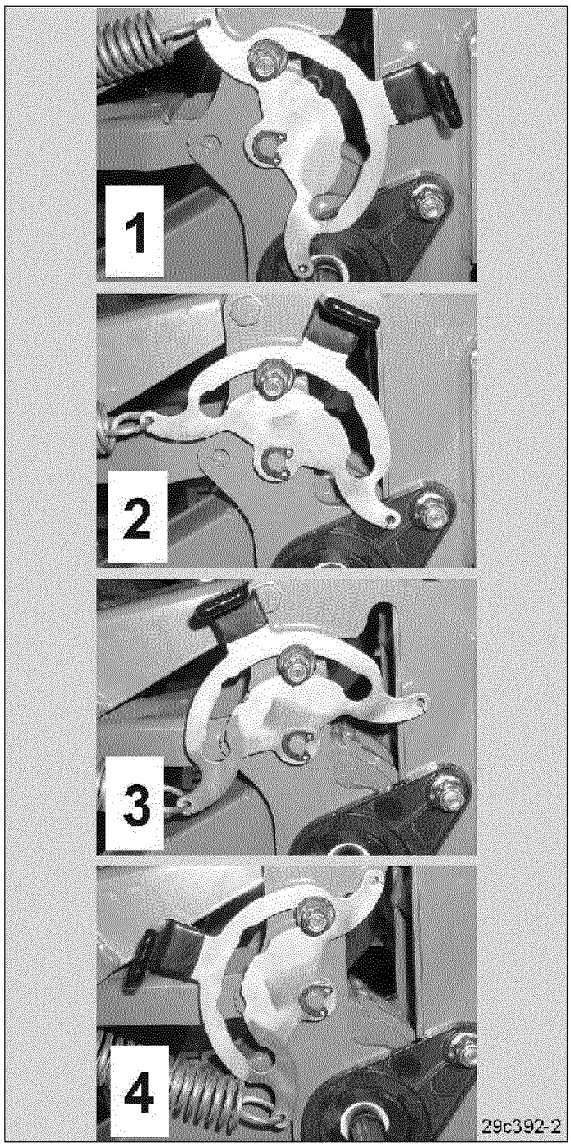


Fig. 137

8.12 Saatgutablagetiefe einstellen (Contour-Säaggregat)

1. Maschine auf dem Feld in Arbeitsstellung bringen (siehe Kapitel „Einsatz der Maschine“, Seite 146).
2. Federbügel (Fig. 138/1) lösen. Der Federbügel sichert die Spindel (Fig. 138/2) gegen Verdrehung.
3. Mit der Spindel (Fig. 138/2) die gewünschte Ablagetiefe einstellen.

Spindelverstellung

Drehung nach rechts: Arbeitstiefe verringern

Drehung nach links: Arbeitstiefe vergrößern.

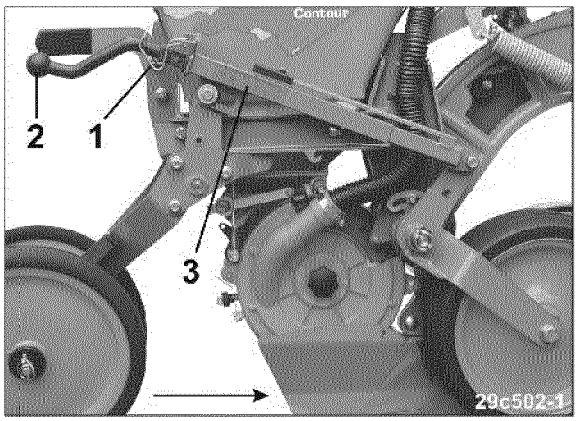


Fig. 138

4. Die Spindel (Fig. 138/2) mit dem Bügel (Fig. 138/1) gegen Verdrehung sichern.
5. Ablagetiefe des ersten Säaggregates prüfen (siehe Kapitel „Saatgutablagetiefe und Kornabstand kontrollieren“, Seite 118) und bei Bedarf korrigieren.

Die maximale Ablagetiefe beträgt 12 cm.

6. Lässt sich die gewünschte Saatgutablagetiefe nicht erreichen, die Belastung auf das Säschar verändern [siehe Kapitel „Belastungsstufe einstellen (Contour-Säaggregat)“, unten].
7. Die Belastungsstufe und die Spindelstellung des ersten Säaggregates an allen Säaggregaten einstellen. Die Spindelstellung an der Skala (Fig. 138/3) ablesen.
8. Abschließende Prüfung der Ablagetiefe aller Säaggregate (siehe Kapitel „Saatgutablagetiefe und Kornabstand kontrollieren“, Seite 118).

8.12.1 Belastungsstufe einstellen (Contour-Säaggregat)

1. Die Maschine im Traktor-Dreipunkt soweit anheben, bis die Säaggregate vom Boden freikommen.
2. Abdrehkurbel (Fig. 139/1) in die Vierkantöffnung des ersten Säaggregates stecken.
3. Abdrehkurbel entgegen der Federkraft drücken und die Strebe (Fig. 139/2) vom Bolzen (Fig. 139/3) lösen.
4. Zugfedern (Fig. 139/4) entspannen.

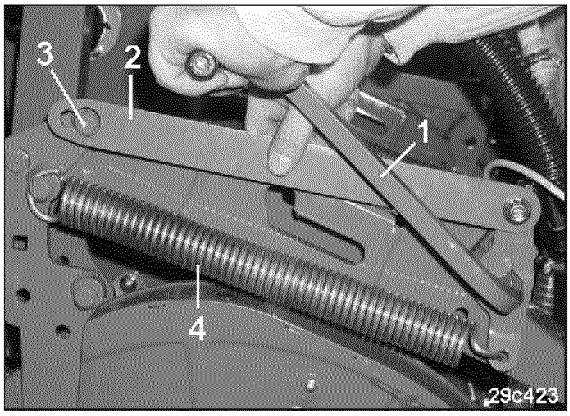


Fig. 139

5. Beide Zugfedern (Fig. 139/4) umhängen, wie in den Figuren (Fig. 140 bis Fig. 142) gezeigt.
6. Mit der Abdrehkurbel die Federn spannen und die Strebe (Fig. 139/2), wie in den Figuren (Fig. 140 bis Fig. 142) gezeigt, an einem Bolzen einhängen.
7. Die Ablagentiefen-Feineinstellung vornehmen mit der Spindel [siehe Kapitel „Saatgutablagetiefe einstellen (Contour-Säaggregat)“, Seite 114].

Belastungsstufe 1:

Befestigung der Feder (Fig. 140/1) und der Strebe (Fig. 140/2), wie dargestellt.

In Belastungsstufe 1 wirkt das geringste Gewicht auf das Säschar und vergrößert sich dann schrittweise.

Belastungsstufe 2: (siehe Fig. 141)

Belastungsstufe 3: (siehe Fig. 142).

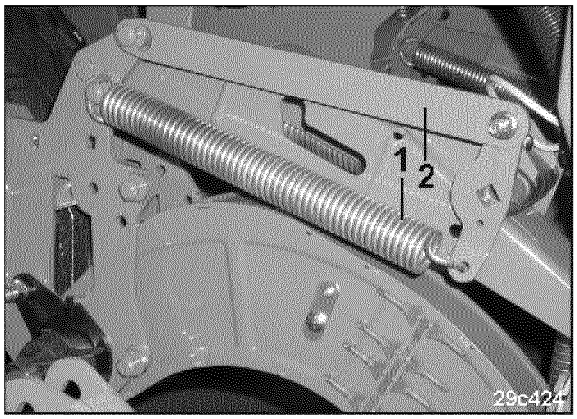


Fig. 140

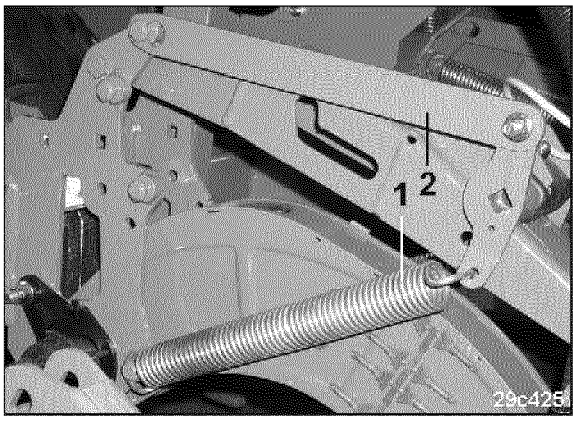


Fig. 141

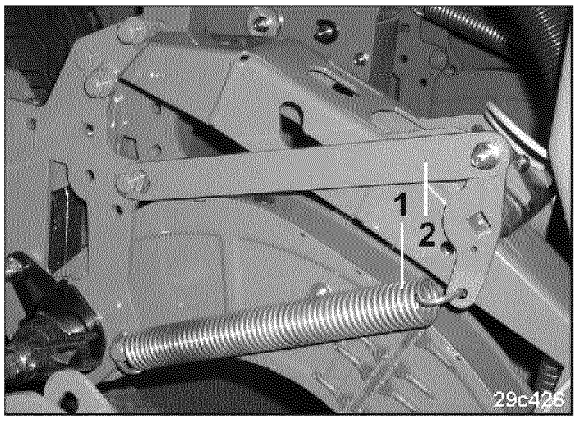


Fig. 142

Die Montagezeichnungen der drei Belastungsstufen finden Sie auf einem Aufkleber (Fig. 143) an der Maschine.

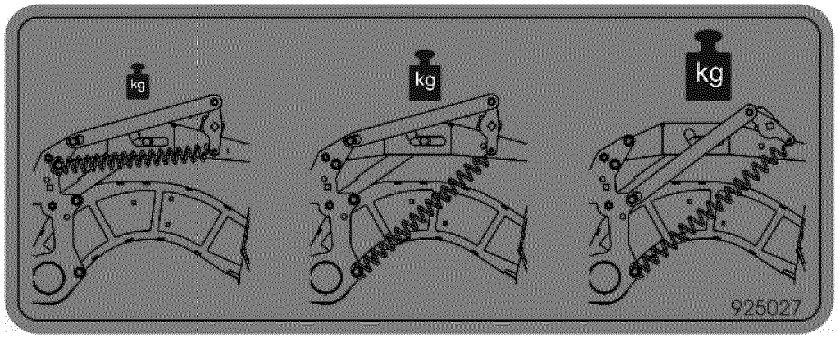


Fig. 143

8.12.2 Lastverteilung der Druckrollen verstellen (Contour-Säaggregat)

Zur Anpassung an die unterschiedlichen Bodenverhältnisse und -zustände ist die Lastverteilung zwischen der vorlaufenden (Fig. 144/1) und der nachlaufenden Druckrolle (Fig. 144/2) einstellbar.

Kann die Säfurche auf Grund des harten Bodens nicht geschlossen werden, ist mehr Last auf die hinteren Walkgummireifen zu bringen, um die Furchenränder zu brechen und die Säfurche zu schliessen.

Werkseitig ist eine gleichmäßige Lastverteilung (50/50) zwischen den Druckrollen eingestellt.

Die Lastverteilung erfolgt durch das Umstecken der Spindel (Fig. 144/3) in die Aufnahmen a bis d.

Stellung A:

Spindel-Aufnahme a und c (Fig. 144/A):

gleichmäßige Gewichtverteilung vorne und hinten (werkseitige Einstellung).

Stellung B:

Spindel-Aufnahme b und c (Fig. 144/B):

Gewichtverteilung vorne 30% und hinten 70%.

Bei Arbeiten auf sehr schweren Böden. Die nachlaufende V-Druckrolle wird belastet.

Stellung C:

Spindel-Aufnahme a und d (Fig. 144/C):

Gewichtverteilung vorne 70% und hinten 30%.

Zur Aussaat druckempfindlicher Saatgüter, z.B. Rüben. Die nachlaufende Gummi-V-Druckrolle wird weniger stark belastet.

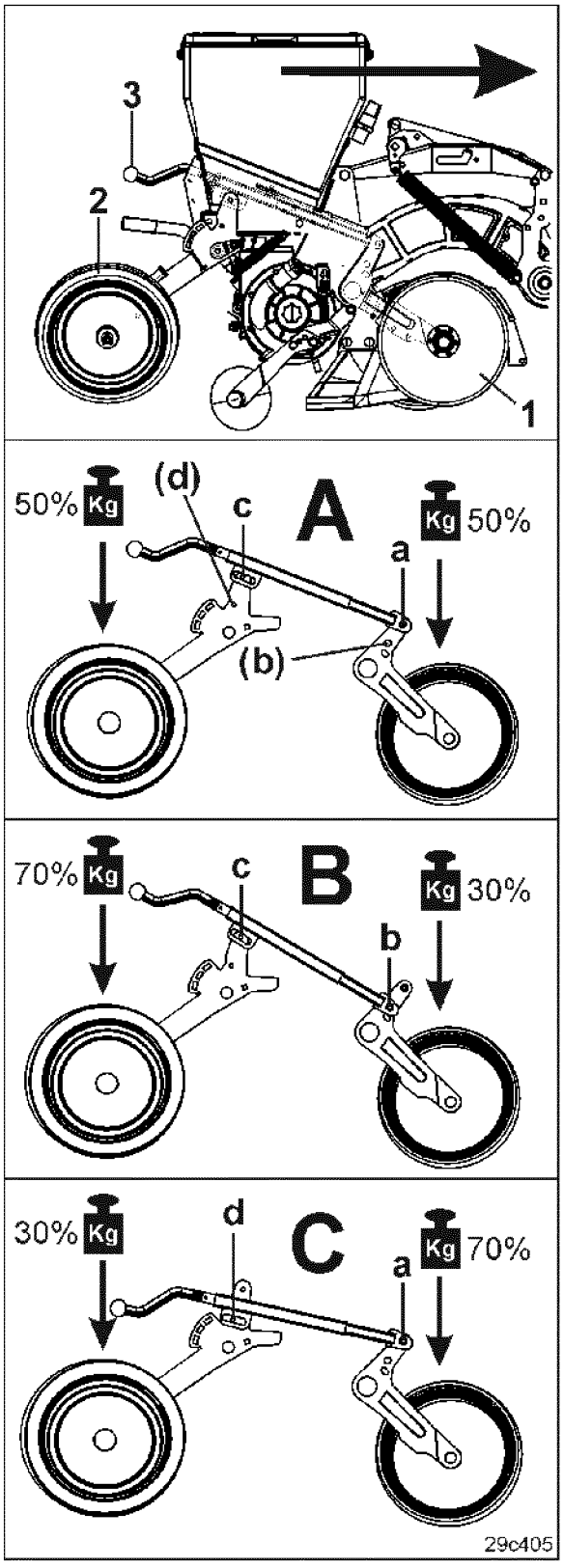


Fig. 144

In jeder der Stellungen „A“ bis „C“ kann das Gewicht, das auf die hintere V-Druckrolle (Fig. 145/1) wirkt mit dem Hebel (Fig. 145/2) verändert werden.

Je höher der Hebel in der Arretierung abgesteckt wird, desto größer ist die Kraft, die auf die nachlaufende Druckrolle wirkt.

Der Hebel rastet in eine der drei Stellungen in der Arretierung (Fig. 145/3) ein.

Hinweis!

Auf wechselnden Böden den Hebel immer ganz oben in der Arretierung befestigen!

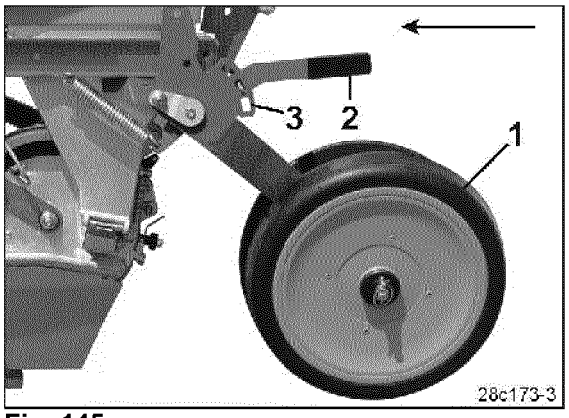


Fig. 145

8.12.3 Klutenräumer einstellen (Contour-Säaggregat)

Die Klutenräumer (Fig. 146/1) im Verstellsegment mit einem Bolzen (Fig. 146/2) nicht zu tief abstecken und mit einem Klappstecker sichern.

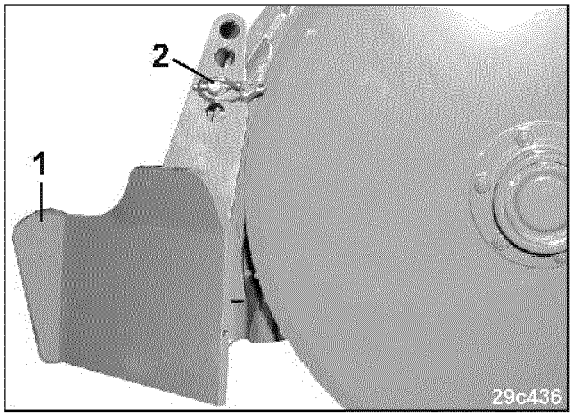


Fig. 146

8.13 Saatgutablagetiefe und Kornabstand kontrollieren

Die Saatgutablagetiefe kontrollieren

- nach jeder Einstellung der Saatgutablagetiefe
- beim Wechsel von leichtem Boden auf schweren Boden und umgekehrt. Die Druckrollen dringen bei leichten Böden tiefer in den Boden ein als bei schwereren Böden.

Saatgutablagetiefe und Kornabstand kontrollieren:

1. Ca. 30 m mit Arbeitsgeschwindigkeit säen.
2. Mit dem Multiablagetester (Option) die Körner an mehreren Stellen freilegen. Die Ablesekante einsetzen zum schichtweise Abtragen der Erde.
3. Multiablagetester (Fig. 147) waagerecht auf den Boden stellen
4. Den Zeiger (Fig. 147/1) auf das Saatgut-Korn stellen und die Saatgutablagetiefe an der Skala (Fig. 147/2) ablesen.
5. Den Kornabstand mit dem Lineal messen.

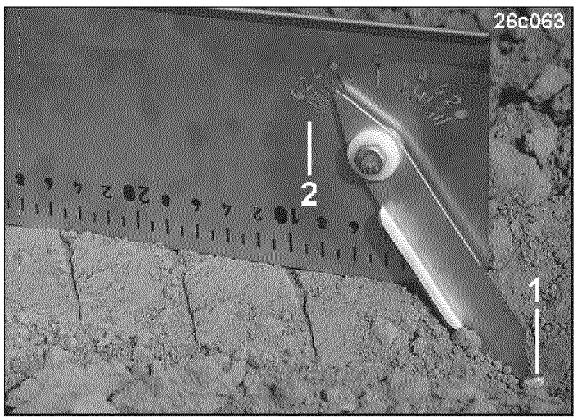


Fig. 147

8.14 Saatfurche verschließen (Classic-Säaggregat)

1. Der Maschine bei Arbeitsbeginn auf dem Feld folgen und die Saatgutbedeckung prüfen.
2. Wird die Saatfurche nicht geschlossen, die Arbeitsintensität der vorlaufenden Zustreicher (Fig. 148/1) verändern durch Einhängen der Feder (Fig. 149/1) in eine der Aussparungen A bis C.

   Die größte Arbeitsintensität wird erreicht beim Einhängen der Feder in die Aussparung C.

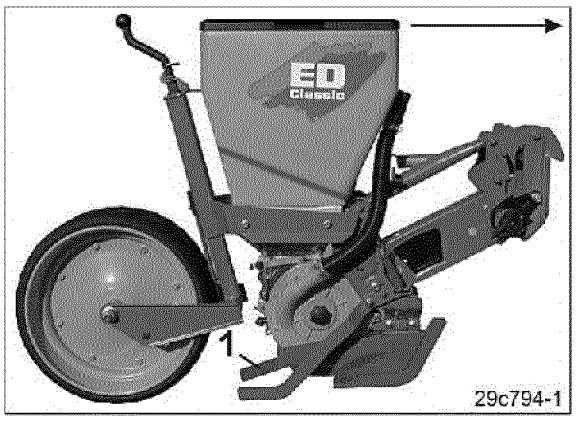


Fig. 148

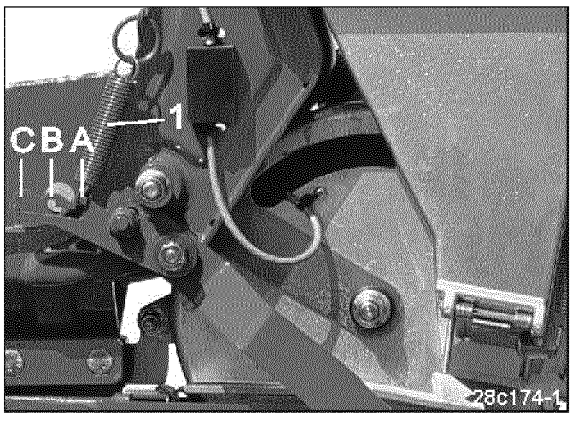


Fig. 149

8.15 Saatfurche verschließen (Contour-Säaggregat)

Die Arbeitsintensität des Zustreichers (Fig. 151/1) bzw. des Scheibenzustreichers (Fig. 152/1) steigt, je höher der Hebel (Fig. 150/1) einrastet.

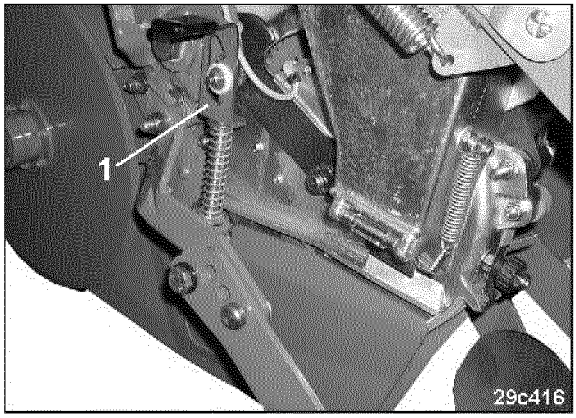


Fig. 150

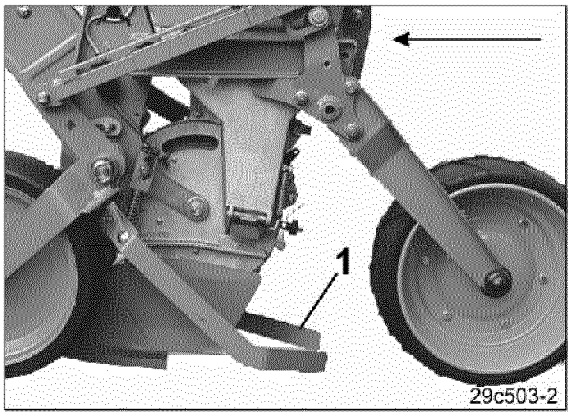


Fig. 151

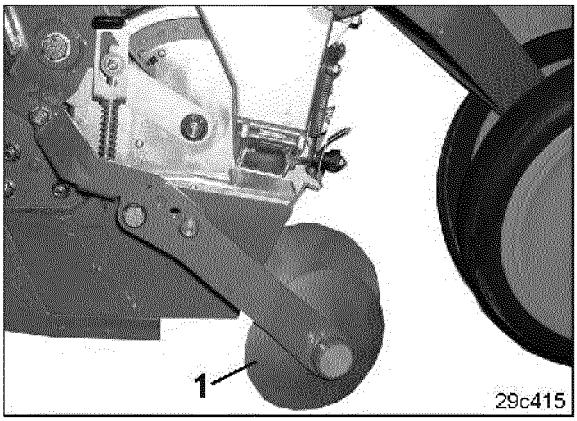


Fig. 152

Die Gummi-V-Druckrollen halten die Ablagetiefe ein und schließen die Säfurche.

Je nach Bodenbeschaffenheit lässt sich der Abstand der Gummi-V-Druckrollen zueinander so einstellen, dass die Gummi-V-Druckrollen dicht neben der Säfurchen-Schnittkante laufen, diese brechen und die Säfurche verschließen.

Jede Einstellung mit einem Klappstecker (Fig. 153/1) sichern.

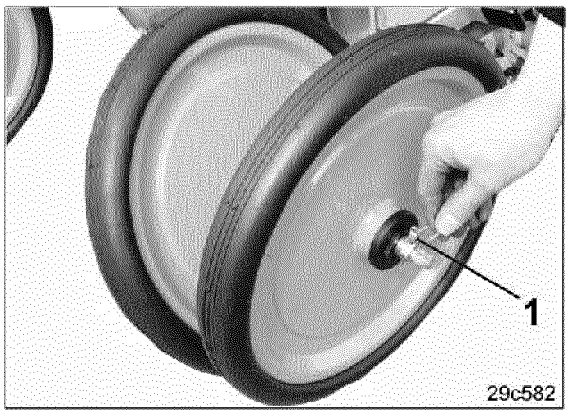


Fig. 153

Hinweis!

Damit die Klappstecker nicht verloren gehen können, darauf achten, dass die Bügel der Klappstecker (Fig. 153/1) einrasten.

Wird die Saatfurche bei richtiger Einstellung des axialen Abstandes nicht geschlossen, lässt sich die Wirkungsweise der beiden schräg zueinander angestellten Druckrollen nach Lösen der Schraubverbindung (Fig. 154/1) stufenlos mit einem Hebel (Fig. 154/2) verändern. Das profilierte Zeigerelement dient als Einstellhilfe.

Hebelverstellung:

Hebel nach oben: verstärkt die Erdbewegung

Hebel nach unten: verringert die Erdbewegung.

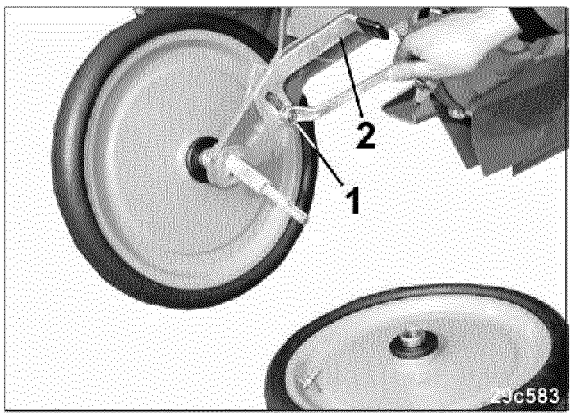


Fig. 154

Führen die Einstellmöglichkeiten der Gummi-V-Druckrollen nicht zu dem gewünschten Erfolg, ist mehr Belastung auf die Gummi-V-Druckrollen zu bringen [siehe Kapitel „Lastverteilung der Druckrollen verstellen (Contour-Säaggregat)“, Seite 116].

Beispiel:

Wird bei werkseitiger Stellung „A“ und Belastungsstufe „3“ die Saatfurche nicht geschlossen, sind die Druckrollen vorne mit 30% des Gewichtes und hinten mit 70% des Gewichtes zu belasten. Die Spindel in den Aufnahmen b bis c befestigen (siehe Stellung „B“).

8.15.1 Zwischenandruckrolle einstellen (Contour-Säaggregat)

Die Arbeitsintensität der Zwischenandruckrolle (Fig. 155/1) steigt, je höher der Hebel (Fig. 156/1) einrastet.

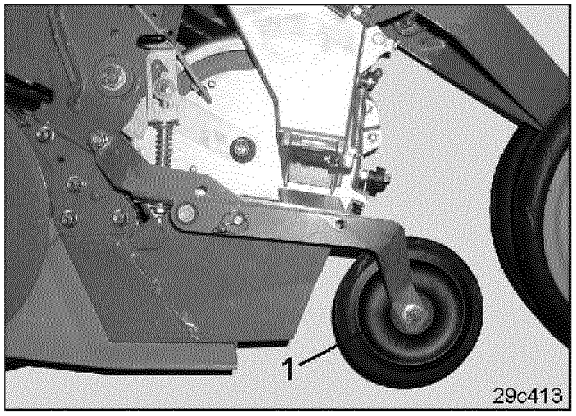


Fig. 155

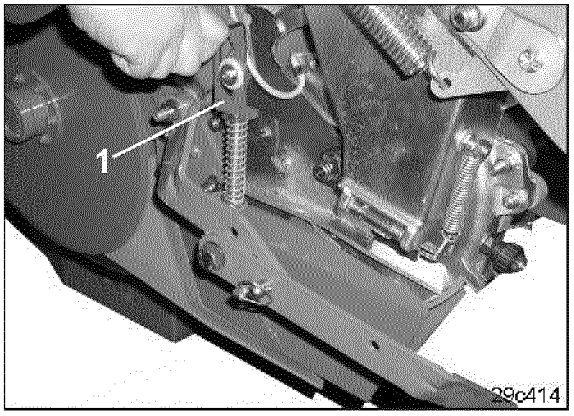


Fig. 156

8.16 Düngerschare einstellen

1. Mutter (Fig. 157/1) lösen zum horizontalen Verschieben des Düngerschares auf der Klemmschiene. Der Abstand zum Säschar beträgt werkseitig 6 cm.
2. Federstecker und Bolzen (Fig. 157/2) entfernen zum Einstellen der Ablagetiefe des Düngerschares.

Die Schläuche zu den Düngerscharen dürfen nicht durchhängen, damit sich kein Dünger im Schlauch festsetzt. Düngerschläuche ggf. kürzen.

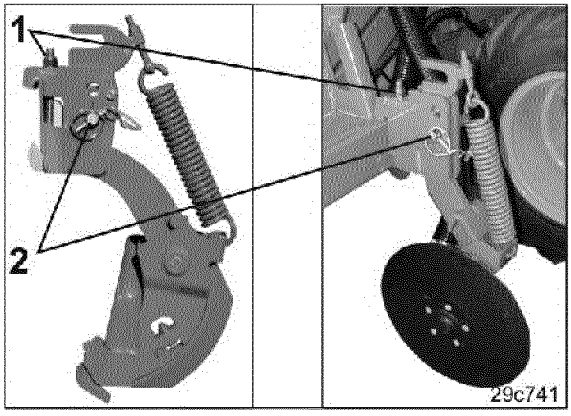


Fig. 157

8.17 Dünger-Vorratsbehälter (2 x 220 l)

Gefahr!

Maschine am Traktor ankuppeln vor dem Befüllen der Dünger-Vorratsbehälter.

Dünger-Vorratsbehälter entleeren vor dem Abkuppeln der Maschine vom Traktor.

8.17.1 Dünger-Vorratsbehälter (2 x 220 l) befüllen

1. Einzelkorn-Sämaschine am Traktor ankuppeln. Die Ausleger ausklappen.
2. Maschine auf einer ebenen Fläche abstellen.
3. Handbremse anziehen, Traktormotor abstellen und Zündschlüssel abziehen.



Fig. 158

4. Die Behälterdeckel (Fig. 159) öffnen und sichern.
5. Die Dünger-Vorratsbehälter befüllen
   - o manueller Zugang über die Trittstufen (Fig. 169/1)
   - o mit der Befüllschnecke [siehe Kapitel „Dünger-Befüllschnecke (Option)“, Seite 142].
6. Behälterdeckel entsichern und schließen.



Fig. 159

8.17.2 Düngermenge einstellen

Die Einstellwerte für die gewünschte Düngermenge den Tabellen (Seite 123) entnehmen.

Mit den Einstellwerten

- die Antriebsübersetzung einstellen (siehe Kapitel „Antriebsübersetzung einstellen“, Seite 124)
- die Dosierstellringe einstellen (siehe Kapitel „Dosierstellringe einstellen“, Seite 124).

Wichtig!

Jede Einstellung mit einer Abdrehprobe prüfen [siehe Kapitel „Abdrehprobe (2x220l-Behälter und 900l/1100l-Behälter)“, Seite 130].

Beispiel:

Düngersorte: Diammonphosphat 18-46-0

Reihenabstand: 75 cm

Dünger-Ausbringmenge: 130 kg/ha

Die Einstellwerte der Tabelle (Fig. 160) entnehmen:

Einstellwert der Dosierstellringe: F - 0

Kettenradpaarung im Dosier-Getriebe: X = 17 / Y = 24

		Diammonphosphat 18 - 46 - 0				
		0,95 kg/l				
		50 cm	60 cm	70 cm	75 cm	80 cm
	C - 0	96	80	69	64	60
	C - 5	114	95	81	75	71
	D - 0	135	113	96	90	84
	D - 5	147	123	105	98	92
	E - 0	162	135	116	108	101
X = 17	E - 5	174	145	124	116	109
Y = 24	F - 0	186	155	133	130	122
[kg/ha]	F - 5	210	175	150	140	131
	G - 0	222	185	159	148	139
	G - 5	240	200	171	160	150
	G - 10	246	205	176	164	154
	C - 0	180	150	129	120	113
	C - 5	228	190	163	152	143
	D - 0	255	213	182	170	159
	D - 5	273	228	195	182	171
	E - 0	300	250	214	200	188
X = 24	E - 5	324	270	231	216	203
Y = 17	F - 0	354	295	253	236	221
[kg/ha]	F - 5	390	325	279	260	244
	G - 0	426	355	304	284	266
	G - 5	456	380	326	304	285
	G - 10	468	390	334	312	293

ME568-2

Fig. 160

Düngersorte		Diammonphosphat 18 - 46 - 0 0,95 kg/l				
Reihenabstand		50 cm	60 cm	70 cm	75 cm	80 cm
X = 17 Y = 24	C - 0	96	80	69	64	60
	C - 5	114	95	81	76	71
	D - 0	135	113	96	90	84
	D - 5	147	123	105	98	92
	E - 0	162	135	116	108	101
	E - 5	174	145	124	116	109
	F - 0	195	163	139	130	122
	F - 5	210	175	150	140	131
	G - 0	222	185	159	148	139
	G - 5	240	200	171	160	150
	G - 10	246	205	176	164	154
X = 24 Y = 17	C - 0	180	150	129	120	113
	C - 5	228	190	163	152	143
	D - 0	255	213	182	170	159
	D - 5	273	228	195	182	171
	E - 0	300	250	214	200	188
	E - 5	324	270	231	216	203
	F - 0	354	295	253	236	221
	F - 5	390	325	279	260	244
	G - 0	426	355	304	284	266
	G - 5	456	380	326	304	285
	G - 10	468	390	334	312	293
Einstellwerte		Dünger-Ausbringmenge [kg/ha]				

Fig. 161

Düngersorte		Kalkammonsalpeter 27,5% N 1,1 kg/l				
Reihenabstand		50 cm	60 cm	70 cm	75 cm	80 cm
X = 17 Y = 24	C - 0	114	95	81	76	71
	C - 5	132	110	94	88	83
	D - 0	150	125	107	100	94
	D - 5	168	140	120	112	105
	E - 0	189	158	135	126	118
	E - 5	204	170	146	136	128
	F - 0	222	185	159	148	139
	F - 5	237	198	169	158	148
	G - 0	252	210	180	168	158
	G - 5	255	213	182	170	159
	G - 10	261	218	186	174	163
X = 24 Y = 17	C - 0	216	180	154	144	135
	C - 5	249	208	178	166	156
	D - 0	276	230	197	184	173
	D - 5	321	268	229	214	201
	E - 0	348	290	249	232	218
	E - 5	387	323	276	258	242
	F - 0	414	345	296	276	259
	F - 5	456	380	326	304	285
	G - 0	474	395	339	316	296
	G - 5	507	423	362	338	317
	G - 10	510	425	364	340	319
Einstellwerte		Dünger-Ausbringmenge [kg/ha]				

Fig. 162

Düngersorte		NPK 14+7+17 1,25 kg/l				
Reihenabstand		50 cm	60 cm	70 cm	75 cm	80 cm
X = 17 Y = 24	C - 0	138	115	99	92	86
	C - 5	150	125	107	100	94
	D - 0	174	145	124	116	109
	D - 5	189	158	135	126	118
	E - 0	210	175	150	140	131
	E - 5	228	190	163	152	143
	F - 0	252	210	180	168	158
	F - 5	267	223	191	178	167
	G - 0	288	240	206	192	180
	G - 5	300	250	214	200	188
	G - 10	309	258	221	206	193
X = 24 Y = 17	C - 0	180	150	129	120	113
	C - 5	270	225	193	180	169
	D - 0	306	255	219	204	191
	D - 5	345	288	246	230	216
	E - 0	384	320	274	256	240
	E - 5	429	358	306	286	268
	F - 0	456	380	326	304	285
	F - 5	507	423	362	338	317
	G - 0	543	453	388	362	339
	G - 5	567	473	405	378	354
	G - 10	582	485	416	388	364
Einstellwerte		Dünger-Ausbringmenge [kg/ha]				

Fig. 163

Düngersorte		Harnstoff 46% N 0,82 kg/l				
Reihenabstand		50 cm	60 cm	70 cm	75 cm	80 cm
X = 17 Y = 24	C - 0	90	75	64	60	56
	C - 5	102	85	73	68	64
	D - 0	117	98	84	78	73
	D - 5	129	108	92	86	81
	E - 0	141	118	101	94	88
	E - 5	156	130	111	104	98
	F - 0	173	144	123	115	108
	F - 5	186	155	133	124	116
	G - 0	197	164	140	131	123
	G - 5	207	173	148	138	129
	G - 10	210	175	150	140	131
X = 24 Y = 17	C - 0	162	135	116	108	101
	C - 5	185	154	132	123	115
	D - 0	212	176	151	141	132
	D - 5	240	200	171	160	150
	E - 0	264	220	189	176	165
	E - 5	293	244	209	195	183
	F - 0	312	260	223	208	195
	F - 5	338	281	241	225	211
	G - 0	372	310	266	248	233
	G - 5	390	325	279	260	244
	G - 10	402	335	287	268	251
Einstellwerte		Dünger-Ausbringmenge [kg/ha]				

Fig. 164

8.17.2.1 Antriebsübersetzung einstellen

1. Handbremse anziehen, Traktormotor abstellen und Zündschlüssel abziehen.
2. Flügelmuttern (Fig. 165/1) lösen.
3. Schutzblech (Fig. 165/2) entfernen.

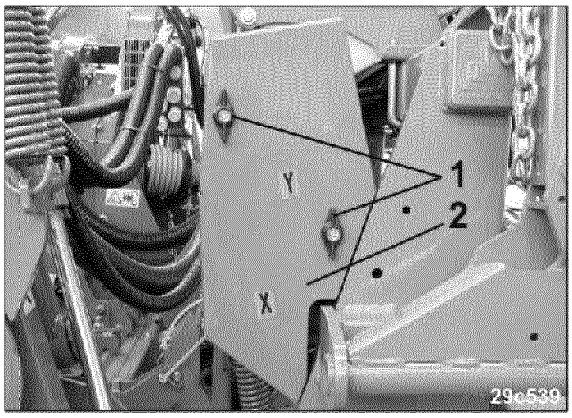


Fig. 165

4. Flügelmutter (Fig. 166/1) des Kettenspanners lösen.
5. Die richtigen Kettenräder montieren.
   Beispiel:
   Kettenrad X (Fig. 166/X) = 17 Zähne
   Kettenrad Y (Fig. 166/Y) = 24 Zähne.
6. Kettenräder mit Klappsteckern sichern.
7. Rollenkette auflegen.
8. Kettenspanner spannen und mit der Flügelmutter (Fig. 166/1) befestigen.
9. Schutzblech (Fig. 165/2) montieren.

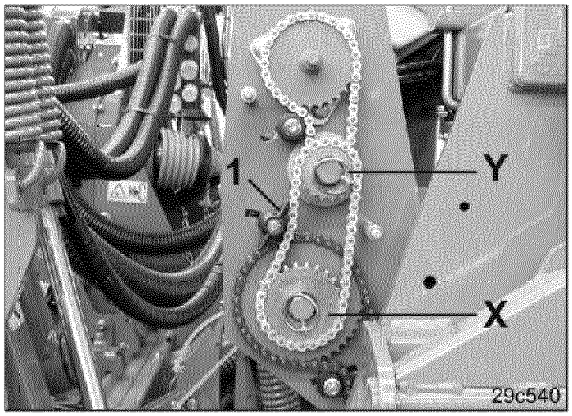


Fig. 166

8.17.2.2 Dosierstellringe einstellen

1. Alle Dosier-Stellringe (Fig. 167/1) auf den richtigen Wert einstellen.

Beispiel:

Einstellwert “E – 5“

Die Dosier-Stellringe so verdrehen, dass die Zahl „5“ (Fig. 167/2) auf der Achse im Bereich „E“ (Fig. 167/3) steht.

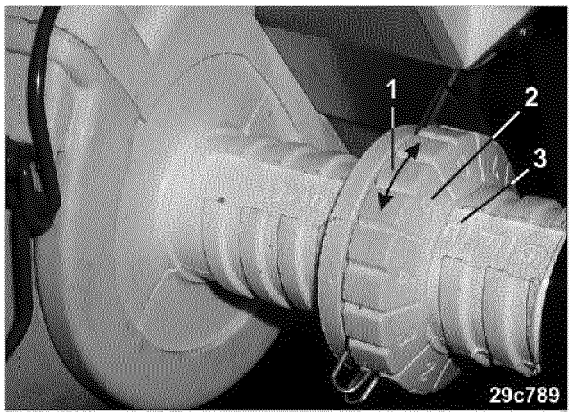


Fig. 167

8.17.2.3 Restentleerung Dünger-Vorratsbehälter (2 x 220 l)

1. Die federbelasteten Schieber öffnen und die Restdüngermenge in einen geeigneten Behälter entleeren.

Schieber-Stellungen

Schieber (Fig. 168/1) geschlossen

Schieber (Fig. 168/2) offen.

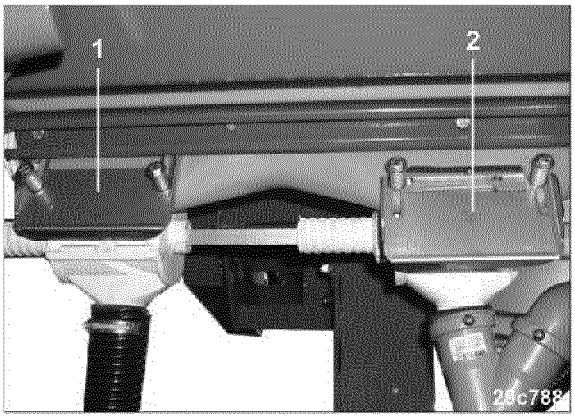


Fig. 168

8.18 Dünger-Vorratsbehälter (900 l und 1100 l)

Gefahr!

Maschine am Traktor ankuppeln vor dem Befüllen der Dünger-Vorratsbehälter.

Dünger-Vorratsbehälter entleeren vor dem Abkuppeln der Maschine vom Traktor.

8.18.1 Dünger-Vorratsbehälter (900 l und 1100 l) befüllen

1. Einzelkorn-Sämaschine am Traktor ankuppeln. Die Ausleger ausklappen.
2. Maschine auf einer ebenen Fläche abstellen.
3. Handbremse anziehen, Traktormotor abstellen und Zündschlüssel abziehen.
4. Die mit Gummischlaufen gesicherte Düngerbehälterplane (Fig. 169) öffnen.



Fig. 169

5. Zum Einstellen des Füllstandsensors (Option) Siebroste (Fig. 170/1) im Dünger-Vorratsbehälter öffnen.

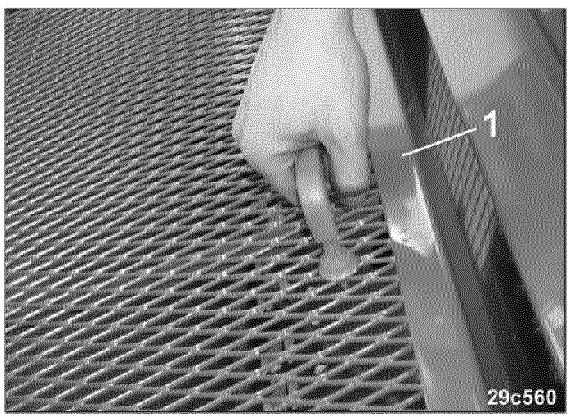


Fig. 170

6. Den Füllstandsensor (Fig. 171/1) im Dünger-Vorratsbehälter einstellen.
   Der Füllstandsensor (Option) löst Alarm aus, sobald der Sensor nicht mehr in den Dünger eintaucht.
7. Die Siebroste (Fig. 170/1) schließen.
8. Den Dünger-Vorratsbehälter befüllen
   - o manueller Zugang über die Trittstufen (Fig. 169/1)
   - o mit der Befüllschnecke [siehe Kapitel „Dünger-Befüllschnecke (Option)“, Seite 142].
9. Düngerbehälterplane schließen.

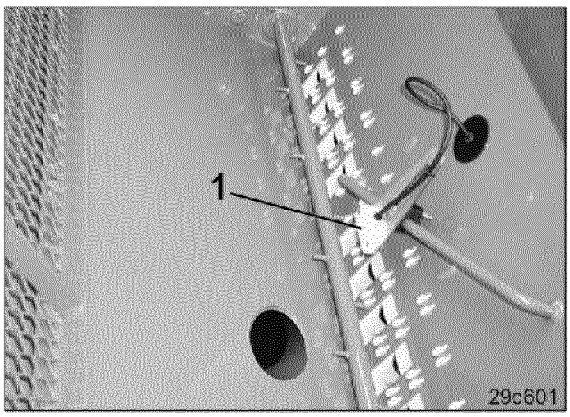


Fig. 171

8.18.2 Düngermenge einstellen

Zum Ausbringen der gewünschten Düngermenge Einstellungen vornehmen:

- an den Absperrschiebern
- an den Bodenklappen
- am Einstellgetriebe.

Wichtig!

Jede Einstellung mit einer Abdrehprobe prüfen [siehe Kapitel „Abdrehprobe (2x220l-Behälter und 900l/1100l-Behälter)“, Seite 130].

Düngermenge einstellen:

1. Den Spritzschutz (Fig. 172/1) entfernen.
   Der Spritzschutz ist an zwei Halterungen (Fig. 172/2) eingehängt.

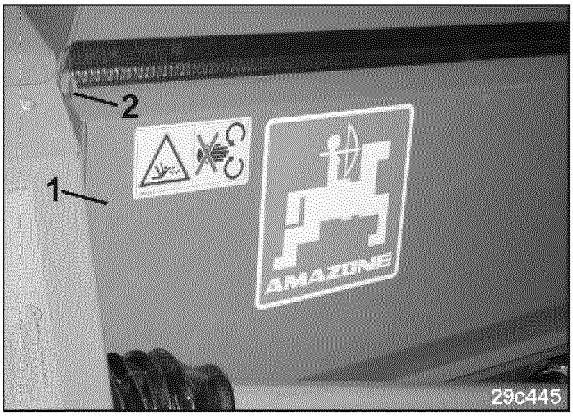


Fig. 172

2. Den Bodenklappen-Stellhebel (Fig. 173/1) in der Kulisse (Fig. 173/2) fixieren.

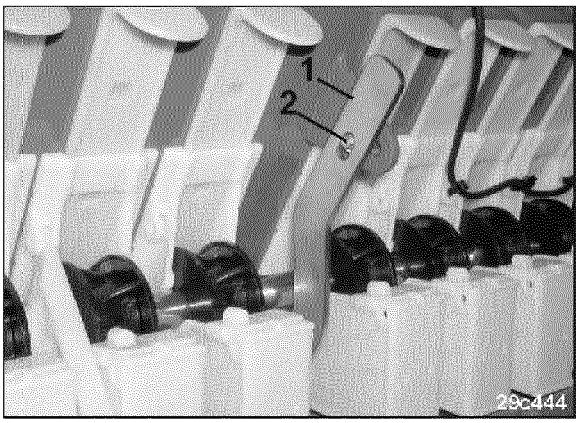


Fig. 173

3. Die aktiven Absperrschieber (Fig. 174) in Position „B“ stellen.
4. Alle anderen Absperrschieber in Position „A“ stellen. Die Düngerzufuhr zu den Düngerscharen ist unterbrochen.

Absperrschieber-Stellungen (Fig. 174):

A = geschlossen

B = 3/4 offen

C = offen

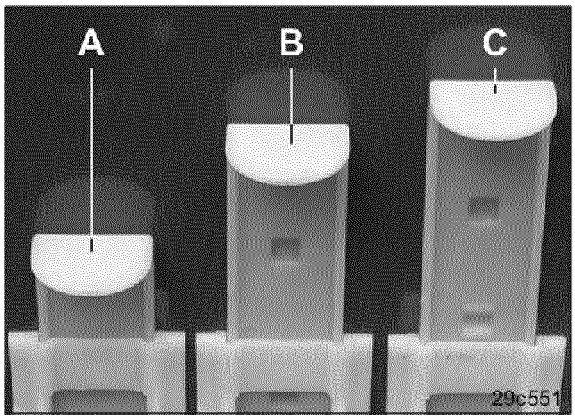


Fig. 174

5. Die Flügelmutter (Fig. 175/1) lösen.
6. Die Getriebe-Einstell-Nummer dem Kapitel „Getriebe-Einstell-Nummer ermitteln“ (Seite 128) entnehmen und an der Skala (Fig. 175/2) einstellen.
   Den Getriebehebel (Fig. 175/3) immer von unten auf den Skalenwert stellen.
7. Die Flügelmutter (Fig. 175/1) festziehen.

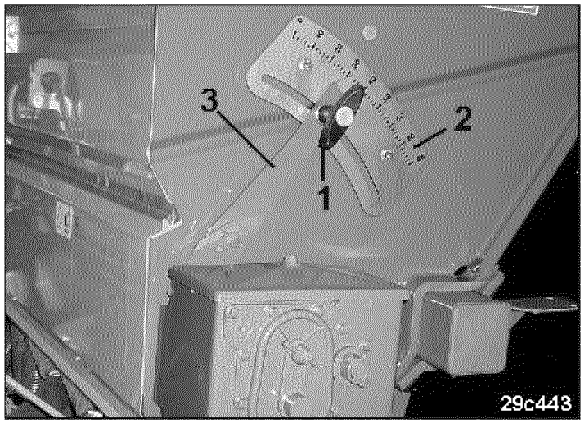


Fig. 175

8.18.2.1 Getriebe-Einstell-Nummer ermitteln

[kg/l]	Diammonphosphat 18-46-0 0,94 kg/l			Kalkammonphosphat 27% N 1,02 kg/l			Harnstoff 46% N 0,76 kg/l		
[cm]	70 cm	75 cm	80 cm	70 cm	75 cm	80 cm	70 cm	75 cm	80 cm
5	29	27	25	30	28	26	25	23	22
10	66	62	58	81	76	71	56	52	49
15	100	93	87	118	110	103	84	78	73
20	135	126	118	160	149	140	111	104	98
25	174	162	152	196	183	172	140	131	123
30	204	190	178	234	218	204	167	156	146
35	236	220	206	270	252	236	195	182	171
40	268	250	234	304	284	266	219	204	191
45	297	277	260	340	317	297	244	228	214
50	333	311	292	381	356	334	274	256	240
55	363	339	318	409	382	358	299	279	262
60	404	377	353	471	440	413	328	306	287
65	429	400	375	490	457	428	358	334	313
70	465	434	407	529	494	463	389	363	340
75	497	464	435	586	547	513	401	374	351
80	512	478	448	593	553	518	418	390	366

[kg/l]	NPK 13+13+21 BASF 1,18 kg/l			Triple-Superphosphat 0,98 kg/l			MAP 12-52 1,02 kg/l		
[cm]	70 cm	75 cm	80 cm	70 cm	75 cm	80 cm	70 cm	75 cm	80 cm
5	42	39	37	26	24	23	14	13	12
10	85	79	74	79	74	69	57	53	50
15	120	112	105	120	112	105	94	88	83
20	162	151	142	158	147	138	139	130	122
25	198	185	173	197	184	173	178	166	156
30	231	216	203	233	217	203	219	204	191
35	271	253	237	267	249	233	246	230	216
40	305	285	267	308	287	269	287	268	251
45	346	323	303	345	322	302	328	306	287
50	388	362	339	383	357	335	343	320	300
55	422	394	369	418	390	366	374	349	327
60	464	433	406	451	421	395	410	383	359
65	507	473	443	493	460	431	447	417	391
70	551	514	482	528	493	462	491	458	429
75	591	552	518	573	535	502	511	477	447
80	599	559	524	585	546	512	521	486	456

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Fig. 176

Berechnung der Getriebe-Einstell-Nummer
für Einzelkorn-Sämaschinen mit anderen Reihenabständen

$$\text{Umrechnungsfaktor} = \frac{\text{Reihenabstand x Ausbringmenge (Tabellenwerte)}}{\text{Reihenabstand x Ausbringmenge}}$$

$$\text{Getriebe-Einstellnummer} = \frac{\text{Getriebe-Einstellnummer (Tabellenwert)}}{\text{Umrechnungsfaktor}}$$

Beispiel:

Gewünschte Düngersorte: Diammonphosphat

gewünschte Ausbringmenge:	300 kg/ha
Reihenabstand:	60 cm
Getriebe-Einstellnummer:	berechnen

Tabellenwerte (Fig. 176):	
Ausbringmenge:	333 kg/ha
Reihenabstand:	70 cm
Getriebe-Einstellnummer:	50

$$\text{Umrechnungsfaktor} = \frac{70\text{ cm} \times 333\text{ kg/ha}}{60\text{ cm} \times 300\text{ kg/ha}} = 1{,}295$$

$$\text{Getriebe-Einstellnummer} = \frac{50}{1{,}295} = 38{,}5$$

Den Getriebehebel (Fig. 175/3) auf den Skalenwert 38,5 stellen, zum Ausbringen von 300 kg/ha Diammonphosphat.

8.18.3 Dünger-Vorratsbehälter entleeren

Zum Entleeren des Dünger-Vorratsbehälters den mit einem Klappstecker (Fig. 177/1) gesicherten Schlauch (Fig. 177/2) der Halterung entnehmen.

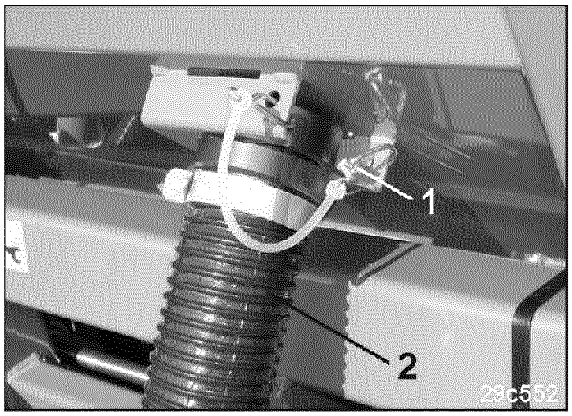


Fig. 177

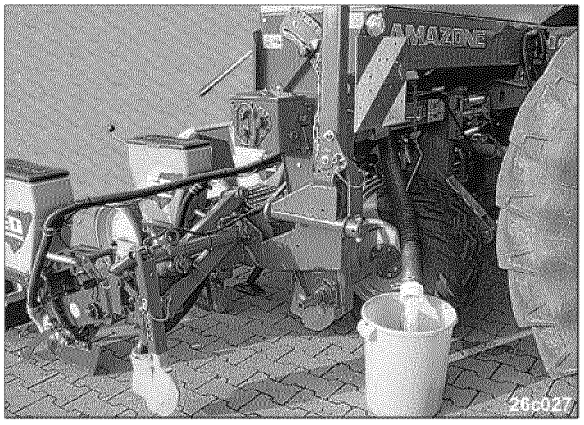


Fig. 178

8.19 Abdrehprobe (2x220l-Behälter und 900l/1100l-Behälter)

Wichtig!

Mit der Abdrehprobe prüfen, ob die gewünschte Düngermenge ausgebracht wird.

Abdrehprobe:

1. Dünger-Vorratsbehälter mindestens 1/4 mit Dünger befüllen.
2. **2x220l-Behälter:**
   Geeignete Auffangbehälter (Fig. 179/1) unter alle Düngerschare (Fig. 179/2) stellen.
3. **900/1100l-Behälter:**
   Geeignete(n) Auffangbehälter (Fig. 179/1) unter ein Düngerschar (Fig. 179/2), wahlweise unter alle Düngerschare stellen.

   Absperrschieber (Fig. 174) schließen zu den Düngerscharen ohne Auffangbehälter.
4. Die Abdrehkurbel (Fig. 180/1) in die Aufnahme des rechten Rades stecken.
5. Wenn Auffangbehälter (Fig. 179/1) unter Düngerscharen platziert sind, die mit Druckluft beschickt werden, das Druckluft-Gebläse einschalten (siehe Kapitel „Gebläse-Drehzahl“, Seite 100).
6. Das Rad mit der Abdrehkurbel rechts herum drehen (Uhrzeigersinn), bis Dünger in alle Auffangbehälter fällt.

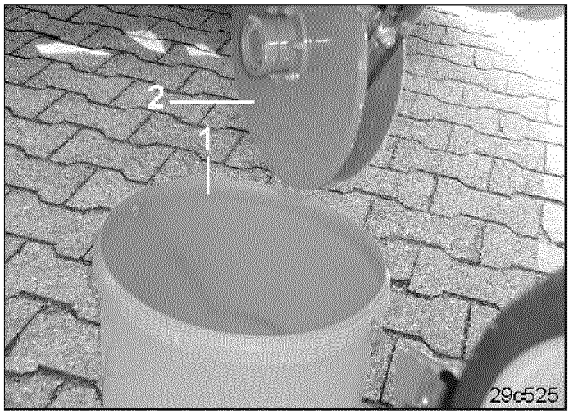


Fig. 179

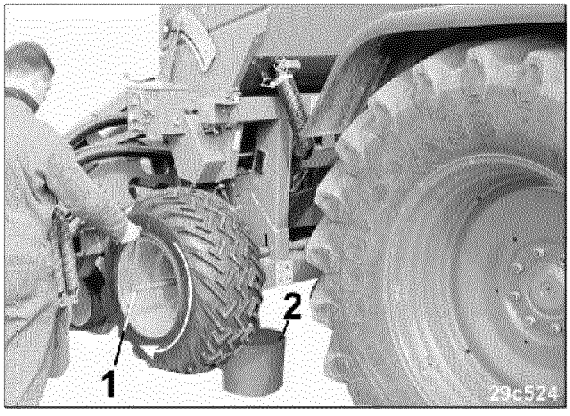


Fig. 180

7. Auffangbehälter entleeren (nicht in den Dünger-Vorratsbehälter bei laufendem Gebläse).
8. Auffangbehälter zurück unter die Düngerschare stellen.
9. Die Anzahl der Kurbelumdrehungen der Tabelle (Fig. 181) entnehmen.
   Die Anzahl der Kurbelumdrehungen richtet sich nach der Arbeitsbreite und Bereifung der Maschine.

	ED302					ED452 [-K]			ED602-K	
Anzahl Säaggregate	6	5	4	4	4	6	6	6	8	8
Reihenabstand [cm]	50	60	70	75	80	70	75	80	—	—
Kurbelumdrehungen auf 1/40 [ha] mit Bereifung 10.0/75-15	36,8	36,8	39,5	36,8	34,5	26,3	24,5	23,0	—	—
Kurbelumdrehungen auf 1/40 [ha] mit Bereifung 31x15.50-15	34,0	34,0	36,4	34,0	31,9	24,3	22,7	21,3	16,1	15,1

Fig. 181

Berechnung der Kurbelumdrehungen für Einzelkorn-Sämaschinen mit anderen Reihenabständen

$$\text{Kurbelumdrehung} = \frac{\text{Kurbelumdrehung x Anzahl Säaggregate x Reihenabstand (Tabellenwerte)}}{\text{Anzahl Säaggregate x Reihenabstand}}$$

Fig. 182

Beispiel:

Daten zur Berechnung der Kurbelumdrehungen am Rad	
Anzahl Säaggregate:	4
Reihenabstand	70 cm
Bereifung:	10.0/75-15
Kurbelumdrehungen:	berechnen

Daten aus Tabelle (Fig. 181)	
Anzahl Säaggregate:	6
Reihenabstand	50 cm
Bereifung:	10.0/75-15
Kurbelumdrehungen:	36,8

$$\text{Kurbelumdrehung} = \frac{36{,}8 \text{ x } 6 \text{ x } 50 \text{ cm}}{4 \text{ x } 70 \text{ cm}} = 39{,}5$$

10. Mit der in Tabelle (Fig. 181) angegebenen Kurbelumdrehung im Uhrzeigersinn drehen.
11. Die aufgefangene Düngermenge unter Berücksichtigung des Behältergewichtes wiegen (Fig. 183) und mit dem Faktor „40" multiplizieren.

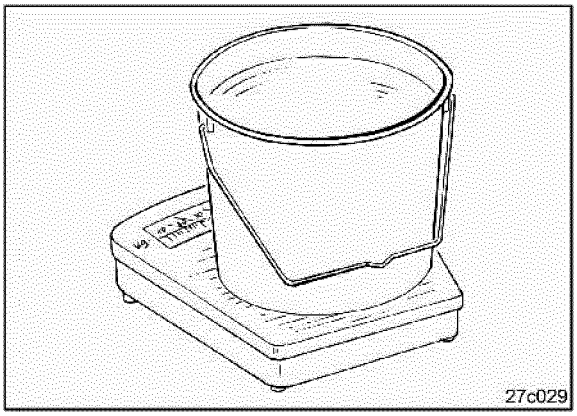


Fig. 183

Beispiel:

aufgefangene Düngermenge: 5 kg (abgedreht auf 1/40 ha)

Dünger-Ausbringmenge = 5 x 40 = 200 [kg/ha]

2x220l-Behälter:
Wird die gewünschte Dünger-Ausbringmenge [kg/ha] bei der Abdrehprobe nicht erreicht, verstellen Sie die Dosier-Stellringe (siehe Kapitel „Dosierstellringe einstellen", Seite 124).

Wiederholen Sie die Abdrehprobe, bis die gewünschte Dünger-Ausbringmenge erreicht ist.

900/1100l-Behälter:
Berechnung, wenn die Düngermenge nur eines Düngerschares aufgefangen wird und bei der späteren Arbeit 6 Düngerschare eingesetzt werden:

Dünger-Ausbringmenge = 20 [kg/ha] x 6 = 120 [kg/ha]

900/1100l-Behälter:
Wird die gewünschte Dünger-Ausbringmenge [kg/ha] bei der Abdrehprobe nicht erreicht, berechnen Sie die Abweichung (%) zwischen gewünschter und ermittelter Düngermenge und verstellen Sie das Getriebe um diese Prozentzahl.

Wiederholen Sie die Abdrehprobe, bis die gewünschte Dünger-Ausbringmenge erreicht ist.

12. Nach der Abdrehprobe
    - o Abdrehkurbel in die Transporthalterung stecken.
    - o Absperrschieber öffnen, die zur Abdrehprobe geschlossen wurden.

Wichtig!

Absperrschieber öffnen, die zur Abdrehprobe geschlossen wurden.

8.20 Fronttank

Gefahr!

Fronttank am Traktor ankuppeln vor dem Befüllen.

Fronttank entleeren vor dem Abkuppeln vom Traktor.

Den Fronttank befüllen anhand der Fronttank-Betriebsanleitung.

8.20.1 Düngermenge einstellen

Zum Ausbringen der gewünschten Düngermenge sind Einstellungen vorzunehmen

- an den Dosierern
- am Variogetriebe.

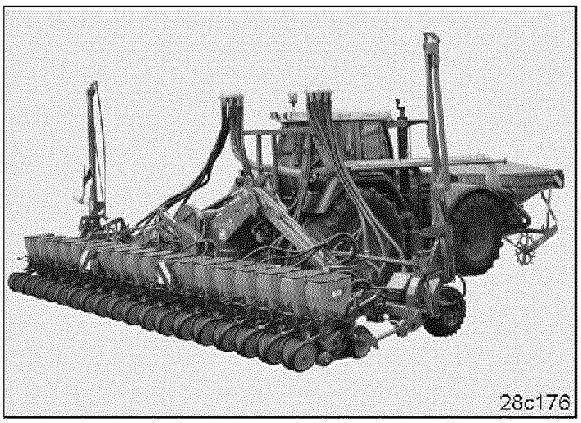


Fig. 184

Wichtig!

Jede Einstellung mit einer Abdrehprobe prüfen (siehe Kapitel „Abdrehprobe“, Seite 139).

Düngermenge einstellen:

1. Das Handrad (Fig. 185/1) soweit verdrehen, bis die Rändelschrauben (Fig. 185/2) sichtbar sind.

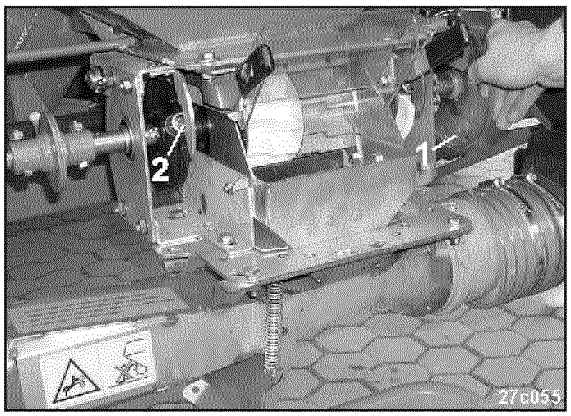


Fig. 185

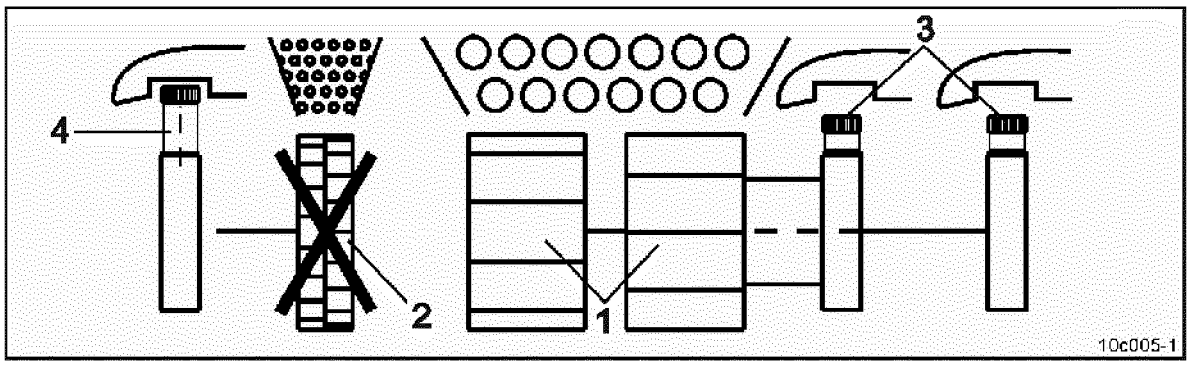


Fig. 186

2. Die Haupt-Dosierräder (Fig. 186/1) einschalten
   Dazu die Rändelschrauben (Fig. 186/3) einschrauben.
3. Das Fein-Dosierrad (Fig. 186/2) ausschalten
   Dazu die Rändelschraube (Fig. 186/4) herausdrehen.

Wichtig!

Rändelschrauben niemals zu fest einschrauben oder gegen den Anschlag drehen.

4. Die Getriebe-Einstellnummer für die gewünschte Dünger-Ausbringmenge den Tabellen (Fig. 188 bis Fig. 191) entnehmen.
5. Den Drehknopf (Fig. 187/1) lösen.
6. Den Zeiger (Fig. 187/2) von unten auf die Getriebe-Einstellnummer der Skala (Fig. 187/3) stellen.
7. Den Drehknopf festziehen.
8. Abdrehprobe durchführen (siehe Kapitel „Abdrehprobe“, Seite 139).

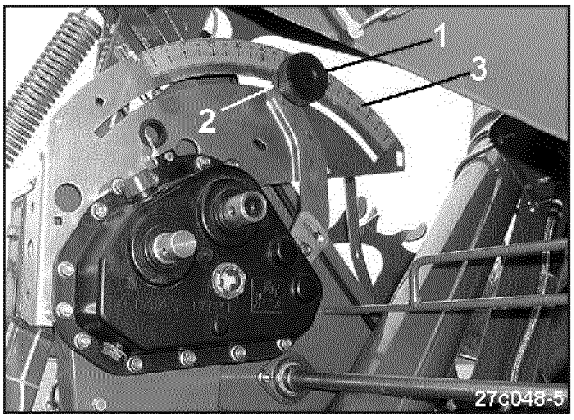


Fig. 187

Düngersorte	Diamonphosphat 18 – 46 – 0 0,97 kg/l							
Typ	FS2				FS1			
Arbeitsbreite	9,0 m	8,1 m	6,0 m	5,4 m	6,0 m	5,4 m	4,5m	3,0 m
5	2,67	2,96	4	4,44	2	2,22	2,67	4
10	20	22,2	30	33,3	15	16,7	20	30
15	38,7	43	58	64,4	29	32,2	38,7	58
20	53,3	59,3	80	88,9	40	44,4	53,3	80
25	74,7	83	112	124	56	62,2	74,7	112
30	92	102	138	153	69	76,7	92	138
35	111	123	166	184	83	92,2	111	166
40	129	144	194	216	97	108	129	194
45	148	164	222	247	111	123	148	222
50	167	185	250	278	125	139	167	250
55	185	206	278	309	139	154	185	278
60	205	228	308	342	154	171	205	308
65	227	252	340	378	170	189	227	340
70	245	273	368	409	184	204	245	368
75	267	296	400	444	200	222	267	400
80	288	320	432	480	216	240	288	432
85	311	345	466	518	233	259	311	466
90	323	359	484	538	242	269	323	484
95	351	390	526	584	263	292	351	526
100	372	413	558	620	279	310	372	558

Getriebe-Einstellnummer

Dünger-Ausbringmenge [kg/ha]

Fig. 188

Hinweis!

Max. Menge bei 10 km/h

Max. Menge bei 8 km/h

Düngersorte	Kalkammonsalpeter 1,06 kg/l							
Typ	FS2				FS1			
Arbeitsbreite	9,0 m	8,1 m	6,0 m	5,4 m	6,0 m	5,4 m	4,5m	3,0 m
Getriebe-Einstellnummer 5	2	2,22	3	3,33	1,5	1,67	2	3
10	16	17,8	24	26,7	12	13,3	16	24
15	37,3	41,5	56	62,2	28	31,1	37,3	56
20	56	62,2	84	93,3	42	46,7	56	84
25	74,7	83	112	124	56	62,2	74,7	112
30	96	107	144	160	72	80	96	144
35	117	130	176	196	88	97,8	117	176
40	136	151	204	227	102	113	136	204
45	157	175	236	262	118	131	157	236
50	179	199	268	298	134	149	179	268
55	197	219	296	329	148	164	197	296
60	216	240	324	360	162	180	216	324
65	237	264	356	396	178	198	237	356
70	256	284	384	427	192	213	256	384
75	280	311	420	467	210	233	280	420
80	301	335	452	502	226	251	301	452
85	323	359	484	538	242	269	323	484
90	341	379	512	569	256	284	341	512
95	363	403	544	604	272	302	363	544
100	389	433	584	649	292	324	389	584
	Dünger-Ausbringmenge [kg/ha]							

Fig. 189

Hinweis!

Max. Menge bei 10 km/h

Max. Menge bei 8 km/h

Düngersorte		NPK 1,15 kg/l							
Typ		FS2				FS1			
Arbeitsbreite		9,0 m	8,1 m	6,0 m	5,4 m	6,0 m	5,4 m	4,5m	3,0 m
Getriebe-Einstellnummer	5	3,33	3,7	5	5,56	2,5	2,78	3,33	5
	10	24	26,7	36	40	18	20	24	36
	15	45,3	50,4	68	75,6	34	37,8	45,3	68
	20	72	80	108	120	54	60	72	108
	25	88	97,8	132	147	66	73,3	88	132
	30	109	121	164	182	82	91,1	109	164
	35	131	145	196	218	98	109	131	196
	40	152	169	228	253	114	127	152	228
	45	171	190	256	284	128	142	171	256
	50	192	213	288	320	144	160	192	288
	55	213	237	320	356	160	178	213	320
	60	235	261	352	391	176	196	235	352
	65	259	287	388	431	194	216	259	388
	70	280	311	420	467	210	233	280	420
	75	304	338	456	507	228	253	304	456
	80	328	364	492	547	246	273	328	492
	85	349	388	524	582	262	291	349	524
	90	368	409	552	613	276	307	368	552
	95	392	436	588	653	294	327	392	588
	100	416	462	624	693	312	347	416	624
		Dünger-Ausbringmenge [kg/ha]							

Fig. 190

Düngersorte		Harnstoff 0,75 kg/l							
Typ		FS2				FS1			
Arbeitsbreite		9,0 m	8,1 m	6,0 m	5,4 m	6,0 m	5,4 m	4,5m	3,0 m
Getriebe-Einstellnummer	5	2,67	2,96	4	4,44	2	2,22	2,67	4
	10	21,3	23,7	32	35,6	16	17,8	21,3	32
	15	37,3	41,5	56	62,2	28	31,1	37,3	56
	20	50,7	56,3	76	84,4	38	42,2	50,7	76
	25	64	71,1	96	107	48	53,3	64	96
	30	77,3	85,9	116	129	58	64,4	77,3	116
	35	93,3	104	140	156	70	77,8	93,3	140
	40	107	119	160	178	80	88,9	107	160
	45	120	133	180	200	90	100	120	180
	50	133	148	200	222	100	111	133	200
	55	144	160	216	240	108	120	144	216
	60	163	181	244	271	122	136	163	244
	65	176	196	264	293	132	147	176	264
	70	189	210	284	316	142	158	189	284
	75	203	225	304	338	152	169	203	304
	80	219	243	328	364	164	182	219	328
	85	235	261	352	391	176	196	235	352
	90	248	276	372	413	186	207	248	372
	95	264	293	396	440	198	220	264	396
	100	277	308	416	462	208	231	277	416
		Dünger-Ausbringmenge [kg/ha]							

Fig. 191

8.20.1.1 Abdrehprobe

Wichtig!

Mit der Abdrehprobe prüfen, ob die gewünschte Düngermenge ausgebracht wird.

Abdrehprobe:

1. Dünger-Vorratsbehälter mindestens 1/4 mit Dünger befüllen.
2. Auffangbehälter der Transporthalterung an der Behälterwand entnehmen.

   Die Auffangbehälter sind zum Transport ineinander gesteckt und mit einem Klappstecker (Fig. 192/1) gesichert.

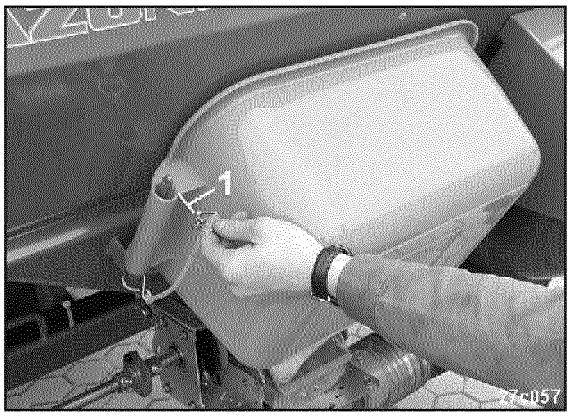


Fig. 192

3. Je einen Auffangbehälter unter jeden Dosierer stellen.
4. Alle Injektor-Schleusenklappen (Fig. 193/1) öffnen.

Warnung!

Quetschgefahr beim Öffnen und Schließen der Injektor-Schleusenklappe (Fig. 193/1)!

Injektor-Schleusenklappe nur an der Lasche (Fig. 193/2) anfassen, sonst besteht Verletzungsgefahr beim Zuschlagen der federbelasteten Injektor-Schleusenklappe.

Niemals mit der Hand zwischen Injektor-Schleusenklappe und Injektorschleuse fassen!

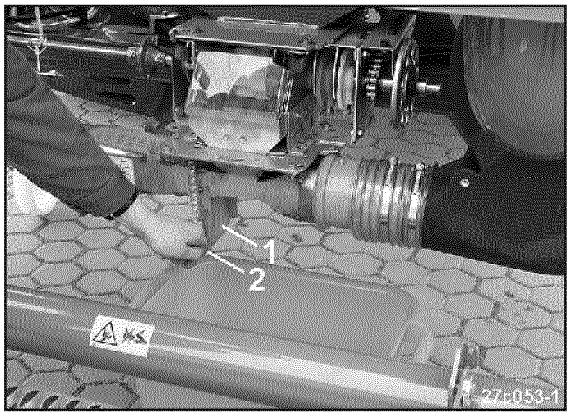


Fig. 193

5. Die Abdrehkurbel in das Vierkantloch des Spornrades stecken.
6. Das Spornrad mit der Abdrehkurbel so lange im Uhrzeigersinn drehen (Fig. 194), bis alle Kammern der Dosierräder mit Dünger gefüllt sind und ein gleichmäßiger Düngerstrom in den/die Auffangbehälter fließt.
7. Auffangbehälter in den Fronttank entleeren und wieder unter den/die Dosierer stellen.

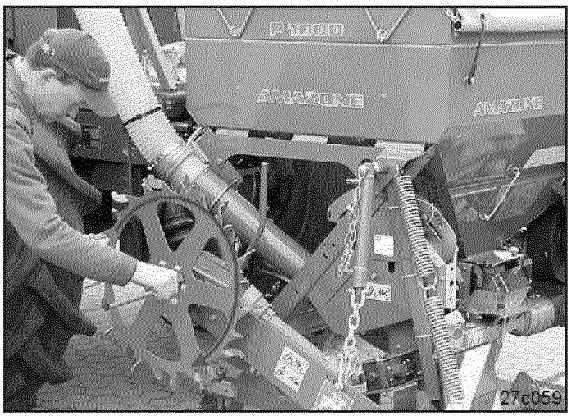
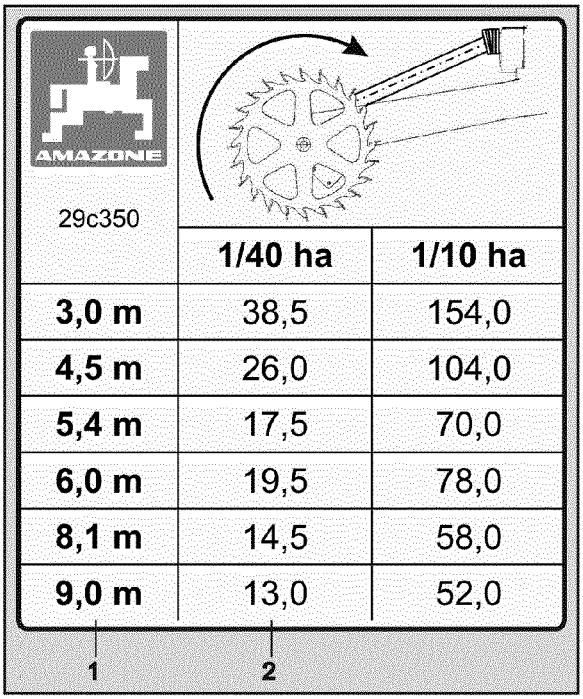


Fig. 194

Die erforderliche Anzahl der Kurbelumdrehungen ermitteln aus:

- der Arbeitsbreite (Fig. 195/1)
- den Kurbelumdrehungen am Spornrad auf 1/40 ha (Fig. 195/2).

Kurbelumdrehungen für nicht aufgeführte Arbeitsbreiten, wie unten aufgeführt berechnen.



	1/40 ha	1/10 ha
3,0 m	38,5	154,0
4,5 m	26,0	104,0
5,4 m	17,5	70,0
6,0 m	19,5	78,0
8,1 m	14,5	58,0
9,0 m	13,0	52,0

1 2

Fig. 195

$$\text{Kurbelumdrehungen} = \text{Tabellen-Kurbelumdrehung} \times \frac{\text{Tabellen-Arbeitsbreite [m]}}{\text{Arbeitsbreite [m]}}$$

Beispiel:

Daten zur Berechnung der Kurbelumdrehungen am Spornrad	
Arbeitsbreite:	8,40 m
Abdrehen:	auf 1/40 ha
Kurbelumdrehungen am Spornrad:	berechnen

Daten aus Tabelle (Fig. 195)	
Arbeitsbreite:	8,10 m
Abdrehen:	auf 1/40 ha
Kurbelumdrehungen am Spornrad:	14,5

$$\text{Kurbelumdrehungen} = 14{,}5 \times \frac{8{,}1\ [\text{m}]}{8{,}4\ [\text{m}]} = 14{,}0$$

8. Mit der in Tabelle (Fig. 195) angegebenen Kurbelumdrehung im Uhrzeigersinn drehen.
9. Die aufgefangene Düngermenge unter Berücksichtigung des Behältergewichtes wiegen (Fig. 196) und mit dem Faktor ”40” multiplizieren.

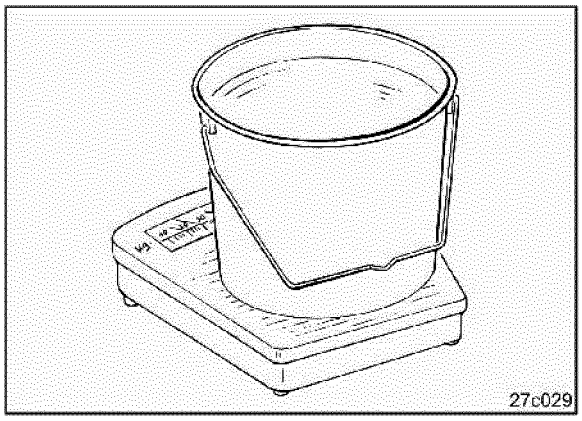


Fig. 196

Beispiel:

aufgefangene Düngermenge: 3,2 kg (abgedreht auf 1/40 ha)

Dünger-Ausbringmenge = 3,2 x 40 = 128 [kg/ha]

10. Wird die gewünschte Dünger-Ausbringmenge [kg/ha] bei der Abdrehprobe nicht erreicht, berechnen Sie die Abweichung (%) zwischen gewünschter und ermittelter Düngermenge und verstellen Sie das Getriebe um diese Prozentzahl.

    Wiederholen Sie die Abdrehprobe, bis die gewünschte Dünger-Ausbringmenge erreicht ist.

11. Nach der Abdrehprobe

    - Abdrehkurbel in die Transporthalterung stecken.
    - Injektor-Schleusenklappe mit besonderer Vorsicht schließen (siehe Gefahren-Hinweis [Fig. 193]).
    - Auffangbehälter (Fig. 192) an der Transporthalterung befestigen und mit einem Klappstecker sichern.

8.21 Dünger-Befüllschnecke (Option)

Dünger-Vorratsbehälter mit der Befüllschnecke befüllen:

1. Maschine auf einer ebenen Fläche abstellen.
2. Handbremse anziehen, Traktormotor abstellen und Zündschlüssel abziehen.
3. Abdeckplane (Fig. 197/1) entfernen.

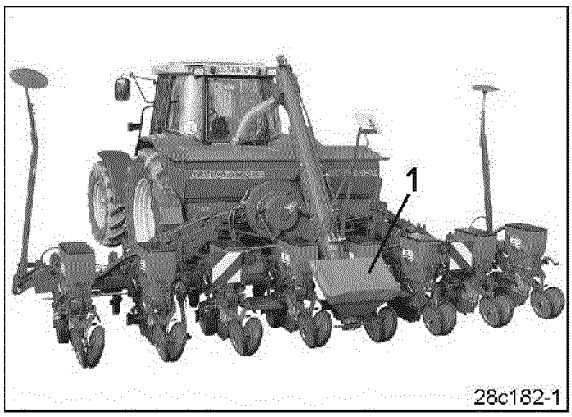


Fig. 197

4. Den hydr. Antrieb der Befüllschnecke ausschalten.

Befüllschnecke ausschalten

- Kugelhahn-Hebelstellung A (Fig. 198)

Befüllschnecke einschalten

- Kugelhahn-Hebelstellung B (Fig. 198).

5. Handbremse anziehen und Traktor-Motor anstellen.
6. Traktor-Steuergerät 4 (siehe Kapitel „Hydraulikanschlüsse“, Seite 80) einschalten.
7. Den hydr. Antrieb der Befüllschnecke am Kugelhahn (Fig. 199/1) langsam einschalten.

   Die Fördergeschwindigkeit am Kugelhahn regeln.

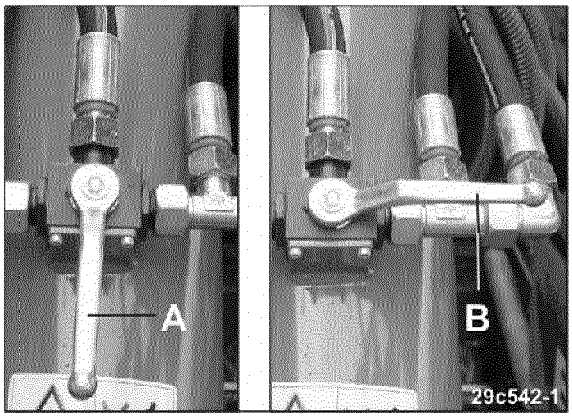


Fig. 198

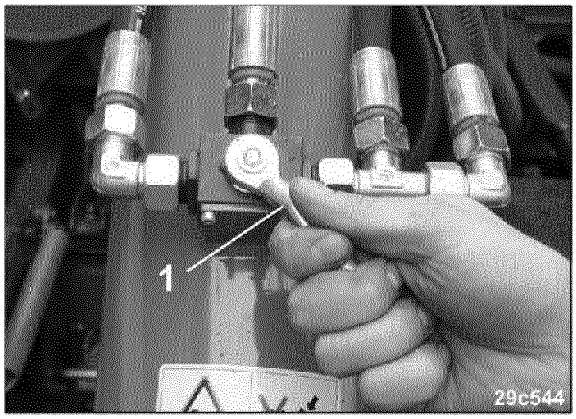


Fig. 199

8. Den Einfülltrichter der Befüllschnecke beschicken, z.B. von einem Versorgungsfahrzeug (Fig. 200).
9. Den hydr. Antrieb der Befüllschnecke ausschalten, sobald der Dünger-Vorratsbehälter gefüllt ist.
   Der Dünger-Vorratsbehälter mit geschlossener Plane ist gefüllt, sobald die Schnecke blockiert.
10. Traktor-Steuergerät 4 ausschalten.
11. Einfülltrichter mit der Abdeckplane (Fig. 197/1) verschließen.



Fig. 200

Gefahr!

Der Aufenthalt zwischen Versorgungsfahrzeug und Einfülltrichter ist beim Rangieren verboten.

Hinweis!

Der Rückspiegel (Option, Fig. 200) erleichtert das Manövrieren mit der Einzelkorn-Sämaschine.

Wichtig!

Den hydr. Antrieb der Befüllschnecke und das Traktor-Steuerventil nach Gebrauch ausschalten.

9 Transportfahrten

Gefahr!

- **Beachten Sie bei Transportfahrten das Kapitel "Sicherheitshinweise für den Bediener", Seite 25.**

Beim Befahren öffentlicher Straßen und Wege müssen Traktor und Maschine den nationalen Straßenverkehrsvorschriften (in Deutschland die StVZO und die StVO) und den Unfallverhütungsvorschriften (in Deutschland denen der Berufsgenossenschaft) entsprechen.

Fahrzeughalter und Fahrzeugführer sind für die Einhaltung der gesetzlichen Bestimmungen verantwortlich.

Darüber hinaus sind die Weisungen in diesem Kapitel vor Antritt und während der Fahrt einzuhalten.

1. Transportbreite der Maschine ermitteln. Dazu die Transportbreite der Maschine der Tabelle (Seite 55) entnehmen oder an der Maschine abmessen.

Wichtig!

Bei bestimmten Ausstattungen ist die Transportbreite größer, als in der Tabelle (Seite 55) angegeben.

Beantragen Sie eine Sondergenehmigung bei Ihrer örtlichen Behörde zum Transportieren Ihrer Maschine auf öffentlichen Straßen, wenn die Transportbreite von 3,0 m überschritten wird.

Hinweis!

Die Einzelkorn-Sämaschine ED 452 nur auf einem Transportfahrzeug befördern.

2. Spuranreißer-Auslegerrohre der ED 452, ED 452-K und ED 602-K einschieben und verriegeln (siehe Kapitel 8.9.5, Seite 107 und Kapitel 8.9.6, Seite 108).
3. Beide Spuranreißer senkrecht stellen (siehe Kapitel „Spuranreißer-Betätigung“, Seite 149).
4. Spuranreißer sichern [siehe Kapitel „Transportsicherung der Spuranreißer (ED 302 und ED 452 [-K])“, Seite 147].
5. Maschinen-Ausleger einklappen und sichern (siehe Kapitel „Maschinen-Ausleger klappen“, Seite 147).
6. Das Bedienterminal des Rechners ausschalten.

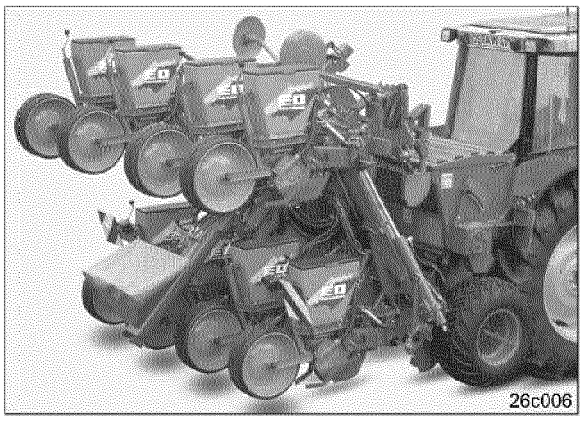


Fig. 201

Die verkehrstechnische Ausrüstung [siehe Kapitel „Verkehrstechnische Ausrüstung (Option)“, Seite 40] ist vorgeschrieben.

7. Die Beleuchtungsanlage auf Funktion prüfen.
8. Die Warntafeln müssen sauber und dürfen nicht beschädigt sein.
9. Maschine zum Straßentransport anheben. Einzuhalten ist der Abstand
   - o Rückleuchten-Oberkante zur Fahrbahn, max. 1550 mm
   - o Rückstrahler-Oberkante zur Fahrbahn, max. 900 mm.
10. Die Traktor-Steuergeräte sperren.



Fig. 202

Wichtig!

Wird die Einzelkorn-Sämaschine in Kombination mit einem Fronttank auf öffentlichen Straßen transportiert, muss auch der Fronttank den nationalen Straßenverkehrsvorschriften (in Deutschland die StVZO und die StVO) entsprechen. Nähere Angaben der Betriebsanleitung zum Fronttank entnehmen.

10 Einsatz der Maschine

Gefahr!

- **Beachten Sie beim Einsatz der Maschine das Kapitel "Sicherheitshinweise für den Bediener", Seite 25.**
- **Beachten Sie die Warnbildzeichen an der Maschine. Die Warnbildzeichen geben Ihnen wichtige Hinweise für den gefahrlosen Betrieb der Maschine. Die Beachtung dieser Hinweise dient Ihrer Sicherheit!**

10.1 Arbeitsbeginn

1. Maschinen-Ausleger ausklappen (siehe Kapitel „Maschinen-Ausleger klappen“, Seite 147).
2. Einzelkorn-Sämaschine am Feldanfang absetzen.
3. Handbremse anziehen, Traktormotor abstellen und Zündschlüssel abziehen.

Wichtig!

Den Saatgut-Behälterdeckel (Fig. 203/1) waagerecht stellen durch Verlängern oder Verkürzen des Oberlenkers (Fig. 203/2).

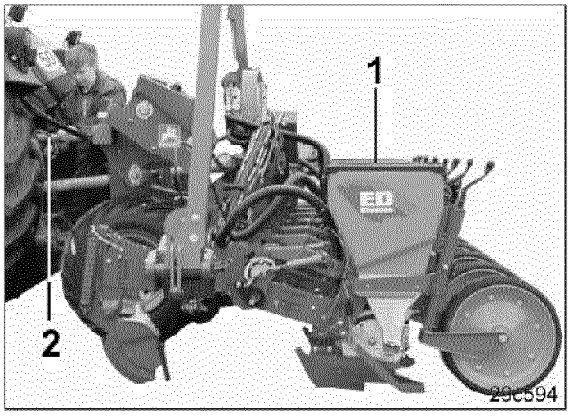


Fig. 203

4. Spuranreißer entsichern (nur ED 302 und ED 452 [-K]), [siehe Kapitel „Transportsicherung der Spuranreißer (ED 302 und ED 452 [-K])“, Seite 147].
5. Spuranreißer in Arbeitsstellung bringen (siehe Kapitel „Spuranreißer-Betätigung“, Seite 149).
6. Das Gebläse auf die richtige Drehzahl bringen (siehe Kapitel „Gebläse-Drehzahl“, Seite 100).
7. Steuergerät für die Traktor-Unterlenker in Schwimmstellung bringen und während der Arbeit in Schwimmstellung betreiben.
8. Traktorzapfwelle einschalten.
   Zur Vermeidung von Beschädigungen Zapfwelle nur im Leerlauf oder bei niedriger Traktormotordrehzahl langsam einkuppeln.
9. Mit dem Traktor anfahren.

Nach den ersten 30 m kontrollieren, ggf. korrigieren:

10. Saatgutablagetiefe und Kornabstand (siehe Kapitel „Saatgutablagetiefe und Kornabstand kontrollieren“, Seite 118).

10.2 Transportsicherung der Spuranreißer (ED 302 und ED 452 [-K])

Gefahr!

- **Die Spuranreißer sichern vor Verlassen des Feldes bzw. bei Fahrten auf Straßen und Wegen.**

Spuranreißer gegen die Halterung drücken und mit einem Klappstecker (Fig. 204/1) abstecken.

Bei Nichtgebrauch den Klappstecker in die Bohrung (Fig. 204/2) stecken (Parkposition).

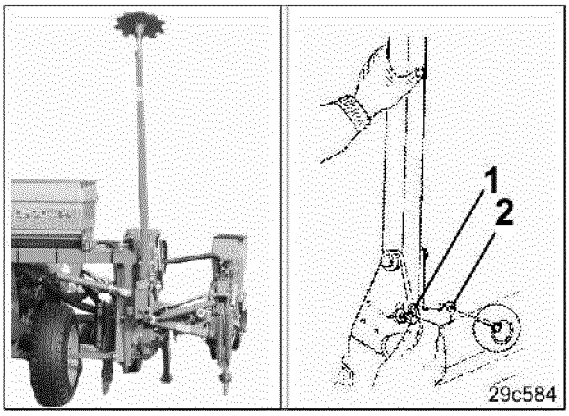


Fig. 204

10.3 Maschinen-Ausleger klappen

Gefahr!

- **Die Maschinen-Ausleger sichern vor Verlassen des Feldes bzw. bei Fahrten auf Straßen und Wegen.**
- **Der Aufenthalt im Schwenkbereich der Maschinen-Ausleger bei Betätigung des Traktor-Steuergerätes ist verboten.**
- **Zwischen Maschinen-Ausleger und Maschine befinden sich Quetsch- und Scherstellen. Niemals in den Quetschbereich greifen.**
- **Die Ausleger der ED 902-K nicht unter Freilandleitungen klappen.**
  - **Während der Arbeit beträgt der Abstand vom Boden zur Spuranreißerspitze bei der ED 902-K ca. 3,65 m.**
  - **Beim Ein- und Ausklappen mit angehobener Maschine beträgt der Abstand vom Boden zur Spuranreißerspitze deutlich über 4 m.**

Wichtig!

- **Den Traktor auf einer ebenen Fläche abstellen und die Einzelkorn-Sämaschine anheben, vor dem Ein- und Ausklappen der Maschinen-Ausleger.**
- **Das Traktor-Steuergerät ohne Unterbrechung betätigen, bis die Maschinen-Ausleger vollständig ein- oder ausgeklappt sind.**
- **Ölfördermengen unter 15 l/min. führen beim Klappen der ED 902-K-Ausleger zur Kollision der Säaggregate.**

10.3.1 Maschinen-Ausleger und Spuranreißer klappen (ED 452-K und ED 602-K)

Zwei Sicherungsbügel (Fig. 205) bilden die mechanische Sicherung der eingeklappten Maschinen-Ausleger.

Maschinen-Ausleger

- vor dem Ausklappen entriegeln (Fig. 205/B).
- nach dem Einklappen verriegeln (Fig. 205/A).

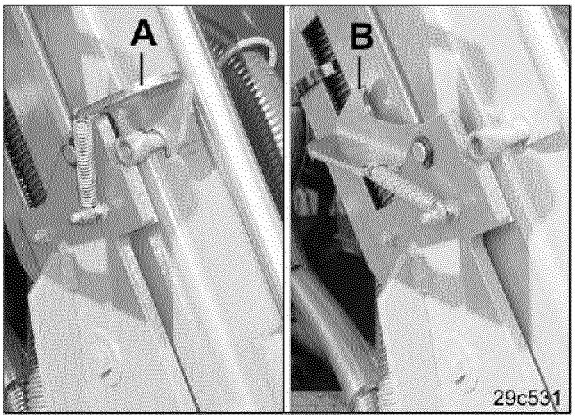


Fig. 205

Maschinen-Ausleger ausklappen:

1. Maschinen-Ausleger entriegeln.
2. Einzelkorn-Sämaschine anheben.
3. Traktor-Steuergerät 2 und 3 (siehe Kapitel „Hydraulikanschlüsse“, Seite 80) solange betätigen, bis die Maschinen-Ausleger ausgeklappt sind.
   Der Kraftschluss der Säaggregate erfolgt automatisch.

   Zusammen mit den Maschinen-Auslegern klappen auch die Spuranreißer der ED 602-K aus.
4. Traktor-Steuergeräte 2 und 3 in „0“-Stellung bringen.

Maschinen-Ausleger einklappen:

Nur ED 452-K:

1. Beide Spuranreißer sichern (siehe Kapitel „Transportsicherung der Spuranreißer (ED 302 und ED 452 [-K])“, Seite 147).

Nur ED 602-K:

1. Beide Spuranreißer anheben (siehe Kapitel „Spuranreißer-Betätigung“, Seite 149).

Alle Typen:

2. Einzelkorn-Sämaschine anheben.
3. Traktor-Steuergerät 2 und 3 solange betätigen, bis die Maschinen-Ausleger eingeklappt sind.

   Zusammen mit den Maschinen-Auslegern klappen auch die Spuranreißer der ED 602-K ein.
4. Die eingeklappten Maschinen-Ausleger verriegeln.

10.3.2 Maschinen-Ausleger und Spuranreißer klappen (ED 902-K)

Maschinen-Ausleger ausklappen:

1. Einzelkorn-Sämaschine anheben.
2. Traktor-Steuergerät 2 (siehe Kapitel „Hydraulikanschlüsse“, Seite 80) solange betätigen, bis die Maschinen-Ausleger und Spuranreißer ausgeklappt sind.
   Der Kraftschluss der Säaggregate erfolgt automatisch.
3. Traktor-Steuergerät 2 in „0“-Stellung bringen.

Maschinen-Ausleger einklappen:

1. Beide Spuranreißer anheben (siehe Kapitel „Spuranreißer-Betätigung“, unten).
2. Einzelkorn-Sämaschine anheben.
3. Traktor-Steuergerät 2 solange betätigen, bis die Maschinen-Ausleger und die Spuranreißer eingeklappt sind.

10.4 Spuranreißer-Betätigung



Gefahr!

- **Der Aufenthalt im Schwenkbereich der Spuranreißer ist verboten.**
- **Beim Betätigen des Traktor-Steuergerätes klappt, je nach Schaltstellung einer der beiden Spuranreißer aus.**
- **Zwischen Spuranreißer und Maschine befinden sich Quetsch- und Scherstellen. Beim Ein- und Ausklappen der Spuranreißer niemals in den Quetschbereich greifen.**

Arbeitsbeginn bzw. nach dem Wenden am Feldende:

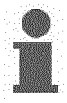
Traktor-Steuergerät 1 in Schwimmstellung stellen

→ der Spuranreißer senkt sich ab.

Vor dem Wenden am Feldende bzw. vor einem Hindernis:

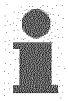
Traktor-Steuergerät 1 mit Druck beaufschlagen

→ beide Spuranreißer sind angehoben.



Hinweis!

Senkt sich beim Betätigen des Traktor-Steuergerätes 1 in Schwimmstellung der falsche Spuranreißer ab, das Steuergerät mehrmals durchschalten.



Hinweis!

Die Wechselautomatik bei Maschinen mit ED-Control ist nur dann aktiv, wenn die Maschine in Arbeitsposition Geschwindigkeit aufgenommen hat.

10.5 Wenden am Feldende

Vor dem Wenden am Feldende die Gebläsedrehzahl soweit absenken, bis das Manometer (Fig. 206/1) einen Wert zwischen 35 und 40 mbar anzeigt.

Bei dieser Drehzahl fallen die Körner nicht von den Vereinzelungsscheiben ab.

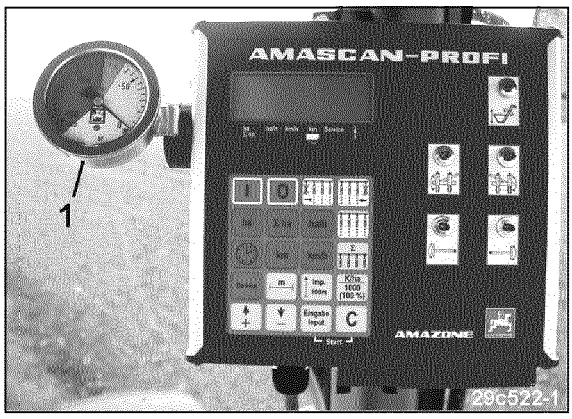


Fig. 206

11 Störungen

11.1 Stillstand einer Vereinzelungsscheibe

Störung:

Ein Scherstift (Fig. 207/1) ist zerstört. Dadurch dreht sich eine Vereinzelungsscheibe nicht.

Anzeige:

Das Bedienterminal (Option) zeigt den Fehler an.

Fehlerbehebung:

Ursache der Störung ermitteln und beheben.

Einen Ersatz-Scherstift (Fig. 207/1) in die Kupplung stecken.
Ersatz-Scherstifte (Fig. 207/2) befinden sich an allen Sägehäusen.

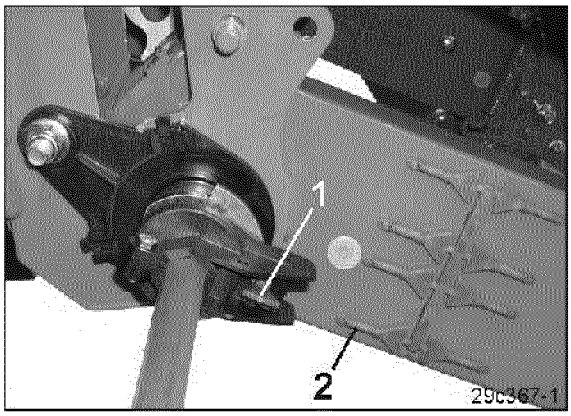


Fig. 207

11.2 Abscheren eines Spuranreißerauslegers

Trifft der Spuranreißer auf ein festes Hindernis, schert eine Schraube (Fig. 208/1) ab und der Spuranreißer klappt nach hinten.

Als Ersatz nur Schrauben der Festigkeit 8.8 verwenden (siehe Online-Ersatzteilliste).

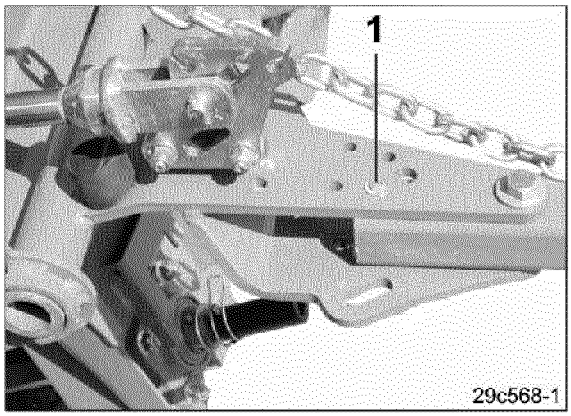


Fig. 208

12 Wartung, Instandsetzung und Pflege



Wichtig!

Kapitel „Wartung, Instandsetzung und Pflege“, Seite 29 lesen und beachten, vor Instandsetzungs-, Wartungs- und Reinigungsarbeiten.

Die Wartungsinterwalle gelten für normale Beanspruchung. Erschwerte Bedingungen verkürzen die Interwalle.

Die Maschine vor längeren Betriebspausen gründlich reinigen.



Gefahr!

Die mit „Fachwerkstatt“ gekennzeichnet Arbeiten dürfen nur in einer Fachwerkstatt ausgeführt werden.



Gefahr!

Sicherheits- und Schutzeinrichtungen nach Wartungs-, Instandsetzungsarbeiten und Reinigungsarbeiten montieren.

12.1 Reinigung



Wichtig!

- **Überwachen Sie Brems-, Luft- und Hydraulikschlauch-Leitungen besonders sorgfältig!**
- **Behandeln Sie Brems-, Luft- und Hydraulikschlauch-Leitungen niemals mit Benzin, Benzol, Petroleum oder Mineralölen.**
- **Schmieren Sie die Maschine nach der Reinigung ab, insbesondere nach der Reinigung mit einem Hochdruckreiniger / Dampfstrahler oder fettlöslichen Mitteln.**
- **Beachten Sie die gesetzlichen Vorschriften für die Handhabung und Beseitigung von Reinigungsmitteln.**



Gefahr!

Schutzmaske tragen. Giftige Stäube von Beizmitteln und/oder Düngermitteln nicht einatmen beim Reinigen mit Pressluft.

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Reinigung mit Hochdruckreiniger / Dampfstrahler



Wichtig!

- **Beachten Sie unbedingt die folgenden Punkte, wenn Sie zur Reinigung einen Hochdruckreiniger / Dampfstrahler einsetzen:**
  - **Reinigen Sie keine elektrischen Bauteile.**
  - **Reinigen Sie keine verchromten Bauteile.**
  - **Richten Sie den Reinigungsstrahl der Reinigungsdüse vom Hochdruckreiniger / Dampfstrahler niemals direkt auf Schmier- und Lagerstellen.**
  - **Halten Sie immer einen Mindest-Düsen-Abstand von 300 mm zwischen der Hochdruckreiniger- bzw. Dampfstrahler-Reinigungsdüse und Maschine ein.**
  - **Beachten Sie die Sicherheits-Bestimmungen beim Umgang mit Hochdruckreinigern.**

12.1.1 Maschine reinigen

1. Maschine entleeren
   - Saatgut-Behälter und Sägehäuse (siehe Kapitel „Saatgut-Behälter und Sägehäuse entleeren“, Seite 98)
   - 900 Liter und 1000 Liter-Dünger-Vorratsbehälter (siehe Kapitel „Dünger-Vorratsbehälter entleeren“, Seite 130)
   - Fronttank- Dünger-Vorratsbehälter (siehe Fronttank-Betriebsanleitung).
2. Maschine mit einem Wasserstrahl, einem Hochdruckreiniger oder mit Pressluft reinigen.



Wichtig!

Düngerrückstände vollständig beseitigen. Düngerrückstände härten aus und können rotierende Bauteile beim nächsten Einsatz beschädigen.

12.1.2 Saugluftgebläseläufer reinigen

Beizmittelstaub kann sich, angesaugt vom Saugluftgebläse, auf dem Saugluftgebläseläufer ablagern und zur Unwucht des Gebläses führen. Dadurch kann das Gebläse zerstört werden. Den Saugluftgebläseläufer regelmäßig reinigen.

Saugluftgebläseläufer reinigen:

1. Kappe eines freien Sauganschlusses entfernen.
2. Traktorhandbremse anziehen.
3. Das Saugluftgebläse einschalten (siehe Kapitel „Gebläse-Drehzahl“, Seite 100).
4. Schutzbrille aufsetzen.
5. Einen Wasserstrahl in den freien Sauganschluss leiten und die Ablagerungen bei laufendem Gebläse entfernen.



Gefahr!

Wasser wird beim Reinigen aus dem Gebläseaustritt herausgeschleudert.

Schutzbrille tragen.



Gefahr!

Nicht in den geöffneten Sauganschluss greifen.

Die Lanze des Hochdruckreinigers nicht in die Öffnung des Sauganschlusses halten.

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12.1.3 Befüllschnecke reinigen

Gefahr!

Reinigung und Wartung der Befüllschnecke nur bei abgeschaltetem Traktor-Motor und abgezogenem Zündschlüssel.

Befüllschnecke reinigen:

1. Sterngriffe (Fig. 209/1) lösen.
2. Einen geeigneten Auffangbehälter unter das Förderrohr stellen.
3. Deckel (Fig. 209/2) entfernen.

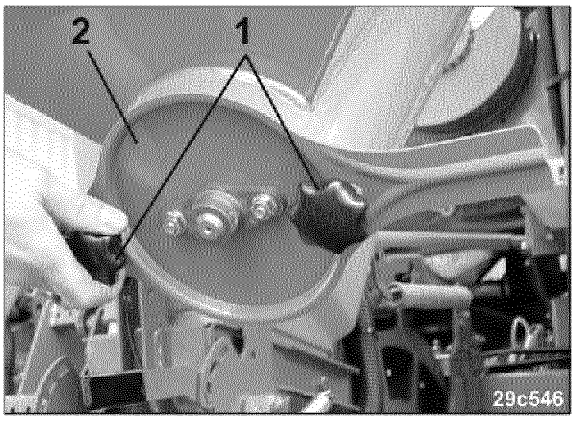


Fig. 209

4. Düngerreste aus dem Förderrohr herausklopfen.

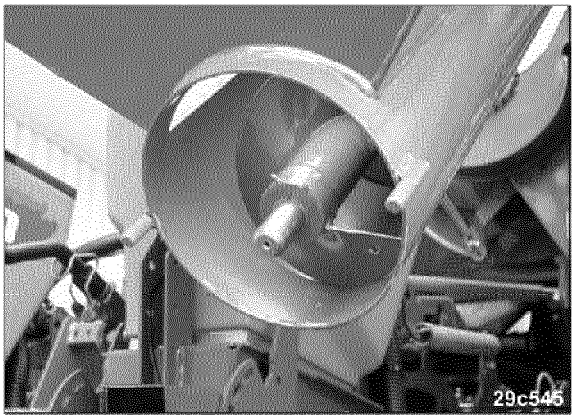


Fig. 210

5. Zur intensiven Reinigung Montageklappe (Fig. 211/1) abschrauben.
6. Befüllschnecke gründlich mit einem Wasserstrahl reinigen.

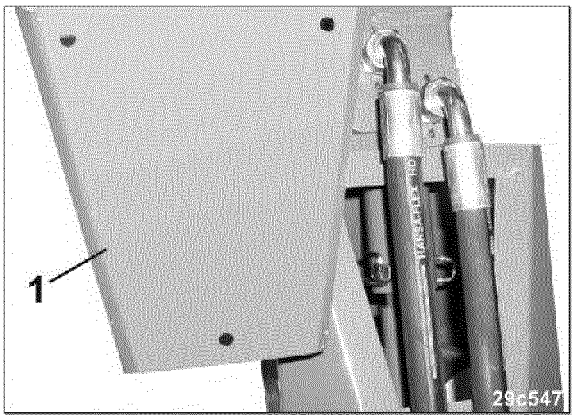


Fig. 211

12.2 Schmiervorschrift

Wichtig!

- **Die Maschine nach Angaben des Herstellers abschmieren.**
- **Verwenden Sie als Schmierstoff ein Lithium-Verseiftes-Mehrzweck-Fett mit EP-Zusätzen.**
- **Schmiernippel und Fettpresse vor dem Abschmieren sorgfältig reinigen, damit kein Schmutz in die Lager hineingepresst wird. Das verschmutzte Fett in den Lagern vollständig herauspressen und gegen neues ersetzen.**

Firma	Schmierstoff-Bezeichnung
ARAL	Aralub HL2
FINA	Marson L2
ESSO	Beacon 2
SHELL	Ratinax A

Die Schmierstellen der Maschine sind mit dem Folienaufkleber (Fig. 212) gekennzeichnet.

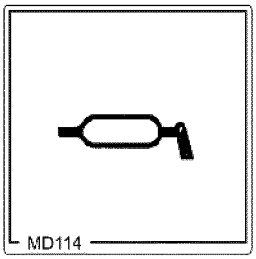


Fig. 212

12.2.1 Schmierstellen – Übersicht

Figur	Typ	Bauteil	Anzahl der Schmiernippel	Schmierintervall
Fig. 213/1	ED 302 ED 452 ED 452-K	Flanschlager	4	50 h
Fig. 214/1	ED 452-K	Ausleger	8	50 h
Fig. 215/1	ED 602-K	Ausleger	8	50 h
Fig. 216/1	ED 602-K	Hydraulikzylinder	2	50 h
Fig. 217/1	ED 602-K	Betätigungsschere	1	50 h
Fig. 217/2	ED 602-K	Betätigungsschere	1	50 h
Fig. 217/3	ED 602-K	Betätigungsschere	1	50 h
Fig. 217/4	ED 602-K	Hydraulikzylinder	1	50 h
Fig. 217/5	ED 602-K	Hydraulikzylinder	1	50 h
Fig. 218/1	ED 902-K	Hydraulikzylinder	1	50 h
Fig. 218/2	ED 902-K	Hydraulikzylinder	1	50 h
Fig. 218/3	ED 902-K	Betätigungsschere	1	50 h
Fig. 218/4	ED 902-K	Betätigungsschere	1	50 h
Fig. 219/1	ED 902-K	Spuranreißer	4	50 h
Fig. 219/1	ED 902-K	Ausleger	2	50 h
Fig. 220/1	ED 902-K	Flanschlager	4	50 h

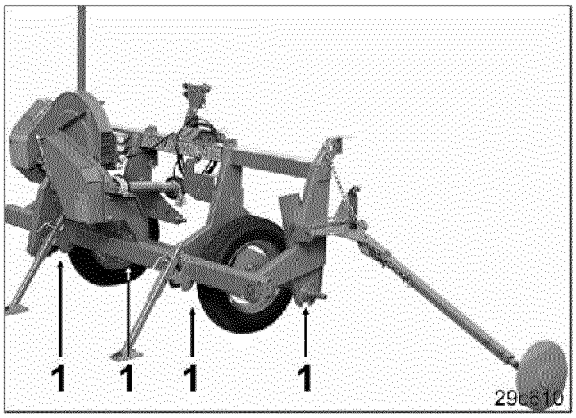


Fig. 213

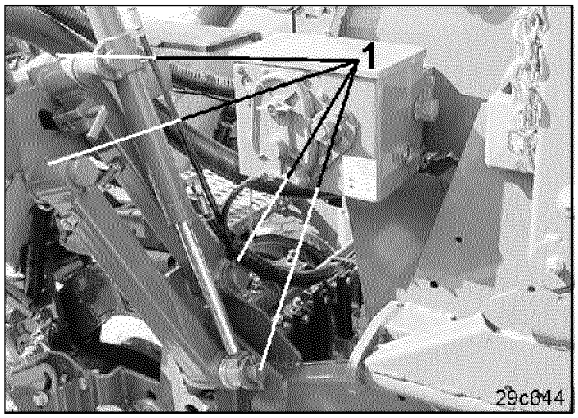


Fig. 214



Fig. 215

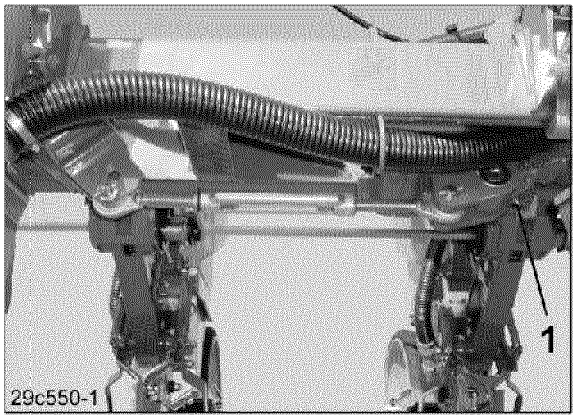


Fig. 216

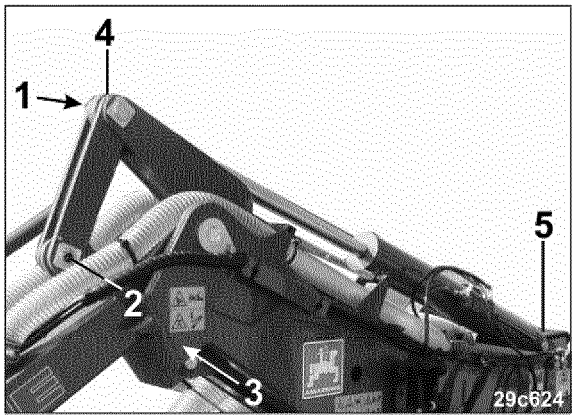


Fig. 217

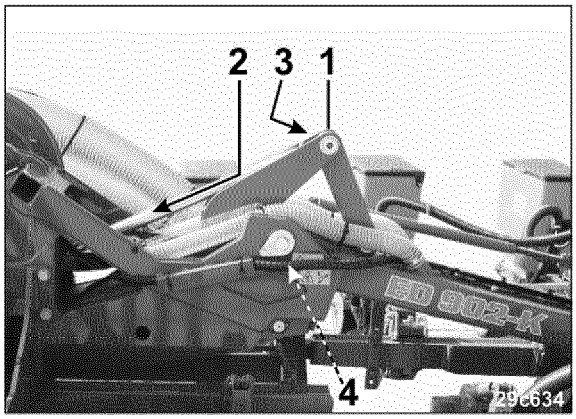


Fig. 218

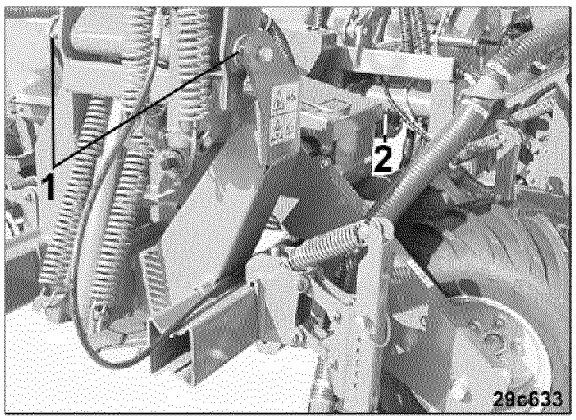


Fig. 219

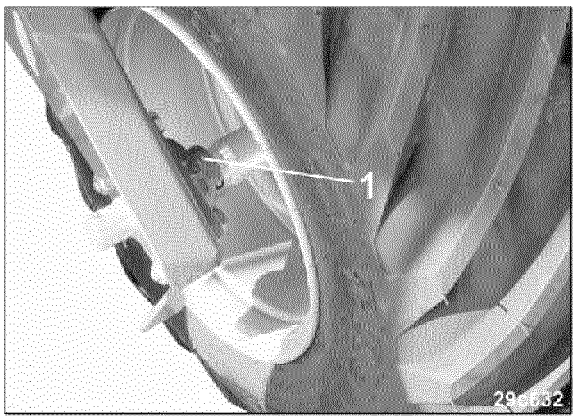


Fig. 220

Schmierstellen Gelenkwellen:

Anhand des Wartungsplans (Fig. 221)

- alle Gelenkwelle abschmieren
- die Schutzrohre und die Profilrohre einfetten.

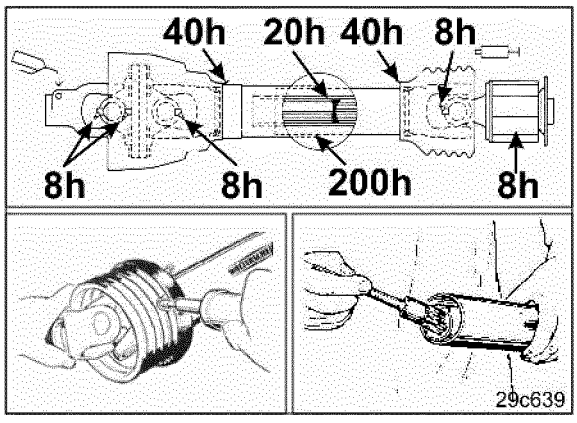


Fig. 221

12.3 Wartungs- und Pflegeplan – Übersicht



Wichtig!

- **Führen Sie die Wartungs-Intervalle nach der zuerst erreichten Frist durch.**
- **Vorrang haben die Zeitabstände, Laufleistungen oder Wartungs-Intervalle der eventuell mitgelieferten Fremd-Dokumentation.**
- **Fronttank-Wartungs-Intervalle, siehe Fronttank-Betriebsanleitung.**

Wartung vor Inbetriebnahme	Fachwerkstatt	Hydraulikschlauch-Leitungen kontrollieren und warten. Inspektion vom Betreiber protokollieren.	Kap. 12.7
		Reifenfülldruck prüfen.	Kap. 12.5
		Ölstand prüfen im Einstellgetriebe (900/1000 l Dünger-Vorratsbehälter).	Kap. 12.6
Wartung nach den ersten 10 Betriebsstunden	Fachwerkstatt	Radschrauben-Anzugsmoment prüfen	Kap. 12.4
	Fachwerkstatt	Hydraulikschlauch-Leitungen kontrollieren und warten. Inspektion vom Betreiber protokollieren.	Kap. 12.7
	Fachwerkstatt	Keilrippenriemen prüfen im Gebläse-Riementrieb	Kap. 12.8
	Fachwerkstatt	Rollenketten-Wartung	Kap. 12.9
10 Betriebsstunden nach einem Radwechsel	Fachwerkstatt	Radschrauben-Anzugsmoment prüfen	Kap. 12.4
Täglich nach Arbeitsende		Reinigung	Kap. 12.1
Jede Woche, spätestens alle 50 Betriebsstunden	Fachwerkstatt	Hydraulikschlauch-Leitungen kontrollieren und warten. Inspektion vom Betreiber protokollieren.	Kap. 12.7
Alle 2 Wochen, spätestens alle 100 Betriebsstunden		Reifenfülldruck prüfen.	Kap. 12.5
		Ölstand prüfen im Einstellgetriebe (900/1000 l Dünger-Vorratsbehälter).	Kap. 12.6
		Säscharspitzen prüfen/austauschen	Kap. 12.11
		Schleppdünger-Scharspitzen prüfen/austauschen	Kap. 12.12
Alle 6 Monate vor der Saison	Fachwerkstatt	Hydraulikschlauch-Leitungen kontrollieren und warten. Inspektion vom Betreiber protokollieren.	Kap. 12.7

Alle 6 Monate nach der Saison	Fachwerkstatt	Keilrippenriemen prüfen im Gebläse-Riementrieb	Kap. 12.8
	Fachwerkstatt	Rollenketten-Wartung	Kap. 12.9
		Säaggregate prüfen	Kap. 12.10

12.4 Radschrauben-Anzugsmomente

Bereifung	**Radschrauben-Anzugsmoment**
Bereifung 10.0/75-15	350 Nm
Bereifung 26 x 12.00/12	350 Nm
Bereifung 31 x 15,5/15 (Terra)	350 Nm

Fig. 222

12.5 Reifenfülldruck

Bereifung	**Reifenfülldruck**
Bereifung 10.0/75-15	1,2 bar
Bereifung 26 x 12.00/12	1,2 bar
Bereifung 31 x 15,5/15 (Terra)	1,2 bar

Fig. 223

12.6 Ölstand im Einstellgetriebe prüfen (900/1000 l Dünger-Vorratsbehälter)

Ölwechsel ist nicht erforderlich.

Ölstand im Einstellgetriebe prüfen:

1. Maschine auf einer waagerechten Fläche abstellen.
2. Der Ölspiegel muss im Ölauge (Fig. 224/1) sichtbar sein.
3. Zum Nachfüllen von Getriebeöl (siehe Tabelle unten), Schraube (Fig. 224/2) lösen und den Getriebedeckel (Fig. 224/3) entfernen.

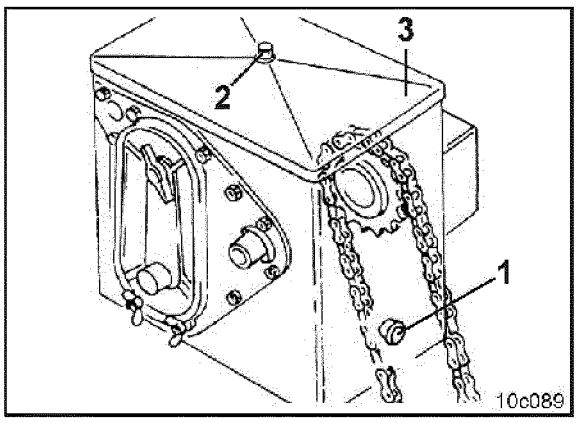


Fig. 224

Gesamtfüllmenge:	1,8 Liter
Getriebeöl (wahlweise):	Wintershall Wintal UG22 WTL-HM (werkseitig)
	Fuchs Renolin MR5 VG22

12.7 Hydraulik Anlage



Gefahr!

- **Nur eine Fachwerkstatt darf Instandsetzungsarbeiten an der Hydraulik-Anlage durchführen!**
- **Die Hydraulik-Anlage steht unter hohem Druck!**
- **Verwenden Sie unbedingt geeignete Hilfsmittel bei der Suche nach Leckstellen!**
- **Machen Sie die Hydraulik-Anlage drucklos, bevor Sie mit den Arbeiten an der Hydraulik-Anlage beginnen!**
- **Unter hohem Druck austretende Flüssigkeiten (Hydrauliköl) können die Haut durchdringen und schwere Verletzungen verursachen! Bei Verletzungen sofort einen Arzt aufsuchen! Infektionsgefahr!**
- **Achten Sie beim Anschluss der Hydraulikschlauch-Leitungen an die Zugmaschinen-Hydraulik darauf, dass die Hydraulik sowohl zugmaschinen- als auch anhängerseitig drucklos ist!**
- **Entsorgen Sie Altöl vorschriftsmäßig. Sprechen Sie bei Entsorgungs-Problemen mit Ihrem Öl-Lieferanten!**
- **Bewahren Sie Hydrauliköl sicher vor Kindern auf!**
- **Hydrauliköl darf nicht ins Erdreich oder Wasser gelangen!**
- **Beachten Sie bei Wartung- und Instandhaltung der Reifen und Räder das Kapitel "Sicherheitshinweise für den Bediener", Seite 25.**



Wichtig!

- **Achten Sie auf korrekten Anschluss der Hydraulikschlauch-Leitungen.**
- **Überprüfen Sie regelmäßig alle Hydraulikschlauch-Leitungen und Kupplungen auf Beschädigungen und Verunreinigungen.**
- **Lassen Sie Hydraulikschlauch-Leitungen mindestens einmal jährlich durch einen Sachkundigen auf ihren arbeitssicheren Zustand prüfen!**
- **Tauschen Sie Hydraulikschlauch-Leitungen bei Beschädigungen und Alterung aus! Verwenden Sie nur Original-AMAZONE Hydraulikschlauch-Leitungen!**
- **Die Verwendungsdauer der Hydraulikschlauch-Leitungen sollte sechs Jahre nicht überschreiten, einschließlich einer eventuellen Lagerzeit von höchstens zwei Jahren. Auch bei sachgemäßer Lagerung und zulässiger Beanspruchung unterliegen Schläuche und Schlauchverbindungen einer natürlichen Alterung, dadurch ist ihre Lagerzeit und Verwendungsdauer begrenzt. Abweichend hiervon kann die Verwendungsdauer entsprechend den Erfahrungswerten, insbesondere unter Berücksichtigung des Gefährdungspotentials, festgelegt werden. Für Schläuche und Schlauchleitungen aus Thermoplasten können andere Richtwerte maßgebend sein.**

Kennzeichnung von Hydraulikschlauch-Leitungen

Die Armatur-Kennzeichnung liefert folgende Informationen:

Fig. 225/...

(1) Kennzeichen des Herstellers der Hydraulikschlauch-Leitung.

(2) Herstelldatum der Hydraulikschlauch-Leitung (04/12 = Dezember 2004)

(3) Maximal zulässiger Betriebsdruck (bar).

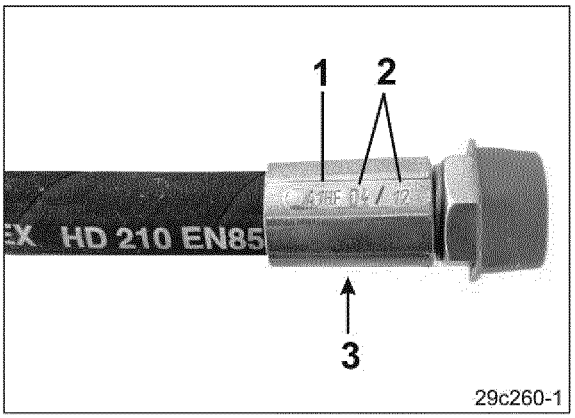


Fig. 225

Wartungs-Intervalle

Nach den ersten 10 Betriebsstunden und in Folge alle 50 Betriebsstunden

1. Prüfen Sie alle Bauteile der Hydraulik-Anlage auf Dichtigkeit.
2. Ziehen Sie gegebenenfalls Verschraubungen nach.

Vor jeder Inbetriebnahme

1. Kontrollieren Sie Hydraulikschlauch-Leitungen auf augenfällige Mängel.
2. Beheben Sie Scheuerstellen an Hydraulikschlauch-Leitungen und Rohren.
3. Tauschen Sie verschlissene oder beschädigte Hydraulikschlauch-Leitungen sofort aus.

Inspektions-Kriterien für Hydraulikschlauch-Leitungen

Wichtig!

Beachten Sie die folgenden Inspektionskriterien zu Ihrer eigenen Sicherheit!

Ersetzen Sie Hydraulikschlauch-Leitungen, wenn Sie bei der Inspektion folgende Inspektions-Kriterien feststellen:

- Beschädigungen der Außenschicht bis zur Einlage (z.B. Scheuerstellen, Schnitte, Risse).
- Versprödung der Außenschicht (Rissbildung des Schlauchmaterials).
- Verformungen, die der natürlichen Form des Schlauchs oder der Schlauch-Leitung nicht entsprechen. Sowohl im drucklosen als auch im druckbeaufschlagten Zustand oder bei Biegung (z.B. Schichtentrennung, Blasenbildung, Quetschstellen, Knickstellen).
- Undichte Stellen.
- Beschädigung oder Deformation der Schlaucharmatur (Dichtfunktion beeinträchtigt); geringe Oberflächenschäden sind kein Grund zum Austausch.

- Herauswandern des Schlauchs aus der Armatur.
- Korrosion der Armatur, die die Funktion und Festigkeit mindern.
- Anforderungen an den Einbau nicht beachtet.
- Die Verwendungsdauer von 6 Jahren ist überschritten.

  Entscheidend ist das Herstelldatum der Hydraulikschlauch-Leitung auf der Armatur plus 6 Jahre. Beträgt das auf der Armatur angegebene Herstelldatum "2004", endet die Verwendungsdauer im Februar 2010. Hierzu siehe "Kennzeichnung von Hydraulikschlauch-Leitungen".

12.7.1 Ein- und Ausbau von Hydraulikschlauch-Leitungen



Hinweis!

Beachten Sie beim Ein- und Ausbau von Hydraulikschlauch-Leitungen unbedingt die folgenden Hinweise:

- **Verwenden Sie nur Original-AMAZONE Hydraulikschlauch-Leitungen!**
- **Achten Sie grundsätzlich auf Sauberkeit.**
- **Sie müssen Hydraulikschlauch-Leitungen grundsätzlich so einbauen, dass in allen Betriebszuständen**
  - **eine Zugbeanspruchung entfällt, ausgenommen durch Eigengewicht.**
  - **bei kurzen Längen eine Stauchbelastung entfällt.**
  - **äußere mechanische Einwirkungen auf die Hydraulik-Schlauchleitungen vermieden werden.**

    Verhindern Sie das Scheuern der Schläuche an Bauteilen oder untereinander, durch zweckmäßige Anordnung und Befestigung. Sichern Sie Hydraulik-Schlauchleitungen gegebenenfalls durch Schutzüberzüge. Decken Sie scharfkantige Bauteile ab.
  - **die zulässigen Biegeradien nicht unterschritten werden.**
- **Bei Anschluss einer Hydraulikschlauch-Leitung an sich bewegende Teile muss die Schlauchlänge so bemessen sein, dass in dem gesamten Bewegungsbereich der kleinste zulässige Biegeradius nicht unterschritten und/oder die Hydraulikschlauch-Leitung zusätzlich nicht auf Zug beansprucht wird.**
- **Befestigen Sie die Hydraulikschlauch-Leitungen an den vorgegebenen Befestigungspunkten. Vermeiden Sie dort Schlauchhalterungen, wo sie die natürliche Bewegung und Längenänderung des Schlauche behindern.**
- **Verboten ist das Überlackieren von die Hydraulikschlauch-Leitungen!**

12.8 Keilrippenriemen prüfen im Gebläse-Riementrieb (Fachwerkstatt)

Keilrippenriemen prüfen im Gebläse-Riementrieb (Fachwerkstatt):

1. Den Keilrippenriemen (Fig. 226/1) austauschen bei
   - o Beschädigung
   - o Ausfransung
   - o Querrissen
   - o Rippenbruch.

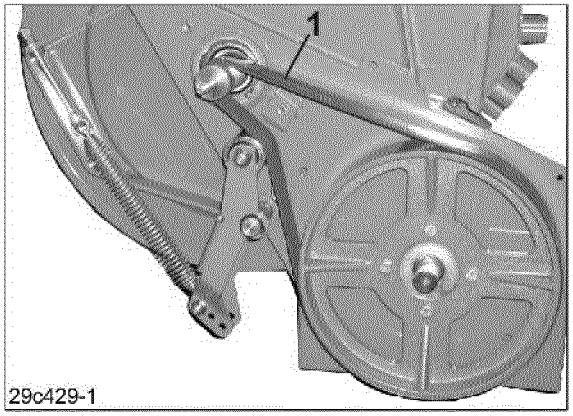


Fig. 226

12.9 Rollenketten und Kettenräder

Alle Rollenketten nach der Saison

1. reinigen (einschließlich der Kettenräder und Kettenspanner).
2. Zustand prüfen.
3. mit dünnflüssigem Mineralöl (SAE10 oder SAE15) schmieren.

12.10 Säaggregate prüfen

Folgende Funktionsteile auf Beschädigungen prüfen und ggf. austauschen:

1. Vereinzelungsscheibe (Fig. 227/1)
2. PE-Schaumprofil-Dichtung (Fig. 227/2)
3. Saugdeckel mit Saugniere (Fig. 227/3)

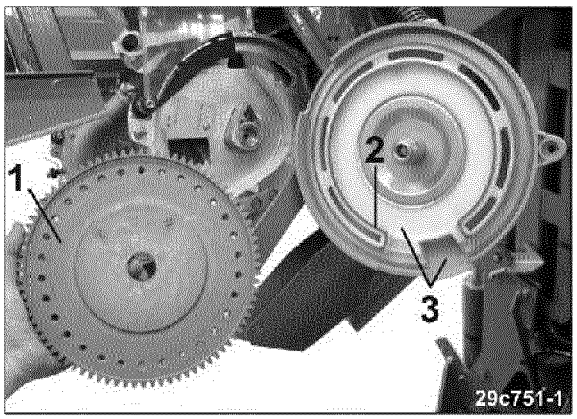


Fig. 227

4. Sägehäusedichtung (Fig. 228/1)
5. Auswerferspitze (Fig. 228/2).

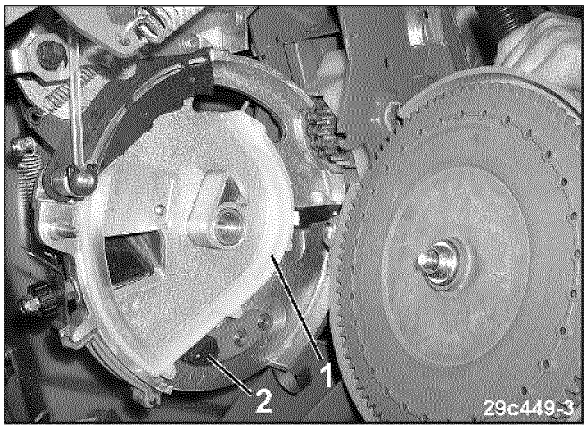


Fig. 228

12.11 Säscharspitzen prüfen/austauschen

Die Säscharspitzen formen die Furche und unterliegen einem natürlichen Verschleiß.

Säscharspitzen austauschen:

1. Maschine anheben und durch geeignete Abstützung sichern.
2. Handbremse anziehen, Motor abstellen und Zündschlüssel abziehen.
3. Muttern (Fig. 229/2) lösen und Säschar (Fig. 229/1) nach unten schwenken.

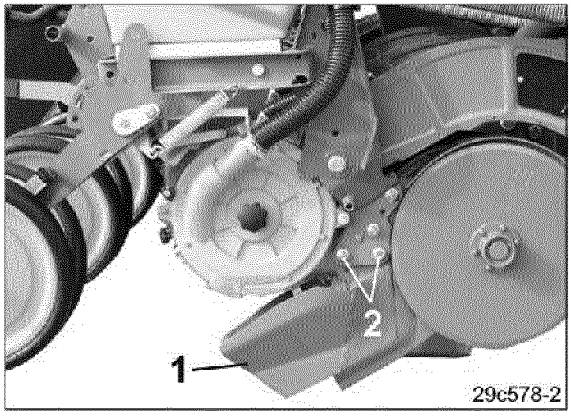


Fig. 229

Classic-Säscharspitze:

4. Mutter (Fig. 230/2) lösen und die Classic-Säscharspitze (Fig. 230/1) austauschen.

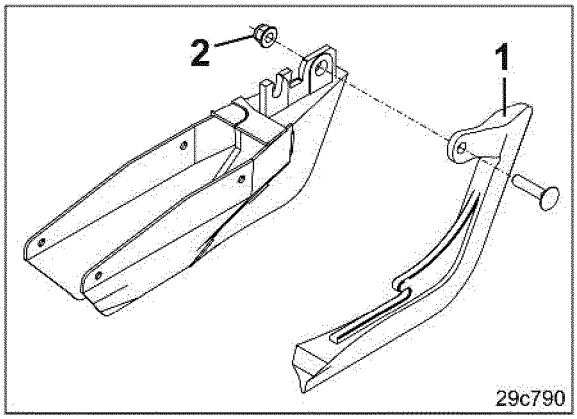


Fig. 230

Contour-Säscharspitze (Mais oder Rübe):

4. Mutter (Fig. 231/2) lösen und die Contour-Säscharspitze (Fig. 231/1) austauschen.

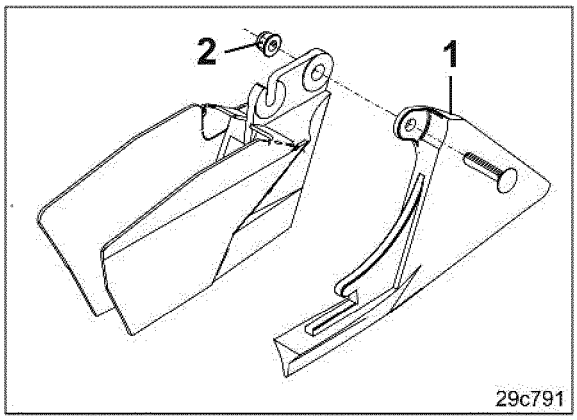


Fig. 231

12.12 Schleppdünger-Scharspitzen prüfen/austauschen

Die Schleppdünger-Scharspitzen formen die Furche und unterliegen einem natürlichen Verschleiß.

Schleppdünger-Scharspitzen austauschen:

1. Maschine anheben und durch geeignete Abstützung sichern.
2. Handbremse anziehen, Traktormotor abstellen und Zündschlüssel abziehen.
3. Mutter (Fig. 232/2) lösen und die Schleppdünger-Scharspitze (Fig. 232/1) austauschen.

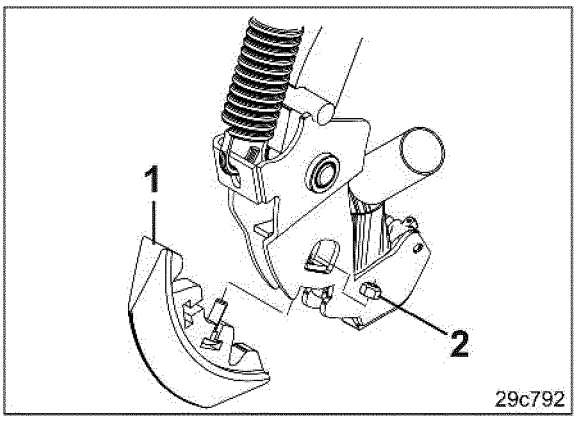


Fig. 232

12.13 Schrauben-Anzugsmomente

Gewinde	Schlüsselweite [mm]	Anzugs-Momente [Nm] in Abhängigkeit der Schrauben-/Muttern-Güteklasse		
		8.8	10.9	12.9
M 8	13	25	35	41
M 8x1		27	38	41
M 10	16 (17)	49	69	83
M 10x1		52	73	88
M 12	18 (19)	86	120	145
M 12x1,5		90	125	150
M 14	22	135	190	230
M 14x1,5		150	210	250
M 16	24	210	300	355
M 16x1,5		225	315	380
M 18	27	290	405	485
M 18x1,5		325	460	550
M 20	30	410	580	690
M 20x1,5		460	640	770
M 22	32	550	780	930
M 22x1,5		610	860	1050
M 24	36	710	1000	1200
M 24x2		780	1100	1300
M 27	41	1050	1500	1800
M 27x2		1150	1600	1950
M 30	46	1450	2000	2400
M 30x2		1600	2250	2700

Wichtig!

Anzugsmomente der Radschrauben (siehe Kapitel „Radschrauben-Anzugsmomente“, Seite 160).

Page 863 of 1596 Precision Exhibit 1005

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Patent No.: 2 637 492

Application No.: 11779702.7

Proprietor: Maschio Gaspardo S.p.A.

Opponent: Precision Planting LLC

2. 9. 2015
E 98381 Me/MF

In the name and on behalf of Precision Planting LLC, 23207 Townline Road, Tremont, Illinois 61568, United States of America a

Notice of Opposition

is filed herewith in accordance with Art. 99 EPC to European Patent No. 2 637 492 (date of mentioning of the grant: December 3, 2014) entitled "Seed distribution element for precision seed drills, seed drill including said element" of Maschio Gaspardo S.p.A., Via Marcello 73, IT-35011 Campodarsego (PD), Italy.

It is requested that EP 2 637 492 (subsequently the opposed patent) be revoked in its entirety for all designated contracting states.

Oral proceedings are requested in accordance with Art. 116 EPC in case the Opposition Division should be inclined to maintain the opposed patent.

The opposition fee amounting to EURO 775 shall be debited from debit account number 28000327. A corresponding voucher is enclosed.

Grounds:

The opposition is based on the grounds for opposition of Art. 100(a) and 100(c) EPC. The subject-matter claimed in the opposed patent is not patentable, because it lacks novelty (contrary to Art. 52 (1), 54 (2), (3) EPC) and inventive step (contrary to Art. 52 (1), 56 EPC). The subject-matter claimed in the opposed patent further extends beyond the content of the application as filed (contrary to Art. 123 (2) EPC).

Documents relied upon:

In the present submission, reference is made to the following documents, copies of which are submitted as enclosure:

D1: U.S. 7,228,807 B1
D2: EP 0 536 543 A1

which were also cited in the examination procedure up to grant, and

D3: EP 2 848 109 A1
D4: U.S. 4,664,290 A
D5: EP 0 140 699 A2
D6: Betriebsanleitung Einzelkorn-Sämaschine ED 302, ED 453, ED 452-K, ED 602-K, ED 902-K, Amazonen-Werke

D7: DE 689 16 976 T2
D8: WO 96/02123 A1

Further, reference is made to the specification of the opposed patent,

B1: EP 2 637 492 B1

and the attached analysis of granted claims 1 and 10. It is also referred to the publication of the PCT application No. PCT/EP2011/069875 forming the application as filed,

A1: WO 2012/062876 A1

and to an Italian patent application the priority of which is claimed by the opposed patent and a machine translation of the latter into English

IT1: IT PD20100338 A1
IT1-EN: machine translation of IT1 into English

Arguments

I. Effective date of the opposed patent

The opposed patent was filed on November 10, 2011 claiming priority of Italian patent application IT1. IT1 was filed on November 12, 2010. According to Art. 87 EPC, priority of an earlier application can only be claimed for the same invention. Thus, for the priority of a claim to be valid, the subject-matter of the claim has to be unambiguously and directly derivable from the disclosure of the priority document (Decision of the Enlarged Board of Appeal G 2/98). To this end the

same tests are applied as for determining if an amendment meets the requirements of Art. 123 (2) EPC (Decision of the Enlarged Board of Appeal G 10/02 and the Guidelines for Examination at the EPO, Section F-IV, 2.2).

According to the machine translation into English of claim 1 of IT1, the seed distribution element disclosed in IT1 necessarily comprises a

> "means for generating a pressure differential between said opposing surfaces in correspondence of a segment of said circumferential crown of holes"

In other words, the seed distribution element comprises a means which generates a pressure differential between the opposing sides of the sowing disc. A similar element can be found in claim 10 of IT1 which is directed to a kit for retrofitting a seed distribution element resulting in a seed distribution element having essentially the same features as the seed distribution element as claim 1.

Claim 1 of the opposed patent does not comprise a similar feature. Also none of the dependent or other independent claims comprises a similar feature. Hence, compared to seed distribution element disclosed in the priority application, the opposed patent lacks a feature and, therefore, represents a generalization of the subject-matter originally disclosed in IT1.

Whether or not a claim generalized in this manner is directed to the same invention within the meaning of Art. 87 (1) EPC has to be determined using the essentiality test defined in Section H-V, 3.1 of the Guidelines. According to Section H-V, 3.1 of the Guidelines a feature may be removed from the claims if the skilled person would unambiguously and directly recognise that

(i) the feature was not explained as essential in the disclosure;

(ii) the feature is not, as such, indispensable for the function of the invention in light of the technical problem the invention serves to solve; and

(iii) the replacement or removal requires no real modification of other features to compensate for the change.

Only if all three of the above criteria are met by the missing feature, a seed distribution element without a means for generating a pressure differential can be considered to be the same invention as the invention disclosed in IT1.

As will be shown in the following paragraphs, at least the criteria listed under items (i) and (ii) are not met by the missing feature in view of IT1. The opposed patent, therefore, cannot validly claim the priority of IT1.

First of all, the feature not comprised by the subject-matter claimed in the opposed patent is explained as essential in the priority application. For example, it is explained in the priority document that "the principle of operation is based on the fact that due to the pressure differential between the opposing faces of the disc, a seed adheres to each hole ..." (IT1-EN, page 1, lines 14 to 16, emphasis added). The operation of the seed distribution element disclosed in IT-1 essentially relies on some means to create a pressure differential between opposing faces of the disc. Thus, the deleted feature is described as essential in IT-1 and may not be omitted from the claimed subject-matter.

Further, the omitted feature is also indispensable in IT-1 for the function of the invention in light of the technical problem the invention serves to solve. Without a pressure differ-

ential created by some means adapted to create a pressure differential, the seed distribution element is not operable. In addition, the pressure differential creates "substantial compression of the disk against [a] seal" (IT1-EN, page 1, lines 24 to 25) which "leads to a strong abrasion of the seal" (IT1-EN, page 1, line 26). This is one of the problems the opposed patent tries to solve (IT1-EN, page 2, lines 21 to 24). Thus, without a means for creating a pressure differential, the problem allegedly solved by the opposed patent does not even exist. The feature is, therefore, not indispensable for the function of the invention in light of the technical problem the invention serves to solve and item (ii) of the criteria laid down in Section H-V, 3.1 of the Guidelines is not met.

In summary, at least two of the three criteria of the test determining whether a feature is a necessary part of an invention are met by the missing feature. Claim 1 of the opposed patent therefore extends beyond the disclosure of the priority application and is therefore not entitled to the priority date. The same applies to all other claims.

The effective date of the opposed patent is, therefore, the filing date of the opposed patent, i.e., November 10, 2011.

II. Extended subject-matter

Claim 1 of the application underlying the opposed patent (the application as filed or "A1") is amongst others characterized by the feature "wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes" (A1, page 8, lines 20 to 22). This feature has been deleted from claim 1 during prosecution of the opposed patent. As a consequence, the claimed subject-matter has been extended to subject-matter not unambi-

guously and directly disclosed in the originally filed application. The opposed patent, therefore, violates Art. 123 (2), 101 (c) EPC and has to be revoked already for this reason.

Whether a feature can be removed from a claim without violating Art. 123 (2) EPC is determined using the essentiality test (Guidelines, Section H-V, 3.1) already discussed in the preceding section. Removing the above feature from claim 1 at least does not meet the criteria laid down under item (i) and item (ii), above.

The deleted feature is identified as an essential feature in the application as filed. A1 explains, for example, that "[t]he operating principle [of the seed distribution element] is based on the fact that, as a result of the pressure differential between the opposed faces of the disc, a seed adheres to each hole ..." (A1, page 1, lines 13 to 15). In other words, without a pressure differential provided between the opposing sides of the disc, the seed distribution element is not functional. The deleted feature is, therefore, an essential in the application as filed.

Furthermore, according to A1 the deleted feature is also indispensable for solving the technical problem underlying the alleged invention. According to A1 the suction effect created by the pressure differential "effects a substantial compression of the disc against [a] seal" (A1, page 2, lines 1 and 2). This causes "severe abrasion of the seal" which is disadvantageous as it limits the lifetime of the seal and makes it necessary to replace the seal frequently (A1, page 2, lines 4 to 8). This is one of the problems of prior art seed distribution elements that the opposed patent alleges to solve (A1, page 3, lines 9 to 12). Thus, without applying a pressure differential to the claimed seed distribution element, the problem allegedly solved by the subject-matter claimed in the op-

posed patent would not even exist. The deleted feature is, therefore, indispensable for the function of the invention in the light of the technical problem the invention serves to solve.

Hence, at least two of the three criteria of the essentiality test are not met by the deleted feature. Deleting the feature, therefore, violates Art. 123 (2) EPC as claim 1 extends to subject-matter not originally disclosed in the application as filed.

The same arguments apply vice-versa to claim 10 and all claims referring directly or indirectly back to any of claims 1 or 10. These claims, therefore also violate Art. 123 (2) EPC as their subject-matter extends to subject-matter not originally disclosed in the application as filed.

III. Subject-matter of the independent claims

1. Independent claim 1

The subject-matter of independent claim 1 defines a seed distribution element for precision pneumatic seed drills comprising the following features:

[1.1] a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
[1.2] a housing (10) with
[1.2.1.] a fixed portion (11) in which the shaft (20) is supported and
[1.2.2.] a portion (12) which is movable relative to the fixed portion (1 1) and can be closed against it,
[1.3] a seed collection chamber (15) being defined in the fixed portion (11),

[1.4] a pneumatic suction chamber (17) being defined in the movable portion (12),

[1.5] the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

[1.6] the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

[1.7] a seal (24) which

[1.7.1.] is arranged on the movable portion (12) and

[1.7.2.] is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

characterized in that

[1.8] the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16),

[1.9] which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

In other words, claim 1 is directed to a seed distribution element comprising a housing 10 and a sowing disc 16 arranged between a fixed and a movable portion 11, 12 of the housing 10 (features [1.1], [1.2]). The sowing disc 16 is further defined by a functional feature explicitly describing that the disc is rotated by a motor-driven transmission shaft 20 at controlled speed.

The movable portion is defined as being "movable" with respect to the fixed portion and can be closed against it (feature [1.2.2]). Both the fixed and the movable portion 11, 12 of the housing are further defined by several additional features. The fixed portion 11 supports the motor-driven transmission shaft 20 for rotating the sowing disc 16 and defines a seed collection chamber 15 (features [1.2.1], [1.3]). Please note

that claim 1 does not require that the motor-driven shaft is supported by or extends through the fixed portion. It only has to be supported somehow in the fixed portion 11.

The movable portion 12 defines a pneumatic suction chamber 17 (feature [1.4]). The chambers 15, 17 defined by the respective portions 11, 12 of the housing 10 are delimited by opposing surfaces of the sowing disc (feature [1.5]). Further, a seal 24 is arranged in the movable portion 12 of the housing 10 (features [1.7], [1.7.1]). The seal 24 is in sliding contact with one of the opposing surfaces of the sowing disc 16, when the movable portion 12 is closed against the fixed portion 11 (feature [1.7.2]).

Finally, a thrust-bearing element 26 is provided which is rotatably supported in the movable portion 12 for withstanding at least some of the axial load produced by the sowing disc 16 on the seal 24 (features [1.8], [1.9]). Thus, claim 1 only requires that the thrust-bearing element 26 is in some way supported in the movable portion 12. It does not have to be supported by the movable portion 12. It could, for example, also be supported – in the movable portion 12 - by the transmission shaft 20.

2. Independent claims 8 and 9

Independent claims 8 and 9 are directed to a sowing element for precision seed drills with a frame and a seed drill comprising a plurality of sowing elements according to claim 8 on a support structure. Both claims incorporate all features of independent claim 1. Therefore, the above considerations fully apply to independent claims 8 and 9.

3. Independent claim 10

Claim 10 is directed to a kit for retrofitting a seed distribution element of precision pneumatic seed drills. The distribution element is defined by the following features:

[10.1] a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

[10.2] a housing (10) with

[10.2.1] a fixed portion (11) in which the shaft (20) is supported and

[10.2.2] a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

[10.3] a seed collection chamber (15) being defined in the fixed portion (11),

[10.4] a pneumatic suction chamber (17) being defined in the movable portion (12),

[10.5] the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

[10.6] the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

[10.7] - a seal (24) which

[10.7.1] is arranged on the movable portion (12) and

[10.7.2] is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another.

The kit itself comprises the following features:

[10.8] the movable portion (12) pre-assembled with:

[10.8.1] a thrust-bearing element(26) of the sowing disc (16),

[10.8.2] which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

Thus, the kit is provided for retrofitting a seed distribution element having essentially the same features as the seed distribution element according to the preamble of claim 1, i.e., features [1.1] to [1.7.2]. Thus, the above discussion presented with regard to features [1.1] to [1.7.2] of claim 1 also applies to claim 10. However, it should be noted that the kit itself is defined by these features only insofar that it has to be adapted to be useable with such a seed distribution element.

The kit itself comprises a movable portion 12 of a seed distribution element pre-assembled with a thrust-bearing element 26 (features [10.8] and [10.8.1]). The thrust-bearing element 26 is rotatably supported in the movable portion like the thrust-bearing element 26 according to claim 1 (feature [10.8.2]). Thus, the thrust-bearing element 26 only has be support by some means or another in the movable portion 12. It does not have to be supported by the movable portion 12.

IV. Lack of novelty of claim 1

1. Lack of novelty in view of D1

D1 is a U.S. patent filed on March 29, 2006. The patent was published on June 12, 2007. Therefore, it represents prior art both with regard to novelty and inventive step. D1 is cited in paragraph [0003] of the opposed patent allegedly forming the closest prior art. However, as we will show in the following paragraphs, D1 is in fact novelty defeating for claim 1 of the opposed patent.

D1 discloses a metering unit 36, i.e., a seed distribution element, comprising a first housing member 50 (column 5, lines 59 to 62) and a second housing member 90 (column 7, lines 19

to 21). A retaining hub 56 connected to a drive shaft 55 is supported in the first housing member (Figure 6). Thus, the first housing member 50 is a fixed portion within the meaning of claim 1 (feature [1.2.1]). The second housing member 90 is attached to the first housing member 50 by a pivot pin 92 (column 7, lines 19 to 21) and can be assembled, i.e., closed, against the first housing member 50 (column 7, lines 28 to 30). Thus, the second housing member 90 discloses a movable portion according to claim 1 (feature [1.2.2]) and the first and the second housing members 50, 90 together disclose a housing of the metering unit 36 (feature [1.2]).

A seed or sowing disk 60 is arranged on the retaining hub 56 connected to the drive shaft 55, which can be engaged to a drive member by a pair of flanges 57 (column 6, lines 1 to 5, Figures 6 to 8, feature [1.1]). The seed disk 60 divides the interior of the housing 50, 90 of the metering unit 36 into a first and a second chamber, i.e., it is interposed between the first and the second housing members 50, 90 (column 7, lines 48 to 52, Figure 7). A first surface 61 of the seed disk 60 defines or delimits the first chamber formed in the interior of the metering disk 36 and a second surface 62 delimits the second chamber formed in the interior of the metering unit 36 (column 7, lines 52 to 56, Figure 7, feature [1.5]). The seed disk 60 also comprises a plurality of transverse holes 67 extending around a circle spaced a short distance within the outer circumference of the sowing disc 60 (column 6, lines 28 to 31). The transverse holes 67 correspond to the ring of selector holes of claim 1 of the opposed patent (D1, column 8, lines 5 to 19) and, therefore, disclose feature [1.6].

The first chamber defined in the first housing member 50 collects seeds from a hopper 32 (column 7, lines 62 to 64) and, thus, discloses feature [1.3]. A vacuum is provided in the second chamber (column, 7, lines 64 to 67) which, therefore, de-

fines a pneumatic suction chamber within the meaning of claim 1 of the opposed patent (feature [1.4]).

Further, the metering unit 36 comprises a sealing member or seal 99 arranged in the second housing member 90 and sealing against a second surface 62 of the seed disk 60 when the housing members 50, 90 are assembled or closed against one another (column 7, lines 26 to 30, Figures 6 to 8, features [1.7], [1.7.1], [1.7.2]).

Finally, D1 also discloses a thrust-bearing element supported rotatably in the movable portion and withstanding at least some of the axial load produced by the disc on the seal. In D1 a thrust-bearing element is formed by a hub handle 58 attached to the distal edge of the retaining hub 56 (column 6, lines 22 to 27). The hub handle 58 is arranged in the second housing member 90, i.e., the movable portion (Figure 6), and supported on the retaining hub 56, i.e., it is supported by the retaining hub 56 in the movable portion 90. The hub handle 58 is attached to the retaining hub 56 and will, therefore, rotate with the retaining hub 56 when the latter is rotated to rotate the sowing disc. Furthermore, the hub handle 58 "retains" the seed disk 60 on the retaining hub 56 (column 5, lines 62 to 67). For retaining the seed disk 60 in position it has to take up at least some of the load produced by the seed disk 60 on the seal 99. Therefore, features [1.8] and [1.9] are also disclosed in D1.

As all features of claim 1 are disclosed in D1, claim 1 of the opposed patent lacks novelty over D1.

2. Lack of novelty in view of D3

D3 is a divisional application of the opposed patent. D3 has a filing date of November 10, 2011 and was published on March

18, 2015. D3 also claims priority of IT-1 which was filed on November 12, 2010. The priority claim of D3 is valid as the seed distribution element according to claim 1 of D3 comprises "a suction device producing a pressure differential between the opposed surfaces in the region of a circumferential segment of ring holes" which is an embodiment of a means for creating a pressure differential as required according to IT-1. Such a means is missing in the claims of the opposed patent. Contrary to the opposed patent D3 can, therefore, validly claim the filing date of IT-1, i.e., November 12, 2010, as effective date with regard to novelty.

As the opposed patent does not validly claim the priority of IT-1, its effective date is November 10, 2011 which is nearly a year after the effective date of D3. Therefore, the disclosure of D3 is relevant for the novelty of the opposed patent (Art. 89, 54 (3) EPC).

D3 discloses a seed distribution element 1 (column 2, lines 40 to 42) comprising a sowing disc 16 rotated by a motor-driven shaft 20 at predetermined, i.e. controlled speed (column 3, lines 13 to 16, feature [1.1]). The distribution element comprises a housing 10 with a fixed portion 11 and a movable portion 12 which is hinged in the region of a hinge 12a on the fixed portion 11 and is, therefore, movable with respect to the fixed portion 11 (column 2, lines 53 to 57, feature [1.2]). The movable portion 12 can be closed against the fixed portion (column 3, lines 27 to 30, feature [1.2.2]). The motor-driven shaft 20 is supported in the fixed portion (column 3, lines 13 to 15, feature [1.2.1]). A seed collection chamber 14 is defined in the fixed portion 11 (column 3, lines 3 to 5, Figure 1, feature [1.3]) and a suction chamber is provided, i.e., defined, in the movable portion 12 (column 2, lines 6 to 8, feature [1.5]).

The sowing disc 16 separates the seed collection chamber 15 from the section chamber 17 (column 3, lines 6 to 8) and has opposed surfaces delimiting the chamber 15, 17 (column 3, lines 22 to 26, Figure 1, feature [1.5]). It is provided with a ring of holes 23 passing, i.e., extending, between the opposed surfaces of the sowing disc 16 (column 3, lines 23 to 26, feature [1.6]).

Furthermore, a seal 24 is fitted in the suction chamber 17 in sliding contact with the facing surface of the disc 16 when the movable portion 12 is closed on the fixed portion 11 (column 3, lines 27 to 30, features [1.7], [1.7.2]). As the suction chamber 17 is defined in the movable portion 12 (column 2, lines 6 to 8), the seal is arranged on the movable portion 12 (feature [1.7.1]).

The seed distribution element 1 also comprises a thrust-bearing element 26 which can be driven in rotation with the sowing disc 16 (column 3, lines 57 to 58) and, therefore, has to be supported rotatably. It comprises a shaft 27 which is rotatably mounted by means of bearings 28 in a seat 29 of the movable portion 12 (column 3, lines 46 to 48). Thus, the thrust-bearing element 26 is supported rotatably in the movable portion and can withstand at least some of the axial load produced by the disc 16 on the seal 24 (column 3, lines 52 and 53, feature [1.9]). The thrust-bearing element 26 can, therefore, be considered a thrust-bearing element 26 of the sowing disc (feature [1.8]).

Hence, all features of claim 1 of the opposed patent are disclosed in D3. Claim 1 is, therefore, not novel within in the meaning of Art. 54 (3) EPC over D3.

3. Lack of novelty over D4

D4 is a U.S. patent published on May 12, 1987, i.e., before the effective date of the opposed patent. D4 is, therefore, relevant both with regard to novelty and inventive step of the opposed patent.

D4 is directed to a seed meter 10, i.e., a seed distribution element, comprising a housing 12 with a first half shell 14 and a second half shell 16 (column 4, lines 67 to column 5, line 1, feature [1.2]). The second half shell 16 is coupled to the first half shell 14 by a hinge 18 and can be closed over the first half shell 14 (column 5, lines 1 to 4). The second half shell 16 is, therefore, a movable portion within the meaning of claim 1 of the opposed patent (feature [1.2.2]). As the second half shell 16 is closed on the first half shell 14, the latter is a fixed portion 14 within the meaning of claim 1. A hub 22 is mounted in the first half shell 14 of the housing 12 (column 5, lines 8 to 10). Lugs 24, 26 are provided outside of the housing 12 for driving the hub 22 into rotation using a driving arrangement (column 5, lines 10 to 14, Figure 3). Thus, the hub 22 is a motor-driven shaft 22 supported in the fixed portion 12 of the housing 10 (feature [1.2.1]).

The seed meter 10 comprises a seed disk 28, i.e., a sowing disc 28, mounted on the hub 22 for rotation (column 5, lines 16 to 20). Thus, the sowing disc 28 is mounted on a motor-driven shaft 22 such that it can be rotated at controlled speed (feature [1.1]).

The seed disk 28 divides the housing 12 into a seed chamber 44 and a vacuum chamber 46. The seed chamber 44, i.e., a seed collection chamber 44, is formed between the seed disk 28 and the first half shell 14 of the housing 12 (column 5, lines 37 to 41). It is, in other words, defined in the fixed portion 14 (feature [1.3]). The vacuum chamber 46, i.e., a pneumatic suction chamber 46, is formed between the seed disk 28 and the

second half shell 16 and, thus, defined in the movable portion 16 of the housing 12 (column 5, lines 37 to 41, feature [1.4]).

For dividing the housing 12 into the seed and the vacuum chamber 44, 46 the seed disk 28 necessarily has to be interposed between the two chambers 44, 46 and half shells 14, 16 (Figure 3). The seed disk 28 has a first side 38 (column 6, line 5) and an opposing second side 42 (column 6, lines 19 and 20, Figure 3). Thus, feature [1.5] is also disclosed in D4. The seed disk 28 comprises a plurality of apertures 34 extending between the first side 38 and the second side 42 of the seed disk 28. As the apertures 34 are arranged circumferentially inside a circular outer edge 36 of the seed disk 28 (column 5, lines 27 to 34), they form a ring of selector holes within the meaning of claim 1 of the opposed patent (column 5, lines 57 to 60, feature [1.6]).

A vacuum seal 56 is mounted on the inside of the second half shell 16 or movable portion 16 (features [1.7], [1.7.1]) and extends into contact with the first side 38 of the seed disk 28 (column 6, lines 2 to 5). As the seed disk 28 rotates relative to the vacuum seal 56, the contact of the first side 38 and the vacuum seal 58 is a sliding contact when the portions 14, 16 of the housing are closed against each other (feature [1.7.2]).

Finally, D4 also discloses a thrust-bearing element in form of a handle 32 which locks the seed disk 28 on the hub 22 (column 5, lines 20 to 21). The handle 32 is attached to the hub 22, but it is clearly arranged in the second half shell or movable portion 16 of the housing 12 (Figure 3). Thus, the handle 32 is supported on the hub 22 in the movable portion 16. The handle 32 is also supported rotatably in the movable portion 16 as it rotates with the hub 22 and the seed disk 28. Finally,

the handle 32 is also adapted to withstand at least some of the axial load produced by the seed disk 27 on the seal 56, as it enables precise positioning of the seed disk 27 relative to the first half shell or fixed portion 14 (column 8, lines 26 to 37, feature [1.9]).

Claim 1 of the opposed patent is, therefore, not novel in view of D4.

4. Lack of novelty over D5

D5 is European patent application filed on October 29, 1984 which was published on May 8, 1985. D5 is, thus, prior art relevant for novelty and inventive step of the opposed patent.

D5 essentially discloses the same seed distribution element as D4. We will, therefore, only briefly discuss where the features of claim 1 of the opposed patent are disclosed in Figure 3 of D5:

[1.1] sowing disc 28 supported on a shaft in form of a rotatable hub 22,
[1.2] housing 10 comprising
[1.2.1] a fixed portion 14 supporting the hub 22,
[1.2.2] a movable portion 20 movable relative to the fixed portion 14 and closable against the fixed portion 14,
[1.3] a first half shell 14 forming a seed collection chamber (page 5, second paragraph),
[1.4] a second half shell 20 forming vacuum chamber (page 5, second paragraph),
[1.5] the sowing disc 28 is interposed between the chambers 14, 20,
[1.6] selector holes in from of apertures 38 extend through the sowing disc 28 (page 5, second paragraph) and form a ring (Figure 2),

[1.7] a seal 42 is
[1.7.1] is arranged in the movable portion 20 of the housing and
[1.7.2] capable of sliding contact with the sowing disc 28 (page 5, last paragraph),
[1.8] a thrust-bearing element in from of an elongated handle 24 and
[1.9] the handle 24 is supported rotatably on the hub 22 in movable portion 20 and takes up at least some of the axial load produced by the disc 28 (page 8, penultimate paragraph, last sentence).

Hence, all features of claim 1 of the opposed patent are known from D5. Claim 1 is, therefore, not novel within the meaning of Art. 54 (2) EPC over D5.

5. Lack of novelty over D6

D6 is a manual ("Betriebsanleitung") for the "Einzelkorn-Sämaschine ED 302, ED 452, ED 452-K, ED 602-K ED 902-K" (single seed sowing machine) produced by Amazonen-Werke, H. Dreyer GmbH & Co. KG in Germany. The manual was created and published in October 2005 and has a copyright of 2005 (see page 3, section titled "Formales zur Betriebsanleitung").

D6 discloses a seed distribution element for pneumatic seed drills ("Einzelkorn-Sähmaschine") comprising a housing ("Sägehäuse", feature [1.2]) having a fixed portion comprising a seed collection chamber ("Saatgut-Vorrats-Bereich", page 53, Figure 39, no. 2, features [1.2.1], [1.3]) and a movable portion comprising a pneumatic suction chamber ("Saugdeckel", page 95, Figure 97, no. 4, feature [1.4]). The movable portion can clearly be moved relative to the fixed portion (see, for example, page 95, Figure 98) and can be closed against it (page 95, Figure 97, feature [1.2.2]).

A sowing disc ("Vereinzelungsscheibe", page 95, Figure 98, no. 1) is interposed between the two portions of the housing. Opposed surfaces of the sowing disc delimit the chambers (feature [1.5]). An outer edge of the sowing disc forms a gear rim which engages with a drive gear provided at the fixed portion of the housing (page 95, Figure 98, gear in the center of the upper half of the Figure). The drive gear drives the sowing disc into rotation. It, thus, forms a drive shaft supported in the fixed portion within the meaning of claim 1 of the opposed patent (features [1.1], [1.2.1]). The sowing disc has a plurality of selector holes ("Bohrungen", page 53, Figure 39, no. 4) which extend through the sowing disc and which are arranged in form of a ring along an outer edge of the sowing disc (page 53, Figure 40, [feature [1.6]).

A seal ("PE-Schaumprofil-Dichtung") arranged in the movable portion of housing is disclosed, for example, in Figure 227 on page 166 as no. 2 (features [1.7], [1.7.1]). The seal is capable of sliding contact with the sowing disc (feature [1.7.2]).

Finally, at least in Figures 40 (page 53), 98 (page 95) and 227 (page 166) a central shaft for mounting the sowing disc is shown in the center of the movable portion. The central shaft serves several purposes: it provides an axis of rotation for the sowing disc, it keeps the sowing disc in position along the axis of rotation and it secures the movable portion to the fixed portion of the housing. The central shaft comprises a male thread (page 95, Figure 98) for engagement with a female thread in the fixed portion of the housing. For securing the movable portion to the fixed portion, the male thread of the central shaft is rotated with the central shaft relative to the movable portion using a handle (page 95, Figure 97, no. 3). Thus, for securing the movable portion to the fixed por-

tion, the central shaft has to be rotatably supported in the movable portion.

Finally, it can be taken from a comparison of Figures 227 and 228 (page 166) that the central shaft has sections of different diameter along its extension direction. One of the transitions between two sections of different diameter takes up at least some of the load produced by the disc on the seal. Thus, the central shaft forms a thrust-bearing element within the meaning of claim 1 and features [1.8] and [1.9] of claim 1 are disclosed in D6.

As all features of claim 1 are disclosed in D6, the subject-matter of claim 1 of the opposed patent lacks novelty over D6.

V. Lack of inventive step of claim 1

1. Lack of inventive step over D7 in combination with common general knowledge

D7 is the publication of the German translation of European patent filed on April 4 1989 and granted on July 20, 1994. D7 is, therefore, relevant with regard to novelty and inventive step of the opposed patent.

D7 also relates to a seed distribution element and can be considered to represent the closest prior art.

D7 discloses a distributor ("Verteiler"), i.e., a seed distribution element, comprising a cylindrical case constituted by a housing 1 and a cover 4 (page 3, third paragraph). The cylindrical case is a housing with the meaning of claim 1 of the opposed patent (feature [1.2]). The housing 1 of D7 is connected to a suction element (page 3, third paragraph) and, therefore, forms a pneumatic suction chamber (feature [1.4]).

The cover 4 constitutes a seed container (page 3, third paragraph), i.e., a seed collection chamber (feature [1.3]).

Neither the housing 1 nor the cover 4 are explicitly defined as a movable or a fixed portion. However, as the two parts 1, 4 of the cylindrical case can be connected to each other using screws 22 which extend through lateral lugs 20, 21 and which are secured by nuts 23 (page 3, penultimate paragraph) they are both movable with respect to one another if disconnected. Thus, as the housing 4 comprises all other features of a movable portion according to claim 1, i.e., a vacuum chamber, we will refer to the housing 1 in the following as a movable portion 1 of the cylindrical case (feature [1.2.2]). The cover 4 on the other hand comprises a seed collection chamber. Further, a drive shaft 16 for rotationally driving a distributor disk 18 is supported by a bearing 19 in the cover 4 (page 3, penultimate paragraph). Hence, the cover 4 comprises all features of a fixed portion according to claim 1. Therefore, we will refer to the cover 4 as a fixed portion 4 of the cylindrical case (feature [1.2.1]).

The distributor of D7 also comprises a distributor or sowing disk 18, which is arranged between the vacuum chamber and the seed collection chamber and delimits the latter (Figures 1, 3, feature [1.5]). The distributor disk 18 is rigidly connected ("fest verbunden") to the shaft 16 (page 3, penultimate paragraph) which can be driven into rotation by a chain sprocket wheel 62 (page 5, last paragraph). Thus the distributor disk 18 is rotated by a motor-driven shaft 16 (feature [1.1]). It further comprises a plurality of selector holes 50 forming at least one ring on the distributor disk (page 4, ultimate paragraph, page 6, first paragraph, Figure 2, feature [1.6]).

The shaft 16 is supported rotatably in both portions 1, 4 of the distributor (page 3, third paragraph). Further, the shaft

16 is rigidly connected to the distributor disk 18 (page 3, lines 21 to 24). Thus, any axial load created by the distributor disk 18 is transmitted to the shaft 16. As the shaft 16 is provided for rotating the distributor disk 18 it has to withstand at least some of the axial load created by the distributor disk 18 towards the movable portion 1 of the distributor. Hence, the shaft 16 forms a thrust-bearing element within the meaning of claim 1 of the opposed patent (features [1.8] and [1.9]).

The subject-matter of D7, therefore, differs from the subject-matter of claim 1 of the opposed patent in that no seal is disclosed which is arranged in the movable portion and which is capable of sliding contact with the facing surface of the disc when the portions are closed against one another. The effect of the seal is to ensure an effective pneumatic seal between the face of the disc and the pneumatic suction chamber (B1, column 1, lines 28 to 31).

The objective technical problem underlying the alleged invention of the opposed patent in view of D7 can be considered to reside in providing an effective pneumatic seal between the face of the disc and the pneumatic suction chamber.

Motivation to solve this problem can be found in D7 itself. The document already states that the distributor disk 18 is in sealing contact with the wall of the housing 1 (page 3, line 22).

The solution as claimed is rendered obvious by D7 and the common general knowledge of the skilled person. This is due to the fact that anyone with some skills in this field would be aware that a seal between the face of the disc and the pneumatic suction chamber reduces the loss of the vacuum at the interface between the disc and the vacuum chamber. It is also

within the general knowledge of the skilled person to provide a seal which is capable of sliding contact with a surface of the disk 18 to provide an effective seal (features [1.8] and [1.9]).

Thus, the subject-matter of claim 1 of the opposed patent cannot be considered inventive within the meaning of Art. 56 EPC over a combination of D7 and the common knowledge of the skilled person.

2. Lack of inventive step over D7 in combination with D8

In view of the objective technical problem defined in the preceding section, the skilled person could alternatively turn towards D8 for solving the problem. D8 is a PCT application filed on July 11, 1995 and published February 1, 1996. D8 represents prior art relevant for novelty and inventive step with regard to the opposed patent.

D8 also relates to seed distribution elements and one of ordinary skill would therefore have been motivated to combine the disclosure of D7 and D8.

D8 discloses, for example, on page 1 in lines 7 to 18 that a seal, i.e., a body member or vacuum manifold, arranged in sliding contact with a seed selection disc has been known for a long time for the purpose of providing an effective seal. Figure 1 of D8 shows a non-rotatable seal 14 with a flexible lip 16 which is arranged in a housing 12 and in sliding contact with a seed selection disc 18 (page 12, lines 17 to 24). Thus, D8 discloses features [1.7], [1.7.1] and [1.7.2] of the opposed patent.

The combination of D7 and D8 discloses all features of claim 1 of the opposed patent. Claim 1 can, therefore, not be considered inventive in view of the combination of D7 and D8.

VI. Patentability of the dependent and the further independent claims

1. Patentability of claim 2

According to claim 2 the thrust-bearing element is rotated with the disc when the portions are closed against each other. The subject-matter of claim 2 is at least not novel in view of D1, D3, D4 and D5 and not inventive in view of a combination of D7 with the general common knowledge or D8.

1.1 Lack of novelty over D1

In D1 a thrust-bearing element in form of hub handle 58 is disclosed. The hub handle 58 is arranged on the distal end of the retaining hub 56 and can be rotated "between a first position for receiving or removing a seed disk 60 and a second position for removably retaining a seed disk 60" (column 5, lines 61 to 67). The retaining hub 56 is in turn attached to a drive shaft 55 (column 6, lines 1 to 5) which is used to rotate the seed disk (Figure 6). As the seed disk 60 and the hub handle or thrust-bearing element 58 are attached to the same rotatable shaft 55, the thrust-bearing element 58 rotates with the seed disk 60. Whether or not the portions of the housing are closed against each other does not affect the rotation of the thrust-bearing element.

D1, therefore, discloses the additional feature of claim 2. The subject-matter of claim 2 is, therefore, not novel in view of D1.

1.2 Lack of novelty over D3

D3 discloses a "thrust-bearing element 26 [which] is driven in rotation with the sowing disc 16 when the fixed and the movable portions 11, 12 are closed against one another ..." (column 3, line 57 to column 4, line 2).

Thus, D3 nearly literally discloses the additional feature of claim 2 which is, therefore, not novel in view of D3.

1.3 Lack of novelty over D4

In D4 a handle 32 discloses a thrust-bearing element within the meaning of claim 1. This thrust-bearing element is mounted on a hub 22 on which also the seed disk 28 is mounted (column 5, lines 15 to 20). As in D1, the handle 32 can be rotated between a first position in which it locks the seed disk 28 on the hub 22 and a second position in which the seed disk 28 can be arranged on the hub 22 (column 5, lines 20 to 21). As the seed disk 28 and the handle 32 are arranged on the same hub 22 and any relative rotational movement between the handle 32 and the seed disk 28 could result in an unlocking of the seed disk 28 from the hub 22, the handle 32 necessarily has to rotate with the hub 22. As this argument also applies when the parts 14, 16 of the housing 12 are closed against each other, all additional features of claim 2 are also known from D4.

The subject-matter of claim 2, therefore, also lacks novelty in view of D4.

1.4 Lack of novelty over D5

D5 essentially discloses the same seed meter as D4. Therefore, D5 also discloses that the thrust-bearing element 56 rotates

with the hub 22 and the seed disk 28 when the parts 14, 16 of the housing 12 are closed against each other. The subject-matter of claim 2 is, therefore, also not novel over D5.

1.5 Lack of inventive step over D7 in view of the general common knowledge or D8

In D7 the thrust-bearing element is formed by the shaft 16 driving the seed disk 18 into rotation. The thrust-bearing element, therefore, necessarily rotates with the seed disk 18. As the additional features of claim 2 are known from D7, the arguments present above regarding a lack of inventive step of claim 1 over D7 in view of the general common knowledge or D8 also apply with regard to claim 2.

The subject-matter of claim 2 is, therefore, not inventive over a combination of D7 with the general common knowledge or D8.

2. Patentability of claim 3

In claim 3 the thrust-bearing element is further defined as comprising a thrust-bearing plate which can bear on that surface of the sowing disc which faces the seal in a zone radially inward of the ring of holes. In the absence of a more precise definition of a thrust-bearing plate, any part of a thrust-bearing element having an extended planar surface will be considered a thrust-bearing plate that is in contact with a surface of the sowing disc facing the seal.

Claim 3 lacks novelty in view of D1, D3, D4 and D5 and is not inventive over a combination of D7 with D8.

2.1 Lack of novelty over D1

Figure 6 of D1 shows, for example, that the hub handle 58 is in contact over an extended area with a planar surface 62 of the sowing disc 60 facing towards the seal 99. The extended area of the hub handle 58, therefore, forms a thrust-bearing plate within the meaning of claim 3 which is arranged inside the ring of holes 67 (Figure 8).

Hence, all additional features of claim 3 are known from D1 and claim 3 lacks novelty over D1.

2.2 Lack of novelty over D3

D3 discloses in column 3, lines 46 to 53 a thrust-bearing element 26 comprising a shaft 27. The shaft 27 is fixed to "a thrust-bearing plate 31 which can bear on that surface of the disc which faces the seal 24 in a zone radially inside the ring of holes 23."

Thus, D3 literally discloses the additional features of claim 3 and claim 3 also lacks novelty over D3.

2.3 Lack of novelty over D4

In Figure 3 of D4 the thrust-bearing element in form of a hub 32 is shown in engagement with an extended surface on the first side 38 of the sowing disc 28 facing towards the seal 56. The entire hub 32 is arranged inside the ring of selector holes 34.

Thus, D4 also discloses the additional features of claim 3. Claim 3, therefore, lacks novelty of D4.

2.4 Lack of novelty over D5

D5 discloses essentially the same system as D4. In Figure 3 the handle 56 forming the thrust-bearing element is shown in planar contact with the sowing disc 28 inside the ring of holes 38. Thus, all additional features of claim 3 are also known from D5 which lacks, therefore, novelty over D5.

2.5 Lack of inventive step over D7 in view of D8

In D7 the thrust-bearing element is formed by a shaft 16 which does not comprise a thrust-bearing plate. Thus, D7 discloses all features of claim 3 but a seal and a thrust-bearing plate. As already discussed with regard to claim 1, the seal has the effect to improve the sealing between the sowing disc 18 and the wall of the housing 1 forming the vacuum chamber. The opposed patent does not define an additional benefit of the providing a thrust-bearing element comprising a thrust-bearing plate. The thrust-bearing plate is one way of connecting a thrust-bearing element to a sowing disc. The seal and the thrust-bearing plate do not have a combined effect, and their contribution to the claimed invention can, therefore, be considered separately (Guidelines, G-VII, 7).

It has already been shown that adding a seal between a sowing disc and a housing cannot constitute an inventive step.

The additional feature of a thrust-bearing plate is one way of connecting a sowing disc to a thrust-bearing device. D7 does not explain how the sowing disc 18 can be effectively connected to the thrust-bearing element in form of the shaft 16.

The skilled person could, for example, turn to D8 when looking for a way of mounting the sowing disc 18 on the thrust-bearing device 16. Figure 1 of D8 shows, for example, an extended surface connected to a shaft for mounting a sowing disc 18 to the shaft. AS can be seen in Figure 1, the extended surface is

mounted to the sowing disc using a bolt. Therefore, the extended surface has to rotate with the sowing disc.

The extended surface could and would be transferred without any problems to D7. The skilled person would also mount the extended surface on the side of the sowing disc facing towards the pneumatic suction chamber and, therefore, the seal as it is done in D8.

Hence, the additional feature of claim 3 missing in D7 is completely known from D8. The combination of D7 and D8, therefore, renders the claimed subject-matter obvious.

3. Patentability of claim 4

According to claim 4 the thrust-bearing element comprises a drive element which is fixed for rotation with the plate and can be coupled with the drive shaft of the disc when the portions are closed against each other. In other words, the thrust-bearing element of claim 4 is formed such that the thrust-bearing plate is directly or indirectly connected to the shaft such that the base plate rotates with the shaft. Claim 4, therefore, does not add anything to claim 3 as the thrust-bearing plate of claim 3 already rotated with the shaft and, therefore, some kind of physical connection, i.e. a drive element, between the shaft and the drive plate was necessary.

For the sake of completeness it should be pointed out that D3 explicitly discloses "a drive element 32" (column 4, line 2). Other distinct drive elements are disclosed in D2, Figure 2 (projection extending of axis from the support of the sowing disc 13 through the sowing disc 13) and in D8, Figure 1 (of axis bolt connecting the extended mounting surface and the sowing disc 18).

Hence, the subject-matter of claim 4 is not novel in view of D1, D3, D4 and D5 for the same reasons as the subject-matter of claim 3.

4. Patentability of claim 5

In claim 5 the thrust-bearing element of claim 4 is further defined as being self-centering relative to the drive shaft. A self-centering thrust-bearing element will be understood as a thrust-bearing element which is formed such that in use its axis of rotation is the same as the axis of rotation of the drive shaft.

The subject-matter of claim 5 also lacks novelty at least over over D1, D3, D4 and D5 and is not inventive over D7 in view of the common general knowledge or D8.

4.1 Lack of novelty over D1, D4 and D5

In D1, D4 and D5 the thrust-bearing element in form of a hub handle is directly attached to the hub rotating the sowing disc (see D1, Figure 6, D4, Figure 3 and D5, Figure 3). The handles are directly attached to the hub and rotate with the hub. The axis of rotation of the handles, therefore, coincides with the axis of rotation of the hub. The thrust-bearing elements of D1, D4 and D5 are, therefore, self-centering and the subject-matter of claim 5 lacks novelty over D1, D4 and D5.

4.2 Lack of novelty over D3

D3 discloses a thrust-bearing element 26 comprising a "drive element 32 which comprises a coupling device constrained for rotation with the thrust-bearing plate but with radial and/or circumferential clearance in such a way as to be self-centered in the rotational coupling with the drive shaft of the disc"

(column 4, lines 2 to 6). Thus, D3 also discloses a thrust-bearing element which is self-centering with respect to the drive shaft. All additional features of claim 5 are, therefore, also known from D3 and claim 5 lacks novelty over D3.

4.3 Lack of inventive step over D7 in view of the common general knowledge or D8

In D7 the thrust-bearing element is formed by the drive shaft 16. Thus, the axis of rotation of the thrust-bearing element 16 always coincides with the axis of rotation of drive-shaft 16. Hence, the thrust-bearing element disclosed in D7 is self-centering within the meaning of claim 5.

The subject matter of claim 5 is, therefore, not inventive over D7 in view of the common general knowledge or D8.

5. Patentability of claim 6

According to claim 6 the drive element comprises a coupling member which rotates jointly with the thrust-bearing plate but has radial and/or circumferential clearance so as to be self-centered during rotational coupling with the drive shaft of the disc. As there is no apparent difference between a "drive element" and a "coupling member" these terms may refer to the same element. When coupling the thrust-bearing element to the drive shaft, a coupling member of the thrust-bearing element shall have "radial and/or circumferential clearance so as to be self-centering." In other words, for coupling the thrust-bearing element with the drive shaft, the thrust-bearing element has to be moved parallel to the axis of the rotation of the drive shaft. To compensate for any misalignments of the axis of rotation of the drive shaft and the thrust-bearing element, the coupling member with or without the entire thrust-bearing element can additionally be moved in plane extending

perpendicular to the axis of rotation of the drive shaft as it has "radial or circumferential clearance".

First of all, it should be pointed out that providing lateral clearance between two elements which shall be connected to compensate for potential misalignments cannot be considered inventive. It's a simple routine task for the skilled person to compensate for potential misalignments between two components to be joined.

In addition, the subject-matter of claim 6 also lacks novelty over D1, D3, D4 and D5 and is not inventive over D7 in view of D8.

5.1 Lack of novelty over D1, D4 and D5

In D1, D4 and D5 the thrust-bearing element in form of a hub handle is directly attached to the hub rotating the sowing disc as already discussed with regard to claim 5. Before connecting the handle to the drive shaft, it can be moved freely in space and, therefore, also translated in a plane extending perpendicular to the axis of rotation of the drive shaft. The means connecting the hub handle to the hub which is a coupling member within the meaning of claim 6 moves with the hub handle and can, therefore, also be translated freely before connection with the hub. The hub handle, therefore, has radial and circumferential clearance to be self-centering.

The subject-matter of claim 6 is, therefore, known from D1, D4 and D5 and not novel within the meaning of Art 54 (2) EPC.

5.2 Lack of novelty over D3

The additional feature of claim 6 is literally disclosed on page 4, lines 2 to 6 of D3. Claim 6, therefore, also lacks novelty over D3.

5.3 Lack of an inventive step over D7 in view of D8

The thrust-bearing plate known from D8 as discussed with respect to claim 3 is arranged co-axially on the drive shaft 16. Before the thrust-bearing plate is attached to the drive shaft 16 by inserting the drive shaft into a central bore on the thrust-bearing plate, the thrust-bearing plate can be translated into any lateral direction with respect to the axis of rotation of the drive shaft 16. The thrust-bearing plate, therefore, has radial or circumferential clearance so as to be self-centered during rotational coupling with the drive shaft 16 within the meaning of claim 6.

As the additional feature of claim 6 is known from D8, claim 6 is not inventive over D7 in view of D8.

6. Patentability of claim 7

In claim 7 the seed distribution element of claim 1 is limited to a seed distribution element with a housing having a fixed and a movable portion, wherein the movable portion is hinged to the fixed portion. Coupling two parts of a housing using a hinge is a routine measure the skilled person would take to couple two elements of a housing which shall be movable between an opened and a closed position with respect to one another. It cannot constitute an inventive step.

The subject-matter of claim 7 is also known from D1, D3, D4 and D5 and, therefore, not novel in view of these references.

6.1 Lack of novelty over D1, D4 and D5

D1 discloses a coupling pin or hinge 92 coupling the fixed and the movable portion 50, 90 of the housing, for example, in Figures 7 and 8 (column 7, lines 19 to 21). In D4 and D5 a hinge 18 coupling the fixed and the movable portion 14, 16 of the housing 12 is shown in Figure 2 (D4, column 5, lines 1 to 4 and D5, page 4, penultimate paragraph).

The subject-matter of claim 7, therefore, lacks novelty over each of D1, D4 and D5.

6.2 Lack of novelty over D3

D3 states in column 2, lines 53 to 57 that the "movable portion 12 [is] hinged in the region of a hinge 12a on the fixed portion 11 by means of a removable hinge pin 13." Thus, the additional feature of claim 7 is literally disclosed in D3.

Claim 7, therefore, lacks novelty over D3.

7. Patentability of claim 8

Claim 8 is directed to a sowing element comprising a frame and a seed distribution element according to any of the preceding claims. Opponent cannot establish any difference between a sowing element and a seed distribution element. A frame appears to be nothing more than an element for mounting the seed distribution element of claim 1 to a seed drill. As each of the seed distribution elements disclosed in the prior art is provided for mounting to a seed drill, each of the seed distribution elements comprises a frame. Claim 8 is, therefore, not novel and not inventive for the same reasons as claim 1.

For the sake of completeness we will briefly point out that at least Figures 1 and 2 of D1, Figure 3 of D3 and the title page

of D6 show a seed distribution element having all features as the seed distribution element of claim 1 of the opposed patent attached to a larger structure by means of a frame.

8. Patentability of claim 9

Claim 9 is directed to a seed drill comprising a supporting structure on which a plurality of sowing elements of claim 8, i.e., comprising a seed distribution element according to any of the preceding claims, are mounted.

All seed distribution elements discussed with respect to the preceding claims are intended for use with a seed drill. A plurality of seed distribution elements mounted to a supporting structure of a seed drill is shown, for example, in Figures 1 and 2 of D1, Figure 3 of D3 and on the title page of D6. Thus, the subject-matter of claim 9 is not novel or not inventive, respectively, for the same reasons as claim 1.

9. Patentability of claims 10 and 11

As already discussed above, the kits of claims 10 and 11 do not comprise any additional features compared to the seed distribution element according to claim 1 or claims 2 to 7, respectively. Hence, the same arguments already presented with regard to these claims also apply to claims 10 and 11.

Claims 10 and 11 are, therefore, also not patentable.

VII. Summary

The subject-matter of the opposed patent extends beyond the originally filed subject-matter. Further, none of the claims of the opposed patent is novel or may constitute an inventive

step. Therefore, the request for revocation of the opposed patent in its entirety is justified.

Malte Frese
(Association No. 1)

Albrecht v. Menges
(Association No. 1)

Encl.: Exhibits D1 to D8, A1, B1, IT1, IT1-EN

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Patent No.: 2 637 492

Application No.: 11779702.7

Proprietor: Maschio Gaspardo S.p.A.

Opponent: Precision Planting LLC

3. 9. 2015
E 98381 Me/MF

In regard to the Opposition filed in the name and on behalf of Precision Planting LLC against the above-referenced patent on September 2, 2015 and September 3, 2015

On September 2, 2015 an opposition was filed in the name and on behalf of Precision Planting LLC against the above European Patent; the opposition fee was paid with the notice of opposition.

The first page of the notice of opposition contained the reference line:

"Opponent: Monsanto International SARL"

The text of the opposition brief and the corresponding opposition Form 2300E clearly indicated that it had always been the intention to file the opposition in the name of Precision Planting.

To avoid any potential discussion on admissibility, today, September 3, 2015, a further opposition was filed referencing only Precision Planting as the Opponent in the reference line, in the submission as such and in EPO Form 2300E. A further opposition fee was paid.

It is requested to reimburse the opposition fee paid for the opposition filed on September 2, 2015.

Malte Frese
(Association No. 1)

Albrecht v. Menges
(Association No. 1)

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Notice of opposition to a European patent

I. Patent opposed

Patent No.	EP2637492
Application No.	EP11779702.7
Date of mention of the grant in the European Patent Bulletin (Art. 97(3), Art. 99(1) EPC)	03 December 2014
Title of the invention	SEED DISTRIBUTION ELEMENT FOR PRECISION SEED DRILLS, SEED DRILL INCLUDING SAID ELEMENT

II. Proprietor of the patent

first named in the patent specification	Maschio Gaspardo S.p.A.
Opponent's or representative's reference	E 98381

III. Opponent

Name	Precision Planting LLC
Address:	23207 Townline Road Tremont IL Illinois 61568 United States of America
State of residence or of principal place of business	United States of America
Multiple opponents (see additional sheet)	☐

IV. Authorisation

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Multiple representatives (see additional sheet) ☐

Authorisation(s)

is/are enclosed ☐

has/have been registered under No. ☐

V. Opposition is filed against

the patent as a whole ☒

claim(s) No(s).

VI. Grounds for opposition:

Opposition is based on the following grounds:

(a) the subject-matter of the European patent opposed is not patentable (Art. 100(a) EPC) because:

• it is not new (Art. 52(1); Art. 54 EPC) ☒

• it does not involve an inventive step (Art. 52(1); Art. 56 EPC) ☒

• patentability is excluded on other grounds, namely articles ☐

(b) the patent opposed does not disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art (Art. 100(b) EPC; see Art. 83 EPC). ☐

(c) the subject-matter of the patent opposed extends beyond the content of the application/of the earlier application as filed (Art. 100(c) EPC, see Art. 123(2) EPC). ☒

VII. Facts (Rule 76(2)(c) EPC)

presented in support of the opposition are submitted herewith on an attached document ☒

VIII. Other requests:

• Oral proceedings are hereby requested auxiliarily.

IX. Evidence presented

A01	Patent document	WO 2012/062876 (A1) , 18.05.2012 original file name: WO_12062876_A1.pdf attached as: Published-Evidence-9.pdf
B01	Patent document	EP2 637 492 (B1) , 03.12.2014 original file name: EP2637492B1.pdf attached as: Published-Evidence-8.pdf
D01	Patent document	US7,228,807 (B1) , 12.06.2007 original file name: D1_US_07228807_B1.pdf attached as: Published-Evidence-1.pdf
D02	Patent document	EP0 536 543 (A1) , 14.04.1993 original file name: D2_EP_00536543_A1.pdf attached as: Published-Evidence-2.pdf
D03	Patent document	EP2 848 109 (A1) , 18.03.2015 original file name: D3_EP2848109A1.pdf attached as: Published-Evidence-3.pdf
D04	Patent document	US4,664,290 (A) , 12.05.1987 original file name: D4_US4664290.pdf attached as: Published-Evidence-4.pdf
D05	Patent document	EP0 140 699 (A2) , 08.05.1985 original file name: D5_EP0140699A2.pdf attached as: Published-Evidence-5.pdf
D06	Other evidence	Manual ("Betriebsanleitung") for the "Einzelkorn-Sämaschine ED 302, ED 452, ED 452-K, ED 602-K ED 902-K" Amazonen-Werke original file name: D6-Amazone.pdf attached as: Other-evidence-1.pdf
D07	Patent document	DE689 16 976 (T2) , 16.03.1995 original file name: D7_DE_68916976_T2.pdf attached as: Published-Evidence-6.pdf
D08	Patent document	WO 96/02123 (A1) , 01.02.1996 original file name: D8_WO_9602123_A1.pdf attached as: Published-Evidence-7.pdf
IT01	Patent document	ITPD20100338 (A1) , 13.05.2012 original file name: IT PD2010A000338.pdf attached as: Published-Evidence-10.pdf
IT01	Other evidence	original file name: IT1 EN PD2010A000338_TRA.pdf attached as: Evidence-Tran-1.pdf

X. Payment

Mode of payment	Debit from deposit account

The European Patent Office is hereby authorised, to debit from the deposit account with the EPO any fees and costs indicated in the fees section below.

Currency:	EUR
Deposit account number:	28000327
Account holder:	Uexküll & Stolberg

Refunds

Any refunds should be made to EPO deposit account:	28000327
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Fees

	Factor applied	Fee schedule	Amount to be paid
010 Opposition fee	1	775.00	775.00
Total:		EUR	775.00

	A Forms	Details:	System file name:
A-1	Form for notice of opposition		ep-oppo.pdf

	B Attached document files	Original file name:	System file name:
B-1	1. Facts and arguments	98381 EPO Notice of Opposition.pdf	OPPO.pdf

	C Attached evidence files	Original file name:	System file name:
C-1	1. Patent document	D1_US_07228807_B1.pdf	Published-Evidence-1.pdf
C-2	2. Patent document	D2_EP_00536543_A1.pdf	Published-Evidence-2.pdf
C-3	3. Patent document	D3_EP2848109A1.pdf	Published-Evidence-3.pdf
C-4	4. Patent document	D4_US4664290.pdf	Published-Evidence-4.pdf
C-5	5. Patent document	D5_EP0140699A2.pdf	Published-Evidence-5.pdf
C-6	6. Patent document	D7_DE_68916976_T2.pdf	Published-Evidence-6.pdf
C-7	7. Patent document	D8_WO_9602123_A1.pdf	Published-Evidence-7.pdf

C-8	8. Patent document	EP2637492B1.pdf	Published-Evidence-8.pdf
C-9	9. Patent document	WO_12062876_A1.pdf	Published-Evidence-9.pdf
C-10	10. Patent document	IT PD2010A000338.pdf	Published-Evidence-10.pdf
C-11	1. Other evidence	D6-Amazone.pdf	Other-evidence-1.pdf
C-12	1. Translation of a citation	IT1 EN PD2010A000338_TRA.pdf	Evidence-Tran-1.pdf

Signature of opponent or representative

Place	**Hamburg**
Date:	**03 September 2015**
Signed by:	**Malte Frese 41443**
Association:	**Uexküll & Stolberg**
Representative name:	**Malte Frese**
Capacity:	**(Representative)**

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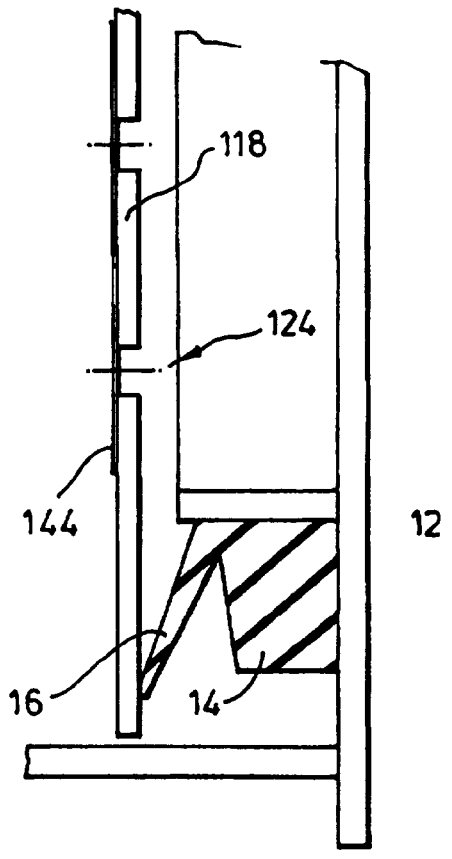
With international search report.

With amended claims and statement.

(54) Title: SEED DISPENSING MECHANISMS

(57) Abstract

A seed selection arrangement for a differential pressure seed selection mechanism comprises a seed selection plate assembly (144) and a flexible seal (14) for defining regions of differing pneumatic pressures. The seed selection plate assembly comprises an apertured flexible seed selection plate (144) mountable on a rotatable support plate (118). The support plate (118) is substantially thicker than the seed selection plate (144). In another aspect of the invention there is provided a seed dispensing mechanism having control means for controlling the application of the pressure differential for seed discharge purposes. The control means is in the form of a resiliently loaded control member mountable for sliding engagement with the seed selection plate assembly.



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BE	Belgium	**GR**	Greece	**NL**	Netherlands
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FR	France	**MN**	Mongolia	**VN**	Viet Nam
GA	Gabon				

SEED DISPENSING MECHANISMS

This invention relates to a method and apparatus for dispensing seed. More particularly, the invention relates to a method and apparatus in which a difference in pneumatic pressure is employed for seed selection purposes.

In the case of known pneumatic seed selection mechanisms as used in currently available farm machinery, and indeed in such mechanism as have been available commercially over the last 30 years or thereabouts, the arrangement is generally as follows. A stainless steel seed selection disc is arranged to co-operate with a body member or vacuum manifold, generally of a plastics material, the disc being rotatable and the body member being fixed. The disc and the body member are in sliding face-to-face contact over a substantial proportion of the side surface of the disc. Sub-atmospheric pressure is applied to the disc over a generally arcuate sub-area of the disc in which seed selection apertures are formed on a pitch circle centred on the rotation axis of the disc. Thus, a sub-atmospheric pressure or "vacuum" applied to the disc over the arcuate area effects seed selection from a seed supply housed in the body member and holds the selected seeds to the disc as the disc rotates. In accordance with well-established practices, the excess seeds are doffed from the seed selection apertures as the disc rotates, until only one seed remains. Then, the vacuum is blanked-off in order to dispense the seeds selectively from the apertures.

All the above technology is extremely well-known and has been widely used internationally over the last 30 years at least, and so far as commercial use is

concerned, has been used more or less exclusively in the form described.

Shortcomings of this prior system which have equally been well-known over this long period relate, inter alia, to the wearing characteristics of the mechanism and the consequential need for replacement parts.

As would be expected by those aware of the characteristics of the working environment of such mechanisms, and indeed of the stainless steel and plastics materials themselves, wear occurs both in relation to the body member and the stainless steel disc itself. One reason for this is the fact that the mechanism in use acts as a vacuum cleaner tending to attract significant amounts of dust in what is inevitably a very dusty situation when seeds are being planted in anything other than damp conditions.

Accordingly, we have identified a significant need for improvements in relation to methods and apparatus for pneumatically selecting seed wherein the wearing characteristics of the method and apparatus are improved.

Accordingly in certain embodiments of the invention there is provided a method and apparatus for dispensing seeds wherein seeds are selected employing a difference in pneumatic pressure applied to a seed selection disc or plate having seed selection apertures. In these embodiments of the invention, the arrangement is such that the seed selection disc or plate assembly is itself capable of supporting the load arising from the difference in pneumatic pressure applied to it and a flexible seal co-operates with the disc or plate to define regions of differing pneumatic pressure.

By arranging for the disc or plate to be self-supporting in combination with flexible sealing means,

the advantage is provided that the seal represents the only significant surface making rubbing contact with the disc or plate, and wear between these surfaces is accordingly correspondingly minimised. For example, when a lip-type seal is employed, the seal makes contact with the disc or plate only over the very narrow lip area, for example substantially line contact in an annular shape, and therefore it is only along this annular line where wear can occur. Because the disc or plate is self-supporting, it does not need to bear or rub against any other structure for reasons of support.

In an embodiment of the invention, the advantage is provided that substantially all or a major proportion of the frictional face-to-face rubbing contact between the rotating disc or plate and the non-rotatable body of prior art mechanisms is eliminated. In the embodiment, the seed selection disc is accordingly no longer a sacrificial component of the mechanism. The thickness of the seed selection disc or plate and its mode of mounting are such that it is self-supporting and thus it differs significantly in these respects from the discs or plates of prior art mechanisms which have not needed to perform this function since they have been supported by the associated non-rotatable body structure.

One more specific aspect of the invention relates to the means for selecting and dispensing relatively small seeds such as carrot or lettuce or tomato seeds - as opposed to maize or field beans or the like seeds.

Pneumatic seed selection mechanisms applicable to small seeds such as lettuce seeds have hitherto been subject to difficulties arising from the fact that the small seeds apertures need to be so very small, as

compared with the apertures applicable to, for example, field beans. As a practical matter, it is difficult and expensive to make seed selection apertures through the metallic structure of a seed selection disc and which are small enough to be suitable for small seeds such as lettuce. Typically, such an aperture might have a diameter in the range of 0.5 to 0.8 mm.

In addition to the mere production cost and difficulty of providing holes at such a size without any burrs or other irregularities, there is the attendant problem of dust and dirt and debris lodging in such holes during use. Conventionally, seed holes are provided in relatively thick discs and the provision of an aperture at such a diameter through a conventional disc means that the aperture is effectively (as compared with its diameter) a tube in which debris can be relatively easily lodged. Moreover, the pneumatic seed selection mechanism applies vacuum to the disc and foreign matter and debris is constantly drawn into these tubes and they tend to become blocked.

The conventional solution to this problem is to countersink the aperture from the non seed-selection side of the disc. However, this arrangement is not particularly satisfactory since it requires relatively complicated additional manufacturing procedures. Also, the arrangements for sealing such discs have hitherto suffered from the same disadvantages as are discussed elsewhere in the specification.

Accordingly, there is a need to provide a seed selection disc or plate arrangement, particularly for use in relation to a pneumatic seed selection mechanism of the kind disclosed above, but applicable more widely also, in which the hitherto conventional countersink arrangement is replaced by an alternative

arrangement which retains the advantages of the countersink arrangement in terms of the seed selection hole proportions, as they affect the resistance of the seed selection apertures to become plugged or otherwise to suffer from technical disadvantages in use, while offering improvements in relation to other aspects of this construction, including manufacturing.

There is disclosed in our own European patent EP 0 145 237 a pneumatic seed selection mechanism in which a thin and flexible or floppy disc is employed. We incorporate herein by reference the entire text and drawings of this prior publication by way of additional disclosure. This enables the convenient and relatively inexpensive production of seed selection apertures for small seeds. This can be done, for example, by a simple etching technique. More than one row of such apertures can be employed. The seed selection disc runs against a plastics manifold or gallery member to define the regions in which vacuum is applied to the disc. The disc can be likewise provided with larger seed selection apertures so as to enable the dispensing of larger seeds such as field beans. To the best of our knowledge, this prior-patented thin disc system represents the only way in which the entire range of seed sizes from large seeds to small seeds can be effectively dispensed by a single metering mechanism using interchangeable discs and a vacuum selection technique.

A shortcoming however of our above-identified and prior patented thin disc pneumatic seed selection mechanism arises in dusty conditions in which dust finds its way between the rotating thin disc and the non-rotating plastics manifold and eventually causes some wear of the thin disc. In non dusty conditions, such a disc lasts the lifetime of the planter. However, some improvement in this respect is desirable

and according to this aspect of the present invention there is provided a method and apparatus as defined in claim 1 of the accompanying claims.

In the embodiments of this aspect of the invention there is provided a seed selection mechanism and a seed selection plate or disc assembly comprising a relatively thin flexible seed selection disc or plate. The term "flexible" as used in this specification in relation to a disc or plate is intended to mean that the disc or plate is flexible to the extent that it is able to deform under the pneumatic pressure differential applied thereto so as to provide a self sealing effect with respect to its support. In an embodiment, a seed selection plate or disc has a thickness of betweeen 0.20 and 0.30 mm, and the reduced pressure applied to the seed selection plate or disc assembly is in the range of 30 to 100 millibars.

In the embodiments, the flexible disc is mounted in relation to a supporting disc or plate. The supporting disc or plate supports the flexible disc against the effect of the applied vacuum. A seal co-operates with the supporting disc or plate to define the region in which vacuum is applied to the disc assembly.

By providing an arrangement in which a flexible disc mounted on or in relation to a supporting disc or plate, is able as an assembly to co-operate with a seal, for example a lip-type seal, the advantage is provided that the seal produces negligible wear of the supporting disc or plate, even under dusty conditions, because it is loaded against the disc or plate only to the extent normal for a seal of that particular kind. Thus, in the case of a lip-type seal, the loading is that which is produced by the relevant degree of deflection of the lip of the seal itself.

Because in the embodiment the lip or other type of seal contacts the seed selection disc assembly only on the supporting disc or plate itself, there is no contact at all between the seal and the flexible disc, and therefore no wear at all of the latter at the region of sliding and sealing contact. In use, the vacuum applied to the assembly draws the flexible disc against its support and they function in this respect as one structure. The flexibility of the disc allows it to accommodate itself to any slight irregularities in the linearity of the support disc or plate under the action of vacuum applied to both.

In the embodiment, a circular and conventional proprietary lip-type seal may be employed. The diameter of this seal is arranged to fully encompass the seed selection region defined by the row or rows of seed selection apertures in the flexible disc so that vacuum is applied to the entire row within the seal, and the row of seed selection apertures does not cross the seal and cause wear, as in the case of the Deere prior proposal mentioned below.

Generally, the arrangement will be such that the disposition of the seal relative to the seed selection disc and its support plate or disc is such that vacuum is applied to the entire inner region of the double disc or plate assembly, apart from the region in which the vacuum is removed by means of the vacuum cut-off assembly in which a control member covers over a portion of the disc assembly and atmospheric pressure may be applied to the seed selection holes.

In accordance with this aspect of the present invention, a seed selection disc or plate assembly for use in a pneumatic seed selection mechanism comprises primary and secondary rotatable apertured plates or discs. For the purpose of dispensing small seeds, the primary dispensing plate is formed with at least one

row of appropriately sized apertures. One or more corresponding apertures or openings are formed in the secondary plate. The apertures in the secondary plate are substantially larger than those in the primary plate and are disposed so as to, at least partially, overlap with those in the primary plate.

The arrangement may be such that the apertures in the secondary plate are generally aligned with those in the primary plate and fully encompass at least some of these. The material of the primary plate is of substantially reduced thickness as compared with that of the secondary plate. As a result, the proportions of the small and large size apertures in the primary and secondary plates are such as to tend to inhibit blocking of the latter by foreign matter. The co-operating arrangement with the secondary disc provides support for the primary disc and allows the application of vacuum to the assembly. Indeed, both discs are held together by the vacuum applied to the assembly.

Accordingly, it can be seen that in the embodiment the advantages of the countersink arrangement are combined with those of the self-supporting disc while permitting the dispensing of small seeds with the required ability to resist the tendency for the apertures to become blocked.

The application of vacuum to the seed selection apertures in the primary flexible disc from the vacuum chamber through the secondary supporting disc or plate in the embodiments is by means of said apertures or openings formed in the supporting disc or plate. In one embodiment there is provided an aperture or opening in the supporting disc or plate for each of the seed selection apertures in the flexible disc. Thus in one embodiment, the supporting disc is itself in the form of a seed selection disc for large seeds

(with its projecting seed-stirring elements removed). Alternatively, the supporting plate or disc can be provided with elongated openings communicating with the small seed selection apertures in the flexible disc. In some cases it may be convenient to provide the supporting disc or plate merely with an annular opening at the appropriate location with occasional (three or more) transverse lands linking its outer portion to its inner portion. Generally, the same supporting disc or plate will be used for each one of a range of flexible discs having differing seed selection hole sizes, but it may be desirable for particular cases to provide a supporting disc or plate for particular ones of such a range.

A further aspect of this invention relates to the provision of a pneumatic seed selection mechanism in which an improved arrangement is provided for the controlled application of "vacuum" (meaning a pressure lower than atmospheric pressure) to the seed selection disc or assembly.

There is disclosed in, inter alia EP-A-0 141 637 (Deere) a pneumatic seed selection mechanism in which a seal having a non-circular shape serves to define and separate regions in which vacuum is applied to the seed selection disc and in which vacuum is not thus-applied.

Shortcomings of this prior proposal include the cost of the seal, which is a non-proprietary item, the fact that the seed selection holes consistently cross the seal during use and thus wear it, and the fact that the vacuum cut-off region is fixed and determined by the seal shape and cannot be changed as, for example, is required in order to change the characteristics of the mechanism for particular crops.

US-A-5 401 035 (Schoenmaekers) discloses a seed selection mechanism in which an O-ring is employed.

There is no disclosure of the system for controlling the application of vacuum in the region where seeds are to be removed from the disc. It must be expected that the mechanism employs a gallery system as indeed is common in planters in commercial use in which the control of the application of vacuum is achieved by the use of galleries moulded into a manifold or gallery member against which the seed selection disc runs. Such an arrangement is likewise subject to the shortcoming that the arrangement for control of the application of the vacuum to the disc cannot be readily varied for different crops since this would require replacement or interchange of the gallery member structure.

According to this aspect of the invention there is provided a seed dispensing mechanism as defined in claim 13 of the accompanying claims.

In the embodiment, since substantially the entire centre region of the seed selection disc has vacuum applied to it, effectively as many lines of seed can be selected by means of seed selection apertures arranged in concentric circles, as may be desired. Normally there will be from one to three lines of seed selected.

The sealing member is preferably of standard circular shape and vacuum is applied to the entire surface of the disc within this circular region defining an inner seed selection region. Control of the application of vacuum is achieved by means of a resiliently-loaded control member which slidingly engages the disc (where a self-supporting disc is used) or the disc assembly (where the combination of a self-supporting disc and a flexible or floppy disc are employed) so as to reduce or eliminate the effect of the vacuum applied to the rearface of the disc or the disc assembly.

The control member may be provided in the form of a spring-loaded plastic pad. This pad is able to accommodate the small degree of movement of the self-supporting disc under the action of the vacuum applied to it, and/or accommodate any irregularities in the linearity of the surface of the disc.

In an embodiment, the control member may be of a circumferential length (with respect to the disc) such as to cover a series of seed selection apertures in the disc or disc assembly, whereby, although the individual seeds are removed from the disc as soon as the vacuum is cut off from the seed selection holes, nevertheless the then open holes do not immediately have vacuum reapplied to them, with the attendant possibility of directly attracting foreign matter or debris before the vacant holes pass through the seed reservoir region and pick up further seeds.

A further feature of the control member in the embodiments is the provision of an opening or channel through to the atmosphere at a region in the control member, which region is aligned with the row of seed holes. In the case of a control member or control members covering more than one row of seed holes, it would be arranged that this opening provides access to atmosphere to both or each row of seed apertures. In this way, the removal of the vacuum applied to the seed selection disc by the presence of the control member is further enhanced by positively allowing the pressure within each seed selection aperture in turn to be brought back to atmospheric pressure. Such an arrangement is preferable to the previously proposed technique of providing a blower delivering a jet of air onto the disc in the relevant region so as to blow seed off. Such an arrangement tends to interfere with the controlled deposition of seed at well defined locations.

Embodiments of the invention will now be described by way of example and with reference to the accompanying drawings, in which :-

Fig 1 shows a cross section through a seed selection mechanism;

Figs 2 and 2A show a cross section through a seed selection mechanism similar to that of Fig 1 showing a modification for small seeds, Fig 2 being an exploded view;

Fig 3 shows an axial view of the seed selection mechanism of Fig 1 as seen in the direction of arrow III therein; and.

Fig 4 shows a partial inverted section on IV - IV of Fig 3 illustrating seed discharge details.

In Figs 1 and 3, the general construction and mode of operation is generally as described above.

The principal constructional items of the seed dispensing mechanism 10 comprise a non-rotatable body or housing 12 carrying an annular non-rotatable seal 14 having a flexible lip 16 which co-operates with a self-supporting seed selection disc 18 mounted on a bearing 20 for rotation about an axis 22 and provided with rows of seeds selection apertures on pitch circles indicated at 24, 26 and 28.

Disc 18 is sufficiently stiff to support itself against the vacuum applied to it by a vacuum pump connected to housing 12 and tending to bend the disc, especially in its outer regions, in the left-to-right direction in Fig 1. Flexible lip 16 accommodates this movement.

In Fig 3 item 30 indicates a seed supply zone fed by seeds from a hopper (not shown) and through which the seed selection apertures on the pitch circle 24 passes.

Item 32 indicates a seed singulating mechanism of generally known construction and adjustable in an arc

between positions indicated at 34 and 36 to vary the singulating effect.

Item 38, shown in more detail in Fig 4, shows the resiliently-loaded control member for controlling the removal of vacuum to an area of disc 18 for seed discharge purposes. The control member 38 comprises pad 44 which is spring-pressed against disc 18 by spring 46.

The spring-loaded pad 44 is able to accommodate any small degree of movement of the self support disc 18 under the action of the vacuum applied to it, as well as accommodating any minor imperfections in the surface of the disc.

The control member 38 is provided with a channel or drilling or bore 48 through to atmospheric pressure, the channel 48 being aligned with a seed selection aperture in disc 18. In this way, in use, the removal of vacuum applied to the seed selection disc 18 by the presence of control member 38 is enhanced by positively allowing the pressure within the seed selection aperture at 24 to be brought back to atmospheric pressure.

This embodiment has the advantage that the sealing lip does not cross the line of seed selection apertures and therefore has excellent wear characteristics.

As can be seen in Fig 3, pad 44 is so shaped as to cover a series of seed selection apertures in disc 18. Although the individual seeds are removed from the disc 18 as soon as the vacuum is cut off from the apertures, by being covered by pad 44, the open apertures do not immediately have vacuum re-applied to them, which would tend to attract foreign matter before the vacant aperture has passed through the seed reservoir to pick up a further seed.

In use, seeds are picked up by seed selection

apertures 40 from seed supply 30 and the seeds are singulated at 32 and finally discharged by the cut-off plate 38.

Figs 2 and 2A illustrate one aspect of the invention, relating to the selection and dispensing of relatively small seeds, such as carrot seeds, lettuce seeds, or tomato seeds. The apparatus of Figs 2 and 2A is similar to the apparatus of Fig 1, and like parts have been given the same reference numerals. This apparatus comprises a support disc 118, similar to the seeds selection disc 18 of Fig 1, but with its projecting seed-stirring elements removed. Typically, the disc 118 has a diameter of 288 millimetres and a thickness of 2 millimetres. The support disc 118 is provided with a row of aperture on the pitch circle indicated at 124. Typically the apertures have a dimension of 5.0 millimetres.

As with the arrangement of Fig 1, support disc 118 cooperates with an annular non-rotatable seal 14 having a lip 16 to define the region in which vacuum is applied to the support disc 118.

Mounted on the support disc 118 is a flexible seed selection disc 144. The seed selection disc 144 is apertured, with the apertures arranged to align or overlap with the apertures of the support disc 118. The seed selection disc 144 is of substantially reduced thickness as compared with the support disc 118 (typically the disc 144 has a thickness of 0.25 millimetres).

The size of the apertures in the seed selection disc 144 are selected according to the type of small seeds to be dispensed. Typically such apertures might have a diameter in the range of 0.5 to 2.0 millimetres.

In use, support disc 118 is sufficiently stiff to support itself, and the seed selection disc 114,

against the vacuum applied to it, with any bending being accommodated by the flexible lip 16 of seal 14. The applied vacuum also serves to draw to, and hold, the seed selection disc 144 against the support disc 118, through the apertures in the support disc 118 forming, in effect, a unitary seed selection assembly. The flexibility of the seed selection disc 144 accommodates itself to any slight irregularities in the linearity of the support disc 118.

Therefore, rotation of the seed selection assembly against the seal 14 produces negligible wear of the support disc 118, and because there is no contact between the seal 14 and the flexible seed selection disc 144, no wear occurs in the region of sliding and sealing contact.

Furthermore, the relative arrangements of the apertures in the disc assembly provide the advantage of prior art countersink arrangements of resisting the tendency for the apertures to become blocked by foreign matter, but without the attendant difficulties and cost of manufacture.

CLAIMS :-

1 A seed selection arrangement for a differential pressure seed selection mechanism comprising :-

a seed selection plate or disc assembly and flexible sealing means for defining regions of differing pneumatic pressures;

characterised in that

said seed selection plate or disc assembly comprises an apertured flexible seed selection disc or plate mountable on, or in relation to, a rotatable support disc or plate.

2 A seed selection arrangement for a differential pressure seed selection mechanism comprising :-

a seed selection plate or disc assembly and flexible sealing means for defining regions of differing pneumatic pressures;

characterised in that

said seed selection plate or disc assembly comprises a relatively thin primary plate and a relatively thick secondary plate;

said primary plate being formed with at least one row of relatively small apertures and said secondary plate being formed with substantially larger apertures disposed so as to be able to at least partially overlap the apertures of the primary plate.

3 A seed selection arrangement according to claim 2 wherein apertures in the secondary plate are arranged to be generally aligned with the apertures in the primary plate.

4 A seed selection arrangement according to any one of the preceding claims wherein said flexible sealing means comprises a lip type seal.

5 A seed selection arrangement according to any one

5 A seed selection arrangement according to any one of the preceding claims wherein the flexible sealing means is disposed relative to the seed selection plate or disc assembly to apply, in use, a reduced pressure to the entire inner region of the disc assembly.

6 A seed selection arrangement according to any one of the preceding claims wherein said seed selection plate or disc has a thickness measured between its opposite faces from 0.2 millimetres to 0.3 millimetres.

7 A seed selection arrangement according to any one of the preceding claims wherein said seed selection plate or disc is provided with circular apertures of diameter between 0.5 millimetres and 5.0 millimetres.

8 A seed selection arrangement according to any one of the preceding claims wherein said pressure differential is applied to the face of said support plate remote from said seed selection plate, and a resiliently-loaded control member is engageable with the support plate to reduce or eliminate the effect of the pressure differential, for seed discharge purposes.

9 A seed selection arrangement for a differential pressure seed selection mechanism comprising a rotatable seed selection plate or disc assembly and flexible sealing means for defining regions of differing pneumatic pressure characterised in that said flexible sealing means comprising a lip type seal.

10 A seed dispensing mechanism for an agricultural precision drill or planter, the seed dispensing mechanism comprising :-

a housing;

a seed supply in the housing;

a seed outlet formed in the housing at a location spaced from said seed supply;

a rotatable seed selection arrangement having a plurality of circumferentially spaced seed selection apertures formed therein and positioned to pass through said seed supply as the arrangement rotates and thereby to be exposed to the seeds in said supply on one side of the arrangement;

a source of pressure differential to be applied to the seed selection arrangement to cause seeds from said supply to be selected therefrom and held in said seed selection apertures as the arrangement rotates;

said pressure differential being a vacuum applied to said other side of said arrangement and being sufficient to permit effective seed selection and seed release by said arrangement; and

seed release means to release seeds from said seed selection arrangement into said seed outlet whereby, in use, seeds are selected from said supply in said seed apertures and are transported by rotation of said arrangement and released into said seed outlet;

characterised by a seed selection arrangement according to any one of the preceding claims.

11 A seed dispensing mechanism comprising a rotatable self-supporting seed selection plate or disc assembly;

a source of pressure differential to be applied to one side of the seed selection plate or disc assembly;

a non-rotatable flexible seal for defining regions of differing pneumatic pressure across the one side of the seed selection plate or disc assembly; and

control means for controlling the application of

the pressure differential for seed discharge purposes; characterised in that said control means comprises a resiliently loaded control member mounted for sliding engagement with said seed selection plate or disc assembly.

12 A seed dispensing mechanism according to claim 11 wherein said control member is adapted to cover simultaneously more than one seed selection aperture in the seed selection plate or disc assembly.

13 The seeds dispensing mechanism according to claim 11 or 12 wherein the control member is provided with an opening or channel through to atmospheric pressure which is adapted to be aligned with a row of seed selection apertures.

AMENDED CLAIMS

[received by the International Bureau on 3 January 1996 (03.01.96); original claims 1-13 replaced by amended claims 1-15 (5 pages)]

1 A seed selection arrangement for a differential pressure seed selection mechanism comprising :-

a) a seed selection plate or disc assembly and sealing means for defining regions of differing pneumatic pressures; and

b) said seed selection plate or disc assembly comprises an apertured flexible seed selection disc or plate mountable on, or in relation to, a rotatable support disc or plate;

characterised in that

c) said sealing means for defining regions of differing pneumatic pressures being flexible so as to be adapted to accommodate relative axial movement between the sealing means and said plate or disc assembly during use; and

d) said apertured flexible seed selection disc or plate being sufficiently flexible to be able to accommodate itself to irregularities in the linearity of said support disc or plate.

2 A seed selection arrangement for a differential pressure seed selection mechanism comprising :-

a) a seed selection plate or disc assembly and flexible sealing means for defining regions of differing pneumatic pressures;

b) said seed selection plate or disc assembly comprising a relatively thin primary plate and a relatively thick secondary plate; and

c) said primary plate being formed with at least one row of relatively small apertures;

characterised in that

d) said secondary plate is formed with substantially larger apertures disposed so as to be able to at least partially overlap the apertures of the primary plate.

3 A seed selection arrangement according to claim 2 wherein said apertures in the secondary plate are arranged to be generally aligned with the apertures in the primary plate.

4 A seed selection arrangement according to any one of the preceding claims wherein said flexible sealing means comprises a lip type seal.

5 A seed selection arrangement according to any one of the preceding claims characterised by said relatively thin or flexible seed selection disc or plate lying, in use, totally within the external profile of said relatively thick secondary support disc or plate.

6 A seed selection arrangement according to any one of the preceding claims wherein the flexible sealing means is disposed relative to the seed selection plate or disc assembly to apply, in use, a reduced pressure to the entire inner region of the disc assembly.

7 A seed selection arrangement according to any one of claims 1 to 6 characterised by said sealing means being positioned for sealing engagement with said secondary support disc or plate.

8 A seed selection arrangement according to

any one of the preceding claims wherein said seed selection plate or disc has a thickness measured between its opposite faces from 0.2 millimetres to 0.3 millimetres.

9 A seed selection arrangement according to any one of the preceding claims wherein said seed selection plate or disc is provided with circular apertures of diameter between 0.5 millimetres and 5.0 millimetres.

10 A seed selection arrangement according to any one of the preceding claims wherein said pressure differential is applied to the face of said support plate remote from said seed selection plate, and a resiliently-loaded control member is engageable with the support plate to reduce or eliminate the effect of the pressure differential, for seed discharge purposes.

11 A seed selection arrangement for a differential pressure seed selection mechanism comprising a rotatable seed selection plate or disc assembly and flexible sealing means for defining regions of differing pneumatic pressure characterised in that said flexible sealing means comprises a lip type seal.

12 A seed dispensing mechanism for an agricultural precision drill or planter, the seed dispensing mechanism comprising :-

a housing;

a seed supply in the housing;

a seed outlet formed in the housing at a location

spaced from said seed supply;

a rotatable seed selection arrangement having a plurality of circumferentially spaced seed selection apertures formed therein and positioned to pass through said seed supply as the arrangement rotates and thereby to be exposed to the seeds in said supply on one side of the arrangement;

a source of pressure differential to be applied to the seed selection arrangement to cause seeds from said supply to be selected therefrom and held in said seed selection apertures as the arrangement rotates;

said pressure differential being a vacuum applied to said other side of said arrangement and being sufficient to permit effective seed selection and seed release by said arrangement; and

seed release means to release seeds from said seed selection arrangement into said seed outlet whereby, in use, seeds are selected from said supply in said seed apertures and are transported by rotation of said arrangement and released into said seed outlet;

characterised by a seed selection arrangement according to any one of the preceding claims.

13 A seed dispensing mechanism comprising a rotatable self-supporting seed selection plate or disc assembly;

a source of pressure differential to be applied to one side of the seed selection plate or disc assembly;

a non-rotatable flexible seal for defining regions of differing pneumatic pressure across the one side of the seed selection plate or disc assembly; and

control means for controlling the application of

the pressure differential for seed discharge purposes; characterised in that

said control means comprises a resiliently loaded control pad mounted for sliding engagement with said seed selection plate or disc assembly, and adapted to remove said pressure differential from said plate or disc over the area of said plate or disc.

14 A seed dispensing mechanism according to claim 13 wherein said pad is adapted to cover simultaneously more than one seed selection aperture in the seed selection plate or disc assembly.

15 The seeds dispensing mechanism according to claim 13 or 14 wherein said pad is provided with an opening or channel through to atmospheric pressure which is adapted to be aligned with a row of seed selection apertures.

STATEMENT UNDER ARTICLE 19

1 New claims 1 to 15 are filed.

2 Claims 5 and 7 are new, based on matters clearly disclosed in the description and drawings. Claims 6 and 8 to 15 correspond to previous claims 5 and 6 to 13 accordingly.

3 Claims 1 and 13 have been amended to clarify the distinctions from the disclosure in US 4,718,574.

4 Claim 2 has been amended so as to correctly delimit it in two-part form with respect to the disclosure in the US '574 specification.

5 The remaining claims have been amended accordingly editorially.

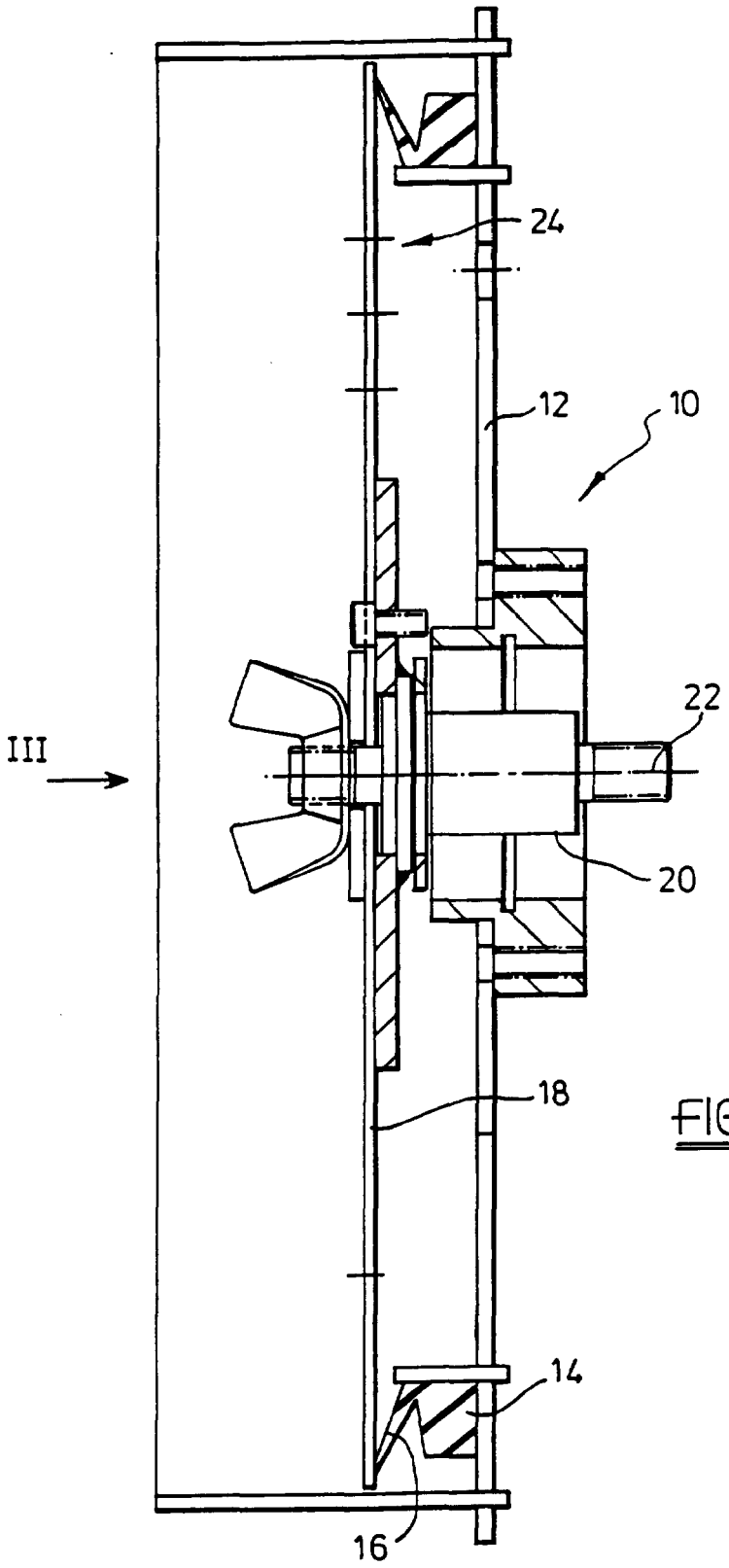


FIG.1

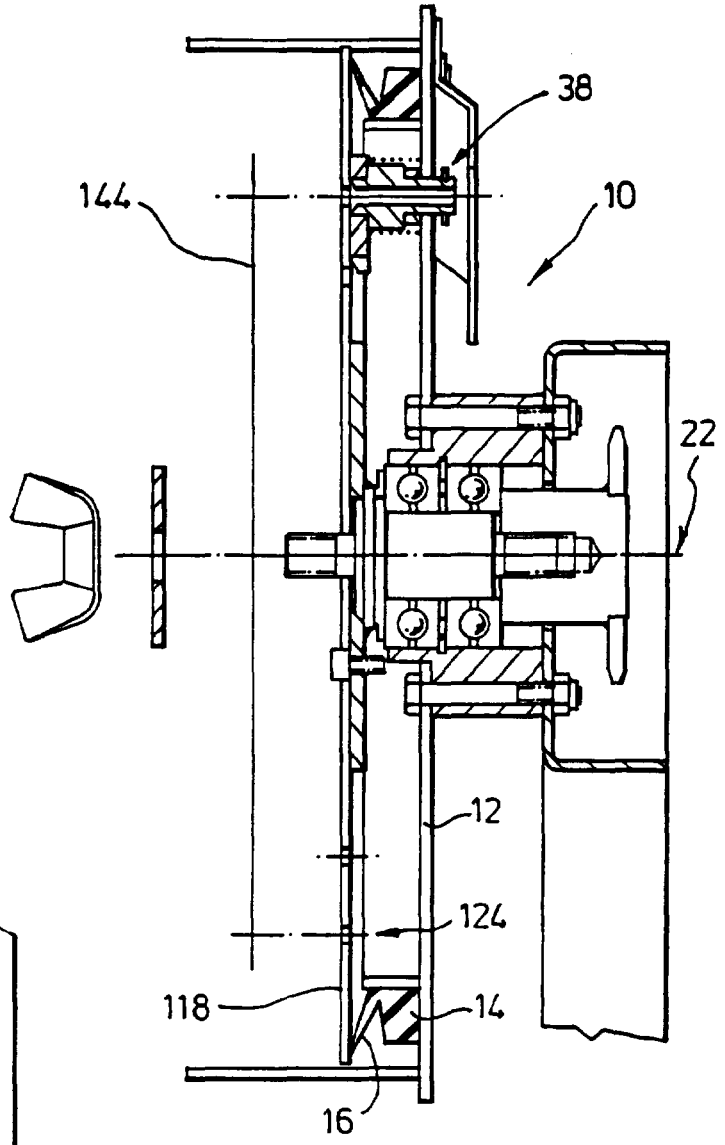


FIG.2

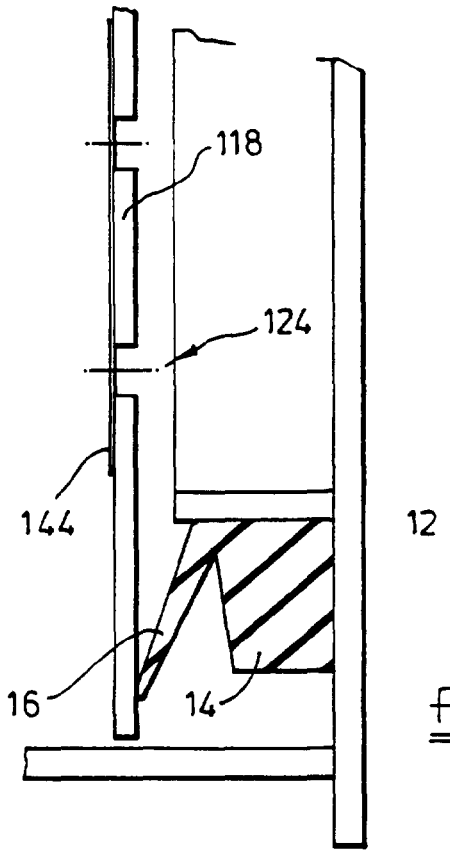


FIG.2A

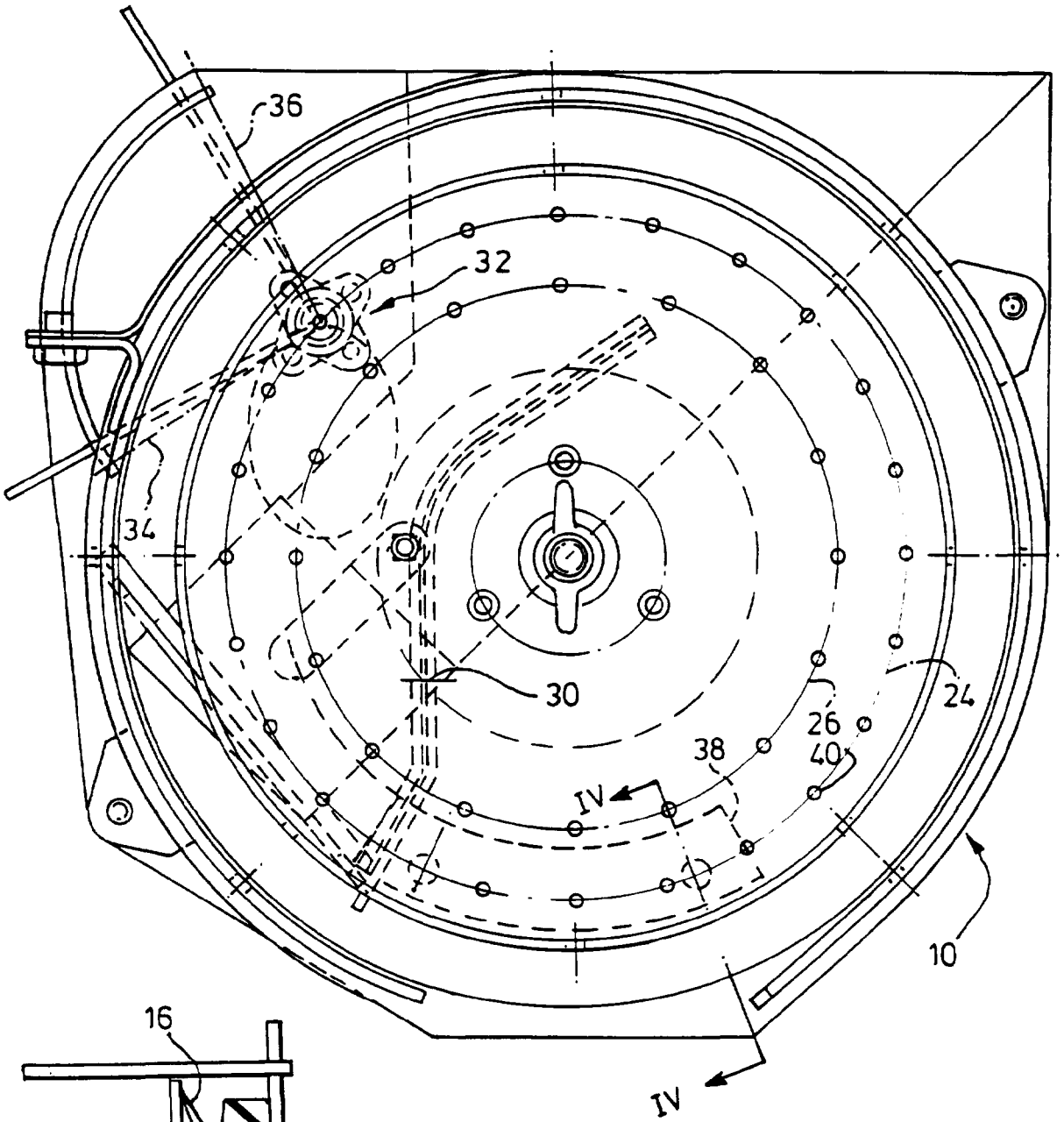


FIG.3

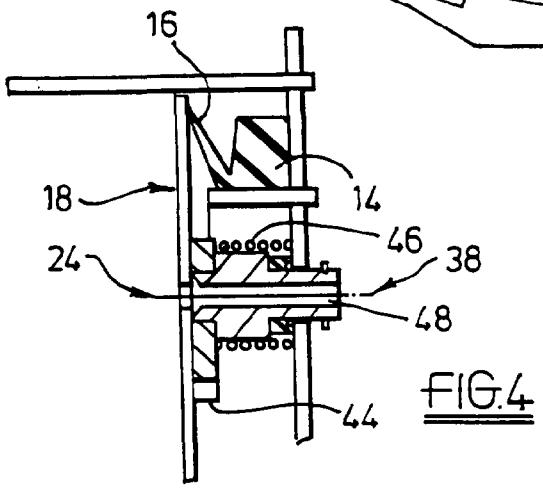


FIG.4

INTERNATIONAL SEARCH REPORT

Inter. ial Application No
PCT/GB 95/01647

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A01C7/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A01C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP,A,0 195 900 (FÄHSE) 1 October 1986 see the whole document	1,5,8, 10,11,13
P,A	EP,A,0 636 305 (FIORIDO) 1 February 1995 see column 4, line 36 - column 7, line 15; figures 1,2	1,4,5,10
A	DE,U,88 02 181 (GUGENHAN) 31 March 1988 see page 6, paragraph 5 - page 7; figures 1,2	8,10-12

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
3 October 1995	31. 10. 95

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax (+31-70) 340-3016	Vermander, R

Form PCT/ISA/210 (second sheet) (July 1992)

Precision Exhibit 1005

INTERNATIONAL SEARCH REPORT

Inter. nal Application No
PCT/GB 95/01647

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A-195900	01-10-86	AU-B- 583347	27-04-89
		AU-B- 5364486	28-08-86
		CA-A- 1268081	24-04-90
		JP-B- 6071365	14-09-94
		JP-A- 61247306	04-11-86
		SU-A- 1556526	07-04-90
		US-A- 4718574	12-01-88
EP-A-636305	01-02-95	NONE	
DE-U-8802181	31-03-88	EP-A- 0329095	23-08-89

Form PCT/ISA/210 (patent family annex) (July 1992)

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(22) Date of filing: **07.09.92**

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14.04.93 Bulletin 93/15

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PROPRIA Protezione Proprietà Industriale
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I-33170 Pordenone (IT)

(54) Pneumatic precision seed drill.

(57) Precision-type single-seed planter with a distributor in the form of a disk (13) provided with perforations (34) and co-operating with a seed container (11, 15) and an air suction device.
The perforations (34) in the disk (13) have an elongated shape and a reduced cross-section. A selector element (14) is arranged to co-operate with the disk (13) by throttling the air suction area of the perforations.
An optimum seed separation and single-seed distribution effect is thereby achieved, regardless of the size and the shape of the seeds.

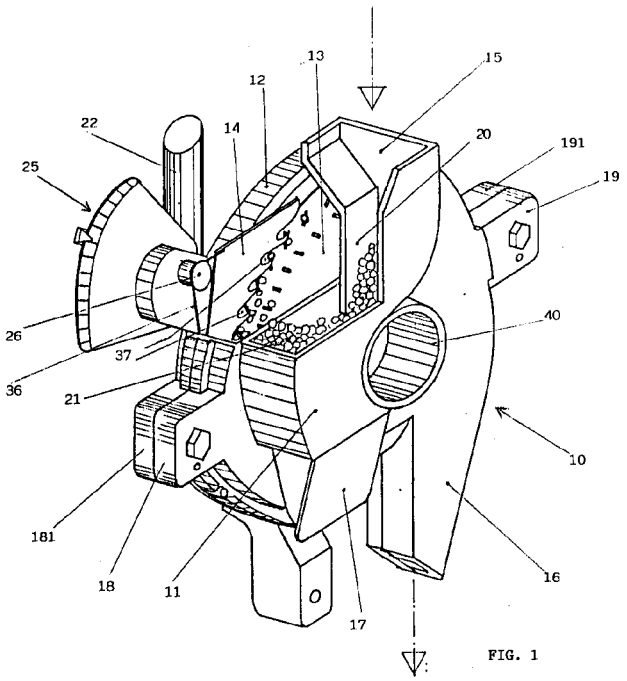


FIG. 1

EP 0 536 543 A1

The present invention relates to precision-type, single-seed drilling planters, which are adapted to deposit seeds in the ground on a one-by-one basis, at regular intervals, ie. regularly spaced, along sowing rows.

It is well-known that these machines are used in particular for such cultivations as maize, sugar beet, soya, horticultural-type vegetables and all those horticultural and agricultural species in general that require regularly spaced sowing or deposition of either peeled or unpeeled, bare or coated seeds. Precision-type single-seed planters have a number of advantages as compared with universal-type ones. These advantages include a reduction in or even the elimination of downtimes required to subsequently carry out a thinning out of the plants, a simplification in the tilling and harvesting operations, a saving in the quantity of seeds used.

Precision-type single-seed planters can essentially be divided into two categories based on the distribution system that they are actually implementing, ie. mechanical or pneumatic.

This invention refers to precision-type single-seed planters falling into the pneumatic-type category, in which the withdrawal of the seeds from the loading container, their separation and their distribution according to a one-by-one pattern are performed by means of a rotating perforated disk having one or more sequences of concentric circular perforations, and co-operating on one side with a suction blower, which creates a negative pressure of the air through the perforations of the disk and thereby keeps the seeds adhering to the disk until the unloading zone is reached, and on the other side with a mechanical separator which enables the seeds to be selected one by one and causes excess seeds to fall back into the container.

In single-seed planters of the known type, in which the perforations of said disk are generally circular in their shape, it is rather difficult to succeed in having a single seed in correspondence of each perforation of the disk, particularly in those cases in which the seeds have no regular shape and/or have differing sizes. It is therefore general practice to try to use disks with quite large perforations so as to ensure that at least one seed is in all cases captured for distribution. However, by increasing the size of the individual perforations so as to enable even the largest seeds in the lot to be sucked in, a further problem is created in that smaller seeds have then the opportunity of passing through the perforations, or else in that many smaller seeds may get stuck in the perforations, thereby obstructing them. It is therefore quite difficult to succeed in separating the seeds so as to ensure that a single seed is actually sucked and kept adhering to each single perforation. It may further occur that the seeds that get stuck in the perforations are ultimately broken up by the separator when the latter interacts with the perforated disk.

It therefore ensues that precision-type single-seed planters have to be provided with several sets of perforated disks having perforations drilled to different diameter sizes, which must therefore be changed quite often according to the average size and shape of the seeds to be planted, so as to reduce the extent of the above described drawbacks.

Furthermore, the separators must be positioned and adjusted in such a way as to ensure that a single seed remains in each perforation. However, in the precision-type single-seed planters of the known type this is not possible when the seeds are irregular in their shape, since any adjustment enabling two smaller seeds that may possibly be inserted in a perforation to be effectively separated, would quite often prove inadequate in keeping a larger seed adhering to the disk, so that the same seed would fall back into the container and create a void in the sowing sequence. In the opposite case, any adjustment of the selector that enables large or ill-positioned seeds to be kept adhering to the disk for their correct deposition, may even enable several smaller seeds to pass through a perforation, thereby giving rise to an irregular seed deposition pattern.

The Italian patent specification no. 1.145.917 filed by F. Walter & H. Wintersteiger KG describes a precision-type single-seed drilling machine of the pneumatic type, in which the seed drilling disk is formed by two parts, ie. more precisely by a disk-type body member connected to the suction fan means and a thin disk-like plate adhering against said body member so as to cover it on its side facing the seeds. Said disk-type body member is fixed and is provided with a guide slot extending from the centre to the periphery of said body member so as to follow the ejection path of the seed. The disk-like plate is rotatable and is provided with a plurality of radial slots extending from the central portion to the periphery of the disk. This particular type of construction enables a slower speed to be implemented at which the seeds are extracted from the container, and therefore the disk to be facilitated in more effectively capturing the extracted seeds. This occurs owing to the fact that the conveying slots are arranged according to a radial pattern and start off from the central portion of the disk. However, in order to have said conveying slots adequately spaced so as to enable the seeds to adhere along a small central circumference of the disk, said slots have be provided only in a limited number. It therefore ensues that, with the distribution of a small number of seeds for each rotation of the disk, it is necessary to work at

a very slow forward-moving speed on the field, otherwise there would be no effective or even acceptable sowing action, since the seeds would necessarily be subjected to an excessively high centrifugal force.

The therein described system proves quite effective in operation with seeds having a roundish shape, while it is clearly less effective when it comes to individually distribute single seeds being irregular in their shape, eg. tapered or pointed, or in their size. Furthermore, this particular arrangement appears to be rather complicate in its construction, since it practically requires a double disk body, each one of said two parts of the disk having further to be provided with a number of special slots.

It should further be stressed how, from a functional point of view, the seeds are with that particular arrangement coming into contact with both said parts of the disk and are subjected to a rolling action which, if it on the one side promotes separation of the seeds, may on the other side cause the seeds to become damaged owing to the considerable friction against the surfaces of said two parts of the disk along a considerable length of their path.

The European patent application no. 0.338.883 filed by ATELIERS RIBOULEAU describes a precision-type single-seed drilling machine of the pneumatical type, in which the distribution disk is provided with circular, equally spaced perforations drilled along one or two circular patterns near the outer edge of the disk.

The main feature of said solution is the suction device which has an inner channel with a differing cross-section branching off into two arms, of which one is provided with a shut-off member capable of isolating said channel arm from the suction device. In a particular embodiment, the distribution disk is provided with circular perforations arranged a long two circular rings, as well as a set of fins arranged in an alternate sequence with said perforations, which set the seeds in motion in the container and convey them from the release point in the suction device through to the point at which they fall into the ground.

In this particular embodiment, in the passage of the seeds from one ring of perforations to the other one there occurs a separation of the individual seeds which, within certain limits, is independent of the actual size and shape of the seeds. It is however quite apparent that the space taken up by the fins arranged in an alternate sequence with the perforations has a limiting effect on the quantity of perforations that can actually be drilled along each circular ring and, as a consequence, the number of seeds that can be distributed for each rotation of the disk.

It therefore ensues that the forward moving speed of the drilling machine in the field shall necessarily be reduced so as to esclude any excessively high rotation speed of the disk, which would negatively affect the seeds owing to the centrifugal forces generated. It will be also appreciated that such an arrangement implies quite an expensive, complicated construction.

In a further embodiment of said arrangement, which is adapted to operate in a likewise manner as the usual precision-type single-seed drilling machines of the pneumatic type, the distribution disk is not provided with any of such fins, but is associated with a selector element provided with rectilinear slits and adjustable into position with respect to the perforations of the disk, so that the sucked-in seeds are caused to impinge against the protrusions of the plate and are in this way selected. However, even such a constructional solution appears to have its drawbacks. As a matter of fact, the circular perforations in the distribution disk cannot be sized to any large diameter, in order to prevent seeds from getting stuck in them or passing unhindered through them. On the other hand, they cannot even be given too small a diameter, since suction would in such a case turn out to be inadequate to effect seed extraction from the hopper. Furthermore, the separator cannot work in a much efficient way in the case of irregularly shaped or sized seeds.

It is the purpose of the present invention to provide an improved type of pneumatically operated, precision-type, single-seed planter which is simpler in construction as compared with the currently known machines of the same category, and which is such as to ensure individual selection of single seeds in a really effective way, whichever the size and the shape of the seeds may also be within certain reasonable limits.

In particular, the advantage is in this way achieved of being able to use the same disk and the same adjustment thereof to individually sow or plant single seeds having different grain sizes. Furthermore, by adjusting the selector element correspondingly, the possibility is achieved to individually, ie. on a one-by-one basis, sow or plant a variety of seed species which is much wider than the one that can normally be handled with pneumatically operated single-seed planters of the hitherto known type.

The main features of the present invention are as detailed in the appended claims. Anyway, the invention, along with its peculiar characteristics and advantages, will be further described below by way of non-limiting example, with reference to the accompanying drawings in which:

- Figure 1 is a perspective, partially cross-sectioned view of the single-seed distributor

means according to the invention;

- Figure 2 is a cross-section view along the II-II line of the single-seed distributor means of Figure 1; and
- Figure 3 is a perspective, exploded view of the distributor means of Figure 1.

The single-seed distributor means 10 according to the invention can be applied to any known type of planters (not shown) whatsoever.

The single-seed distributor means 10 is essentially formed by a seed container 11 and a box-like casing 12, with a perforated disk 13, associated with a selector element 14, arranged therebetween.

The seed container 11 is provided on its upper portion with a hopper 15 for loading the seeds, and on its lower portion with an unloading conduit 16 for depositing the seeds into the ground, as well as in a preferred way with a lid 17 that can be opened to clean the container 11, particularly when it is required to change the type of seeds to be distributed.

Said seed container 11 is further provided with projections 18, 19 that are adapted to co-operate with respective projections 181 and 191 of the casing 12 to effect the connection and the closure (by means of holes, pins and bolts) of the container 11 with the casing 12.

In a preferred way, the hopper 15 extends downwards into the interior of the container 11 with a wall 20, which acts an effective fending and conveying means for the seeds 21 in the same container, as shown in Figure 2.

The box-like casing 12 is connected with an air suction device (for instance, a motor-driven fan of known type, not shown in the Figure) through a suction conduit 22 which terminates in a hole 23 (Figure 3) in correspondence of a suction slit 24 that is provided along a circumferential arc in the body of the casing 12. Said slit 24 is open on the side facing the disk 13 which, when the distributor means is assembled, is enclosed between the container 11 and the casing 12.

The casing 12 further carries a hand-operated adjusting member with related indicator means 25, which is provided with an eccentric means 26, or a similar provision, so as to adjust the position of the selector element 14 as will be described hereinafter.

The casing 12 is also provided with a perforated hub 27 (Figure 2) through which passes, as supported by bearings 28, a shaft 29 that may for instance be driven through a cog-wheel 30 to rotatably drive the disk 13, to which it is connected by means of a driving disk 31, a centering dowel 32 and a driving pin 33 (Figures 2 and 3).

According to the main feature of the present invention, said disk 13 is provided with a ring of perforations 34, which are preferably arranged according to an equally spaced pattern along a circumferential circle near the outer periphery of the same disk. Said perforations 34 have an elongated shape and a reduced cross-section, so as to prevent seeds with a smaller size from passing therethrough, while at the same time ensuring the passage of a suction air flow which is sufficient to keep seeds with a larger size adhering to the perforations during the rotation of the disk 13. Said perforations 34 may in an advantageous manner be given an arrangement which is inclined with respect to the radial direction of the disk 13, as for instance shown in Figure 3.

The selector element 14, the profile of which is situated in front of the perforations 34, co-operates with that surface of the disk 13 which is facing the seed container 11. According to a particular embodiment, said profile of the selector element 14 is designed so as to divide the perforations into two portions, ie. a seed suction portion situated in an area which is closer to the centre of the disk 13, and a single-seed selection portion that is closer to the periphery of the same disk. This enables the effectiveness of the action of the selector element to be considerably enhanced as far as both the separation of small sized seeds, without them passing through the perforation, and the retention of larger sized seeds, which are exposed to a larger flow of suction air, are concerned.

If the point is to achieve a basically low-cost planter, such as only adapted to handle seeds of the same kind, said selector element 14 may be of a fixed type. Even in this case, with the disk 13 provided with perforations 34 according to the invention, a significant improvement is achieved in the operation and the performance capabilities of the planter, under a more reliable and accurate distribution of the single seeds. In a preferred way, however, said selector element 14 as described in this patent specification is mounted so as to pivot about a pin 35 fixed inside the casing 12, and is retained in a position adhering against the eccentric means 26 by means of a spring fork 36.

By actuating the regulator member 25, the eccentric means 26 is shifted and, as a consequence, the selector element 14 is moved into a suitable position with respect to the surface of the disk 13, as well as with respect to the perforations 34, according to the type of seeds that have to be distributed.

Said shifting and adjustment of the selector element may of course be performed also by means of different mechanical elements, such as screws, levers or sliders, while in all cases achieving a similar result and effect.

According to a further feature of the present invention, the selector element 14 is provided with a number of slots 37 that are cut along the region

of its profile which is situated in front of the ring of perforations 34 around the disk 13, said slots 37 being further co-operating with said perforations 34.

Said slots 37 are arranged with their open ends following an inclined pattern in the direction of rotation of the disk 13 and are very deep in their extension so as to ensure, in co-operation with said selector element 14, the suction and the selection of the seeds, with the distribution of single seeds and the falling of multiple or excess seeds back into the container 11.

Each one of said slots 37 further terminates with an end portion having a sharp profile, so as to create a ridge that promotes leapfrogging into the next slot by the seed which is kept sucked in the perforation in a privileged position, regardless within certain reasonable limits of the shape and the size of the seed, and that also causes multiple or excess seeds to be released and come off.

It may be useful, although not strictly necessary, to provide the inner surface of the disk 13 with a circle of radially arranged lugs 38 or the like, so as to promote an agitation of the seeds in the container 11 during the rotation of the disk 13.

In the operation of the planter, after the seeds are filled into the container 11, the disk 13 is set rotating (in the direction as indicated by the arrow F in Figure 3) and the air suction device is started.

The seeds 21, owing to the air suction through the conduit 22, the hole 23, the slit 24 and the perforations 34, are caused to adhere to the disk 13 and are lifted off the same disk, and get progressively separated, as they proceed in front of the slots 37 of the selector element 14.

Through an appropriate selection of the position of said selector element 14 it is possible to achieve that, in correspondence of the last slot 37 in the direction of rotation of the disk 13, there will be only one seed for each perforation 34 that keeps adhering to the disk 13 and that will then come off the same disk when it reaches the unloading area in correspondence of the unloading conduit 16, where the seed is no longer subjected to the air suction effect, since the suction slit 24 is in fact terminated.

It will of course be appreciated that the above described arrangement may be the subject of any modification or integration considered to be appropriate, without departing from the scopes of the present invention. For instance, the perforations may be given an elongated shape, which however deviates from the herein shown shape, eg. rhomboidal. Furthermore, a hollow sealing ring 39 or similar gasketing means of plastic material may be appropriately provided between the casing 12 and the disk 13 so as to ensure correct positioning of said two elements and an effective sealing effect between them (Figure 2).

Furthermore, the seed container 11 may be provided with a central opening 40 (Figures 1 and 2) to possibly introduce the support and driving elements for the disk 13 from the opposite side of the device, as opposed to the arrangement shown in the accompanying drawing.

Claims

1. Precision-type single-seed pneumatic planter, provided with distributor means for single seeds comprising a disk (13) that is provided with perforations (34) arranged circumferentially in the vicinity of its outer edge and is rotatably operable, said disk (13) being adapted to co-operate on one side with a seed container (11, 15) and on the other side with a casing (12) provided with an opening (24) connected with an air suction device to extract the seeds from said seed container (11, 15) through the action of a negative air pressure created through said perforations (34), and a selector element (14) provided in correspondence of said perforations (34) on the seed facing side of said disk (13) to separate single seeds, **characterized in that** said perforations (34) of the disk (13) have an elongated shape and a reduced cross-section so as to prevent seeds of a smaller size from passing therethrough and to enable at the same time such a suction air flow to pass therethrough as necessary to keep seeds with a larger size adhering on to the disk (13), said selector element (14) being arranged so as to have its profile co-operating with said perforations by throttling the suction area thereof so as to select the single seeds.

2. Precision-type single-seed pneumatic planter according to claim 1, characterized in that said selector element (14) is arranged so that its profile co-operates with said perforations (34) by dividing them up into two portions, of which one is a seed suction portion situatedin an area that is closer to the centre of the disk (13) and the other one is a single-seed selection portion situated in an area that is closer to the periphery of the same disk (13).

3. Precision-type single-seed pneumatic planter according to claim 1 or 2, in which the perforations (34) of the disk (13) are arranged at equally spaced intervals along a circle running circumferentially near the outer periphery of said disk (13), characterized in that said perforations (34) are arranged according to a pattern that is inclined with respect to the radial direction of the disk (13).

4. Precision-type single-seed pneumatic planter according to any preceding claims, characterized in that said selector element (14) is pivotally attached to said casing (12) and is connected through a spring fork (36) and a cam (26) with a hand-operated regulator means (25) adapted to adjust the position of said selector element (14) according to the type of seeds to be distributed.

5. Precision-type single-seed pneumatic planter according to any preceding claims, characterized in that said selector element (14) is provided with appropriately deep slots (37) having their edges protruding and terminating with a sharp contour so as to create an air suction effect that causes the seeds to adhere, as well as to cause single seeds to get over the ridge.

6. Precision-type single-seed pneumatic planter according to any preceding claims, characterized in that said casing (12) is provided with an annular slit (24) extending along an arc of circumference in front of the circumferential circle of perforations (34) of the disk (13), said slit (24) being in connection through a hole (23) with a conduit (22) connected to the air suction device.

7. Precision-type single-seed pneumatic planter according to any preceding claims, characterized in that said disk (13) is rotatably driven through a shaft (29), which is supported in the casing (12), a driving disk (31), which is attached to one end of said shaft (29), and an eccentric pin (33) fixed on said driving disk (31).

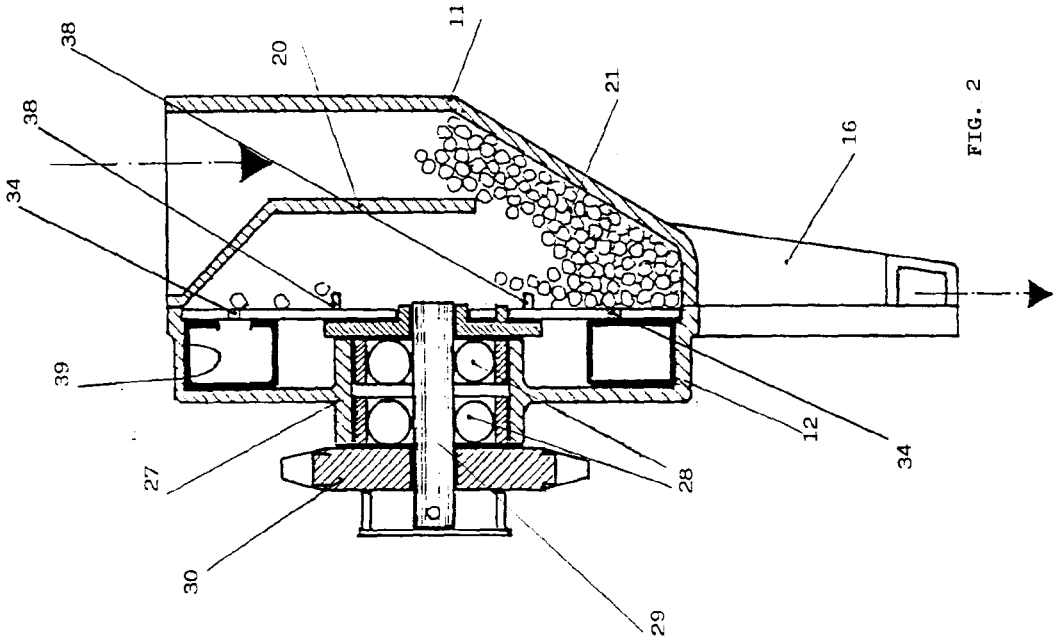

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FIG. 2

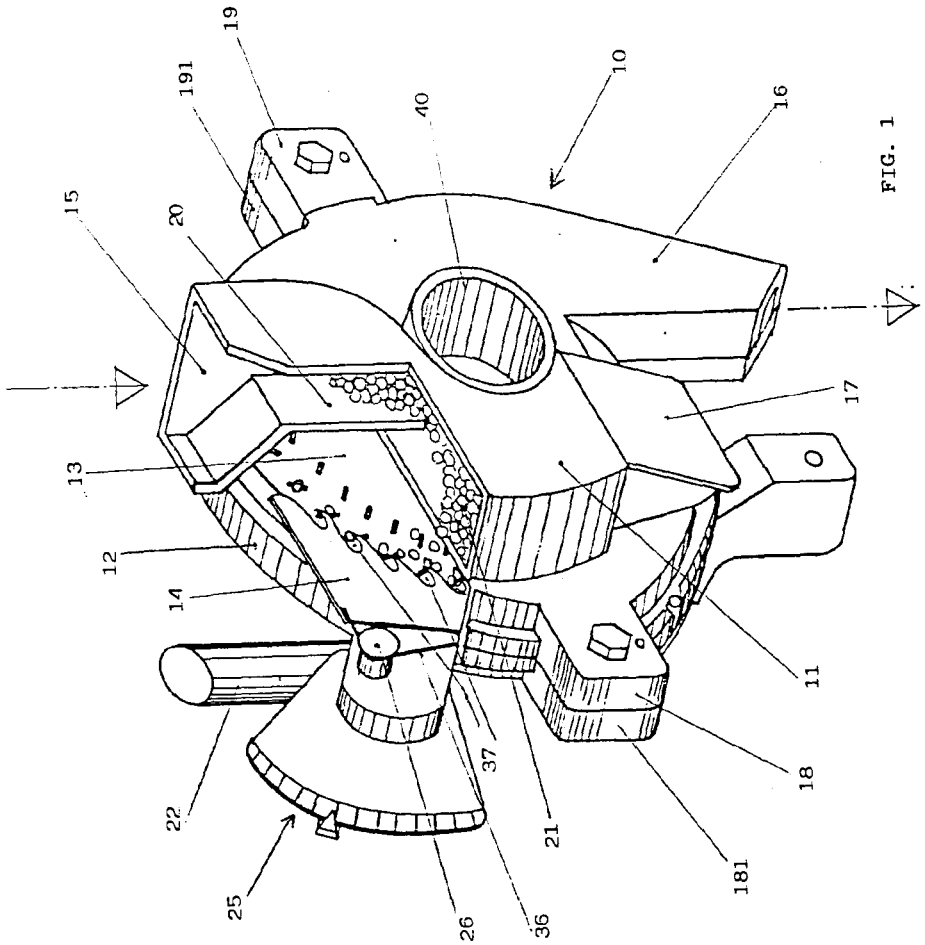

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FIG. 1

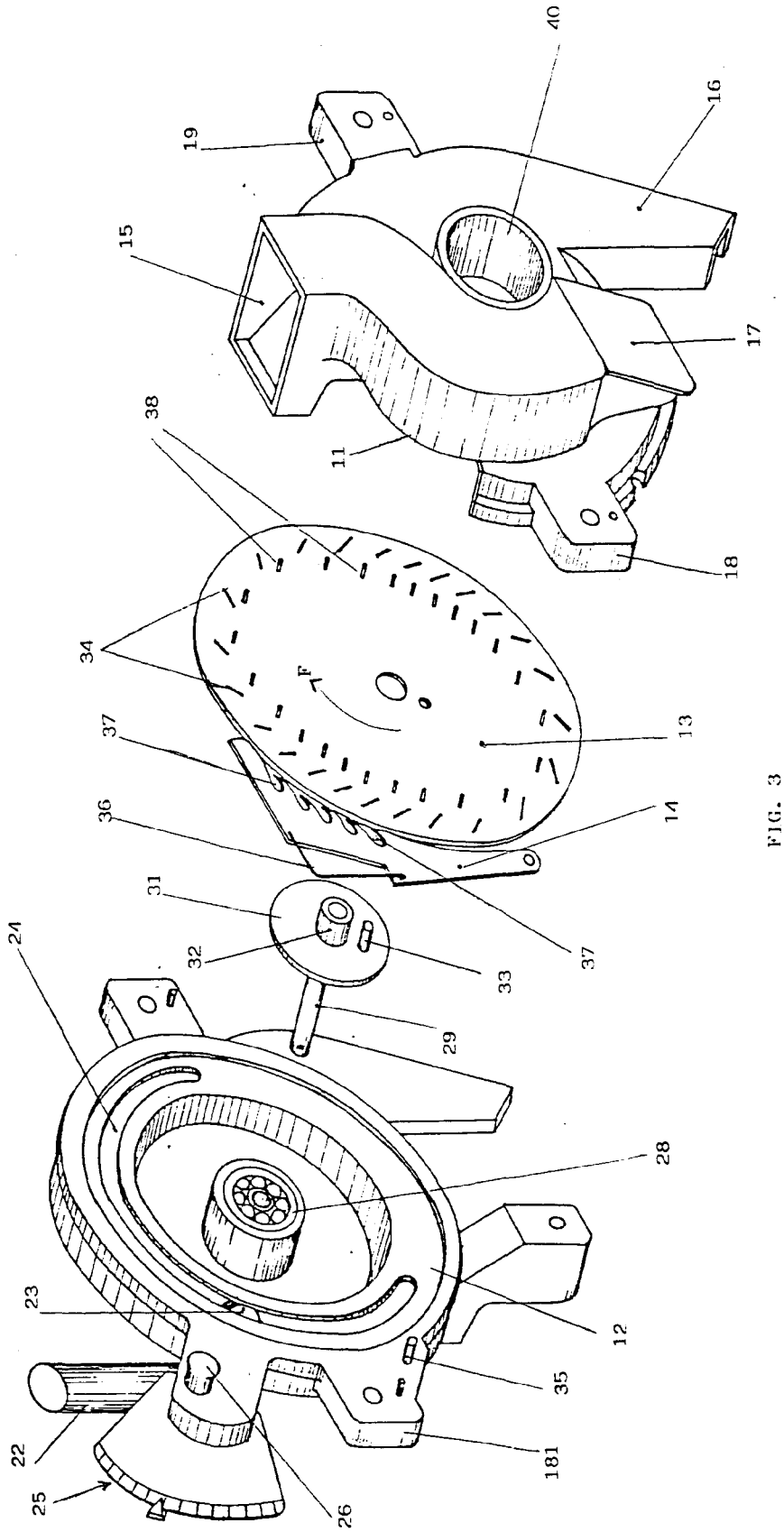

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FIG. 3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 11 5258

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	FR-A-2 643 212 (ATELIERS RIBOULEAU) * page 4, line 20 - page 10, line 21; figures 1-6 *	1	A01C7/04
A		2,5,6	
Y	GB-A-2 132 395 (FEDMECH HOLDINGS LTD.) * page 2, line 26 - line 72; figure 1 *	1	
A	US-A-3 990 606 (GUGENHAN H.) * column 4, line 35 - column 7, line 62; figures 1-8 *	1,2,4,5	
A	US-A-4 074 830 (ADAMS C.E.) * column 3, line 22 - line 59; figures 10-14 *	3	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

A01C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	02 DECEMBER 1992	ELSWORTH D.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
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Precision Exhibit 1005

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DOCUMENT MADE AVAILABLE UNDER THE PATENT COOPERATION TREATY (PCT)

International application number:		**PCT/EP2011/069875**
International filing date:		**10 November 2011 (10.11.2011)**
Document type:		**Certified copy of priority document**
Document details:	Country/Office:	**IT**
	Number:	**PD2010A000338**
	Filing date:	**12 November 2010 (12.11.2010)**
Date of receipt at the International Bureau:		**26 January 2012 (26.01.2012)**

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a),(b) or (b-*bis*)

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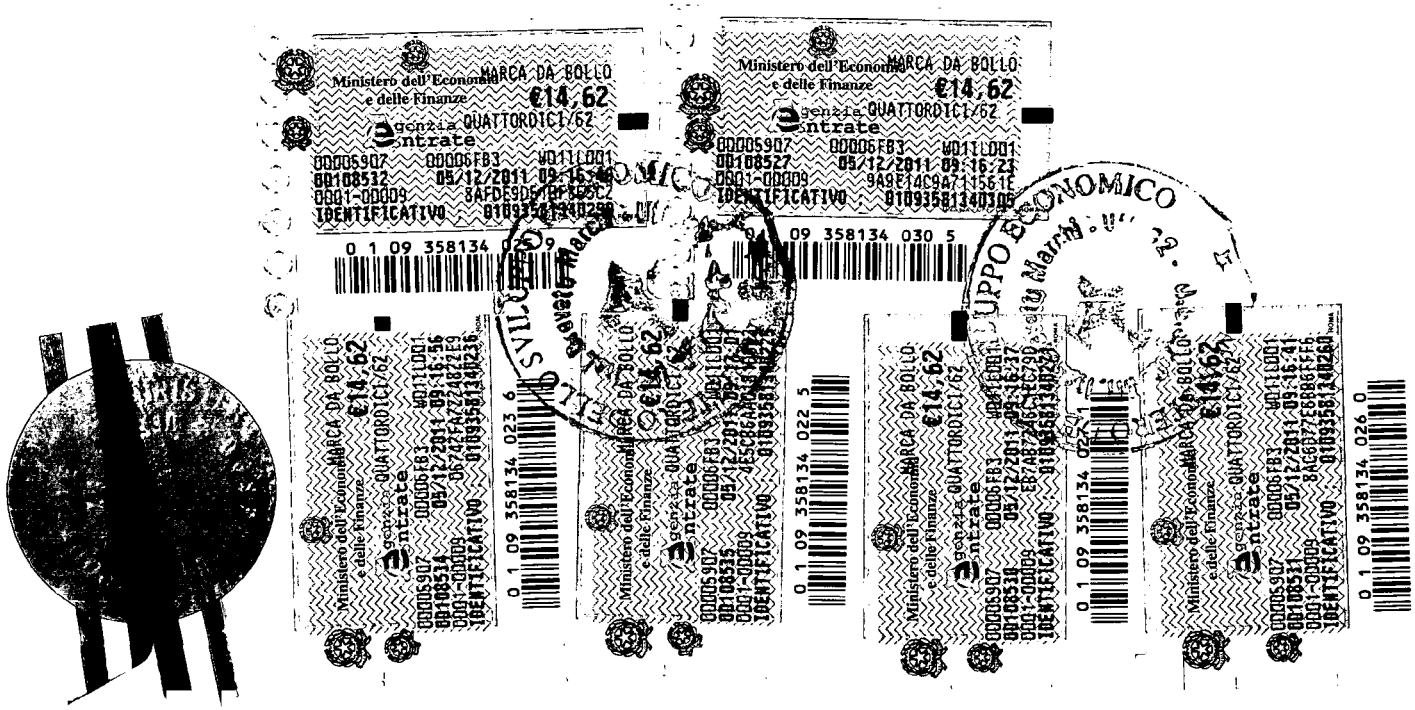
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Si compone di pagg. 21

06 DIC. 2011

ROMA li.....

IL FUNZIONARIO
Elena Marinelli
Sig.ra E. MARINELLI



Domanda di Brevetto per Invenzione Industriale

Richiedente/i

Denominazione: **MASCHIO GASPARDO S.P.A.;**
Natura Giuridica: ***PG*** *(Persona Giuridica);*
Codice Fiscale: **03272800289;**
Indirizzo: **VIA MARCELLO 73;** *Localita' Residenza:* ; *Comune:* **CAMPODARSEGO;** *Cap:* **35011;** *Provincia Residenza:* **PADOVA (PD);** *Stato:* **ITALIA (IT);**

Recapito

Cognome/Denominazione: ; *Nome:* ;
Indirizzo recapito: ; *Localita' Recapito:* ; *Comune:* ; *Provincia:* **();** *Cap:* ;

Titolo

Descrizione: **ELEMENTO DISTRIBUTORE DEL SEME PER SEMINATRICI DI PRECISIONE, SEMINATRICE INCLUDENTE DETTO ELEMENTO**

Inventori Designati

Cognome: ; *Nome:* ; *Nazionalita':*

Classi Proposte

Sezione: **A;** *Classe:* **01;** *Sottoclasse:* **C;**

Centro Abilitato di Raccolta Colture di Microorganismi

Denominazione:

Mandatario abilitato presso UIBM

Numero Iscrizione Albo: **00436**
Cognome: **CANTALUPPI** *Nome:* **STEFANO**

Denominazione Studio: **CANTALUPPI & PARTNERS S.R.L.**
Indirizzo: **PIAZZETTA CAPPELLATO PEDROCCHI,18**
Comune: **PADOVA** *Cap:* **35122** *Provincia:* **PADOVA**
Numero Domicilio Professionale: **865**

Annotazioni Speciali

Descrizione:

Documentazione Allegata o con Riserva di Presentazione

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PADOVA, 12/11/2010

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A. RICHIEDENTE

Cognome Nome/ Denominazione **MASCHIO GASPARDO S.P.A.**
Codice fiscale: 03272800289
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VIA MARCELLO 73 cap 35011
Natura Giuridica: Persona Giuridica

C. TITOLO

Titolo **ELEMENTO DISTRIBUTORE DEL SEME PER SEMINATRICI DI PRECISIONE, SEMINATRICE INCLUDENTE DETTO ELEMENTO**

E. CLASSE PROPOSTA

Classe A01C - PIANTAGIONE; SEMINAGIONE; FERTILIZZAZIONE

I. MANDATARIO ABILITATO PRESSO L'UIBM

Mandatario Numero iscrizione albo: 436
CANTALUPPI STEFANO

Denominazione Studio CANTALUPPI & PARTNERS S.R.L.
Indirizzo: PADOVA (PD)
PIAZZETTA CAPPELLATO PEDROCCHI,18 cap 35122

M. DOCUMENTAZIONE DICHIARATA

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Tavole Disegno
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PROSPETTO MODULO A

DOMANDA DI BREVETTO PER INVENZIONE INDUSTRIALE

NUMERO DI DOMANDA:		DATA DI DEPOSITO:	

A. RICHIEDENTE/I COGNOME E NOME O DENOMINAZIONE, RESIDENZA O STATO

MASCHIO GASPARDO S.P.A.
VIA MARCELLO 73
35011 CAMPODARSEGO (PD)

C. TITOLO

Elemento distributore del seme per seminatrici di precisione, seminatrice includente detto elemento.

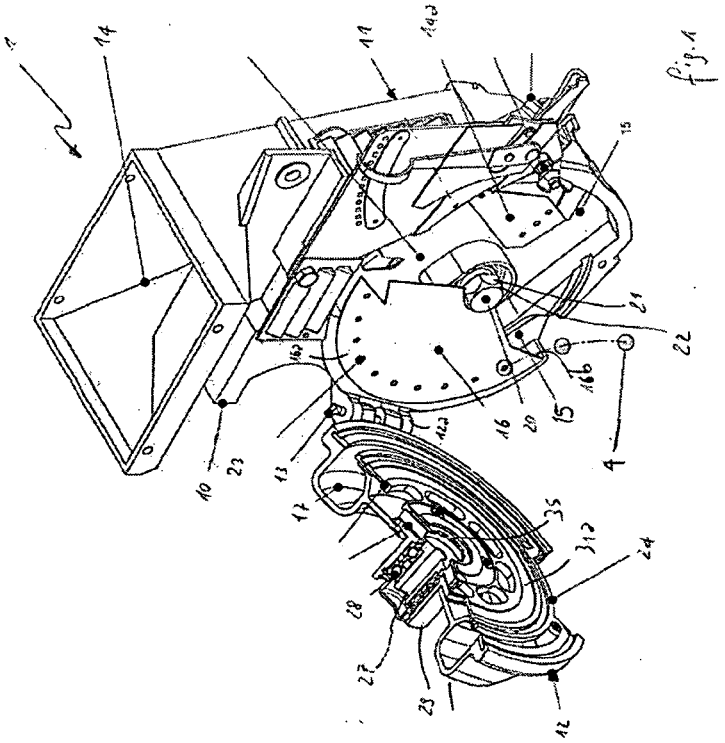
	SEZIONE	CLASSE	SOTTOCLASSE	GRUPPO	SOTTOGRUPPO
E. CLASSE PROPOSTA	A	01	C		

O. RIASSUNTO

Un elemento distributore del seme per macchine seminatrici pneumatiche di precisione, include:

- un disco di semina trascinato da un albero motorizzato di trasmissione in rotazione a velocità controllata in solido con detto albero,
- un involucro con una parte fissa nella quale è supportato detto albero ed una parte mobile rispetto a detta parte fissa e richiudibile su di essa, con una camera di raccolta del seme nella parte fissa e una camera di aspirazione pneumatica nella parte mobile,
- il disco di semina essendo interposto tra dette parti ed avente superfici contrapposte delimitanti dette camere, ed essendo provvisto di almeno una corona di fori selettori passanti tra dette superfici contrapposte,
- mezzi per generare un differenziale di pressione tra le dette superfici contrapposte in corrispondenza di un segmento circonferenziale di detta corona di fori, includenti la camera di aspirazione pneumatica ed
- una guarnizione sulla parte mobile suscettibile di contatto di strisciamento con la superficie affacciata del disco quando dette parti sono chiuse l'una sull'altra,
- un elemento reggispinta del disco di semina girevolmente supportato nella parte mobile, per sostenere almeno parte del carico assiale generato dal disco sulla guarnizione.

P. DISEGNO PRINCIPALE



FIRMA DEL/DEI RICHIEDENTE/I

DESCRIZIONE

La presente invenzione ha per oggetto un elemento distributore del seme per macchine seminatrici pneumatiche di precisione, un elemento di semina per tali macchine ed una macchina seminatrice includente una pluralità di tali elementi di semina.

Nelle macchine seminatrici pneumatiche di precisione vengono notoriamente utilizzati elementi di semina dotati ciascuno di un elemento distributore del seme (di seguito, in breve, distributore) per distribuire un seme alla volta in erogazione controllata mentre l'elemento di semina si muove lungo una traccia di semina.

E' parimenti noto l'impiego di distributori del seme che utilizzano un differenziale di pressione d'aria tra facce contrapposte di un disco di semina (o selettore) munito di una o più corone di fori passanti. Il principio di funzionamento si basa sul fatto che, per effetto del differenziale di pressione tra le facce contrapposte del disco, un seme aderisce a ciascun foro ed è quindi trasportato con la rotazione del disco di semina dalla zona di selezione del seme fino al punto in cui cessa il differenziale di pressione ed il seme è rilasciato per caduta attraverso un condotto di semina nel solco o traccia di semina. In pratica su di una delle facce del disco viene esercitata una forte aspirazione d'aria che trattiene i semi sulla faccia contrapposta in corrispondenza dei rispettivi fori.

Per il buon funzionamento di tali distributori è necessario garantire una tenuta pneumatica efficace tra la faccia del disco soggetta ad aspirazione ed una guarnizione che delimita la camera di aspirazione pneumatica. L'effetto stesso di aspirazione determina una sostanziale compressione del disco

contro la guarnizione. Se ciò da un lato garantisce una adeguata aderenza della guarnizione alla superficie del disco soggetta a depressione, dall'altro lato ciò comporta una forte abrasione della guarnizione che ne limita la durata efficace. E' quindi necessario sostituire periodicamente la guarnizione per prevenire errori di semina derivanti da una insufficiente depressurizzazione della camera di aspirazione.

D'altro canto, anche se sostituire tale guarnizione è una operazione semplice, in ogni caso essa comporta un indesiderato fermo macchina, oltre al costo in sé del ricambio.

Per ovviare a tale inconveniente sono state sviluppate macchine seminatrici dotate di un elemento reggispinta che allevia il carico gravante sulla guarnizione. In tutti i casi, tuttavia, l'elemento reggispinta, che deve essere condotto in rotazione con il disco, è montato sulla parte fissa dell'involucro, vale a dire quella che viene fissata all'intelaiatura degli elementi di semina. Questo comporta che il disco debba essere agganciato all'elemento reggispinta; quindi deve essere previsto un sistema di aggancio che in fase di sostituzione del disco deve essere disinserito allungando conseguentemente tale operazione. Ciò è inevitabile nelle macchine note poiché sulla parte fissa deve obbligatoriamente essere montata la trasmissione che conduce in rotazione l'albero motorizzato che conduce in rotazione il disco.

Posizionare l'elemento reggispinta sulla parte fissa comporta tuttavia che la camera di aspirazione pneumatica sia realizzata sulla parte fissa, ovvero dalla stessa parte in cui è posto l'elemento reggispinta, mentre la camera di raccolta del seme deve essere realizzata nella parte mobile. Ciò è fonte di

numerosi inconvenienti, tra i quali il fatto che l'apertura dell'involucro comporta necessariamente l'allontanamento della parte contenente la camera di raccolta del seme dal magazzino a tramoggia soprastante che deve necessariamente essere fissato alla intelaiatura dell'elemento di semina.

Inoltre per la sostituzione del disco di semina è necessario rimuovere alcune parti del distributore, quali il selettore registrabile del seme, e l'epulsore del seme, ove previsto.

Il problema alla base della presente invenzione è quello di mettere a disposizione un elemento distributore del seme strutturalmente e funzionalmente concepito così da consentire il superamento di tutti gli inconvenienti lamentati con riferimento alla tecnica nota citata.

Questo problema è risolto dall'invenzione mediante un elemento distributore del seme realizzato in accordo con una o più delle unite rivendicazioni.

Le caratteristiche ed i vantaggi del trovato meglio risulteranno dalla descrizione dettagliata che segue di un suo esempio preferito di realizzazione illustrato, a titolo indicativo e non limitativo, con riferimento agli uniti disegni in cui:

- la fig. 1 è una vista in prospettiva di un elemento distributore del seme realizzato in accordo con la presente invenzione;
- la fig. 2 è una vista prospettica a parti staccate di un particolare dell'elemento di fig. 1;
- la fig. 3 è una vista prospettica di una seminatrice dotata di elementi di semina con elemento distributore del seme secondo l'invenzione.

Nelle figure con 1 è complessivamente indicato un elemento distributore del

seme destinato ad equipaggiare un elemento di semina 2 di una seminatrice pneumatica di precisione 3.

L'elemento distributore 1 è l'organo destinato a depositare un seme 4 alla volta ad una prefissata distanza regolabile in un solco di semina aperto da un assolcatore 5. L'elemento di semina 2, oltre all'elemento distributore 1 comprende un telaio 6 ed un magazzino del seme o tramoggia 7, oltre ad altri organi in sé noti e non necessari per la comprensione della presente invenzione; La seminatrice 3 a sua volta comprende una struttura portante 8 sulla quale è montata una pluralità di elementi di semina 2, tutti collegati ad un aspiratore pneumatico 9.

L'elemento di semina 1 a sua volta comprende un involucro 10 con una parte fissa 11 fissata stabilmente sul telaio 6 ed una parte mobile 12 incernierata in corrispondenza di una cerniera 12a sulla parte fissa 11 tramite un perno di cerniera 13 rimovibile. La parte fissa include una imboccatura 14 tramite la quale essa è collegata al di sotto di una bocca di efflusso del magazzino o tramoggia 7 in modo tale da essere alimentata direttamente da questo.

Dall'imboccatura 14 il seme fluisce attraverso una porta 14a di afflusso del seme in una camera 15 di raccolta del seme.

Un disco di semina 16 separa la camera 15 di raccolta del seme da una camera di aspirazione 17 ricavata nella parte mobile 12. Un aspiratore 18 montato sulla struttura portante 8 è collegato alla camera di aspirazione 17 mediante tubazioni 19 per generare un differenziale di pressione tra le superfici contrapposte 16a,b del disco selettore 16.

Il disco di semina 16 è montato in modo rimovibile su di un albero di

trascinamento 20 motorizzato, supportato nella parte fissa 11 e condotto in rotazione a velocità prefissate e regolabili da una trasmissione non rappresentata. La presenza di tale trasmissione impone che l'albero 20 sia montato sulla parte fissa 11 dell'involucro 10. Il calettamento tra albero 20 e disco 16 è ottenuto mediante un profilo poligonale 21 alla estremità libera dell'albero 20 che sporge oltre il disco 16 ed ha preferibilmente smussi 22 i quali servono da invito per le funzioni chiarite di seguito.

Alla periferia del disco 16 è ricavata una (o più) corona di fori 23 passanti tra le facce contrapposte del disco di semina 16.

Una guarnizione 24 è applicata nella camera di aspirazione 17 ed è posta in contatto di strisciamento con la superficie affacciata del disco 16, quando la parte mobile 11 è chiusa sulla parte fissa 12, a delimitare un segmento circonferenziale in cui i fori 23 sono assoggettati al differenziale di pressione anzidetto. Tale segmento circonferenziale si estende tra la camera 15 di raccolta del seme ed un condotto di caduta del seme 25 in cui i semi sono rilasciati uno alla volta nel solco tracciato dall'assolcatore 5.

In ragione del differenziale di pressione tra le due superfici contrapposte del disco di semina , i semi 4 sono trattenuti, uno per ciascun foro 23, quando i fori transitano nella camera 15 di raccolta del seme e sono rilasciati in corrispondenza del condotto 25 quando cessa l'effetto pneumatico del differenziale di pressione ovvero per la presenza di un espulsore del seme (non rappresentato).

Per limitare l'usura della guarnizione 24 in conseguenza dello strisciamento contro la superficie del disco 16 sulla parte mobile è montato un elemento reggispinta complessivamente indicato con 26.

L'elemento reggispinta 26 comprende un albero 27 montato girevolmente mediante cuscinetti 28 in una sede 29 della parte mobile 12. L'albero 27 reca una flangiatura 30 tramite la quale esso è fissato ad un piattello reggispinta 31 suscettibile di appoggio alla superficie del disco affacciata alla guarnizione 24 in una zona radialmente interna alla corona di fori 23 per sostenere almeno parte del carico assiale generato dal disco 16 sulla guarnizione 24.

L'appoggio tra il piattello reggispinta 31 ed il disco 16 avviene in corrispondenza di una corona 31a in rilievo sulla superficie del piattello affacciata al disco 16.

L'elemento reggispinta 26 è condotto in rotazione con il disco di semina 16 quando le parti fissa e mobile 11,12 sono chiuse l'una sull'altra mediante un elemento di trascinamento 32 che comprende un organo accoppiatore vincolato al piattello reggispinta in rotazione ma con gioco radiale e/o circonferenziale in modo da auto-centrarsi nell'accoppiamento rotazionale con l'albero di trascinamento del disco 16. A tale scopo, nella presente forma di realizzazione, l'elemento di trascinamento 32 è accoppiato con limitato gioco radiale e/o circonferenziale all'elemento 26 tramite una (o più) appendice 33 sporgente radialmente verso l'esterno ed annidata in corrispondenti sedi 34 del piattello. L'elemento di trascinamento 32 si accoppia tramite un profilo poligonale interno 35 (simile a quello adottato per le chiavi a stella o box-end wrench) al profilo poligonale 21 della estremità libera dell'albero 20, i cui smussi 22 servono da invito per facilitare la centratura dei due profili ed il rispettivo innesto.

L'elemento di trascinamento 32 risulta così auto-centrante rispetto all'albero

di trascinamento 20 da cui esso è condotto. Il posizionamento tra guarnizione 24 e piattello 31 sarà tale per cui le rotazione di quest'ultimo non sarà ostacolata dalla presenza della guarnizione 24 e, al tempo stesso, verranno entrambi mantenuti in appoggio al disco 16.

È altresì previsto che l'elemento reggispinta 26 possa essere realizzato folle e non condotto in rotazione dall'albero 20.

L'assieme della parte mobile 12 completa di elemento reggispinta 26 e guarnizione 24 si presta vantaggiosamente alla realizzazione di un kit per il retrofitting di seminatrici già esistenti. È sufficiente in tal caso separare la parte mobile di vecchio tipo rimuovendo il perno di cerniera 13 e sostituirla con il kit anzidetto. Ricollegando le tubazioni pneumatiche preventivamente sganciate la seminatrice è pronta al lavoro.

Tra i principali vantaggi dell'elemento distributore secondo l'invenzione vi è il fatto che viene sensibilmente ridotta, se non eliminata, l'usura della guarnizione per effetto del contatto di strisciamento con il disco selettore del seme; l'elemento reggispinta è autocentrante il che consente una facilitata apertura e chiusura della parte mobile sulla parte fissa dell'involucro; il sistema si presta inoltre ad un agevole retrofitting, il tutto senza rimozioni di parti mobili e/o operazioni di sgancio del disco di semina.

RIVENDICAZIONI

1. Elemento distributore del seme per macchine seminatrici pneumatiche di precisione, del tipo includente:

- un disco di semina trascinato da un albero motorizzato di trasmissione in rotazione a velocità controllata in solido con detto albero,
- un involucro con una parte fissa nella quale è supportato detto albero ed una parte mobile rispetto a detta parte fissa e richiudibile su di essa,
- in detta parte fissa essendo definita una camera di raccolta del seme,
- in detta parte mobile essendo definita una camera di aspirazione pneumatica,
- detto disco di semina essendo interposto tra dette parti ed avente superfici contrapposte delimitanti dette camere,
- detto disco di semina avente almeno una corona di fori selettori passanti tra dette superfici contrapposte,
- mezzi per generare un differenziale di pressione tra le dette superfici contrapposte in corrispondenza di un segmento circonferenziale di detta corona di fori,
- detti mezzi includenti detta camera di aspirazione pneumatica ed
- una guarnizione sulla parte mobile suscettibile di contatto di strisciamento con la superficie affacciata del disco quando dette parti sono chiuse l'una sull'altra,
- caratterizzato dal fatto di comprendere
- un elemento reggispinta del disco di semina girevolmente supportato

in detta parte mobile, per sostenere almeno parte del carico assiale generato dal disco su detta guarnizione.

2. Elemento distributore del seme secondo la rivendicazione 1 in cui detto elemento reggispinta è condotto in rotazione con detto disco quando dette parti sono chiuse l'una sull'altra.
3. Elemento distributore del seme secondo la rivendicazione 1 o 2, in cui detto elemento reggispinta comprende un piattello reggispinta suscettibile di appoggio alla superficie del disco di semina affacciata a detta guarnizione in zona radialmente interna alla corona di fori.
4. Elemento distributore del seme secondo la rivendicazione 3 in cui l'elemento reggispinta comprende un elemento di trascinamento solidale in rotazione al piattello e suscettibile di accoppiamento con l'albero di trascinamento del disco quando dette parti sono chiuse l'una sull'altra.
5. Elemento distributore del seme secondo la rivendicazione 4 in cui l'elemento di trascinamento è auto-centrante rispetto all'albero di trascinamento.
6. Elemento distributore del seme secondo la rivendicazione 4 o 5 in cui l'elemento di trascinamento comprende un organo accoppiatore vincolato al piattello reggispinta in rotazione ma con gioco radiale e/o circonferenziale in modo da auto-centrarsi in accoppiamento rotazionale con l'albero di trascinamento del disco.
7. Elemento distributore del seme secondo una o più delle rivendicazioni precedenti in cui la parte mobile è incernierata alla parte fissa.
8. Elemento di semina per seminatrici di precisione includente un telaio

sul quale è montato un elemento distributore del seme secondo una o più delle rivendicazioni precedenti.

9. Seminatrice comprendente una struttura portante sulla quale è montata una pluralità di elementi di semina secondo la rivendicazione 8.

10. Kit per retrofitting degli elementi distributori del seme di seminatrici pneumatiche di precisione in cui gli elementi distributori sono del tipo includente:

- un disco di semina trascinato da un albero motorizzato di trasmissione in rotazione a velocità controllata in solido con detto albero,
- un involucro con una parte fissa nella quale è supportato detto albero ed una parte mobile rispetto a detta parte fissa e richiudibile su di essa,
- in detta parte fissa essendo definita una camera di raccolta del seme,
- in detta parte mobile essendo definita una camera di aspirazione pneumatica,
- detto disco di semina essendo interposto tra dette parti ed avente superfici contrapposte delimitanti dette camere,
- detto disco di semina avente almeno una corona di fori selettori passanti tra dette superfici contrapposte,
- mezzi per generare un differenziale di pressione tra le dette superfici contrapposte in corrispondenza di un segmento circonferenziale di detta corona di fori,
- detti mezzi includenti detta camera di aspirazione pneumatica ed

- una guarnizione sulla parte mobile suscettibile di contatto di strisciamento con la superficie affacciata del disco quando dette parti sono chiuse l'una sull'altra,

caratterizzato dal fatto di comprendere:

- detta parte mobile preassemblata con
- un elemento reggispinta del disco di semina girevolmente supportato in detta parte mobile, per sostenere almeno parte del carico assiale generato dal disco su detta guarnizione.

11. Kit secondo la rivendicazione 10 in cui detta parte mobile e detto elemento reggispinta comprendono una o più delle caratteristiche delle rivendicazioni da 2 a 7.

RIASSUNTO

Un elemento distributore del seme per macchine seminatrici pneumatiche di precisione, include:

- un disco di semina trascinato da un albero motorizzato di trasmissione in rotazione a velocità controllata in solido con detto albero,
- un involucro con una parte fissa nella quale è supportato detto albero ed una parte mobile rispetto a detta parte fissa e richiudibile su di essa, con una camera di raccolta del seme nella parte fissa e una camera di aspirazione pneumatica nella parte mobile,
- il disco di semina essendo interposto tra dette parti ed avente superfici contrapposte delimitanti dette camere, ed essendo provvisto di almeno una corona di fori selettori passanti tra dette superfici contrapposte,
- mezzi per generare un differenziale di pressione tra le dette superfici contrapposte in corrispondenza di un segmento circonferenziale di detta corona di fori, includenti la camera di aspirazione pneumatica ed
- una guarnizione sulla parte mobile suscettibile di contatto di strisciamento con la superficie affacciata del disco quando dette parti sono chiuse l'una sull'altra,
- un elemento reggispinta del disco di semina girevolmente supportato nella parte mobile, per sostenere almeno parte del carico assiale generato dal disco sulla guarnizione.

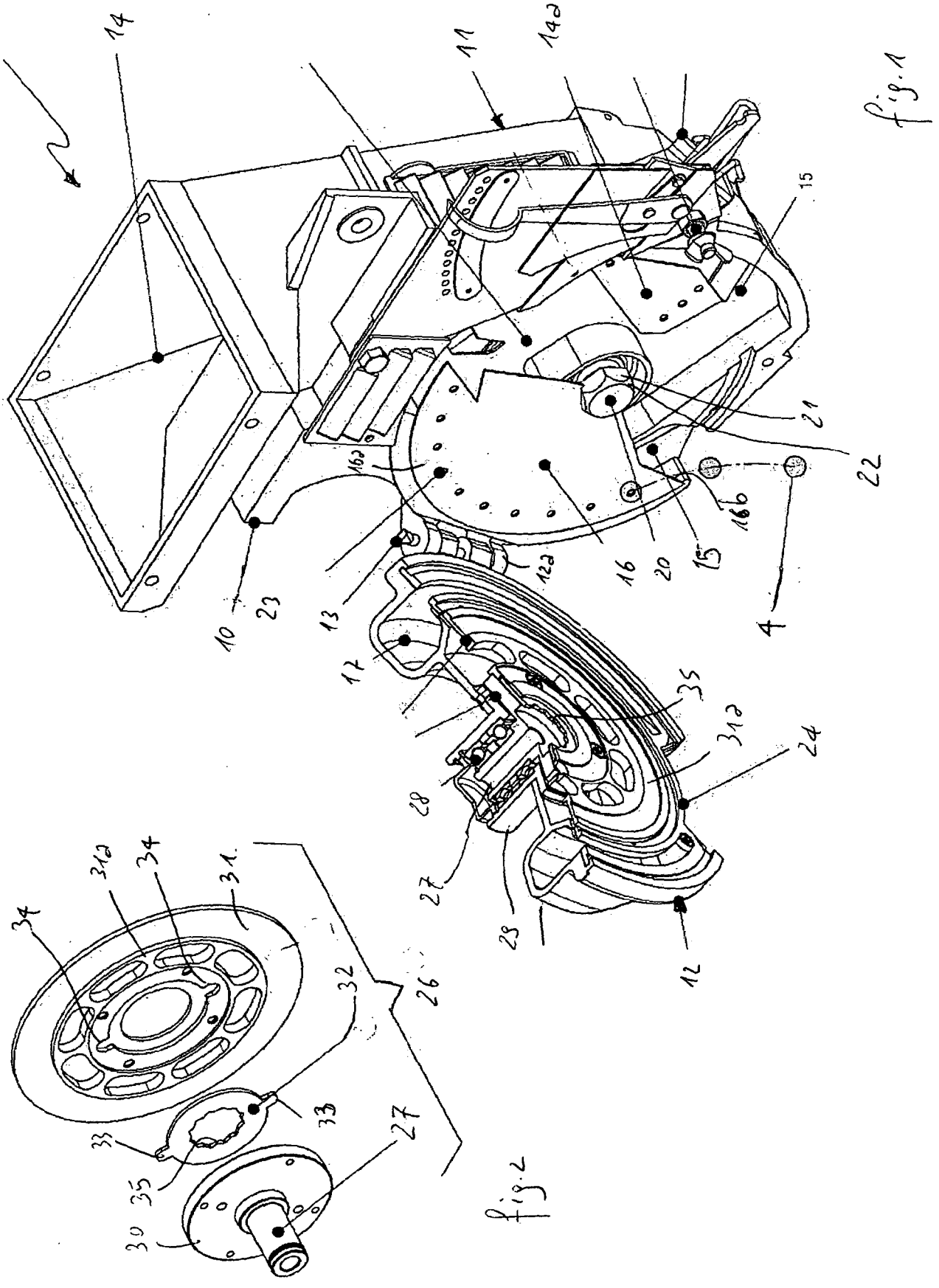

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fig.1

fig.2

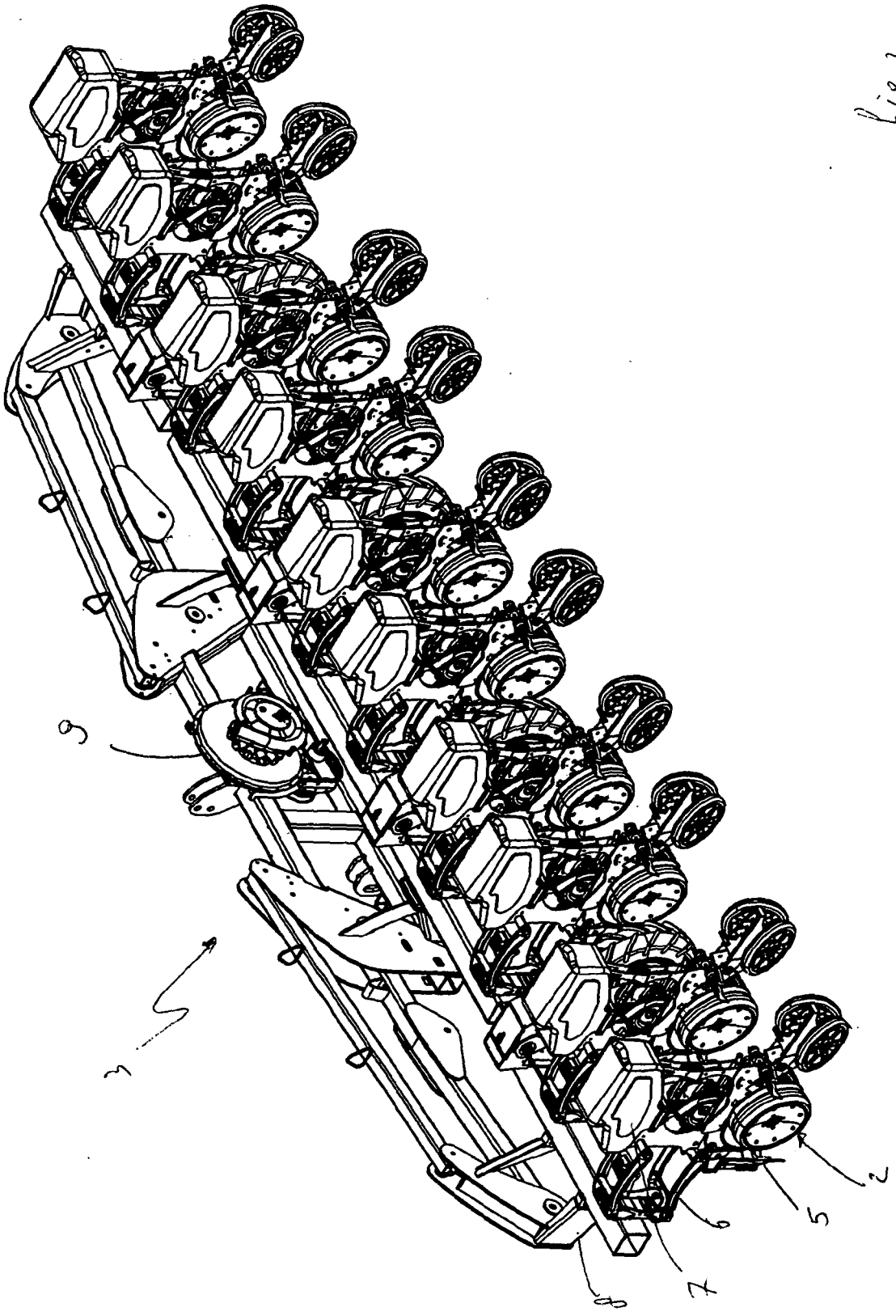


Fig. 3

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(12) # EUROPEAN PATENT APPLICATION

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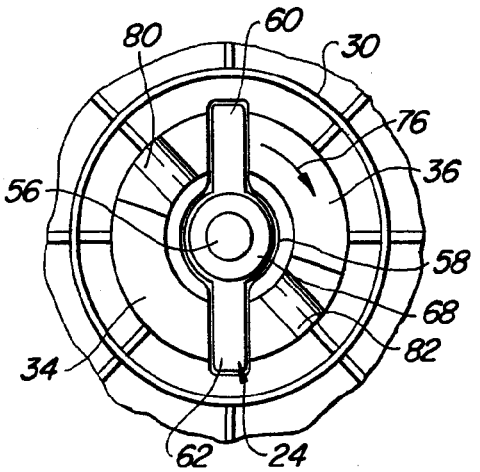
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(54) **Disk mounting arrangement.**

(57) A seed disk in a vacuum seed meter has a central mounting aperture in the form of a slot widening to a circular hole at its centre. When the disk is mounted on the hub of the seed meter a correspondingly shaped raised portion of the hub is received in the aperture to key the disk to the hub and a correspondingly shaped handle (24) passes through the aperture. The handle is retained rotatably on a shaft by a cap (56) and a coil spring under the cap urges the handle towards the hub. After the disk has been fitted, the handle is rotated as indicated by arrow (76) and the arms (60, 62) of the handle ride up ramps (34, 36) until the arms click into detent recesses (82. 80).



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DISK MOUNTING ARRANGEMENT

The present invention relates to an arrangement for releasably mounting a disk or other relatively flat member on a hub, comprising a relatively flat member having an elongated aperture therein, a hub, and an elongated handle rotatably mounted on the hub, the handle being adapted to fit through the elongated aperture and when rotated out of alignment with the aperture, to trap the said member on the hub.

It is sometimes necessary that a disk be releasably mounted on a rotatable hub, e.g. if the disks are interchangeable or are removed for cleaning or for other reasons.

One example of an arrangement in which a disk must be releasably mounted on a rotatable hub is a seed meter in which a relatively flat seed disk is releasably mounted on a rotatable hub within the generally cylindrical housing of the seed meter. The generally cylindrical housing is composed of mating half shells which are hinged and are coupled together with a clasp. In this manner, the housing may be opened to permit removal of or replacement of the seed disk. Removal of the seed disk may be necessary in order to clean the seed disk or to clean the interior of the seed meter housing or otherwise gain access thereto. Different seed disks are used to meter different types of seeds. Therefore, removal of the seed disk may be necessary in order to replace it with another seed disk designed for use with a different type of seed which is to be planted. The seed disk in a vacuum seed meter must be securely retained on the hub so as to be able to withstand the force of a seed mass and air pressure on the disk and must be driven by the hub through the seed mass and past various other restraining objects within the seed meter housing. In addition, the seed disk must form a relatively airtight seal with the hub so that the vacuum created at one side of the disk communicates with the opposite side of the disk only through apertures in a plurality of seed cells within the disk. At the same time the disk should be capable of relatively easy replacement and preferably without the need for special tools.

A number of different arrangements are known for releasably mounting a relatively flat member such as a seed disk on a rotating

hub within a seed meter or similar agricultural implement. One such arrangement is shown in US Patent 2,695,733 wherein the disk is retained by a cap fitted on to a T-bar by a bayonet fixing. The arrangement is relatively complicated and such arrangements have proved to be cumbersome if not impractical because of the difficulty involved in changing the seed disk. In many cases special tools are required. Even if special tools are not required, considerable physical effort may be necessary. These factors become even more of a problem in situations involving limited space such as where the planting units are spaced closely together for planting narrow rows.

At the same time certain other arrangements in the art have achieved some simplicity but have not addressed the particular problems peculiar to devices such as agricultural seed meters where a tight, sealing, load-bearing fit are necessary. Such arrangements include those shown in US Patent 3,214,996 where replaceable cams are releasably mounted on a rotatable bushing by a spring loaded retaining ring and those shown in US Patent 4,101,232 where legs are mounted on a disk-like member using a lugged post in conjunction with a head having ramped bearing surfaces.

The object of the present invention is to provide an improved arrangement which is useable in relatively quick and simple fashion and without the need for special tools or the expenditure of considerable physical effort. It is furthermore desirable to provide an arrangement in which the disk is capable of forming a seal with the hub as well as having a substantial load-bearing fit.

The arrangement in accordance with the invention is characterised by a ramp surface adjacent the aperture, whereby the handle rides up the ramp surface when it is rotated out of alignment with the aperture and jams the said member on to the hub.

In a preferred arrangement in accordance with the invention, a rotatable hub on which a disk is releasably mounted is provided with a central raised portion having a cross-sectional shape similar to that of a central mating elongated slot in the disk. The raised portion of the hub is slightly smaller in size than the slot in the disk so that the raised portion is received within the slot when the disk is mounted on the hub. The raised portion of the hub seats the disk on the hub in relatively secure, close-fitting fashion so that

the disk is capable of bearing a substantial load when driven in response to rotation of the hub.

An elongated handle having a cross-sectional shape similar to that of the raised portion of the hub is disposed on the raised portion by a shaft which is mounted on the raised portion and which has the handle slidably and rotatably mounted thereon. The handle is resiliently biased toward and into contact with the raised portion by a coil spring which encircles the shaft and resides between the elongated handle and a keeper at the end of the shaft opposite the raised portion. The spring seats a pair of rounded detent surfaces at the bottom of opposite portions of the handle in opposite detent recesses in the raised portion of the hub to maintain the handle in alignment with the raised portion of the hub when the disk is positioned on the hub.

The disk has a pair of camming ramps formed therein on opposite sides of the elongated slot. The camming ramps are of partially circular configuration and have heights which gradually increase in a common direction around the slot. Each of the camming ramps has a detent recess therein at a position of maximum height thereon.

The disk is releasably mounted on the hub by inserting the elongated handle through the slot in the disk so that the disk is seated on the hub and the raised portion of the hub resides within the slot. The elongated handle is then rotated, causing it to unseat from the opposite detent recesses in the raised portion at the hub and to ride up on the opposite camming ramps against the resistance of the coil spring disposed between the handle and the keeper at the end of the shaft. Eventually the opposite detent surfaces at the bottom of the elongated handle are pushed into the detent recesses in the ramps by the coil spring to complete the disk mounting operation.

Removal of the disk is accomplished by rotating the elongated handle in the opposite direction to unseat the detent surfaces of the opposite portions of the handle from the detent recesses in the ramps and then allow such opposite portions to ride down along the opposite camming ramps until the handle is aligned with the raised portion of the hub and the slot and the detent surfaces of the handle are seated in the detent recesses in the raised portion. The

disk may then be pulled away from the hub to complete the removal thereof.

A sealing, relatively airtight fit between the disk and the hub is accomplished by providing the side of the disk opposite the pair of camming ramps and adjacent the hub with an annular flange which seats against the face of the hub when the disk is seated in place on the hub.

The invention will be described in more detail, by way of example and with reference to the accompanying drawings, in which:

Fig 1 is a perspective view of a seed meter in an open position and showing a seed disk in conjunction with a disk mounting arrangement embodying the invention;

Fig 2 is a front view of the seed meter of Fig 1 and showing the reverse side of the seed disk;

Fig 3 is a sectional view of the seed meter of Fig 1 with the seed disk releasably mounted and the meter in the closed position;

Fig 4 is a perspective, exploded view of a portion of the disk mounting arrangement illustrating the manner in which the handle is mounted on the hub;

Fig 5 is a plan view of a central portion of the seed disk illustrating the details thereof;

Fig 6 is a plan view of the central portion of the seed disk with the disk placed over the handle and onto the hub;

Fig 7 is a plan view of the central portion of the seed disk illustrating the position that the handle assumes after it has been rotated up on opposite camming ramps and into detent recesses therein; and

Fig 8 is a perspective view of the central portion of the seed disk.

Fig 1 illustrates a seed meter 10 which has a generally cylindrical housing 12. The housing 12 is composed of a first half shell 14 which is mounted at the base of a seed hopper 16 and is coupled via a hinge 18 to an opposite, mating second half shell 20.

A hub 22 is rotatably mounted within the first half shell 14 at the centre thereof. An elongated handle 24 mounted on the hub 22 forms part of a disk mounting arrangement 26 in accordance with the invention for releasably mounting a seed disk 28 on the hub 22. As

described hereafter in detail, the seed disk 28 has a central portion 30 having an elongated slot 32 therein. A pair of curved camming ramps 34 and 36 are formed within the central portion 30 of the seed disk 28 on opposite sides of the elongated slot 32. When the seed disk 28 is placed on the hub 22, the elongated handle 24 extends through the elongated slot 32. Rotation of the handle 24 causes the opposite ends thereof to ride up on the camming ramps 34 and 36 of the seed disk 28 to a pair of opposite detent recesses in which the handle becomes seated.

With the seed disk 28 mounted on the hub 22 using the disk mounting arrangement 26, the second half shell 20 may be closed over the seed disk 28 and onto the first half shell 14 to close the seed meter 10. Seeds from the hopper 16 flow into the bottom of the first half shell 14 where they form a seed mass on one side of the seed disk 28. Seed cells 37 on that side of the seed disk 28 agitate, accelerate and then capture therein individual seeds from the seed mass. The individual seeds are held in the cells by the force of a vacuum created within the second half shell 20 on the opposite side of the seed disk 28 and which communicates with the seed cells 37 via apertures 38 located at the bottoms of the seed cells 37 and which extend through the thickness of the seed disk 28. The seeds are held by such vacuum until they reach a seed discharge area 39 within the first half shell 14 which is isolated from the effects of the vacuum within the second half shell 20. This causes the individual seeds to be released from the seed cells 37 in the seed disk 28 so that the seeds fall through a seed chute 40 at the bottom of the first half shell 14 to the ground below.

As the seed disk 28 rotates within the generally cylindrical housing 12 it encounters considerable resistance from a number of items including the seed mass at the bottom of the first half shell 14, a seal 42 at the inside of the second half shell 20 which bears against the opposite side of the seed disk 28 from the seed mass, and a divider brush 44 which is mounted within the first half shell 14 and which helps to separate the seed discharge area 39. This resistance requires that the seed disk 28 be mounted on the hub 22 in positive, non-slip fashion. At the same time the seed disk 28 must be positioned within the generally cylindrical housing 12 in

relatively accurate and precise fashion requiring a relatively accurate, precise fit of the seed disk 28 on the hub 22. This fit must be maintained in the face of forces exerted on the sides of the disk by the seed mass and the vacuum. In addition, the presence of the vacuum within the second half shell 20 requires a relatively air-tight mounting of the seed disk 28 onto the hub 22 so that the seed cells 37 located about the seed disk 28 are exposed to the full force of the vacuum within the second half shell 20 via the aperture 38.

Referring to Fig 4 it will be seen that the hub 22 which has a central axis 46 has a raised portion 48 at the centre thereof. The raised portion 48 is composed of a generally cylindrical portion 50 at the centre of the raised portion 48 and an opposite pair of elongated portions 52 and 54 having concave upper surfaces forming an opposite pair of detent recesses 55 thereon. An elongated shaft 56 is mounted on the cylindrical portion 50 of the raised portion 48 so as to extend upwardly along the central axis 46.

The elongated handle 24 is composed of a generally cylindrical portion 58 at the centre thereof and opposite elongated portions 60 and 62 having convex lower surfaces forming an opposite pair of detent surfaces 63. The detent surfaces 63 normally reside in the detent recesses 55 in the raised portion 48 of the hub 22 when the second seed disk 28 is not mounted in the hub 22. The cylindrical portion 58 has a central aperture 64 therein for receiving the shaft 56. The central aperture 64 also receives a coil spring 66 which encircles the shaft 56. A keeper 68 is mounted on the upper end of shaft 56 opposite the hub 22. The keeper 68 is disposed on the opposite side of the coil spring 66 from the elongated handle 24.

Referring now to Fig 5 it will be seen that the elongated slot 32 within the central portion 30 of the seed disk 28 is composed of a generally circular central portion 70 and opposite elongated portions 72 and 74. Accordingly, the elongated slot 32 has a shape similar to the cross-sectional shape of the raised portion 48 of the hub 22 and a size slightly larger than the raised portion 48. When the seed disk 28 is mounted on the hub 22, the raised portion 48 resides within the elongated slot 32 to provide a positive, driving fit therebetween.

Fig 6 illustrates the central portion 30 of the seed disk 28 with the elongated handle 24 inserted through the elongated slot 32 in the disk 28. The elongated handle 24 has a cross-sectional shape similar to that of the raised portion 48 and also the elongated slot 32. As in the case of the raised portion 48, the handle 24 is slightly smaller than and therefore fits freely through the elongated slot 32. The detent surfaces 63 at the bottom of the handle 24 reside in the detent recesses 55 in the raised portion 48 to provide positive alignment of the opposite portions 52 and 54 of the raised portion 48 with the opposite portions 60 and 62 respectively of the handle 24 to facilitate placement of the seed disk 28 over the handle 24 and the raised portion 48. Thereafter, rotation of the elongated handle 24 in a direction shown by arrows 76 causes the detent surfaces 63 of the opposite elongated portions 60 and 62 thereof to begin to ride up on the opposite camming ramps 34 and 36.

As illustrated in Figs 5-8 the opposite camming ramps 34 and 36 extend generally about major portions of a circle the centre of which lies on a central axis 78 of the central portion 30 of the seed disk 28. It will be seen that each of the camming ramps 34 and 36 is of partially circular shape so as to extend around a portion of the central portion 30 between the opposite elongated portions 72 and 74 of the elongated slot 32. Each of the camming ramps 34 and 36 has a height which gradually increases in a common direction around the central axis 78 to a maximum height at one end thereof. The camming ramp 34 has a concave detent recess 80 in the top surface thereof at a region of maximum height of the ramp 34. Likewise, the camming ramp 36 has a concave detent recess 82 in the top surface thereof at the region of maximum height. The detent recesses 80 and 82 lie along a common diameter which intersects the central axis 78.

Referring again to Fig 4 it will be observed that the elongated handle 24 is capable of movement up and down along the shaft 56 as well as rotation about the shaft 56. Movement of the handle 24 along the shaft 56 in a direction away from the hub 22 is restrained by the coil spring 66. As best seen in Fig 3 the coil spring 66 extends between the keeper 68 and an annular flange 84 formed in the

wall of the central aperture 64 within the handle 24. The coil spring 66 bears against the keeper 68 at the upper end of the shaft 56 to exert a downward force on the handle 24. This downward force tends to maintain the detent surfaces 63 of the handle 24 seated in the detent recesses 55 on the raised portion 48. Upward movement of the handle 24 in a direction away from the raised portion 48 is possible only against the resilient resistance of the spring 66.

It will be noted in connection with Fig 6 that rotation of the handle 24 in the direction of the arrows 76 causes the opposite elongated portions 60 and 62 of the handle 24 to begin to ride up on the opposite camming ramps 34 and 36. Such rotational movement causes the handle 24 to move upwardly and away from the raised portion 48 against the resistance of the coil spring 66. When the opposite elongated portions 60 and 62 of the handle 24 reach the portions of maximum height of the camming ramps 34 and 36, the detent surfaces 63 at the bottom thereof eventually encounter and then seat within the opposite detent recesses 80 and 82. The detent recesses 80 and 82, the concave surfaces of which conform to the rounded detent surfaces 63 of the handle 24, hold the handle 24 in a locked position so as to maintain the seed disk 28 mounted on the hub 22. This position of the handle 24 relative to the central portion 30 of the seed disk 28 is illustrated in Fig 7.

Fig 2 illustrates the side of the seed disk 28 opposite the camming ramps 34 and 36. As shown in Fig 2 such opposite side of the seed disk 28 is provided with an annular flange 86. When the seed disk 28 is mounted on the hub 22, the annular flange 86 resides against the face of the hub 22 to provide a sealing fit between the seed disk 28 and the hub 22. This prevents vacuum pressure within the second half shell 20 from being lost at the interface between the seed disk 28 and the hub 22. The manner in which the annular flange 86 seats against the hub 22 is illustrated in Fig 3. The coil spring 66 must be strong enough to maintain the annular flange 86 seated against the hub 22 in the face of forces exerted on the sides of the seed disk 28 by the seed mass and the vacuum.

Removal of the seed disk 28 from the hub 22 is initiated by rotating the handle 24 in a direction shown by arrows 90 in Fig 7. This unseats the opposite elongated portions 60 and 62 of the handle

24 from the detent recesses 80 and 82 and allows the portions 60 and 62 to ride down along the camming ramps 34 and 36 to the bottoms thereof where continued rotation of the handle 24 places it in the position shown in Fig 6. At this point the tension in the coil spring 66 is released and the detent surfaces 63 of the handle are seated in the detent recesses 55 in the raised portion 48 to align the handle 24 with the elongated slot 32. The seed disk 28 can then simply be lifted to pass the handle 24 through the elongated slot 32 and remove the disk 28 from the hub 22.

Alternatively, removal of the seed disk 28 from the hub 22 can be initiated by rotating the handle 24 in a direction opposite that of the arrows 90 shown in Fig 7. However, this causes the opposite elongated portions 60 and 62 of the handle 24 to drop abruptly off of the high ends of the camming ramps 34 and 36. Because rotation of the handle 24 in the direction shown by the arrows 90 provides a smoother and less abrupt action, this is generally preferred.

CLAIMS

1. An arrangement for releasably mounting a disk or other relatively flat member on a hub, comprising a relatively flat member (28) having an elongated aperture (32) therein, a hub (22), and an elongated handle (24) rotatably mounted on the hub, the handle being adapted to fit through the elongated aperture and, when rotated out of alignment with the aperture, to trap the said member on the hub, characterised by a ramp surface (34) adjacent the aperture (32), whereby the handle (24) rides up the ramp surface when it is rotated out of alignment with the aperture, and jams the said member on to the hub.

2. An arrangement according to claim 1, characterised in that there are two ramp surfaces (34, 36) on opposite sides respectively of the elongated aperture (32).

3. An arrangement according to claim 1 or 2, characterised in that the or each ramp surface (34, 36) leads to a detent recess (80, 82) for receiving the elongated handle (24).

4. An arrangement according to claim 3, characterised in that there are two diametrically opposite detent recesses (80, 82) for receiving opposite ends of the handle.

5. An arrangement according to any of claims 1 to 4, characterised in that the elongated handle (24) is also movable axially relative to the hub (22) and by a spring (66) biasing the handle axially towards the hub.

6. An arrangement according to claim 5, characterised by a shaft (56) mounted on the hub (22) receiving the elongated handle (24), and a keeper (68) mounted on the shaft to retain the elongated handle thereon, and in that the spring (66) is a coil spring encircling the shaft and disposed between the keeper and the elongated handle.

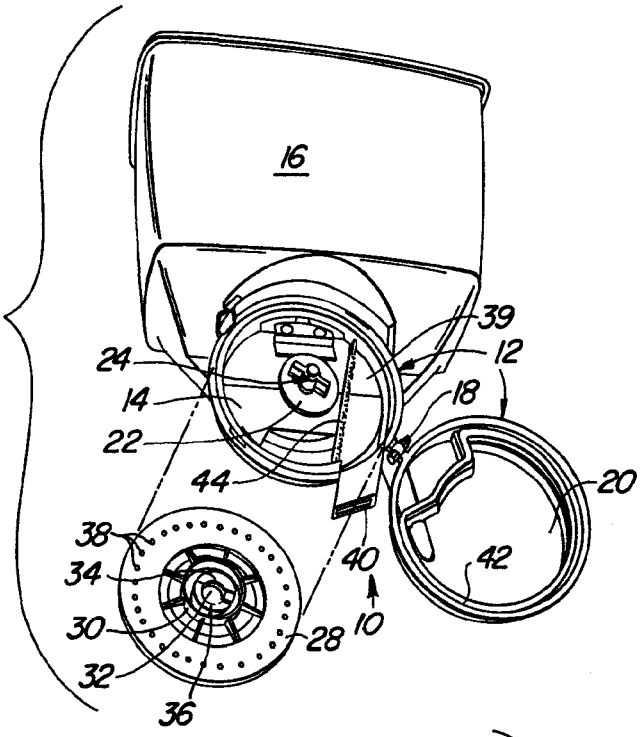
7. An arrangement according to any of claims 1 to 6, characterised

in that the hub (22) has a central raised portion (48) with a cross-sectional shape similar to but slightly smaller than the aperture in the relatively flat member and which resides within the aperture when the said member is mounted on the hub; and in that the elongated handle (24) has a cross-sectional shape similar to the cross-sectional shape of the raised portion of the hub.

8. An arrangement according to claim 7, characterised in that the aperture (32) has a generally circular central portion and a pair of elongated outer portions on opposite sides of the generally circular central portion.

9. An arrangement according to claim 7, wherein the relatively flat member (28) is a seed disk in a seed meter, characterised in that the disk (28) has an annular flange (86) on the side opposite the ramp surfaces (34, 36), the annular flange forming a seal with the hub (22) when the disk is mounted on the hub.

Fig. 1


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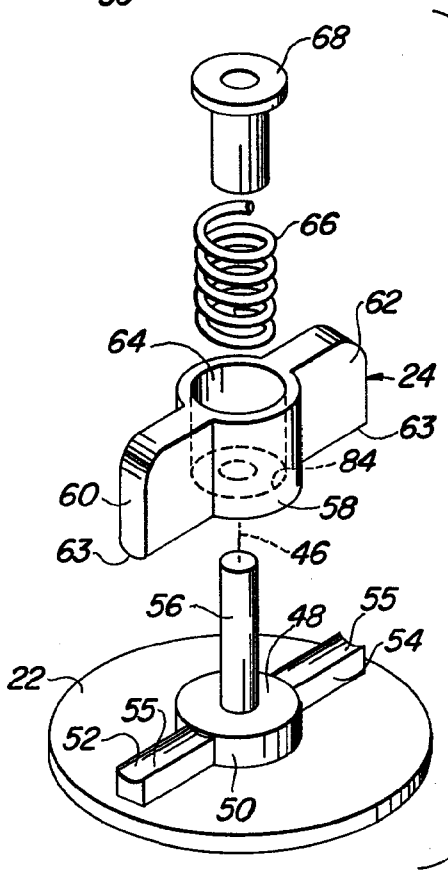

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Fig. 4

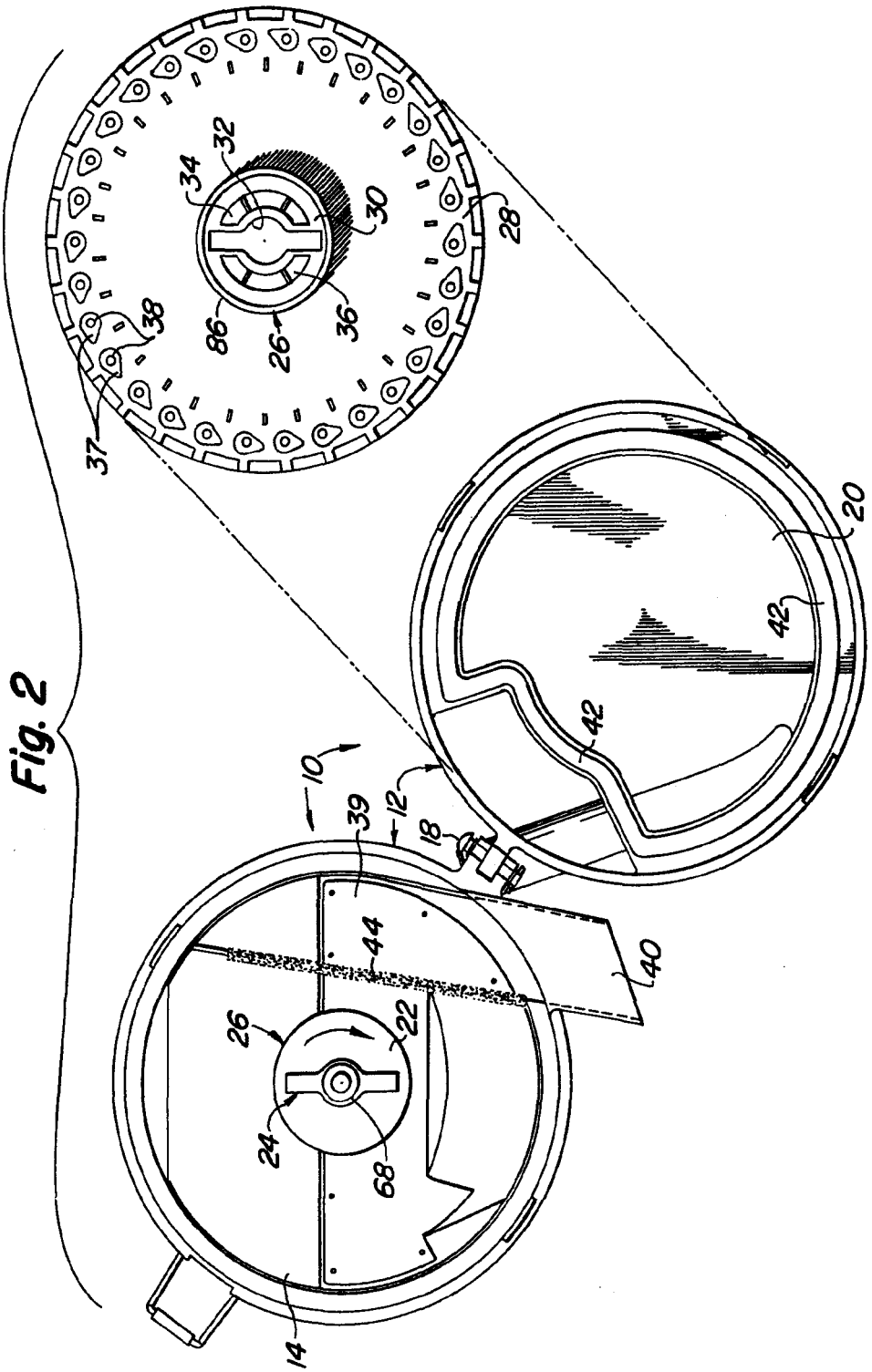


Fig. 2

Fig. 3

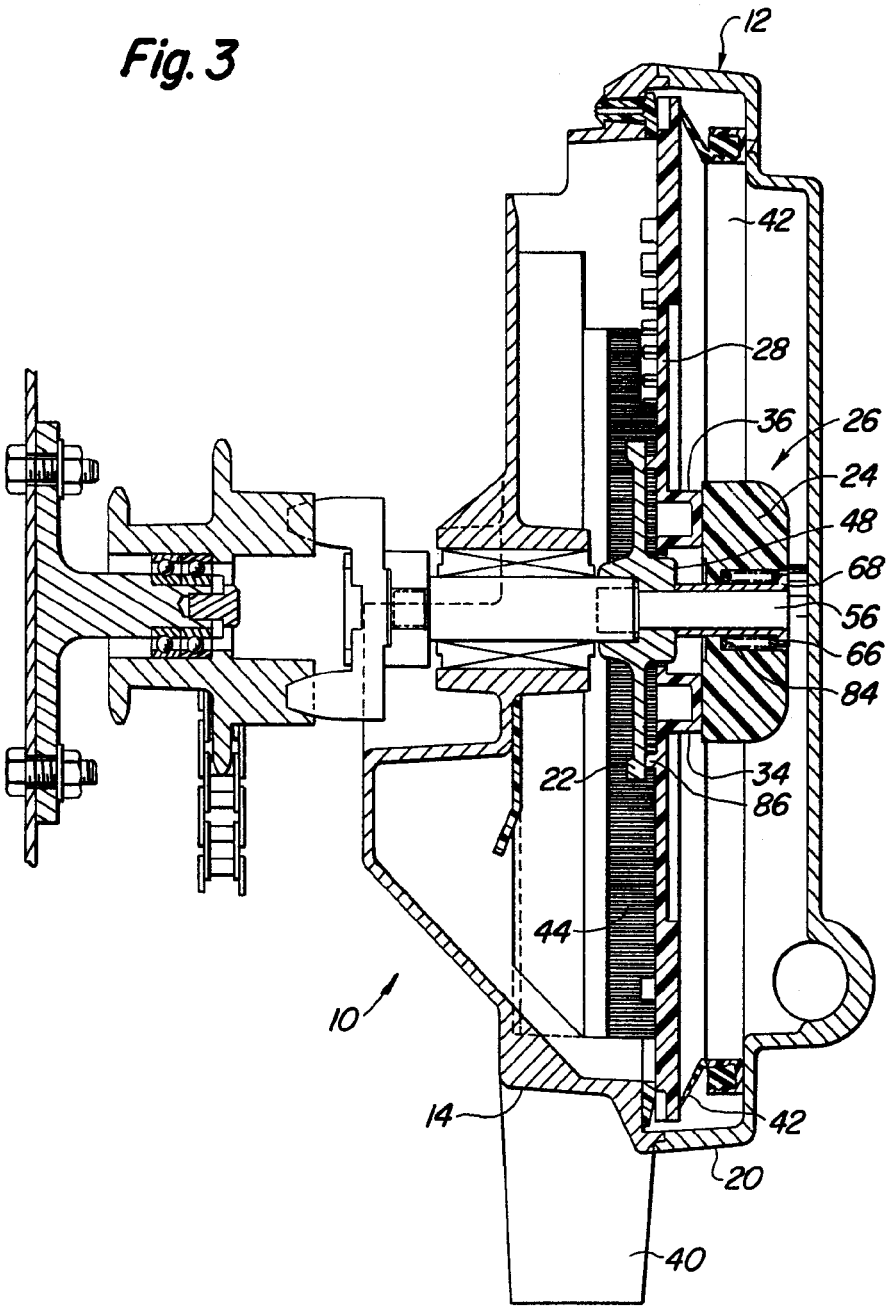


Fig. 5

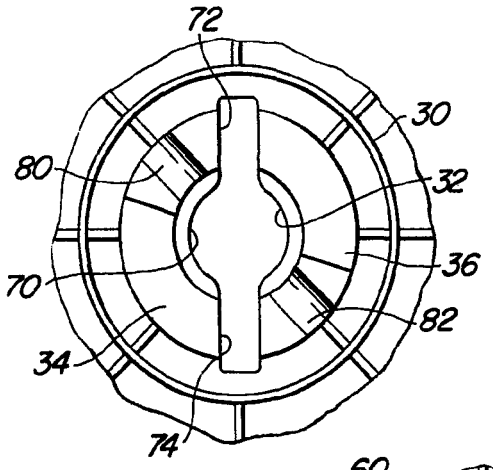
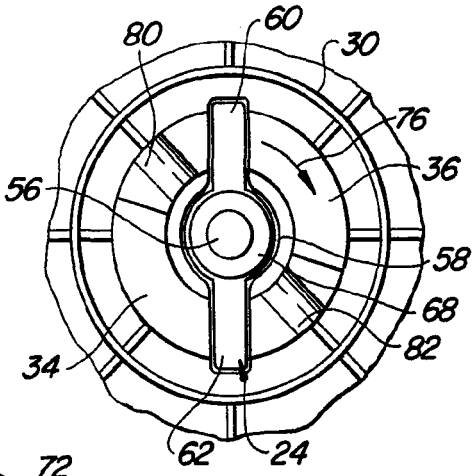


Fig. 6



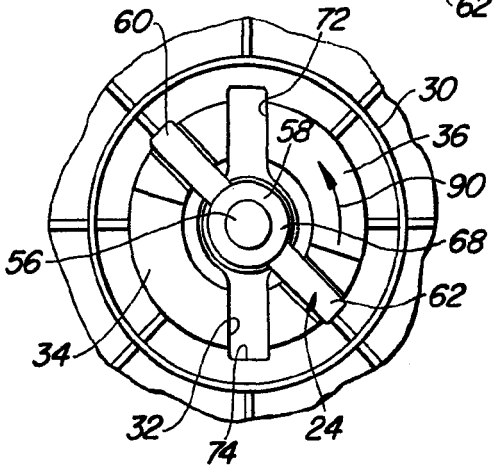


Fig. 7

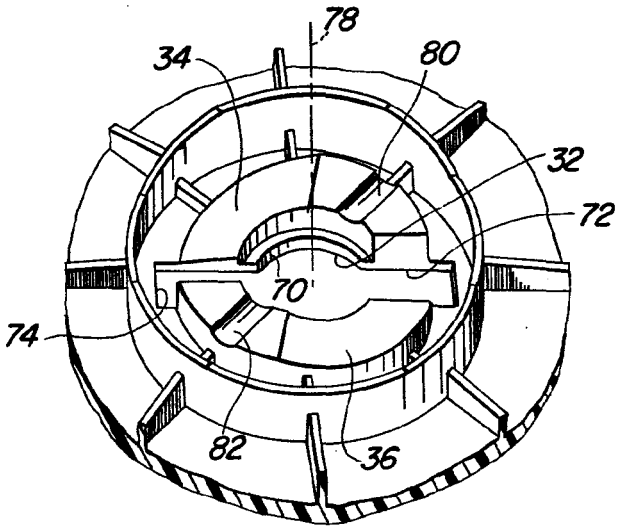


Fig. 8

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ÉLÉMENT DE DISTRIBUTION DE SEMENCES POUR SEMIS MONOGRAINE DE PRÉCISION, SEMOIR COMPRENANT CET ÉLÉMENT

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(56) References cited:
EP-A1- 0 536 543 **US-B1- 7 228 807**

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EP 2 637 492 B1

Description

[0001] The subject of the present invention is a seed distribution element for precision pneumatic seed drills, a sowing element for such machines and a seed drill including a plurality of such sowing elements.

[0002] In precision pneumatic seed drills it is known to use sowing elements which are each equipped with a seed distribution element (hereinafter, in brief, distributor) for distributing one seed at a time in a controlled delivery while the sowing element moves along a sowing track.

[0003] It is equally known to use seed distributors which use an air pressure differential between opposed faces of a sowing disc (or selector) provided with one or more rings of through holes. The operating principle is based on the fact that, as a result of the pressure differential between the opposed faces of the disc, a seed adheres to each hole and is then transported by the rotation of the sowing disc from the seed selection zone to the point at which the pressure differential ceases and the seed is released to drop through a sowing pipe into the furrow or sowing track. In practice, on one of the faces of the disc a strong air suction is exerted which retains the seeds on the opposite face in the region of the respective holes. An example of such devices is disclosed in US 7 228 807.

[0004] For the correct functioning of such distributors it is necessary to ensure an effective pneumatic seal between the face of the disc that is subjected to suction and a seal which delimits the pneumatic suction chamber. The suction effect itself effects a substantial compression of the disc against the seal. If on the one hand this ensures adequate adherence of the seal to the disc surface which is subjected to negative pressure, on the other hand it involves severe abrasion of the seal which limits the effective service life thereof. It is therefore necessary periodically to replace the seal in order to prevent sowing errors arising from insufficient depressurization of the suction chamber.

[0005] On the other hand, even if replacing the seal is a simple operation, in each case it entails an unwanted machine stoppage, besides the cost of the spare part itself.

[0006] In order to remedy this drawback, seed drills have been developed which are equipped with a thrust-bearing element which relieves the heavy load on the seal. In all cases, however, the thrust-bearing element, which must be rotated with the disc, is mounted on the fixed portion of the housing, that is to say, that portion which is fixed to the framework of the sowing elements. This means that the disc must be attached to the thrust-bearing element; therefore an attachment system must be provided which in the stage of replacement of the disc must be removed, consequently lengthening the operation. This is inevitable in the known machines since it is obligatory to mount on the fixed portion the transmission which drives in rotation the motor-driven shaft which rotates the disc.

[0007] However, positioning the thrust-bearing element on the fixed portion entails the pneumatic suction chamber being provided on the fixed portion, or on the same side at which the thrust-bearing element is placed, while the seed collection chamber must be provided in the movable portion. This is the source of numerous drawbacks, including the fact that the opening of the housing necessarily involves the removal of the portion containing the seed collection chamber from the hopper type store located above, which must necessarily be fixed to the framework of the sowing element.

[0008] Furthermore, for the replacement of the sowing disc it is necessary to remove some parts of the distributor, such as the adjustable seed selector, and the seed ejector, where provided.

[0009] The problem underlying the present invention is that of providing a seed distribution element structurally and functionally designed to make it possible to remedy all the drawbacks mentioned with reference to the prior art cited.

[0010] This problem is solved by the invention by means of a seed distribution element produced in accordance with one or more of the attached claims. The features and advantages of the invention will become clearer from the following detailed description of a preferred exemplary embodiment thereof, illustrated by way of non-limiting example with reference to the appended drawings, in which:

- Fig. 1 is a perspective view of a seed distribution element produced according to the present invention;
- Fig. 2 is an exploded perspective view of a detail of the element of Fig. 1;
- Fig. 3 is a perspective view of a seed drill equipped with sowing elements with a seed distribution element according to the invention.

[0011] In the drawings the reference 1 indicates as a whole a seed distribution element intended for equipping a sowing element 2 of a precision pneumatic seed drill 3.

[0012] The distribution element 1 is the device intended to deposit one seed 4 at a time at a predetermined adjustable spacing in a sowing furrow opened by a coulter 5. The sowing element 2, besides the distribution element 1, comprises a frame 6 and a seed store or hopper 7, besides other devices which are known per se and not necessary for the understanding of the present invention. The seed drill 3 itself comprises a bearing structure 8 on which a plurality of sowing elements 2 are mounted, all connected to a pneumatic suction device 9.

[0013] The sowing element 1 itself comprises a housing 10 with a fixed portion 11 fixed in a stable manner on the frame 6 and a movable portion 12 hinged in the region of a hinge 12a on the fixed portion 11 by means of a removable hinge pin 13. The fixed portion includes a throat 14 by means of which it is connected below an

outflow mouth of the store or hopper 7 in such a way as to be fed directly by the latter.

[0014] From the throat 14 the seed flows through a gate 14a through which the seed flows into a seed collection chamber 15.

[0015] A sowing disc 16 separates the seed collection chamber 15 from a suction chamber 17 provided in the movable portion 12. A suction device 18 mounted on the bearing structure 8 is connected to the suction chamber 17 by means of pipes 19 for producing a pressure differential between the opposed surfaces 16a, 16b of the selector disc 16.

[0016] The sowing disc 16 is removably mounted on a motor-driven drive shaft 20, supported in the fixed portion 11 and driven in rotation at predetermined adjustable speeds by a transmission which is not shown. The presence of the transmission requires the shaft 20 to be mounted on the fixed portion 11 of the housing 10. The keying between the shaft 20 and the disc 16 is obtained by means of a polygonal profile 21 at the free end of the shaft 20 which protrudes beyond the disc 16 and preferably has chamfers 22 which serve to facilitate the functions explained hereinafter. At the periphery of the disc 16 is/are provided one (or several) ring(s) of holes 23 passing between the opposed faces of the sowing disc 16.

[0017] A seal 24 is fitted in the suction chamber 17 and is placed in sliding contact with the facing surface of the disc 16, when the movable portion 11 is closed on the fixed portion 12, to delimit a circumferential segment in which the holes 23 are subjected to the aforesaid pressure differential. The circumferential segment extends between the seed collection chamber 15 and a seed fall pipe 25 in which the seeds are released one at a time into the furrow formed by the coulter 5.

[0018] By reason of the pressure differential between the two opposed surfaces of the sowing disc, the seeds 4 are held, one to each hole 23, when the holes pass in the seed collection chamber 15, and are released in the region of the pipe 25 when the pneumatic effect of the pressure differential ceases or owing to the presence of a seed ejector (not shown). In order to limit the wear on the seal 24 resulting from sliding against the surface of the disc 16, a thrust-bearing element indicated as a whole by 26 is mounted on the movable portion.

[0019] The thrust-bearing element 26 comprises a shaft 27 rotatably mounted by means of bearings 28 in a seat 29 of the movable portion 12. The shaft 27 has flanging 30 by means of which it is fixed to a thrust-bearing plate 31 which can bear on that surface of the disc which faces the seal 24 in a zone radially inside the ring of holes 23 in order to withstand at least some of the axial load produced by the disc 16 on the seal 24.

[0020] The bearing between the thrust-bearing plate 31 and the disc 16 takes place in the region of a ring 31a in relief on the surface of the plate which faces the disc 16.

[0021] The thrust-bearing element 26 is driven in rotation with the sowing disc 16 when the fixed and movable portions 11, 12 are closed against one another by means of a drive element 32 which comprises a coupling device constrained for rotation with the thrust-bearing plate but with radial and/or circumferential clearance in such a way as to be self-centred in the rotational coupling with the drive shaft of the disc 16. For this purpose, in the present form of embodiment, the drive element 32 is coupled with limited radial and/or circumferential clearance to the element 26 by means of one (or more) appendage(s) 33 protruding radially towards the outside and fitted into corresponding seats 34 of the plate. The drive element 32 is coupled by means of an internal polygonal profile 35 (similar to that adopted for box-end wrenches) to the polygonal profile 21 of the free end of the shaft 20, the chamfers 22 of which serve to facilitate the centring of the two profiles and the respective engagement. The drive element 32 is thus self-centring relative to the drive shaft 20 by which it is driven. The positioning between seal 24 and plate 31 is such that the rotation of the latter will not be hindered by the presence of the seal 24 and, at the same time, both will be kept bearing against the disc 16.

[0022] Provision is also made for the thrust-bearing element 26 to be made idle and not driven in rotation by the shaft 20.

[0023] The whole of the movable portion 12 complete with thrust-bearing element 26 and seal 24 lends itself advantageously to the production of a kit for the retrofitting of existing seed drills. It is sufficient in this case to separate the old type of movable portion by removing the hinge pin 13 and replacing the old movable portion with the aforesaid kit. By reconnecting the pneumatic pipes previously disconnected, the seed drill becomes ready for use.

[0024] Among the principal advantages of the distribution element according to the invention is the fact that the wear on the seal resulting from the sliding contact with the seed selector disc is substantially reduced, if not eliminated; the thrust-bearing element is self-centring, thereby allowing easy opening and closing of the movable portion on the fixed portion of the housing; the system additionally lends itself to easy retrofitting, all without removing movable parts and/or operations of disconnecting the sowing disc.

Claims

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

   - a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
   - a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
   - a seed collection chamber (15) being defined

in the fixed portion (11),
- a pneumatic suction chamber (17) being defined in the movable portion (12),
- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),
- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and
- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another, **characterized in that** the seal distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
- a seed collection chamber (15) being defined in the fixed portion (11),
- a pneumatic suction chamber (17) being defined in the movable portion (12),
- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),
- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and
- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another, **characterized in that** the kit comprises:
- the movable portion (12) pre-assembled with:
- a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

Patentansprüche

1. Samenverteilungselement (1) für pneumatische Präzisionssämaschinen (3), umfassend:

- eine Aussaatscheibe (16), die durch eine motorbetriebene Getriebewelle (20) mit kontrollierter Geschwindigkeit gedreht wird,
- ein Gehäuse (10) mit einem fixierten Bereich (11), in dem die Welle (20) abgestützt ist, und mit einem Bereich (12), der bezüglich des fixierten Bereichs (11) beweglich ist und gegen diesen geschlossen werden kann,

- ein Saatgut-Sammelbehälter (15), der im fixierten Bereich (11) ausgebildet ist,
- eine pneumatische Ansaugkammer (17), die im beweglichen Bereich (12) ausgebildet ist,
- wobei die Aussaatscheibe (16) zwischen den Bereichen (11, 12) angeordnet ist und gegenüberliegende Flächen aufweist, die die Kammern (15, 17) begrenzen,
- wobei die Aussaatscheibe (16) zumindest einen Ring von Auswahllöchern (23) aufweist, die sich zwischen den gegenüberliegenden Flächen erstrecken, und
- eine Dichtung (24), die auf dem beweglichen Bereich (12) angeordnet ist und einen Gleitkontakt mit der zugewandten Fläche der Scheibe (16) bilden kann, wenn die Bereiche (11, 12) gegeneinander geschlossen sind,

dadurch gekennzeichnet, dass das Samenverteilungselement (1) ferner ein Drucklagerelement (26) der Aussaatscheibe (16) aufweist, wobei das Drucklagerelement (26) drehbeweglich im beweglichen Bereich (12) abgestützt ist, um zumindest etwas der axialen Last standzuhalten, die durch die Scheibe (16) auf der Dichtung (24) erzeugt wird.

2. Samenverteilungselement (1) gemäß Anspruch 1, wobei das Drucklagerelement (26) mit der Scheibe (16) gedreht wird, wenn die Bereiche (11, 12) gegeneinander geschlossen sind.

3. Samenverteilungselement (1) gemäß Anspruch 1 oder Anspruch 2, wobei das Drucklagerelement (26) eine Drucklagerplatte (31), die sich auf der Fläche der Aussaatscheibe (16) abstützen kann, die der Dichtung (24) zugewandt ist, in einem Bereich aufweist, der radial innerhalb des Lochrings (23) liegt.

4. Samenverteilungselement (1) gemäß Anspruch 3, wobei das Drucklagerelement (26) ein Antriebselement (32) aufweist, das zur Drehung mit der Platte (31) fixiert ist und mit der Antriebswelle (20) der Scheibe (16) gekoppelt werden kann, wenn die Bereiche (11, 12) gegeneinander geschlossen sind.

5. Samenverteilungselement (1) gemäß Anspruch 4, wobei das Antriebselement (32) bezüglich der Antriebswelle (20) selbstzentrierend ist.

6. Samenverteilungselement (1) gemäß Anspruch 4 oder Anspruch 5, wobei das Antriebselement (32) ein Kopplungselement (33) aufweist, das sich mit der Drucklagerplatte (31) gemeinsam dreht, aber einen radialen und/oder umfangsmäßigen Abstand aufweist, um somit während einer drehbeweglichen Kopplung mit der Antriebswelle (20) der Scheibe (16) selbstzentrierend zu sein.

7. Samenverteilungselement (1) gemäß einem oder mehreren der vorhergehenden Ansprüche, wobei der bewegliche Bereich (12) gegen den fixierten Bereich (11) drehbar angeordnet ist.

8. Saatgutelement für Präzisionssämaschinen (3) mit einem Rahmen (6), auf dem ein Samenverteilungselement (1) gemäß einem oder mehreren der vorhergehenden Ansprüche befestigt ist.

9. Sämaschine (3) mit einer Abstützanordnung, auf der eine Mehrzahl von Saatgutelementen gemäß Anspruch 8 befestigt ist.

10. Bausatz zur Nachrüstung von Samenverteilungselementen (1) von pneumatischen Präzisionssämaschinen (3), wobei die Verteilungselemente (1) umfassen:

- eine Aussaatscheibe (16), die durch eine motorbetriebene Getriebewelle (20) mit kontrollierter Geschwindigkeit gedreht wird,
- eine Gehäuse (10) mit einem fixierten Bereich (11), in dem die Welle (20) abgestützt ist, und mit einem Bereich (12), der bezüglich des fixierten Bereichs (11) beweglich ist und gegen diesen geschlossen werden kann,
- ein Saatgut-Sammelbehälter (15), der im fixierten Bereich (11) ausgebildet ist,
- eine pneumatische Ansaugkammer (17), die im beweglichen Bereich (12) ausgebildet ist,
- wobei die Aussaatscheibe (16) zwischen den Bereichen (11, 12) angeordnet ist und gegenüberliegende Flächen aufweist, die die Kammern (15, 17) begrenzen,
- wobei die Aussaatscheibe (16) zumindest einen Ring von Auswahllöchern (23) aufweist, die sich zwischen den gegenüberliegenden Flächen erstrecken, und
- eine Dichtung (24), die auf dem beweglichen Bereich (12) angeordnet ist und einen Gleitkontakt mit der zugewandten Fläche der Scheibe (16) bilden kann, wenn die Bereiche (11, 12) gegeneinander geschlossen sind,

dadurch gekennzeichnet, dass der Bausatz aufweist:

- den beweglichen Bereich (12), der vormontiert ist mit:
- einem Drucklagerelement (26) der Aussaatscheibe (16), wobei das Drucklagerelement (26) drehbeweglich im beweglichen Bereich (12) abgestützt ist, um zumindest etwas der axialen Last standzuhalten, die durch die Scheibe (16) auf der Dichtung (24) erzeugt wird.

11. Bausatz gemäß Anspruch 10, wobei der bewegliche Bereich (12) und das Drucklagerelement (26) ein oder mehrere der Merkmale der Ansprüche 2 bis 7

aufweisen.

Revendications

1. Elément de distribution de semences (1) pour des semoirs pneumatiques de précision (3), du type comprenant :

   - un disque de semis (16) qui est entraîné en rotation par un arbre de transmission motorisé (20) à une vitesse contrôlée,
   - un boîtier (10) avec une partie fixe (11) dans laquelle l'arbre (20) est supporté et une partie (12) qui est mobile par rapport à la partie fixe (11) et peut être fermée contre cette dernière,
   - une chambre de collecte de semences (15) étant définie dans la partie fixe (11),
   - une chambre d'aspiration pneumatique (17) étant définie dans la partie mobile (12),
   - le disque de semis (16) étant intercalé entre les parties (11, 12) et ayant des surface opposées délimitant les chambres (15, 17),
   - le disque de semis (16) ayant au moins une bague de trous sélecteurs (23) s'étendant entre les surfaces opposées, et
   - un joint d'étanchéité (24) qui est agencé sur la partie mobile (12) et est capable d'entrer en contact coulissant avec la surface en vis-à-vis du disque (16) lorsque les parties (11, 12) sont fermées l'une contre l'autre,

   caractérisé en ce que l'élément de distribution de semences (1) comprend en outre un élément de palier de butée (26) du disque de semis (16), lequel élément de palier de butée (26) est supporté en rotation dans la partie mobile (12) afin de résister au moins à une certaine partie de la force axiale produite par le disque (16) sur le joint d'étanchéité (24).

2. Elément de distribution de semences (1) selon la revendication 1, dans lequel l'élément de palier de butée (26) est entraîné en rotation avec le disque (16) lorsque les parties (11, 12) sont fermées l'une contre l'autre.

3. Elément de distribution de semences (1) selon la revendication 1 ou la revendication 2, dans lequel l'élément de palier de butée (26) comprend une plaque de palier de butée (31) qui peut s'appuyer sur cette surface du disque de semis (16) qui fait face au joint d'étanchéité (24), dans une zone radialement à l'intérieur de la bague de trous (23).

4. Elément de distribution de semences (1) selon la revendication 3, dans lequel l'élément de palier de butée (26) comprend un élément d'entraînement (32) qui est fixé pour tourner avec la plaque (31) et peut être couplé avec l'arbre d'entraînement (20) du disque (16) lorsque les parties (11, 12) sont fermées l'une contre l'autre.

5. Elément de distribution de semences (1) selon la revendication 4, dans lequel l'élément d'entraînement (32) se centre automatiquement par rapport à l'arbre d'entraînement (20).

6. Elément de distribution de semences (1) selon la revendication 4 ou la revendication 5, dans lequel l'élément d'entraînement (32) comprend un élément de couplage (33) qui tourne conjointement avec la plaque de palier de butée (31), mais a un jeu radial et/ou circonférentiel afin d'être centrée automatiquement pendant le couplage rotatif avec l'arbre d'entraînement (20) du disque (16).

7. Elément de distribution de semences (1) selon une ou plusieurs des revendications précédentes, dans lequel la partie mobile (12) est articulée par rapport à la partie fixe (11).

8. Elément de semis pour des semoirs de précision (3) comprenant un bâti (6) sur lequel est monté un élément de distribution de semences (1) selon une ou plusieurs des revendications précédentes.

9. Semoir (3) comprenant une structure de support sur laquelle est montée une pluralité d'éléments de semis selon la revendication 8.

10. Kit pour la modernisation des éléments de distribution de semences (1) de semoirs pneumatiques de précision (3), dans lequel les éléments de distribution (1) sont du type comprenant :

    - un disque de semis (16) qui est entraîné en rotation par un arbre de transmission motorisé (20) à une vitesse contrôlée,
    - un boîtier (10) avec une partie fixe (11) dans laquelle l'arbre (20) est supporté et une partie (12) qui est mobile par rapport à la partie fixe (11) et peut être fermée contre cette dernière,
    - une chambre de collecte de semences (15) qui est définie dans la partie fixe (11),
    - une chambre d'aspiration pneumatique (17) qui est définie dans la partie mobile (12),
    - le disque de semis (16) étant intercalé entre les parties (11, 12) et ayant des surfaces opposées délimitant les chambres (15, 17),
    - le disque de semis (16) ayant au moins une bague de trous sélecteurs (23) s'étendant entre les surfaces opposées, et
    - un joint d'étanchéité (24) qui est agencé sur la partie mobile (12) et est capable d'entrer en contact coulissant avec la surface en vis-à-vis du disque (16) lorsque les parties (11, 12) sont fer-

mées l'une contre l'autre,
caractérisé en ce que le kit comprend :
- la partie mobile (12) pré-assemblée avec :
- un élément de palier de butée (26) du disque de semis (16), lequel élément de palier de butée (26) est supporté en rotation dans la partie mobile (12) afin de résister au moins à une certaine partie de la force axiale produite par le disque (16) sur le joint d'étanchéité (24).

11. Kit selon la revendication 10, dans lequel la partie mobile (12) et l'élément de palier de butée (26) comprennent une ou plusieurs des caractéristiques selon les revendications 2 à 7.

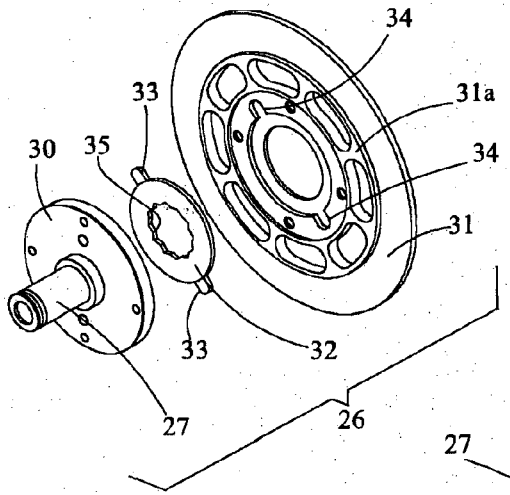

34
33
31a
30
35
34
31
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32
27
26

fig. 2

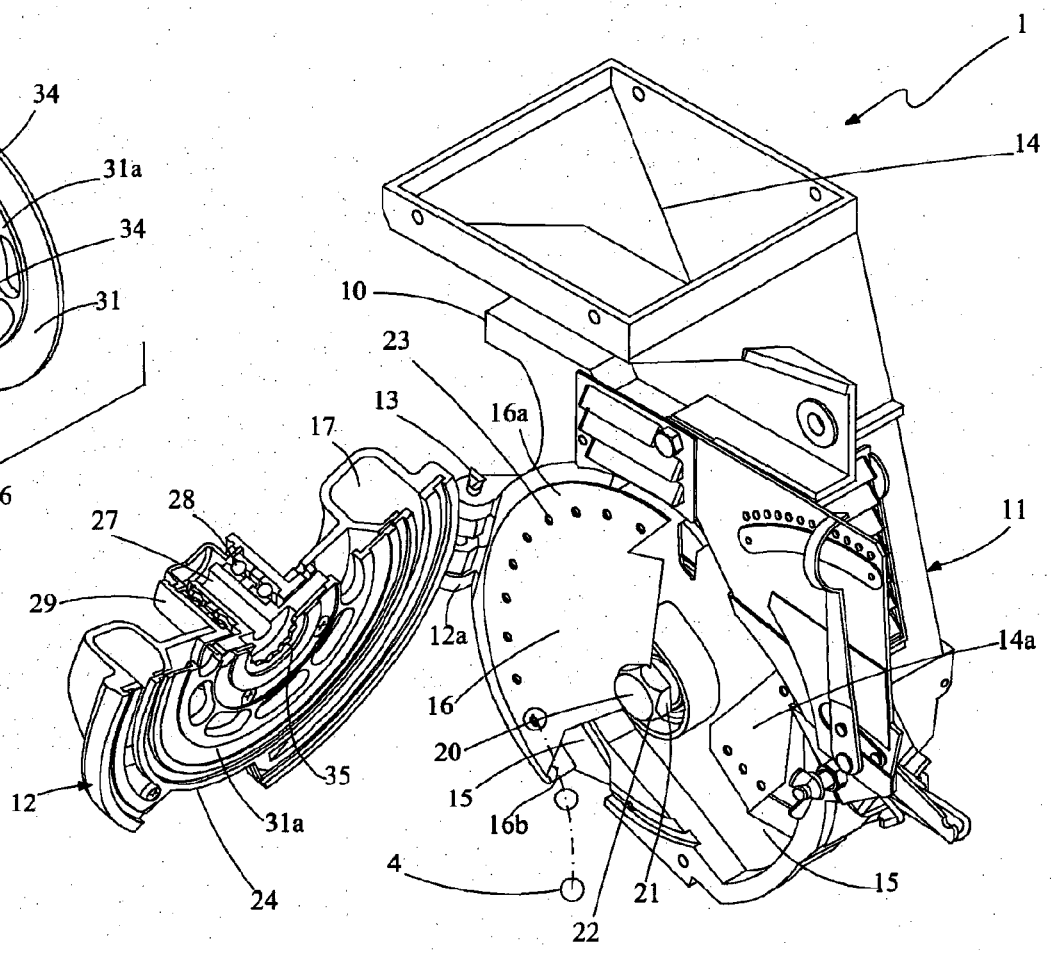

1
14
10
23
13
16a
17
28
27
11
29
12a
14a
16
20
15
16b
12
35
31a
4
21
15
24
22

fig. 1

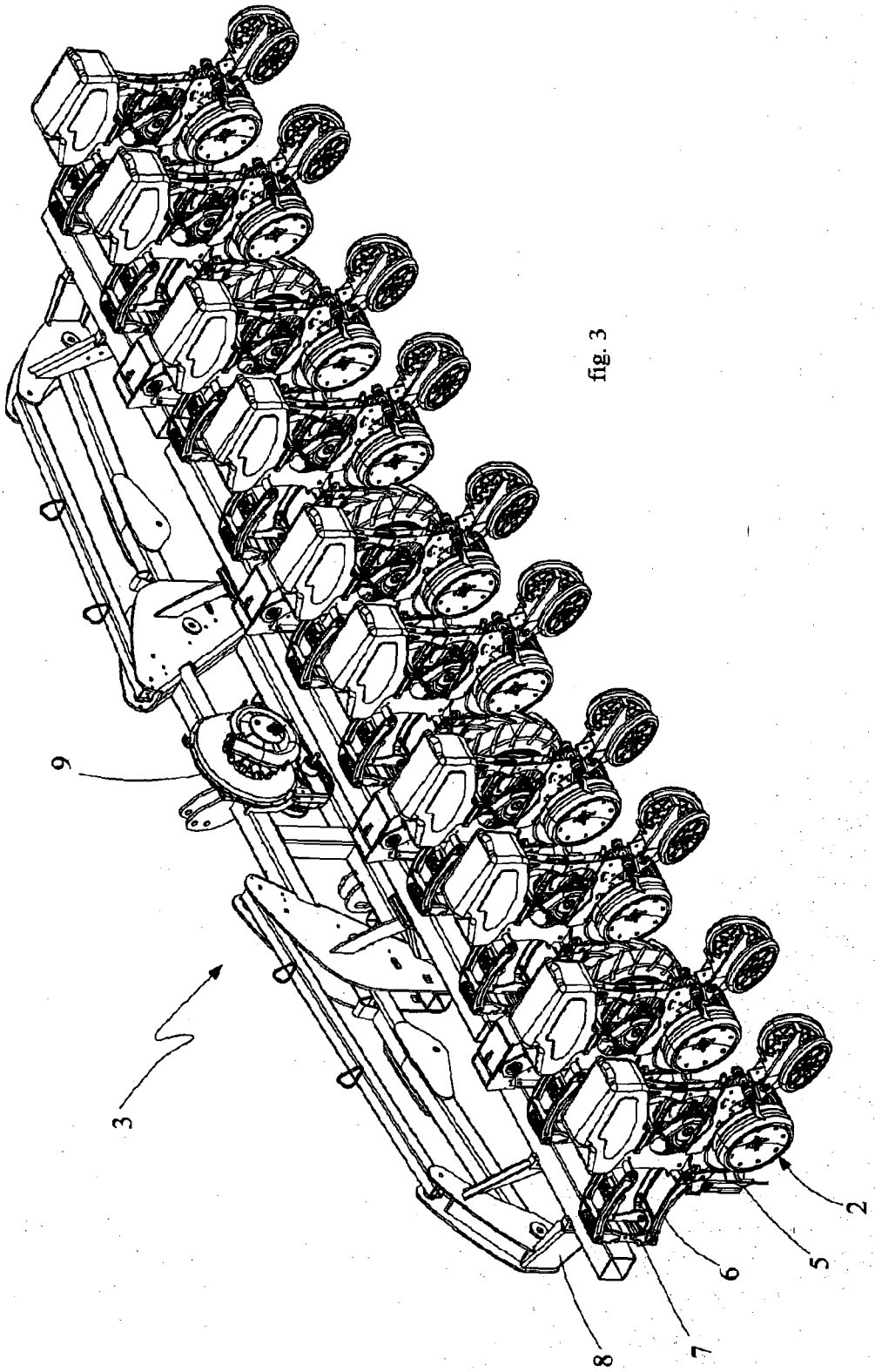


fig. 3

REFERENCES CITED IN THE DESCRIPTION

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US007228807B1

(12) **United States Patent**
VenHuizen

(10) **Patent No.: US 7,228,807 B1**
(45) **Date of Patent: Jun. 12, 2007**

(54) **DEVICE FOR IMPROVING THE SPACING BETWEEN SEEDS PLANTED BY A JOHN DEERE VACUUM PLANTER**

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A01C 7/00 (2006.01)
A01C 9/00 (2006.01)

(52) **U.S. Cl.** **111/174**; 111/185

(58) **Field of Classification Search** 111/170–189
See application file for complete search history.

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Primary Examiner—Christopher J. Novosad
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(57) **ABSTRACT**

A seed planter of the type having a metering unit with a seed chute that drops seeds into a seed tube for planting as manufactured by John Deere is provided with a deflector in the metering unit. The deflector directs the path of the seeds as they fall away from the seed disk so as to free fall along a vertical centerline between the leading and trailing walls of the seed tube and between the opposing sides thereof.

13 Claims, 8 Drawing Sheets

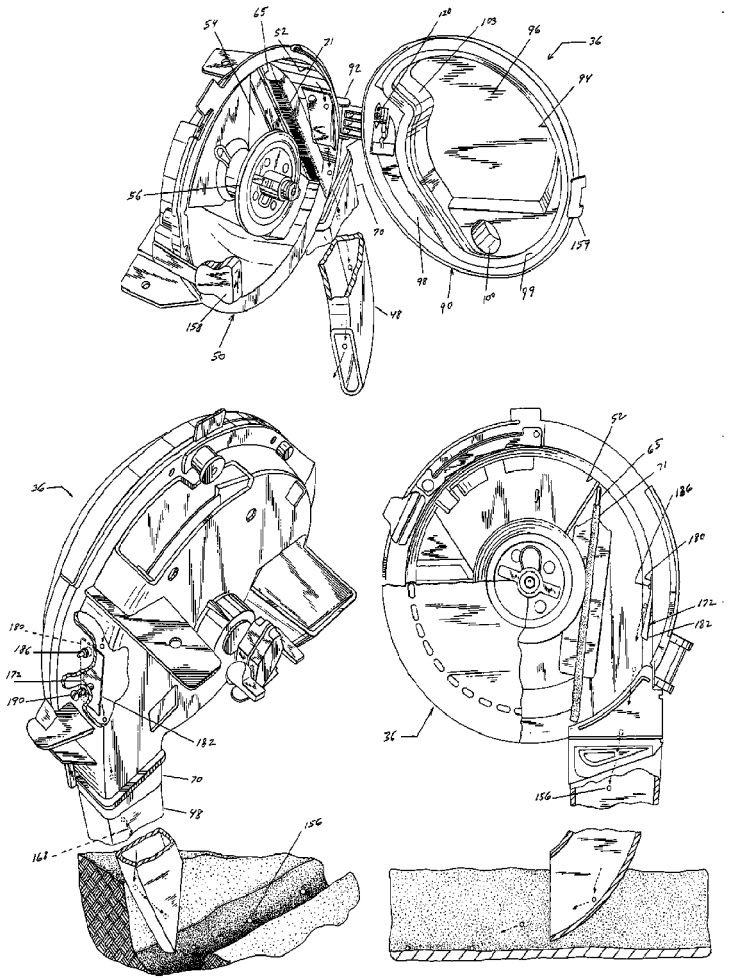


FIG. 1
PRIOR ART

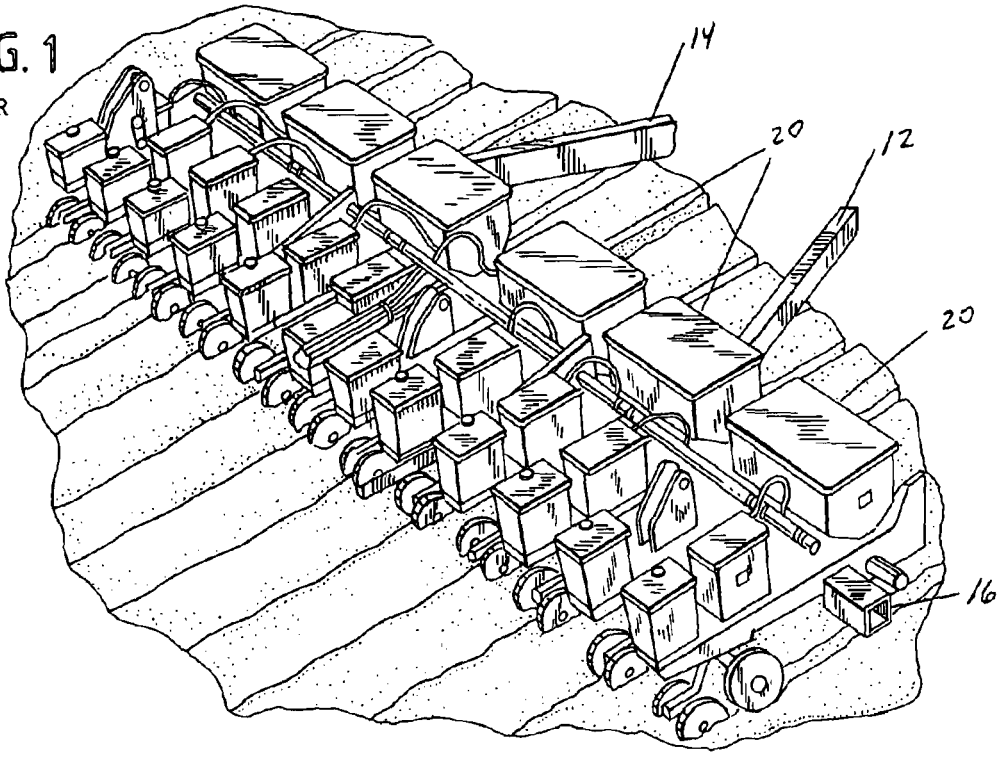


FIG. 2 PRIOR ART

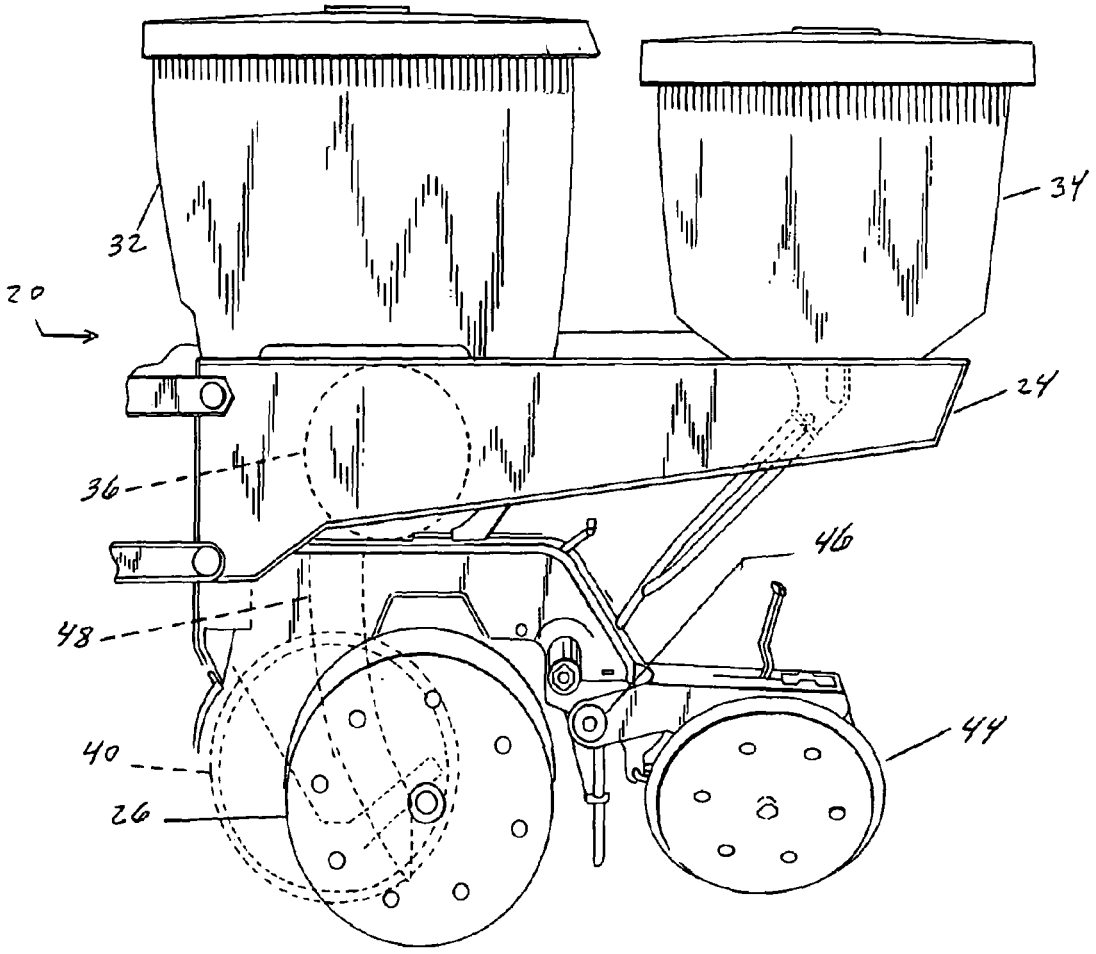


FIG. 3 PRIOR ART

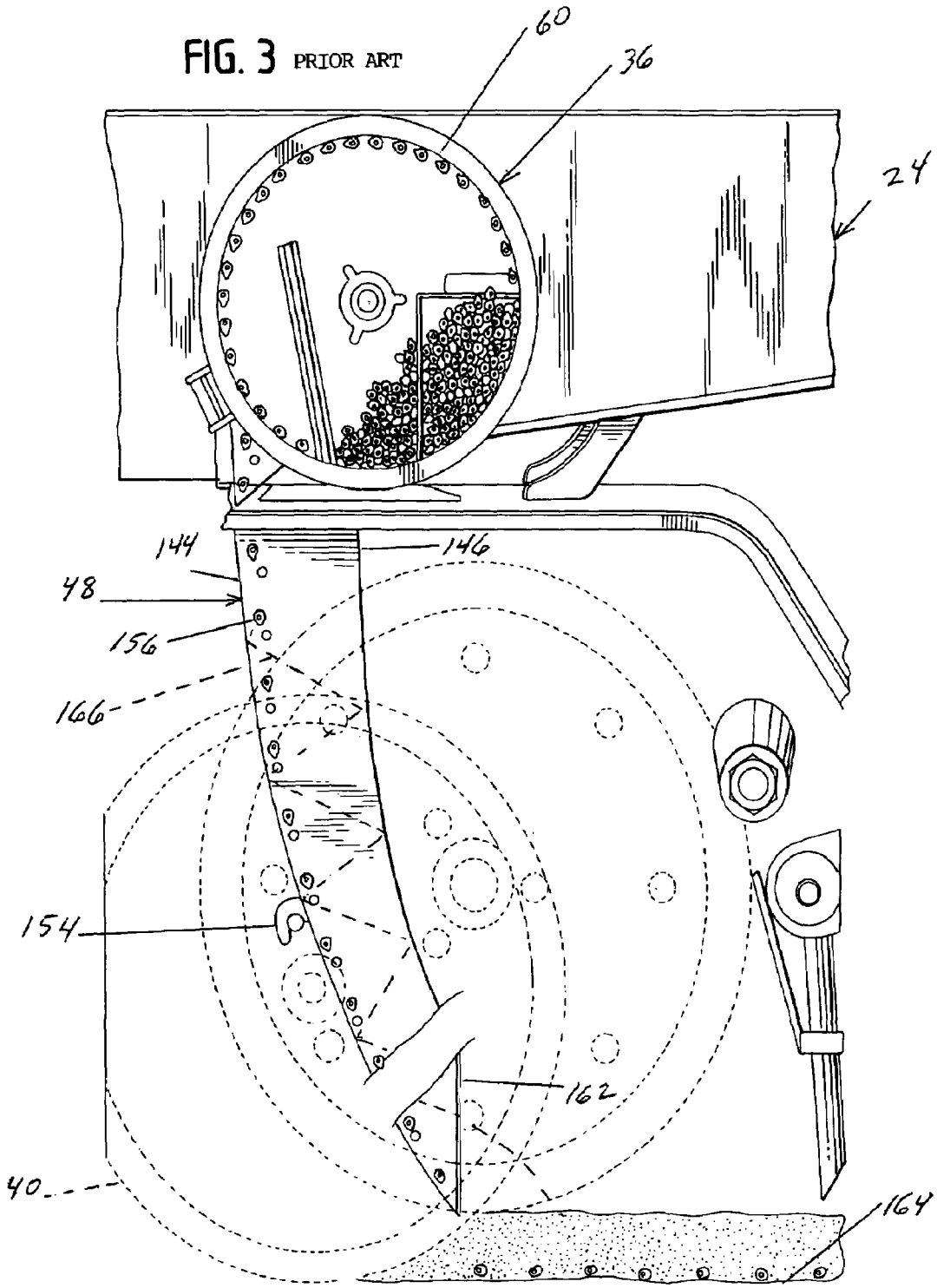


FIG. 4 PRIOR ART

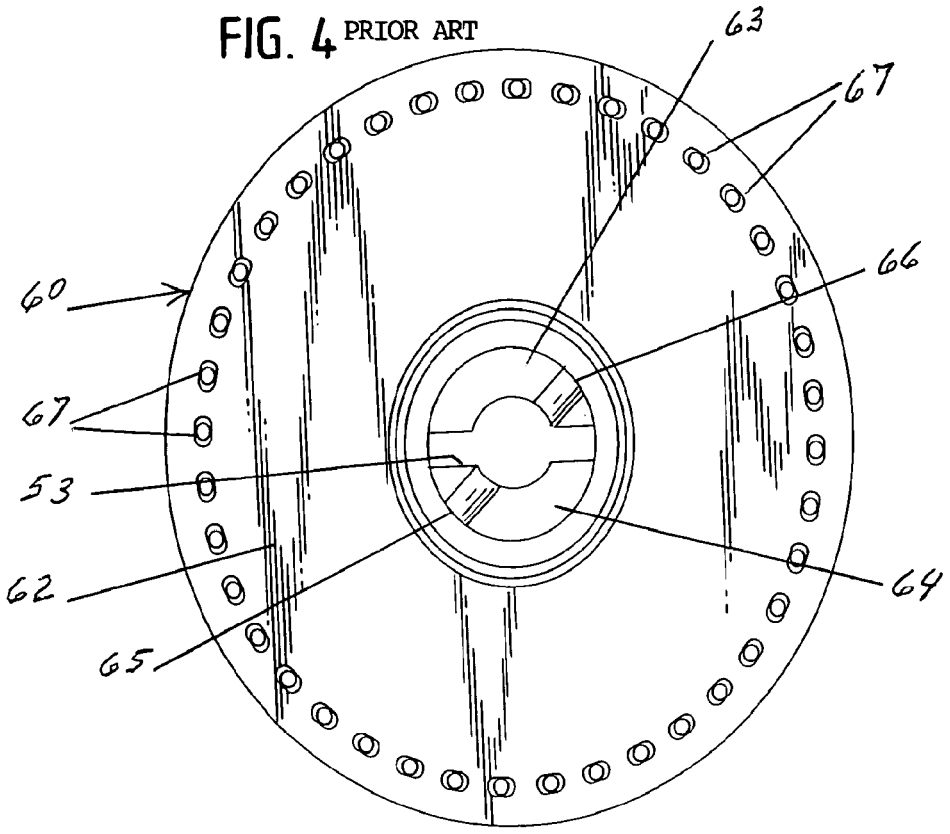


FIG. 5 PRIOR ART

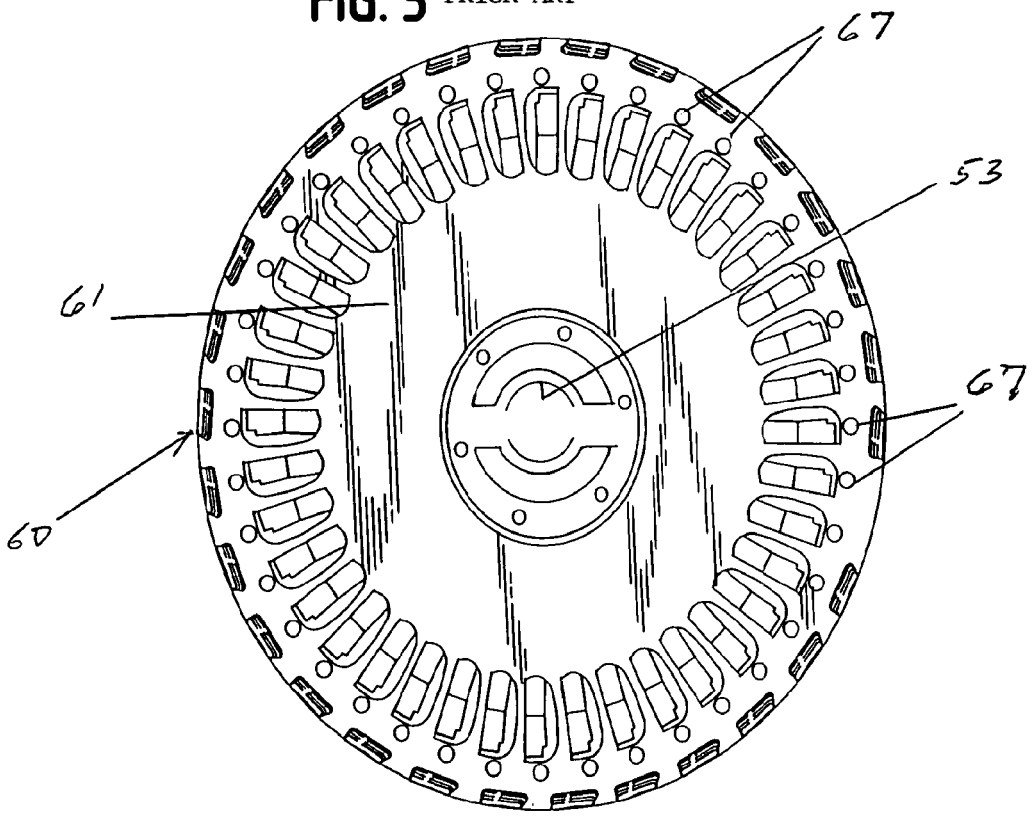
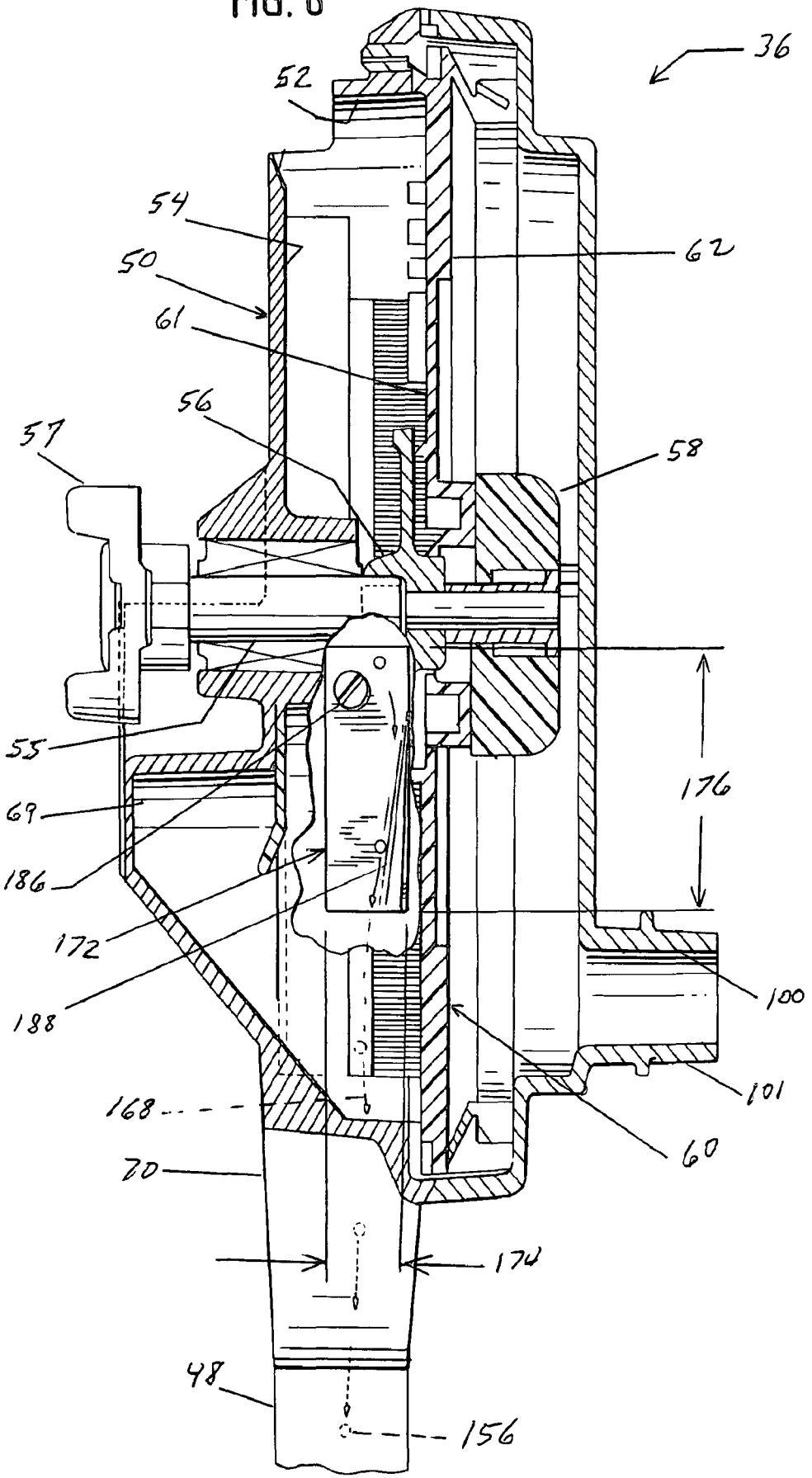


FIG. 6


36
52
54
50
61
62
56
57
58
55
69
186
172
188
176
100
101
168
60
70
174
48
156

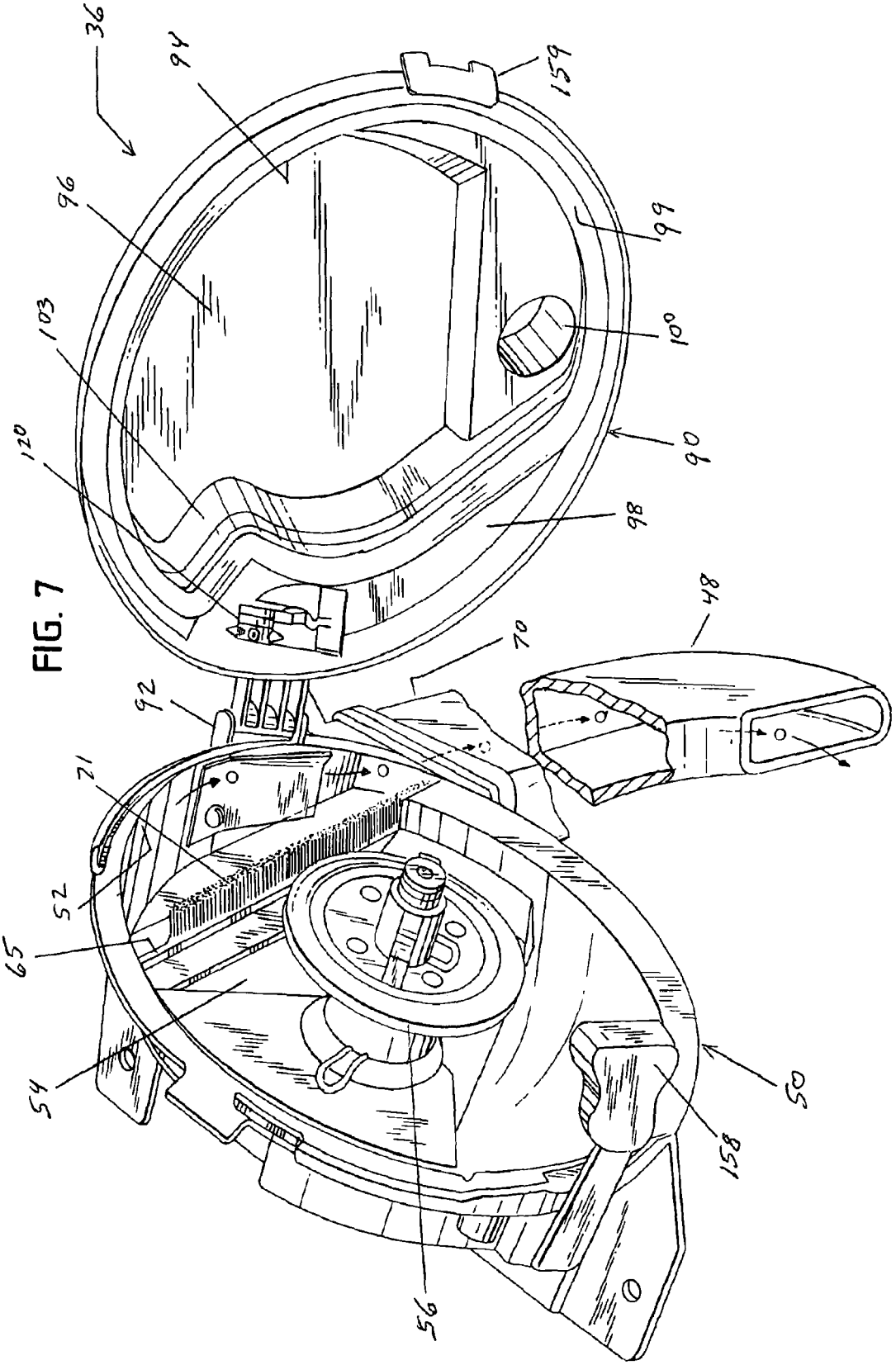


FIG. 7

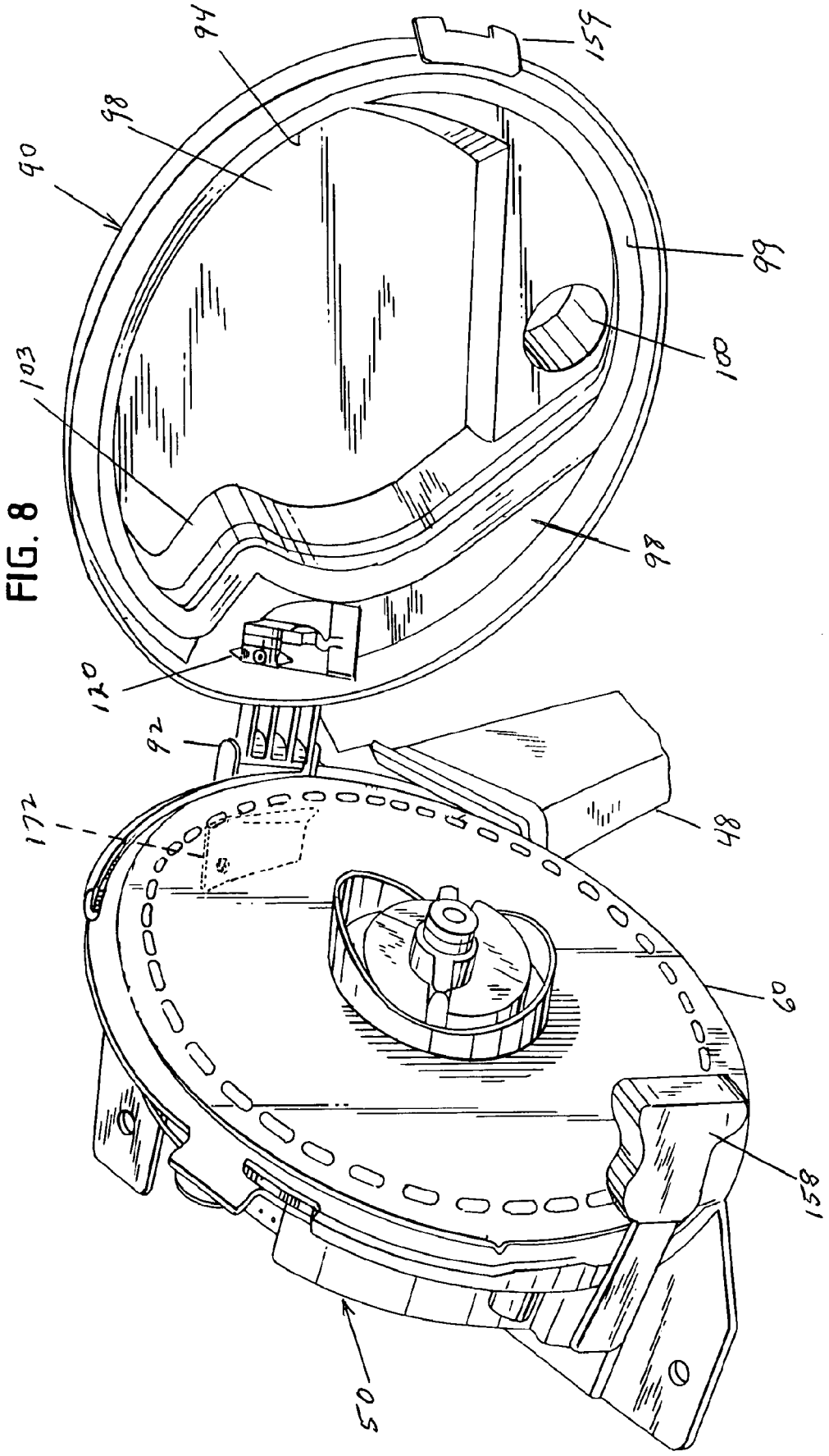


FIG. 8

FIG. 9

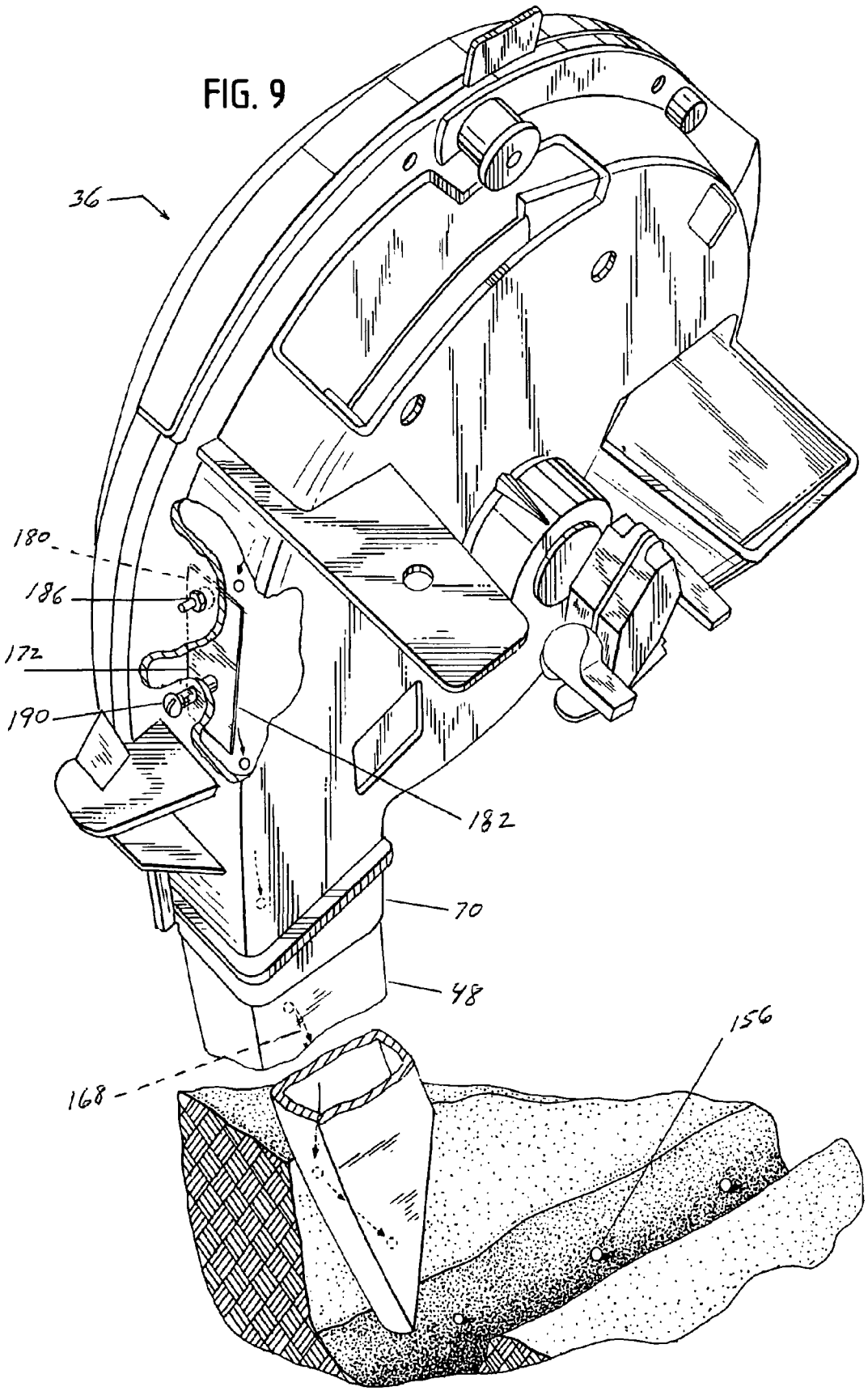
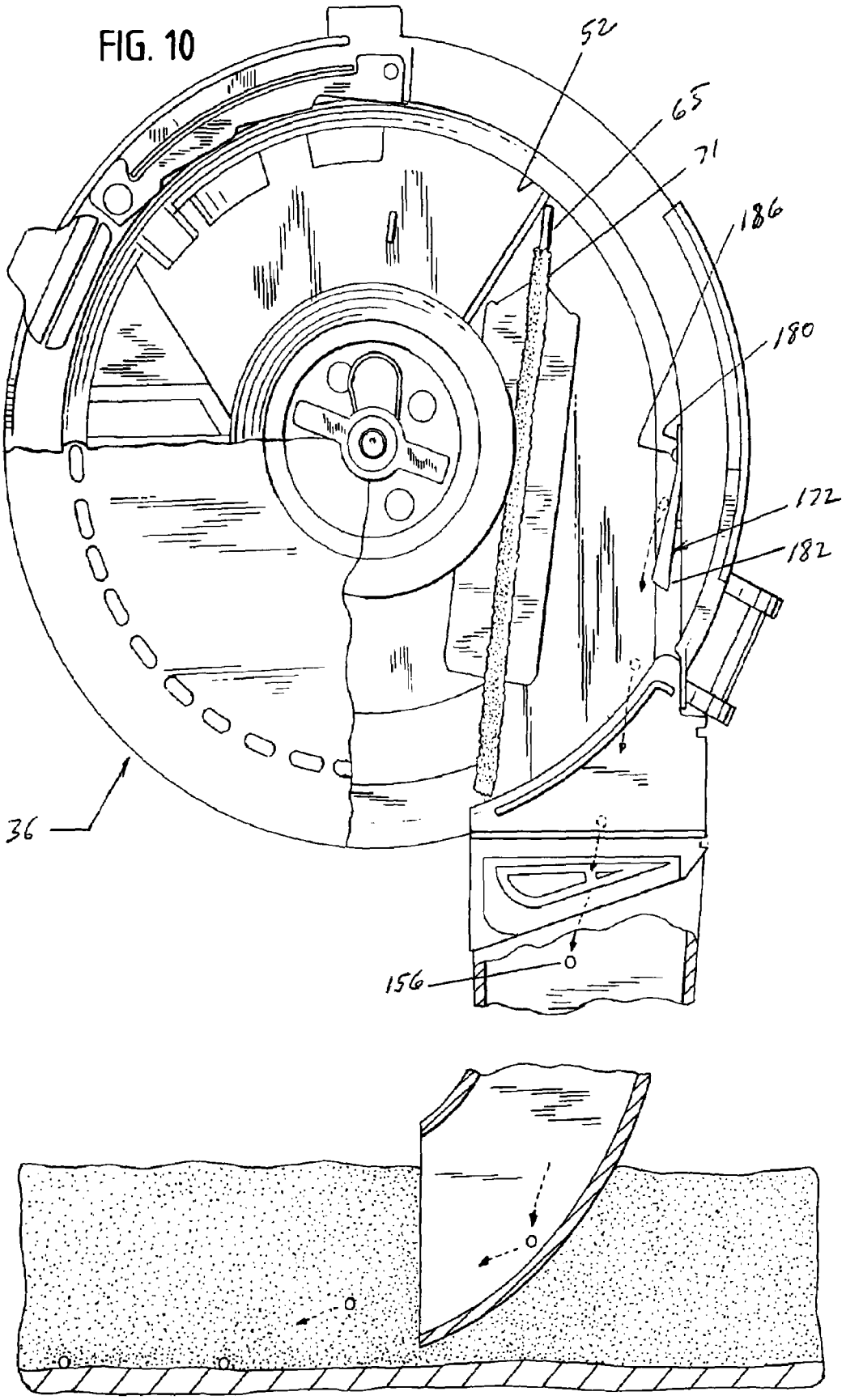


FIG. 10



DEVICE FOR IMPROVING THE SPACING BETWEEN SEEDS PLANTED BY A JOHN DEERE VACUUM PLANTER

The present invention relates to seed planters of the type manufactured by John Deere which receive a rotatable seed disk and, in particular, to a method and apparatus for retaining equal spacing between seeds that are planted by such machines.

BACKGROUND OF THE INVENTION

John Deere manufactures a Max Emerge Drawn Conservation Flex-fold planter. The heart of the John Deere planter is a metering unit which retains a circular rotatable seed disk that separates the interior of the metering unit into two chambers, one on each side of the disk. The seed disks employed in the machine have a plurality of holes, with the centers thereof spaced to define a circle having a radius a little less than the radius of the disk. A vacuum is drawn in the chamber formed on one side of the disk and seeds are introduced into the chamber on the opposite side of the disk. The diameter of the holes in the seed disks are sized such that, when operating properly, the vacuum will draw one seed against the aperture of each hole in the disk and retain the seed as the disk rotates to a position above a seed tube, at which point the disk moves away from the vacuum chamber and the seed falls away from the disk and into the seed tube to be planted.

The planter is intended for use with many types of seed, including sunflower, cotton, soybean, sorghum, sugar beets, popcorn, sweet corn, and corn seed (feed corn seed). Each type of seed has a different size and configuration and the planter is, therefore, provided with a plurality of seed disks, which each of the seed disks having a different configuration of holes through which the vacuum is drawn to move seeds from the input to the seed tube.

The manual for the 7200 Max Emerge, 16 row, narrow flex-fold planter, for example, describes and depicts thirteen different seed disks. According to the manual, the seed size for certain grains, such as corn seed, vary widely. The manual recommends disk H136478 for the smallest sized corn seed, recommends disk A43215 for medium sized corn seed, and recommends disk A50617 for large sized corn seed.

The proper operation of the John Deere planter, therefore, requires the selection of the appropriate seed disk for use with the size and type of seed to be planted. To compensate for differences in weight, size, and shape of the various seeds, the proper operation of the planter also requires adjustments to the vacuum drawn to one side of the seed disk and depending on the size of seed being planted, the installation or removal of certain optional features. It is also recommended that the machine be monitored during its use and that the strength of the vacuum be adjusted if the machine is found to be under planting or over planting seed.

The machine scratches a trough in the ground and when the machine is operating properly it will deposit one seed every six inches along the trough or one hundred seeds along a six hundred inch length of ground. When the one hundred seeds are all equally spaced from one another, the stalks of corn, or other produce that grows from the seed, will not interfere with each other and the harvest from a tract of land will be maximized. When the machine drops two seeds at once through the seed tube the stalks that grow from the two seeds compete for the same nutrients from the ground and the same light from the sun resulting in both stalks being

stunted and a reduced harvest from the tract of land. Similarly, when the machine fails altogether to drop a seed at one of the planting locations, the harvest is also reduced. A machine is considered to be operating at one hundred percent efficiency if it will plant one hundred seeds in one hundred equally spaced planting locations along a length of ground. Where the machine plants ninety-eight seeds in one hundred locations, it is considered to be operating at ninety-eight percent efficiency and where it is planting one hundred and two seeds in every one hundred locations (a second seed into each of two locations), the machine is considered to be operating at one hundred and two percent efficiency. A farmer will consider a machine that is operating outside the range of ninety-five percent to one hundred and five percent to be unacceptably inefficient and in either case will be required to adjust the vacuum or replace the seed disks of the machine to improve its efficiency. The desired operating range for such machines is between ninety-nine percent and one hundred and one percent efficiency. The planters manufactured by John Deere are adapted to plant from four to thirty-one rows simultaneously with a metering unit including a hopper retaining seed and a seed disk for each row to be planted by the machine.

The difficulties of maintaining proper efficiency are accentuated in the case of corn seed, which is one of the major grains for which the John Deere planter is employed. Although it would be desirable for a farmer to obtain seed which is of all the same size, as a practical matter, he must deal with seeds of varying size. As previously stated, John Deere offers three different seed disks for use in planting corn seed, one disk for each of three ranges of seed size.

In my patent application filed Mar. 28, 2002, now U.S. Pat. No. 6,932,236 B2, I disclosed a kit that includes an improved seed disk for insertion into the metering unit of a John Deere planter to improve the efficiency with which seed, especially corn seed, is planted. Specifically, machines having metering units fitted with the parts described in my patent no. 6,932,236 B1 will reliably deposit between ninety-nine and one hundred and one corn seeds along a length of ground that should receive one hundred seeds.

Another factor that effects the harvest produced by a tract of land is the spacing between the seeds along a row. Even though a row of seeds may have the correct number of seeds spaced along its length, if the seeds are not equally spaced apart from each other, the seeds that are spaced too close together will experience the problems of crowding and seeds that are spaced too far apart will not flourish enough to compensate for the stalks that are crowded.

Farmers have long recognized that John Deere planters have difficulty maintaining the spacing between seeds needed to maximize the harvest for a tract of land. The recognized solution to improve spacing is to operate the planter at a slower rate of speed. Although John Deere recommends that its planter be pulled at five miles per hour, farmers who want to avoid having a harvest that is reduced by poor seed spacing will choose to pull their planters at four miles per hour. Reducing the speed at which the planter is pulled increases the time required for planting and farmers who plant large acreage often encounter weather conditions and the like that allow a short planning season. In such cases, the farmer may be forced to pull the planter at six miles per hour, causing the spacings of the seeds to be even more uneven than when pulled at five miles per hour.

Even planters having metering units fitted with parts in accordance with my U.S. Pat. No. 6,932,236 B1 experience uneven spacing between seeds. This problem has been partially dealt with in my co-pending application Ser. No.

10/803,265 filed Mar. 18, 2004, but that has not resulted in a total solution the problem. It would be desirable; therefore, to provide an improvement to a vacuum seed planter that would improve the spacings between seeds planted without requiring that the machine be pulled at a slower rate of speed.

SUMMARY OF THE INVENTION

Briefly, the present invention is embodied in a method and apparatus for improving the spacing of seeds planted by a seed planter of the type manufactured by John Deere, having a metering unit for retaining a circular rotatable seed disk wherein seed is introduced into a first cavity in the metering unit defined by a first surface of the seed disk and a vacuum in drawn in a second cavity defined by the second surface of the seed disk. The vacuum draws individual seeds against transverse holes in the seed disk and releases the seeds to drop through a seed chute in the bottom of the metering unit and into the upper end of a seed tube that directs the seed into the ground for planting.

The seed chute is a channel having a generally rectangular opening with two approximately four inch long sides that are generally parallel to the seed disk and shorter, two inch long leading and trailing ends perpendicular to the long sides. The seed tube is an elongate tubular member having a generally rectangular cross-section which flares outward at the upper end thereof. The upper end of the seed tube is rectangular in shape with long sides that are a little longer than the outer dimensions of the long sides of the seed chute and short sides that are a little longer than the short sides of the seed chute.

During operation, seeds are drawn by the vacuum against the holes at the outer circumference of the rotating seed disk where they are retained as the disk moves through an arc that carries the seeds to a position above the seed chute and the seed tube. As the seeds reach a position above the seed chute, the disk moves away from the vacuum and the seeds fall away from the disk and through the rectangular opening of the seed chute and into the upper end of the seed tube. I have observed that all of the seeds that fall away from a given seed disk follow the same arc or path as they drop away from the seed disk and fall through the opening of the seed chute and into the seed tube below. Since each seed disk is intended for a different size and type of seed, each seed disk has a different thickness and surface configuration and therefore the path of the seeds falling away from one seed disk may be greatly different from the path of seeds falling away from another seed disk, but seeds falling away from a single seed disk all follow substantially the same path. Where the vacuum holes of the seed disk are positioned around the perimeter of the seed disk, as are the vacuum holes for all seed disks intended for use with corn, including a disk in accordance with my U.S. Pat. No. 6,932,236 B2, the seeds will be released very near to the leading wall of the seed tube where the leading wall is the narrow wall that is in the direction of motion of the planter as it moves across the field.

Where the path of seeds falling away from the seed disk carries the seeds along one wall of the seed tube, the moving seeds encounter the surface of the seed tube and some of the seeds are deflected by the irregularities in the inner surface of the seed tube. As the seeds become deflected by contact with the surfaces of the seed tube, they begin to ricochet or bounce down the remaining portion of the seed tube until they reach the lower end thereof and fall into the trough in the ground cut by the planter after which they are covered up and allowed to grow. Although the seeds falling away from a seed disk follow the same path as they move through the air, each seed follows a different path once it makes contact with the surface of the seed tube. Whereas one seed may slide along the surface and move smoothly down the length of the tube until it is expelled, a second seed following the first seed may be deflected from one surface to another of the seed chute and ricochet down its length causing it to be emitted into the trough after a longer period of time than the first seed. If the third seed slides through the seed tube without being deflected as severely as the second seed, it will be expelled into the trough as rapidly as the first seed and follow shortly behind the second seed such that the second seed is planted near the third seed and spaced a longer distance away from the first seed resulting in the uneven spacing of the seeds. To minimize the deflection of the seeds within the seed tube, it is desirable that the seeds follow a path that carries them near a vertical centerline of the seed tube such that the free fall of the seeds is maximized. It is desirable that the falling seeds do not contact the leading end or either of the side walls of the seed tube until the seed has dropped as far as possible down the length of the seed tube. It should be noted that the seed tube, as manufactured by John Deere, is somewhat tapered at the upper end thereof such that the walls are angled rather than vertical and seeds that engage the angled walls of the upper portion of the seed tube will be more highly deflected than seeds that fall between the sloping walls of the upper portions of the seed tube and do not engage the walls of the seed tube until the midportion thereof is reached where the side walls are vertical.

To direct the path of seeds falling from the seed disk so as to carry them near the center line of the seed tube, a deflector in accordance with the present invention is positioned on the outer wall of the first cavity of the metering unit immediately following the position at which the seed disk moves away from the vacuum. The deflector is configured so as to urge the path of seeds falling away from the seed disk away from the leading wall of the seed tube, and toward a centerline between the side walls of the seed tube to thereby maximize the free fall of the seeds before engaging a surface of the seed tube.

BRIEF DESCRIPTION OF THE DRAWINGS

A better and more complete understanding of the invention will be had after a reading of the following detailed description taken in conjunction with the drawings wherein:

FIG. **1** is a an isometric view of a John Deere planter;

FIG. **2** is a side elevational view of a row unit of the planter shown in FIG. **1** with the metering unit therein shown in broken lines;

FIG. **3** is an enlarged fragmentary side elevational view of the row unit shown in FIG. **2** with the metering unit visible within, the metering unit being without a deflecting member in accordance with the invention;

FIG. **4** is a front elevational view of a seed disk for use in the metering unit shown in FIG. **2**;

FIG. **5** is a rear elevational view of the seed disk shown in FIG. **4**;

FIG. **6** is a cross-sectional view of a metering unit such as shown in FIG. **2** but fitted with a deflector in accordance with the present invention;

FIG. **7** is an isometric view of the metering unit shown in FIG. **6** with the metering unit open and the seed disk removed;

FIG. **8** is an isometric view of the metering unit in the open condition with the seed disk inserted;

FIG. **9** is an isometric view of the metering unit shown in FIG. **6** with the unit closed and a portion of the wall broken away so the deflector is visible; and

FIG. **10** is a front elevational view of one side of the metering unit shown in FIG. **6** with a portion of the seed disk broken away.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Referring to FIG. **1**, a John Deere planter such as a 7200 Max Emerge Flex-fold planter **10** includes a pair of elongate tow bars **12**, **14** at the rearward end of which is a cross bar **16** having wheels, not shown, for transporting the planter **10** across the open highway. Extending along the length of the cross bar **14** are a plurality of row units **30**-**30**. John Deere manufactures planters **10** which vary in width from four to thirty one row units.

The model 7200 planter was first offered for sale in 1987 and since then John Deere has placed several other models on the market including models 1750, 1760, 1770, and 1780, each of which has corresponding parts and the performances of all of which are improved by the use of the present invention.

Referring to FIGS. **2** and **3**, each row unit **20** has a frame **24** supported by a pair of spaced apart wheels, one of which **26** is visible in FIG. **2**. Mounted above the frame **24** are a first hopper **32** for retaining seed and a second hopper **34** for retaining a dry herbicide. Below the seed hopper **32** is a metering unit **36** and a chute, not shown, directs seed from the hopper **32** to the metering unit **36**. Below the metering unit **36** are opener discs **40**. Rearward of the opener discs **40** are closing wheels **44**, the elevation of which is adjustable through a pivot **46** to thereby permit the opener discs **44** to create a trench of the depth desired for the seed being planted.

A seed tube **48** extends from the metering unit **36** to a position between the opener discs **40** for directing individual seeds singulated by the metering unit **36** into the furrow of ground formed by the opener discs **40**, thereby planting the seed. A gearing assembly, not shown, connected to the wheels **26** rotates a drive member, also not show, which rotates a shaft **42** that extends through the metering unit and drives the metering unit **36** such that the rate at which the metering unit discharges seed is coordinated to the ground speed of the planter **10**.

When the planer **10** operates properly, the planted seed will have a predetermined spacing, such as six inches, between adjacent seeds. If the spacing between adjacent seeds is too close, the plants that grow from the seed will interfere with each other and thereby reduce the yield of the field. If the spacing between seeds is too far apart, the yield from the field will also be reduced and therefore, yield is maximized when the seed is consistently planted with the desired spacing between seed.

Referring to FIGS. **6** through **10**, the metering unit **36** includes a first housing member **50**, having a generally cylindrical outer wall **52** and a planar rear wall **54** thereby forming a cavity. Extending from the rear wall **54**, axially with respect to the cylindrical outer wall **52**, is a tubular retaining hub **56** at the distal end of which is a handle **58** which is rotatable between a first position for receiving or removing a seed disk **60** and a second position for removably retaining a seed disk **60** on the hub **56**.

Referring to FIGS. **6**, **7**, and **8**, the retaining hub **56** is threaded on a cylindrical drive shaft **55** at the distal end of which are a pair of flanges **57** for drivingly engaging a drive member, not shown, which in turn is drivingly connected by the gearing, also not shown, to the wheels **26**. A removable spring locking pin, not shown, locks the tubular retaining hub **56** to the inner drive shaft **55**. By removing the spring locking pin, the retaining hub **56** can be rotated with respect to the inner shaft to thereby axially move the retaining hub **56** with respect to the rear wall **54** of the first housing member **50**. Rotating the retaining hub **56** clockwise with respect to the drive shaft moves a seed disk **60** retained thereon toward the rear wall **54** and rotating the retaining hub **56** counterclockwise moves a seed disk **60** thereon away from the rear wall **54** of the first housing member **50**. Adjusting the retaining hub **56** causes the axial adjustment of the seed disk **60**, after which the parts are locked into their desired orientation by locking pin **59**.

Referring briefly to FIGS. **4** and **5**, the seed disk **60** has a generally circular body with first and second planar surfaces **61**, **62**, and having a wing shaped central opening **53**. The opening **53** is shaped to receive the winged hub handle **58**, not shown, at the distal end of the retaining hub **56** of first housing member **50**. Surrounding the central opening **53** on the second side **62** are two arcuately shaped opposing ramped surfaces **63**, **64** and opposing locking notches **65**,**66** for locking the seed disk **60** to the hub **56**. Extending around a circle which is spaced a short distance within the outer circumference of the seed disk **60** are a plurality of spaced transverse holes **67**-**67**. The diameter of the cylindrical outer end of the seed disc **60** is a little less than the inner diameter of the tubular outer wall **52** of the first housing member **50** of the metering unit **36** (and of the cylindrical outer wall of the second housing member **90**, as is further described below).

Referring further to FIGS. **3** and **6**, the first housing **50** includes an upwardly opening access port **69** in the rear wall **52** into which the lower end of the chute from the hopper **32** extends, allowing seeds to enter the first housing member **50**. Approximately diametrically opposite the access port **69** is a seed chute **70** in the cylindrical wall **52** of the housing member **50** through which singulated seeds drop and fall into the seed tube **48** for planting. When assembled on a row unit **30**, the metering unit **36** is oriented with the axis of the hub **56** horizontal and the seed chute **70** extending downward as is shown in FIG. **3**.

Referring to FIGS. **11** and **12**, the seed chute **70** is a short, tubular member with a generally rectangular cross-section having parallel long sides **122**, **124** and parallel short sides **126**, **128**. The short sides **126**, **128** and long side **122** are formed as part of the casting for first housing member **50** and create a channel. Long side **124**, extends generally parallel to long side **122** and is formed by a plastic member **129** that extends across the ends of short sides **126**, **128** and is held in place by hooks **132**, **133** that are received in holes **134**, **135** in the ends of short side **128** and by a removable snap **136** that attaches to a catch **138** on the short side **126**.

Referring to FIGS. **3**, **11** and **12**, the seed tube **48** is an elongate, tapered, tubular member having a rectangular cross-section consisting of first and second opposing side walls **140**, **142** and generally perpendicular thereto, leading and trailing walls **144**, **146**. The seed tube **48** is molded of plastic and has formed into the body thereof and has a plurality of mounting points along the length thereof, now shown, except for hook **154** shown on FIG. **3**, for the attachment of the seed tube **48** to the row unit **30**.

Referring to FIG. **7**, extending across the rear surface of the first housing member **50** and adjacent the hub **56** is an elongate brush **71** having one end connected to the outer wall **52** and the second end spaced a short distance from the cylindrical outer wall **52** leaving a gap **65** between the distal end of the brush **71** and the inner surface of the cylindrical outer wall **52**. The brush **71** is positioned to separate seed entering the access port **69** from inadvertently reaching the seed chute **70**. The bristles of the brush **71** extend axially away from the rear wall **52** and brush against the first surface **61** of a seed disk **60** which has been retained thereto by the retaining hub **56** thereby creating a partial barrier between the outer wall **52** and the seed disk **60**. The brush **71** insures that seeds singulated by the seed disk **60** are removed therefrom as the disk passes over the seed chute **70** in the wall **52** and further separates the loose seeds entering through the port **69** from inadvertently entering the seed chute **70** and falling into the seed tube **48**.

Referring further to FIGS. **6**, **7**, and **8**, the metering unit **36** includes a second housing member **90** attached by a pivot pin **92** to the first housing member **50**. The second housing member **90** has a generally tubular outer wall **94** and a planar rear surface **96** such that it too has a cavity therein. The tubular outer wall **96** includes an intrusions portion **98** including a generally radial wall **103**, and around the inner edge of the outer wall **94** and the intrusion portion **98** is a rubberized sealing member **99** which seals against the second surface **62** of a seed disk **60** when the housing members **50**, **90** are assembled against each other as further described below.

The second housing member **90** further has an aperture **100** in the rear wall **96** and the outer surface of the second housing member has a tubular protrusion **101** the inner opening of which communicates with the aperture **100** and is adapted to receive a vacuum hose, not shown, leading from a vacuum pump. Most John Deere planters **10** have one or two vacuum pumps, not shown.

Within the intrusion portion **98** of the second housing member **90** is a third cavity defined by a portion of the cylindrical outer wall **94** and the wall of the intrusion portion **98**, and mounted thereon is a knockout assembly **120** of the type manufactured by John Deere.

Referring to FIGS. **7** and **8**, a latch assembly **158** on the first housing member **50** is adapted to engage a second latch member **159** on the second housing member **90** for retaining the two housing members **50**, **90** engaged with one another, to thereby form the assembled metering unit **36**.

As shown in FIGS. **3**, **5**, and **7**, when the two housing members **50**, **90** are latched in assembled relationship, with a seed disk **60** retained on the retaining hub **56** of the housing member **50**, the interior of the metering unit **36** will be divided into two chambers. The first chamber is defined by the cavity in the first housing member **50** and the first surface **61** of the seed disk **60**. The second chamber is defined by the cavity in the second housing member **90** and the second surface **62** of the seed disk **60**. It should be appreciated that the second chamber excludes the intrusion portion **98** of the second housing member **90**.

A vacuum is drawn by the vacuum pumps through lines connected to the second housing member **90** and through the aperture **100** creating a vacuum in the second chamber of the metering unit **36**. Meanwhile, seeds **156** from within the seed hopper **32** drops through the chute **38** and through the port **69** into the first chamber. When the metering unit **36** is operating properly, the vacuum in the second chamber is drawn through the plurality of holes **67-67** of the seed disk **60** except for those holes **67-67** positioned beyond the sealing member **99** (defined by the intrusion portion **98**). The intrusion portion **98** sections off from the cavity of the second housing member **90** the portion of the seed disk **60** for which a vacuum is not drawn through the vacuum holes **67-67**. As the disk **60** rotates through the mass of seeds **156** which accumulate near the port **69**, one seed is drawn by the vacuum against each of the transverse holes **67-67**. As the seed disk **60** continues to rotate within the metering unit **36**, the singulated seeds are moved through the gap **65** at the distal end of the brush **71** and over the seed chute **70** in the outer wall **52** of the second housing member **50**. As each of the singulated seeds is moved over the seed chute **70**, the aperture of the associated hole **67** on the second side **62** of the seed disk **60** crosses the vacuum barrier formed by the sealing member **99** across the radial wall **103** thereby releasing the seed from the first side **61**. The seeds then fall away from the seed disk **60** and fall in an arc or path through the seed chute **70** in the outer wall **52** of the first housing member **50** and through the seed tube **48** to be planted.

Each seed disk **60** has a different thickness and configuration and is intended for a different size and shape of seed **156**. As a result, the seeds **156** that fall away from a first seed disk **60** fall through a different path than those that fall away from a second seed disk **60** used for a different type or different size of seed. However, all the seeds **156** that fall off a given seed disk **60** follow substantially the same path as they fall away from the seed disk **60**.

For example, the seed disks sold by John Deere, not shown, for planting corn in the planer **10** have contoured pockets with raised outer boundaries that surround the openings for the vacuum holes on the first side thereof. The pockets and raised boundaries are intended to assist in singulating the seed and they also cause the seeds to fall nearly midway between the side walls **140**, **142**. On the other hand, the seed disk disclosed in my U.S. Pat. No. 6,932,236 B2 has a flat first surface against which the seeds are held as they are moved over the seed chute **70**. The absence of raised boundaries around the vacuum holes **67** causes the seed **156** dropped from the seed disk disclosed in my U.S. Pat. No. 6,932,236 B2 to drop through the seed chute **70** nearer to the second housing **90** and nearer to side wall **142** than do seeds dropped by the disks sold by John Deere for planting corn seed.

For example, the seed disks sold by John Deere, not shown, for planting corn in the planer **10** have contoured pockets with raised outer boundaries that surround the openings for the vacuum holes on the first side thereof. The pockets and raised boundaries are intended to assist in singulating the seed and they also cause the seeds to fall nearly midway between the seeds walls **140**, **142**. On the other hand, the seed disk disclosed in my U.S. Pat. No. 6,932,236 B2 has a flat first surface against which the seeds are held as they are moved over the seed chute **70**. The absence of raised boundaries around the vacuum holes **67** causes the seed **156** dropped from the seed disk disclosed in my U.S. Pat. No. 6,932,236 B2 to drop through the seed chute **70** nearer to the second housing **90** and nearer to side wall **142** than do seeds dropped by the disks sold by John Deere for planting corn seed.

Referring to FIG. **3**, the seed tube **48** is positioned with the leading wall **144** directly below the most forward position of the seed disk **60**. The manufacturers of the product intended that the seeds **156** released by the seed disk **60** would slide along the slightly curved leading wall **144** until they fall out of the distal end **162** thereof and into the trough **164** in the ground for planting. In reality, not all of the seeds **156** slide along the curved leading wall **144** as intended, but some are

deflected and follow irregular paths, such as path **166** and encounter several of the inner surfaces of the seed tube **48** as it they are ricocheted along the tube **48** before being expelled out the discharge opening **162** for planting. For all the seed disks manufactured by John Deere, the seeds are released near the outer wall **52** of the metering unit **36** and follow a path that takes them along the leading wall **144** from the point of entry into the seed tube **48** such that many are deflected as they move downward through the length of the seed tube **48**.

Furthermore, depending on the configuration and thickness of the seed disk **60** in the metering unit **36**, the seeds falling from the seed disk **60** may follow a downward path that does not take it midway between the side walls **140**, **142**, but rather in a path that is near side wall **142** such that the seeds **156** engage the side wall **142** where it is partially sloped causing some of the seeds to be deflected and thereafter ricochet down the remaining portions of the length of the seed tube **48**.

Referring to FIGS. **6**, **7**, **8**, **9**, and **10**, it is desirable to direct the path **168** of seeds **156** so that they fall as nearly as possible to a center line **170** of the seed tube **48** that is equally spaced between the side walls **140**, **142** of the seed tube **48** and spaced from the leading wall **144** so that the seeds **156** will drop as far as possible down the length of the seed tube **48** before encountering one of the side walls **140**, **142** or the lead wall **144**. To direct the path **168** of the seed **156** toward the center line **170**, a deflector **172** is mounted on the cylindrical inner wall **52** of the first housing member **50** at a position immediately opposite the radial wall **103** that defines the position at which seeds are released from the seed disk **60** and allowed to fall. The deflector **172** is preferably made of a stainless spring steel plate so as to not be subject to corrosion and so as to retain its shape while being subjected to pressure applied by the seeds as they move along its surface. Preferably, the deflector **172** is rectangular in shape with a width **174** of approximately three-quarters inch and a length **176** of between one and one-half and two inches. The deflector **172** preferably also has a first very gentle bend **178** separating a mounting section **180** from a deflection section **182** and a transverse hole, not visible, in the mounting section **180** such that a mounting screw **186** can be extended through the hole in the mounting portion and into a threaded hole, **187**, in the cylindrical inner wall **52** of the first housing **50** for retaining the deflector **172**. The deflector **172** has a second bend in the form of a clearly definable crease **188** that extends at an angle that more closely parallels the length **176** than the width **174** of the deflector **172**. The deflector **172** is attached to the inner wall **52** of the first housing **50** with the end of the crease **188** nearest the mounting section **180** positioned at the point where the seeds **156** are released from the seed disk **60**. Since the seeds **156** are released by the seed disk very near the outer wall **54**, soon after they are released, they will contact the surface of the deflector **182**. Once released from the seed disk **60**, the seeds **156** will be directed by the surfaces of the deflector along the crease **188** and the deflector **172** will cause the path **168** of the seeds to be directed towards a centerline **170** generally midway between the side walls **140**, **142** of the seed tube **48**.

Referring to FIG. **9**, a threaded adjustment screw **190** is threaded into a tapped hole in the cylindrical wall **52** of the first housing member **50** until the distal end of the screw **190** contacts the rear surface of the deflection section **182** of the deflector **172**. Further tightening of the screw **190** causes the distal end of the deflection section **182** to move further outward of the cylindrical wall **52** thereby deflecting the path **168** of the seeds **156** further from the leading wall **144** of the seed tube **48**. By adjusting the screw **190**, the path **168** of the falling seeds **156** can be set so they do not follow the curve of the leading wall **144** of the seed tube **48** but free fall through down half the length of the seed tube **48** or more before first contacting a portion of the leading wall **144**. Since the path **168** of falling seeds results in the seeds not encountering the walls of the seed tube **48** until the seeds have dropped approximately half the length of the seed tube **48**, the seeds that are planted are more nearly equally spaced apart as they are emitted through the aperture **162** at the lower end of the seed tube **48**. As a consequence of the seeds being equally spaced apart as they are emitted through the aperture **162**, the seeds planted by the planter **10** are very nearly equally spaced apart so as to minimize any reduction in harvest caused by the unequal spacing of seeds.

While the present invention has been described with respect to a single embodiment, it will be appreciated that many modifications and variations may be made without departing from the true spirit and scope of the invention. It is, therefore, the intent of the following claims to cover all such modifications and variations which fall within the true spirit and scope of the invention.

What is claimed:

1. In a seed planter having a metering unit having a housing retaining a circular rotatable seed disk, said seed disk having a center, a first surface, a second opposing surface, and a plurality of transverse spaced vacuum holes extending from said first surface to said second surface, wherein seeds are introduced into a first cavity in said housing defined by said first surface and a vacuum is drawn into a second cavity in said housing defined by an inner wall of said housing and by said second surface, such that seeds are retained against said vacuum holes until they are released from said vacuum and dropped through a seed chute and into a seed tube, said seeds follow a predetermined path as they fall away from said seed disk and into said seed tube, the improvement comprising

said seed tube having generally parallel side walls, a leading wall and a trailing wall,

said side walls spaced apart from each other by a distance significantly greater than a diameter of one of said seeds,

said leading wall and said trailing wall spaced from each other by a distance significantly greater than said diameter of one of said seeds,

a deflector on said inner wall, said deflector deflecting said path toward a vertical centerline between said leading and trailing walls wherein said seeds will free fall between said leading and trailing walls for a portion of a length of said seed tube.

2. The improvement of claim **1** and wherein said deflector further deflects said path toward a vertical centerline between said opposing side walls.

3. The improvement of claim **1** wherein said deflector comprises

a metal body,

said body having a mounting portion for attaching said body to said housing, and

a deflecting portion,

said deflecting portion has a surface angled with respect to a surface of said mounting portion wherein said deflecting portion deflects said predetermined path toward said centerline between said leading and trailing walls.

4. The improvement of claim **3** and further comprising a crease in said deflecting portion wherein said crease also

deflects said predetermined path toward a centerline between said opposing side walls.

5. The improvement of claim **3** wherein said deflector is made of stainless steel.

6. The improvement of claim **3** wherein said deflector is made of spring steel.

7. The improvement of claim **3** and further comprising an adjustment screw for changing an angle of said deflecting portion to thereby adjust said path towards said centerline.

8. In a seed planter having a metering unit having a housing retaining a circular rotatable seed disk, said seed disk having a center, a first surface, a second opposing surface, and a plurality of transverse spaced vacuum holes extending from said first surface to said second surface, wherein seeds are introduced into a first cavity in said housing defined by said first surface and a vacuum is drawn into a second cavity in said housing defined by an inner wall of said housing and by said second surface, such that seeds are retained against said vacuum holes until they are released from said vacuum and dropped through a seed chute and into a seed tube, said seeds follow a predetermined path as they fall away from said seed disk and into said seed tube, the improvement comprising

said seed tube having generally parallel side walls, a leading wall and a trailing wall,

said side walls spaced apart from each other by a distance significantly greater than a diameter of one of said seeds,

said leading wall and said trailing wall spaced from each other by a distance significantly greater than said diameter of one of said seeds,

a deflector on said inner wall, said deflector deflecting said path toward a vertical centerline between said opposing side walls wherein said seeds will free fall between said opposing side walls for a portion of a length of said seed tube.

9. The improvement of claim **8** wherein said deflector comprises a metal body,

said body having a mounting portion for attaching said deflector to said housing, and

a deflecting portion,

said deflecting portion having a surface angled with respect to a surface of said mounting portion wherein said deflecting portion deflects said predetermined path toward said centerline.

10. The improvement of claim **9** and further comprising an adjustment screw of changing an angle of said deflecting portion to thereby adjust said path toward said centerline.

11. A seed planter comprising

a metering unit having a housing,

a rotating seed disk in said housing,

said seed disk having a first surface, a second surface opposite said first surface, a plurality of vacuum holes extending from said first surface to said second surface,

said first surface defining a first cavity in said housing and said second surface defining a second cavity therein,

a vacuum drawn in said second cavity,

a seed chute extending downward from said first cavity wherein seeds released from said first side fall in a path through said seed chute,

a seed tube extending downward from said seed chute,

said seed tube having generally parallel side walls, a leading wall and a trailing wall,

said side walls spaced apart from each other by a distance significantly greater than a diameter of one of said seeds,

said side walls spaced apart from each other by a distance significantly greater than a diameter of one of said seeds,

said leading wall and said trailing wall spaced from each other by a distance significantly greater than said diameter of one of said seeds,

a deflector on an inner wall of said housing,

said deflector deflecting said path toward a centerline generally midway between said side walls and midway between said leading wall and said trailing wall wherein said seeds will free fall through a portion of a length of said seed tube.

12. The seed planter of claim **11** wherein said deflector comprises a metal body,

said body having a mounting portion for attaching said deflector to said housing, and

a deflecting portion,

said deflecting portion having a surface angled with respect to a surface of said mounting portion wherein said deflecting portion deflects said predetermined path toward said centerline.

13. The seed planter of claim **12** and further comprising an adjustment screw for changing an angle of said deflecting portion to thereby adjust said path toward said centerline.

* * * * *

United States Patent [19]

Martin et al.

[11] **Patent Number: 4,664,290**

[45] **Date of Patent: May 12, 1987**

[54] **METHOD AND APPARATUS FOR PRECISE POSITIONING OF A SEED DISK IN A SEED METER**

[75] Inventors: **James C. Martin**, Davenport, Iowa; **Jay H. Olson**, Rock Island, Ill.

[73] Assignee: **Deere & Company**, Moline, Ill.

[21] Appl. No.: **704,859**

[22] Filed: **Feb. 25, 1985**

[51] **Int. Cl.**[4] **A01C 7/04**

[52] **U.S. Cl.** ..... **221/211**; 29/526 R; 111/78; 221/241; 301/113; 301/114; 403/17; 403/379

[58] **Field of Search** ..... 221/211, 241, 242; 111/34, 77, 78; 301/113, 114, 128; 403/17, 259, 379; 29/526 R

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Primary Examiner—L. J. Paperner

Assistant Examiner—P. McCoy Smith

[57] **ABSTRACT**

In a seed meter in which a seed disk is rotatably mounted within a housing, a method and apparatus are provided for positioning the seed disk within the housing so that the peripheral portion of the seed disk is located a desired, relatively uniform distance from an adjacent peripheral portion of the housing. A shaft having a threaded outer portion is rotatably mounted within the housing and a hub having a threaded aperture therein is positioned on and turned relative to the threaded outer portion of the shaft to begin advancing the threaded aperture onto the shaft. The seed disk is then mounted on the hub, following which rotation of the hub relative to the shaft is continued in a direction to advance the hub along the shaft toward the housing until a gap of desired size exists between the peripheral portion of the seed disk and the peripheral portion of the housing. The hub is then releasably secured on the shaft by inserting a pin through an aperture in the shaft and through an opposite pair of a plurality of slots spaced about the hub.

14 Claims, 12 Drawing Figures

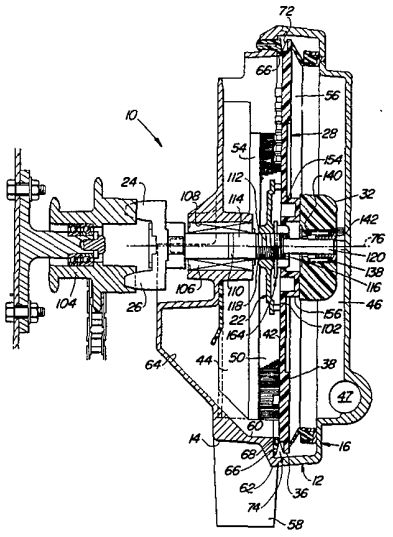
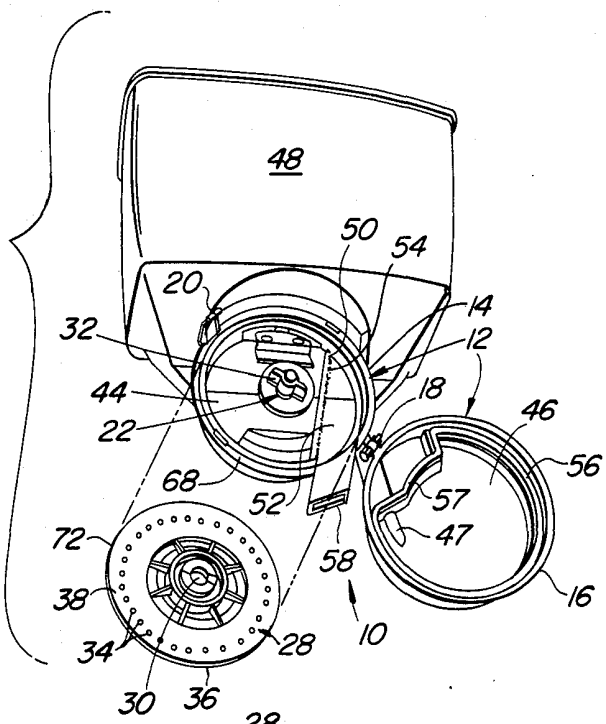


Fig. 1


48
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22
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72
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58
16
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36

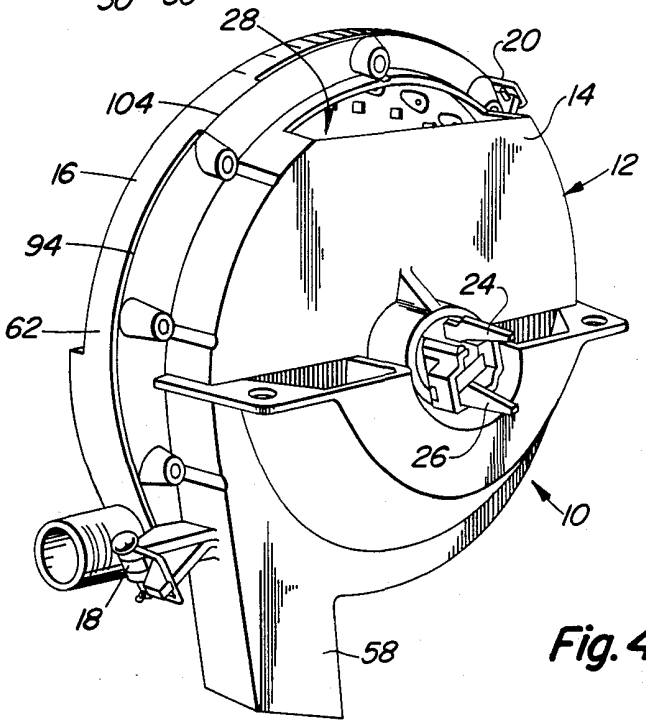

28
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104
14
16
12
94
24
62
26
10
18
58

Fig. 4

Fig. 2

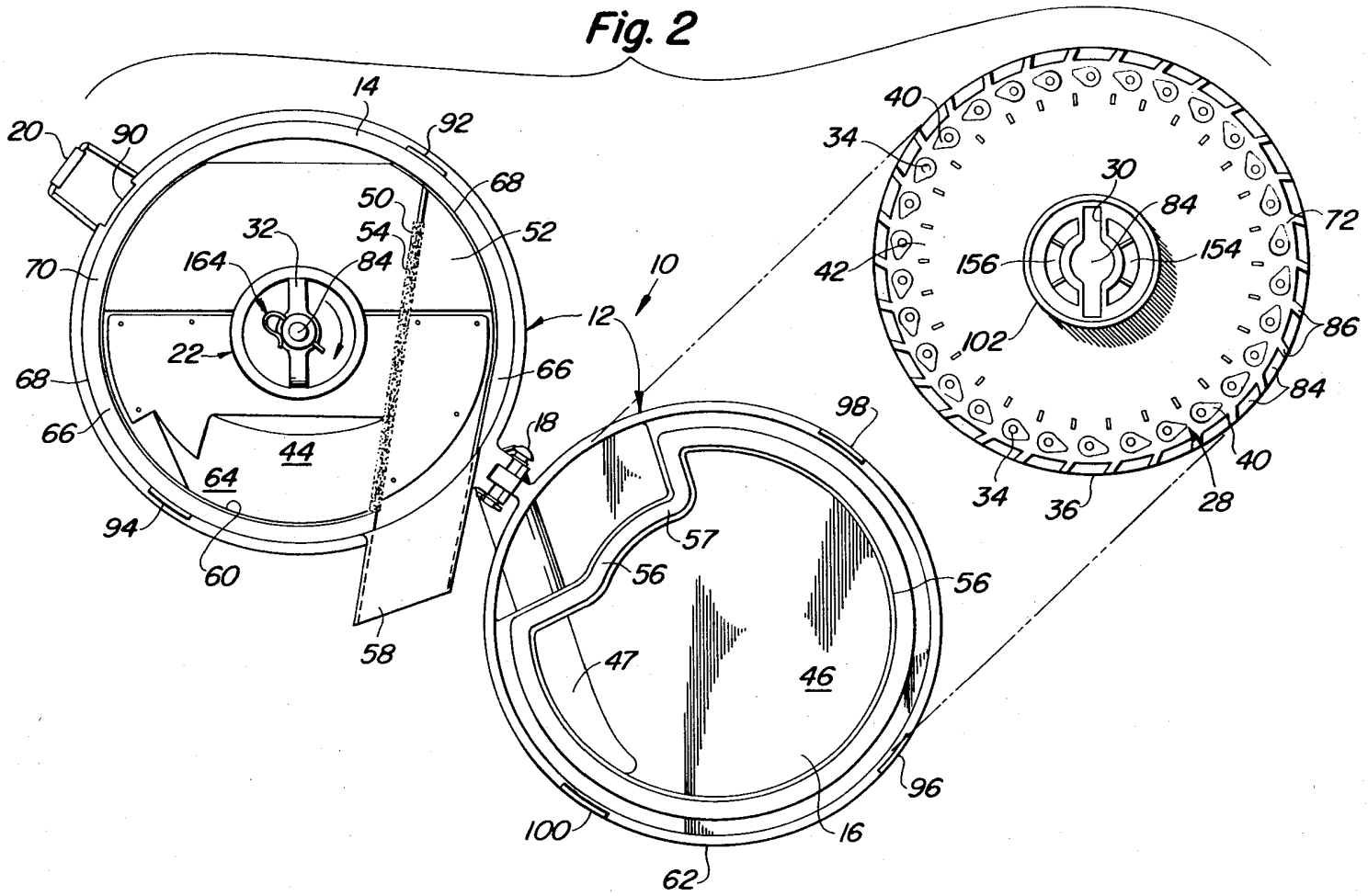

14
20
90
92
68
50
54
52
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164
84
70
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68
66
44
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18
94
60
58
98
57
56
56
47
46
96
100
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62
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34
30
84
72
42
156
154
102
86
84
40
34
36
28

Fig. 3

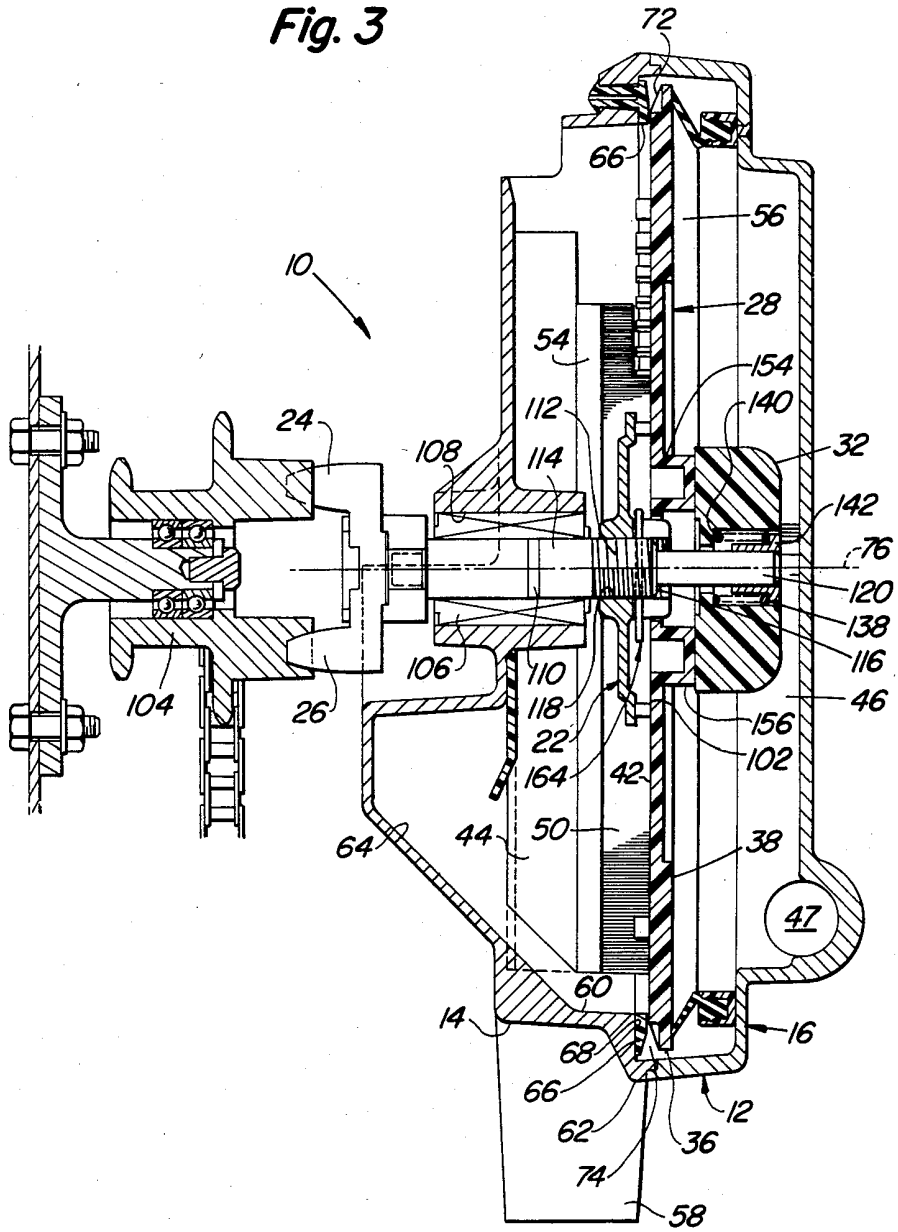

72
66
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10
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154
140
112
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108
114
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142
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116
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156
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106
110
118
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164
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104
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62
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36
74
58

Fig. 5

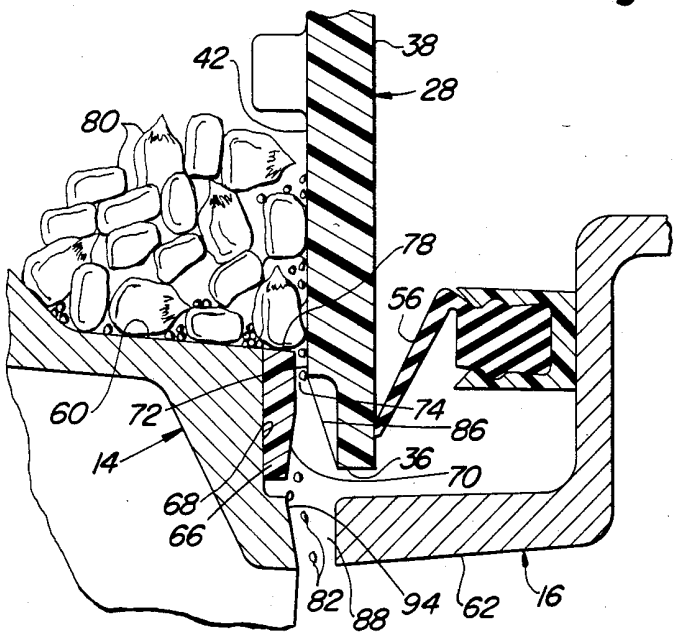
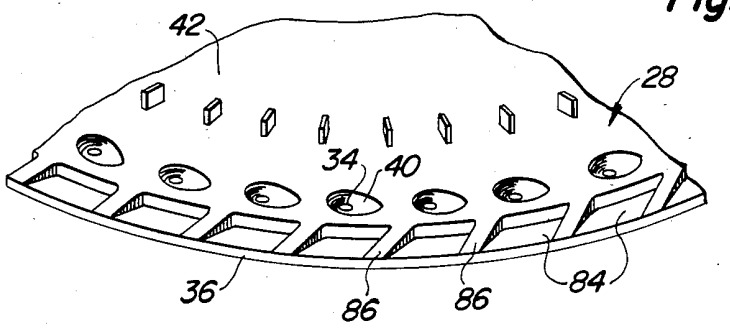

42
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60
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14
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66
82
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94
62
16

Fig. 6


42
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86
84

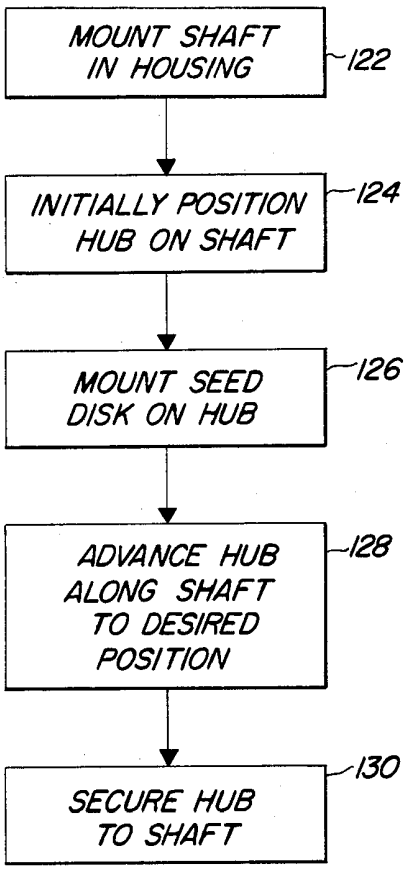

MOUNT SHAFT IN HOUSING
122
INITIALLY POSITION HUB ON SHAFT
124
MOUNT SEED DISK ON HUB
126
ADVANCE HUB ALONG SHAFT TO DESIRED POSITION
128
SECURE HUB TO SHAFT
130

Fig. 7

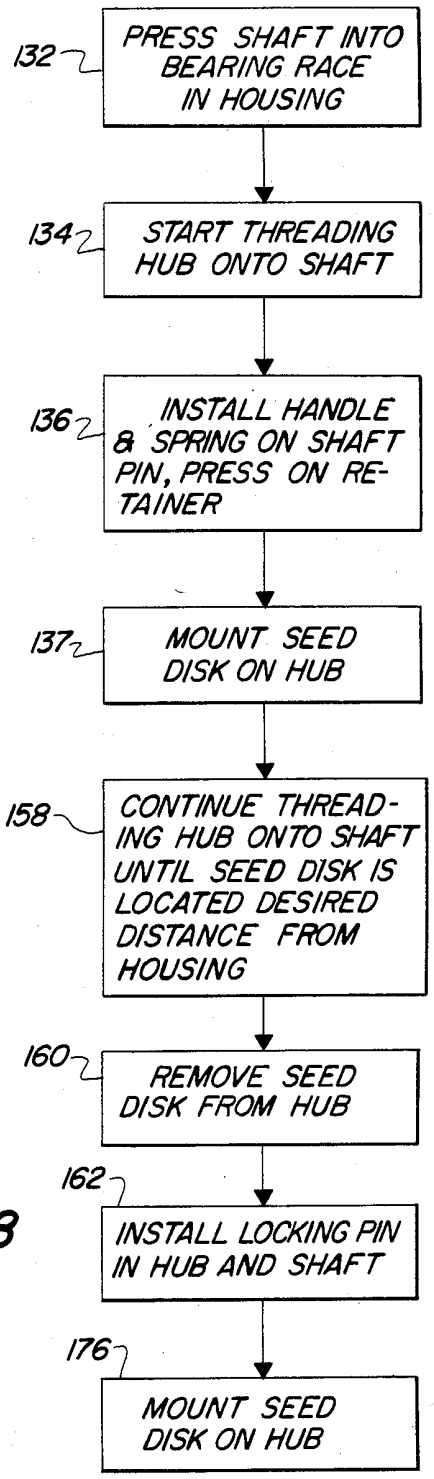

132
PRESS SHAFT INTO BEARING RACE IN HOUSING
134
START THREADING HUB ONTO SHAFT
136
INSTALL HANDLE & SPRING ON SHAFT PIN, PRESS ON RETAINER
137
MOUNT SEED DISK ON HUB
158
CONTINUE THREADING HUB ONTO SHAFT UNTIL SEED DISK IS LOCATED DESIRED DISTANCE FROM HOUSING
160
REMOVE SEED DISK FROM HUB
162
INSTALL LOCKING PIN IN HUB AND SHAFT
176
MOUNT SEED DISK ON HUB

Fig. 8

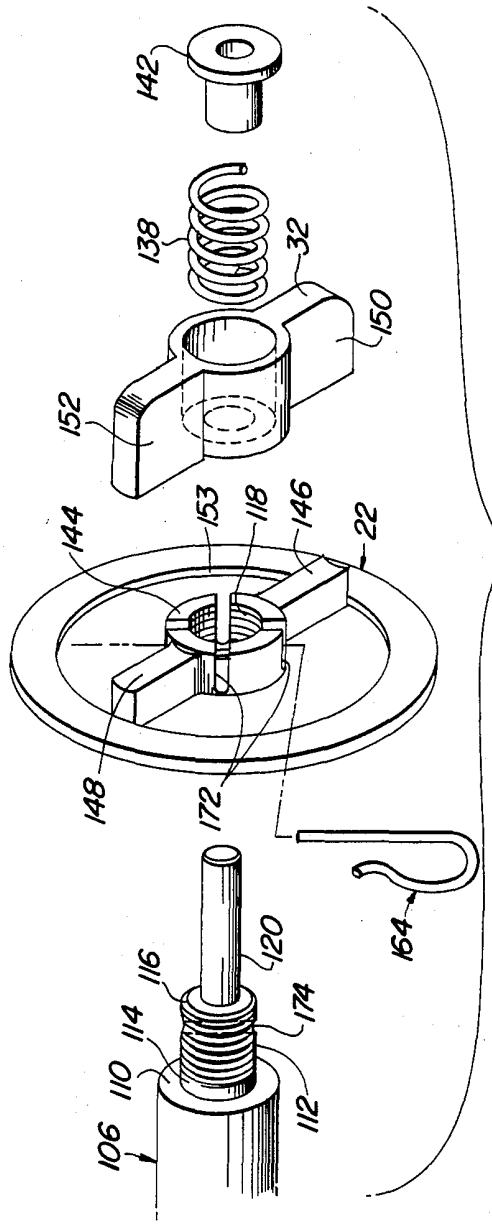


Fig. 9

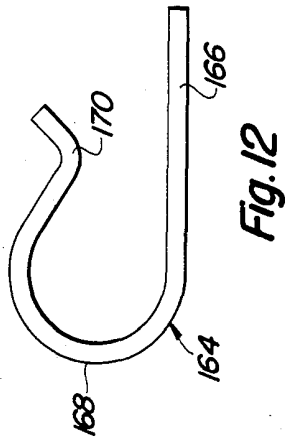


Fig. 12

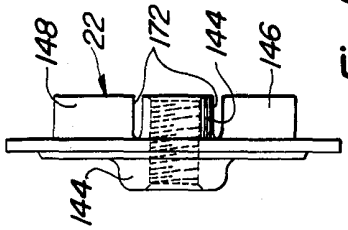


Fig. 11

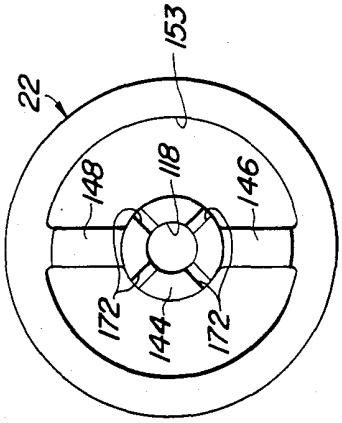


Fig. 10

Precision Exhibit 1005

METHOD AND APPARATUS FOR PRECISE POSITIONING OF A SEED DISK IN A SEED METER

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to seed meters in which a seed disk is rotatably mounted within the meter housing, and more particularly to methods and apparatus for rotatably positioning a rotatably mounted seed disk at a desired location within the housing of a seed meter.

2. History of the Prior Art

It is known in the field of agricultural equipment and machinery to provide seed meters which meter or dispense individual seeds into a furrow in the ground at a controlled rate in conjunction with associated apparatus for creating the furrow and then moving loose soil back into the furrow after the seeds have been deposited therein. There are various different types of seed meters including the mechanical type in which individual seeds are plucked from a seed mass and discharged from the meter for deposit within the furrow by mechanical devices. Still other types of seed meters are of the air type in which a pressure differential is employed, typically in conjunction with a rotating seed disk or similar device, to pick up seeds from the seed mass and then discharge them from the meter into the furrow. Air seed meters can be of the positive air flow type in which the seeds are picked up by the seed disk and held thereon by blowing air. Air seed meters can also be of the vacuum type in which a reduced pressure is communicated to the seed disk in a manner enabling the disk to pick up and carry individual seeds thereon with the assistance of the reduced pressure.

An example of a vacuum seed meter is provided by a co-pending application, Ser. No. 546,834, abandoned, Lundie et al, filed Oct. 31, 1983 and commonly assigned with the present application. The Lundie et al application describes a vacuum seed meter in which a rotating seed disk is mounted within the hollow interior of a housing so as to have a seed mass disposed on one side thereof and a source of reduced pressure coupled to a vacuum chamber at the opposite side of the disk. The reduced pressure communicates with a plurality of seed cells recessed in the side of the disk facing the seed mass via apertures extending through the thickness of the disk from the bottoms of the cells. The reduced pressure assists the cells in picking up individual seeds from the mass and transporting them to a seed discharge area sealed off from the reduced pressure to provide for release of the seeds carried in the seed cells. The released seeds fall through a discharge chute into a furrow in the ground formed by an opener unit mounted in conjunction with the seed meter.

In the vacuum seed meter described in the Lundie et al application the seed mass on one side of the rotating seed disk is formed by seeds falling from a hopper mounted above the seed meter into a seed chamber formed at the side of the seed disk by the shape of the hollow interior of the meter housing. The outer peripheral portion of the seed disk is disposed closely adjacent an outer peripheral portion of the hollow interior of the meter housing to prevent seeds in the seed chamber from escaping to the outside of the seed meter.

A co-pending application, Ser. No. 546,829, now U.S. Pat. No. 4,613,056, Olson, filed Oct. 31, 1983 and commonly assigned with the present application, describes an arrangement of the vacuum seed meter of the Lundie et al application in which a relatively small space is formed between the outer peripheral portion of the seed disk and the adjacent peripheral portion of the hollow interior of the housing on the side of the seed disk where the seed mass resides. The space defines a gap between the seed disk and the housing which is large enough to permit expulsion of debris from the interior of the meter housing while at the same time preventing the escape of the seeds themselves including in particular seeds of relatively small size. The debris which is eliminated by passing through such gap includes dust, dirt and unwanted particles of relatively small size such as broken seed particles or chips and the like. As described in the Olson application the outer peripheral portion of the seed disk may be provided with a succession of fins disposed on the opposite sides of recesses therebetween to agitate and encourage the expulsion of debris which may accumulate at the interface between the seed disk and adjacent portions of the housing interior.

In the arrangement described in the Olson application, it is desirable not only that the gap between the seed disk and the housing interior be of desired nominal size but also that such gap be of relatively uniform size about the entire outer peripheral portion of the seed disk. A gap which is too large may result in expulsion of the seeds themselves, particularly those seeds of smaller size, in addition to the debris. Conversely, a gap which is too small may not allow proper expulsion of the debris. A non-uniform gap tends to provide non-uniform expulsion of debris and the unwanted expulsion of seeds at locations where the gap becomes unduly large.

In the particular vacuum seed meters described in the Lundie et al and Olson applications, the seed disk is mounted for rotation within the hollow interior of the meter housing by a shaft rotatably mounted within the housing and having a seed disk mounting hub disposed on the outer end thereof so as to mount the seed disk for rotation with the shaft. An example of the seed disk mounting hub is provided by a co-pending application, Ser. No. 546,831, now abandoned, Webber, filed Oct. 31, 1983 and commonly assigned with the present application. During manufacture of such seed meters, the seed disk mounting hub is typically mounted on the outer end of the shaft such as by a cotter pin, following which the opposite end of the shaft is pressed into the outer race of a bearing within the housing to achieve an interference fit therebetween. The pressing of the shaft into the bearing race is carried out using equipment which has been programmed to provide a desired gap between the seed disk and the housing. Unfortunately, this process makes it difficult to form such gap within the close tolerances desired. Moreover, once the shaft is pressed into the bearing race, it can be very difficult to relocate the shaft to provide desired disk-housing spacing, particularly where the shaft installation equipment is not available. Such a problem may arise, for example, in the field where the farmer discovers that the gap between the seed disk and the housing is too large or too small. Another problem which commonly exists is lack of perpendicularlity. As a result of misalignment of the shaft upon pressing into the bearing race, or possibly due to other factors, the central axis of the shaft and thus of the seed disk itself may not be precisely perpendicular to the plane of the peripheral portion of the housing interior which interfaces with the outer peripheral portion of the seed disk. This may result in a non-

uniform gap with its attendant disadvantages as previously noted.

Accordingly, it would be advantageous to provide an improved method and apparatus for rotatably mounting a seed disk within the hollow interior of a housing of a seed meter.

It would furthermore be advantageous to provide an improved method and apparatus for rotatably mounting a seed disk within the hollow interior of a housing of a seed meter in a manner which provides both a gap of desired size therebetween and a gap which is relatively uniform in size about the entire outer peripheral portion of the seed disk.

BRIEF DESCRIPTION OF THE INVENTION

These and other objects are accomplished in accordance with the invention by disk mounting methods and apparatus in which a seed disk mounting hub can be secured to a shaft at any of a plurality of different locations along a portion of the length of the shaft following installation of the shaft in the meter housing. Moreover, the fit between the hub and the shaft is provided with enough tolerance or play to compensate for a lack of perpendicularity that may exist between the seed disk and the housing.

The shaft is first installed in the seed meter housing such as by pressing an end thereof into position in a bearing race within the housing. Thereafter, the hub is initially positioned on the opposite end of the shaft and the seed disk is then mounted on the hub. The hub and included seed disk are then advanced along the shaft toward the housing interior until a gap of desired size between the outer peripheral portion of the seed disk and the adjacent outer peripheral portion of the housing interior is achieved. The hub is then secured to the shaft so that the desired gap is thereafter maintained. The seed disk is removed from the hub if necessary to permit securing of the hub to the shaft following which the disk is again mounted on the hub. A predetermined amount of tolerance or play is provided in the fit of the hub on the shaft so that the axis of rotation of the hub and the seed disk can form relatively small angles with the central axis of the shaft. This small amount of play allows the axis of rotation of the seed disk to shift slightly as necessary so as to maintain the gap between the seed disk and the housing relatively uniform.

In a preferred embodiment of a method and apparatus according to the invention, an outer portion of the shaft opposite the housing interior is threaded as is an aperture within a central portion of the hub. Following installation of the shaft in the housing and with the seed disk removed from the hub, the central aperture in the hub is threaded onto the threaded outer portion of the shaft to initially position the hub on the shaft. The seed disk is then mounted on the hub, following which the hub and included seed disk are rotated relative to the shaft in a direction to advance the hub along the length of the shaft toward the housing interior. When a gap of desired size between the seed disk and the housing is achieved, the hub is secured on the shaft so that such gap is thereafter maintained. Securing of the hub to the shaft is accomplished by removing the seed disk from the hub, following which a pin is inserted through an aperture in the shaft and through an opposite pair of a plurality of slots in the hub which extend about the threaded aperture. The pin is releasably held in place by way of a curved portion thereof having an outer curved end which resiliently seats within a different one of the plurality of slots in the hub. With the hub thereby releasably secured in place on the shaft so as to provide a gap of desired size between the seed meter and the housing, the seed disk is again mounted on the hub.

The threaded aperture in the hub is slightly larger than the threaded outer portion of the shaft. This provides a small amount of tolerance or play between the threaded aperture of the hub and the shaft, enabling the axis of rotation of the hub and the seed disk to pivot slightly and form small angles with the central axis of the housing. This small amount of play causes the seed disk to rotate in a manner which provides a uniform gap between the outer peripheral portion of the seed disk and the adjacent peripheral portion of the housing.

BRIEF DESCRIPTION OF THE DRAWING

The foregoing and other objects, features and advantages of the invention will be apparent from the following more particular description of a preferred embodiment of the invention, as illustrated in the accompanying drawings, in which:

FIG. **1** is a perspective view of a seed meter having apparatus for the precise positioning of the seed disk therein in accordance with the invention, the seed meter being shown in an open position together with the seed disk;

FIG. **2** is a plan view of the seed meter of FIG. **1** with the meter in the open position and showing the reverse side of the seed disk;

FIG. **3** is a sectional view of the seed meter of FIG. **1** with the meter in a closed position;

FIG. **4** is a left rear perspective view of the seed meter of FIG. **1** with the meter in the closed position;

FIG. **5** is a sectional view of a portion of the seed meter of FIG. **1** illustrating the small gap between the outer peripheral portion of the seed disk and the adjacent outer peripheral portion of the seed meter housing;

FIG. **6** is a perspective view of a portion of the outer edge of the seed disk illustrating a series of spaced-apart cavities and intervening ribs formed therein;

FIG. **7** is a block diagram of the successive steps of a method for precise positioning of a seed disk in a seed meter in accordance with the invention;

FIG. **8** is a block diagram of the successive detailed steps of a detailed example of the method of FIG. **7** for precise positioning of the seed disk in the seed meter of FIGS. **1–6**;

FIG. **9** is an exploded perspective view of a portion of the seed meter of FIGS. **1–6** including a shaft, hub and pin which are included in the apparatus utilized in the method of FIG. **8**;

FIG. **10** is a front view of the hub of FIG. **9**;

FIG. **11** is a side view of the hub of FIG. **9**; and

FIG. **12** is an enlarged front view of the pin of FIG. **9**.

DETAILED DESCRIPTION

FIGS. **1–6** illustrate a vacuum seed meter **10** useful in describing the methods and apparatus according to the invention. The vacuum seed meter **10** is similar to that shown and described in the previously referred to co-pending application Ser. No. 546,834 of Lundie et al which is incorporated herein by reference. Accordingly, those portions of the vacuum seed meter **10** not directly relating to the present invention are described only briefly hereafter.

The vacuum seed meter **10** has a generally cylindrical housing **12** comprised of a first half shell **14** and an

opposite, mating second half shell **16**. The second half shell **16** is coupled to the first half shell **14** by a hinge **18** permitting the second half shell **16** to be closed over the first half shell **14** to close the housing **12**. A clasp **20** mounted on the first half shell **14** on a side thereof opposite the hinge **18** is secured to the second half shell **16** to hold the housing **12** in the closed position.

A hub **22** is rotatably mounted within the first half shell **14** of the housing **12** at the center of the first half shell **14**. As seen in FIGS. **3** and **4** a pair of lugs **24** and **26** are disposed on the outside of the first half shell **14** at the back of the housing **12**. The lugs **24** and **26** are engaged by a driving arrangement shown in FIG. **3** to rotatably drive the hub **22**.

The seed meter **10** includes a seed disk **28** which has an elongated aperture **30** at the center thereof. The seed disk **28** is mounted for rotation on the hub **22** by passing a handle **32** which is mounted on the hub **22** through the elongated aperture **30** to seat the seed disk **28** on the hub **22**. The handle **32** is then rotated into a position to lock the seed disk **28** on the hub **22**. This arrangement for mounting the seed disk **28** on the hub **22** which is also shown in FIG. **9** is similar to an arrangement described in detail in previously referred to co-pending application Ser. No. 546,831 of Webber, which application is incorporated herein by reference.

The seed disk **28** has a plurality of apertures **34** therein arranged in a circumferential array adjacent and inside of a circular outer edge **36** of the seed disk **28**. Each of the apertures **34** extends through the thickness of the seed disk **28** between a first side **38** of the seed disk **28** and the bottom of one of a pluraity of seed cells **40** formed in an opposite second side **42** of the seed disk **28**.

With the seed disk **28** mounted on the hub **22** and the second half shell **16** closed over the first half shell **14**, the seed disk **28** divides the hollow interior of the cylindrical housing **12** into a seed chamber **44** between the seed disk **28** and the first half shell **14** and a vacuum chamber **46** between the seed disk **28** and the second half shell **16**. A vacuum source is coupled by a vacuum port **47** in the second half shell **16** to create a reduced pressure within the vacuum chamber **46** adjacent the first side **38** of the seed disk **28**. The reduced pressure communicates with the seed cells **40** formed in the second side **42** of the seed disk **28** via the apertures **34**.

As shown in FIG. **1** the first half shell **14** of the cylindrical housing **12** is mounted at the base of a seed hopper **48** for containing seeds to be metered by the vacuum seed meter **10**. Seeds from the seed hopper **48** flow into the seed chamber **44** within the first half shell **14** where they form a seed mass against the second side **42** of the seed disk **28**. As the hub **22** is rotatably driven so as to rotate the seed disk **28**, the seed cells **40** agitate, accelerate and then capture individual seeds therein as they move through the seed mass within the seed chamber **44**. As each seed cell **40** rises out of the seed mass, the seed contained therein is held in place by the reduced pressure within the vacuum chamber **46** which communicates with the seed via the aperture **34**. The reduced pressure holds the seed in place in the seed cell **40** until the seed cell **40** passes across a divider brush **50**. The divider brush **50** extends across the interior of the first half shell **14** and defines a seed discharge area **52** which is separated from the seed chamber **44** and the seed mass contained therein by the divider brush **50** and a divider wall **54** from which the brush **50** is mounted. As the seed cell **40** enters the seed discharge area **52**, the effects of the reduced pressure from within the vacuum chamber **46** are cut off. This is due to the shape of a vacuum seal **56** which is mounted on the inside of the second half shell **16** and which extends into contact with the first side **38** of the seed disk **28**. A portion **57** of the vacuum seal **56** extends inwardly from the region adjacent the circumference of the second half shell **16** to isolate the seed discharge area **52** from the reduced pressure. As the reduced pressure is cut off from each seed cell **40**, the seed contained therein falls out of the seed cell **40** under the influence of gravity. The seed falls through a seed discharge chute **58** at the bottom of the first half shell **14** to the ground below.

Referring to FIG. **3** the seeds from the seed hopper **48** shown in FIG. **1** form the seed mass within the lower part of the seed chamber **44**. The seeds of the seed mass reside on an inner surface **60** of a generally circular outer edge **62** of the generally cylindrical housing **12**. The seeds also reside against the second side **42** of the seed disk **28** as well as an opposite inner wall **64** within the first half shell **14**. As the seed meter **10** is used, seed chips, broken seeds, dirt and other debris begin to form within the seed chamber **44**. Most of such debris is drawn through the apertures **34** in the seed disk **28** by the reduced pressure in the vacuum chamber **46**. Much of the remaining debris settles on the inner surface **60** at the second side **42** of the seed disk **28**.

The debris which settles within the seed chamber **44** is eliminated by an arrangement which is described in greater detail in previously referred to co-pending application Ser. No. 546,829 of Olson, which application is incorporated herein by reference. Such arrangement includes a cleanout and seed sealing member **66** mounted on a flat surface of circular configuration comprising an outer peripheral portion **68** of the first half shell **14** of the housing **12**. As seen in FIGS. **1** and **2** the cleanout and seed sealing members **66** is of elongated configuration so as to extend around a substantial portion of the circumference of the outer edge **62** of the housing **12**. The cleanout and seed sealing member **66** is interrupted only by the seed discharge chute **58** at the bottom of the seed discharge area **52**.

The cleanout and seed sealing member **66** has an outer surface **70** which extends along the length of the member **66** adjacent an outer peripheral portion **72** of the seed disk **28** in the region of the circular outer edge **36** so as to form a small gap **74** therewith. The cross-sectional shape of the cleanout and seed sealing member **66** is tapered such that the outer surface **70** thereof slopes gradually away from the outer peripheral portion **72** of the seed disk **28** with increasing distance from an axis of rotation **76** about which the seed disk **28** rotates.

The size of the gap **74** adjacent an inner edge **78** of the cleanout and seed sealing member **66** should be small enough to be below the limited range of sizes of a particular type of seed being used within the seed meter **10**. At the same time the size of the gap **74** should be large enough to freely pass most seed chips, broken seeds, dirt and other debris therethrough. Accordingly, the gap **74** facilitates cleanout of the interior of the seed chamber **44** while at the same time sealing the seeds therein. This is illustrated in FIG. **5** which shows both full seeds **80** and particles of debris **82** which can comprise seed chips, broken seeds or dirt.

As shown in FIG. **6** the outer edge **36** of the seed disk **28** is provided with a series of spaced-apart cavities **84** therein. Each adjacent pair of the cavities **84** defines a rib **86** therebetween. The ribs **86** which are located at

one side of the gap **74** and which have top surfaces that slope down from the side **42** of the seed disk **28** to a level equal to that of the cavaties **84** perform a scraping function by scraping any buildups of debris which may occur within the gap **74**. The ribs **86** also agitate debris which enters the gap **74** to speed up the passage of such debris through the gap **74**. This is aided by the intervening cavities **84** which receive some of the debris agitated by the ribs **86** and pass it freely and quickly out of the gap **74**.

The cylindrical housing **12** has a slot **88** therein which extends around substantially the entire circumference of the generally circular outer edge **62** thereof. The slot **88** is formed by opposite edges of the first and second half shells **14** and **16** which are held in slightly spaced-apart relation by an arrangement of flange as shown in FIGS. **1,2** and **4**. As best seen in FIG. **2**, the first half shell **14** has a flange **90** at the outer edge thereof opposite the hinge **18** and located just outside of the cleanout and seed sealing member **66**. An additional pair of flanges **92** and **94** are located on opposite sides of the first half shell **14** between the flange **90** and the hinge **18**. The second half shell **16** has a flange **96** at the outer edge thereof opposite the hinge **18** and an opposite pair of intermediate flanges **98** and **100**. The radial spacing of the flanges **96,98** and **100** from the center of the second half shell **16** is slightly greater than the radial spacing of the flanges **90,92** and **94** from the center of the first half shell **14**. When the second half shell **16** is closed over the first half shell **14**, the flange **96** extends just to the outside of and in engagement with the flange **90**. In like fashion the flanges **98** and **100** extend just to the outside of and in contact with the flanges **92** and **94** respectively. The various flanges **90,92,94,96,98** and **100** combine with the action of the hinge **18** to hold the edges of the first and second half shells **14** and **16** apart by a small and relatively uniform distance which forms the slot **88**.

It will therefore be seen that the slot **88** extends around substantially the entire circumference of the cylindrical housing **12** adjacent the cleanout and seed sealing member **66** and the outer edge **36** of the seed disk **28**. The slot **88** facilitates expulsion of debris from the interior of the cylindrical housing **12** at virtually any location around the generally circular outer edge **62** of the housing **12**, as illustrated in FIG. **5**.

As shown in FIG. **2**, the second side **42** of the seed disk **28** has an outwardly extending spacer ring **102** formed thereon. The spacer ring **102** is centered on the seed disk **28** so as to have the center thereof at the axis of rotation **76**. The spacer ring **102** which extends into contact with the hub **22** and the seed disk **28** is mounted thereon determines the spacing of the seed disk **28** from the hub **22**. Accordingly, once the hub **22** is actually fixed within the housing **12**, the spacer ring **102** determines the nominal size of the gap **74** between the cleanout and seed sealing member **66** at the outer peripheral portion **68** of the housing **12** and the outer peripheral portion **72** of the seed disk **28**. The seed disk **28** is normally usable only with a particular kind of seed having a predetermined limited size range. Thus the spacer ring **102** can be dimensioned to provide the desired size of the gap **74** to seal the seed which have sizes within the limited size range within the seed chamber **44** while at the same time providing escape of debris through the gap **74**. When a different type of seed is to be used in the seed meter **10**, the seed disk **28** is normally changed. The new disk is provided with a spacer ring **102** having a thickness corresponding to the size of the seeds which the new seed disk is designed to be used with. Seed disks **28** designed for use with larger seeds have spacer rings **102** with are relatively wide so as to position the second side **42** of the seed disk **28** a greater distance form the hub **22** to provide the gap **74** with a larger size. When smaller seeds are to be metered, the gap **74** must be reduced in size to seal the seeds within the seed chamber **44** and prevent the escape therefrom. This is accomplished by providing the seed disks **28** which are used with the smaller seeds with a narrower spacer ring **102** which positions the second side **42** of the seed disk **28** closer to the hub **22**.

As previously noted in connection with FIG. **3**, the seed disk **28** which is mounted on the hub **22** is rotatably driven by engagement of the lugs **24** and **26**. The lugs **24** and **26** which are engaged by a rotating driving arrangement **104** shown in FIG. **3** are coupled to a bearing **106** journaled within a bore **108** within the first half shell **14** of the housing **12** and having an outer race **110**. The hub **22** is coupled to the outer race **110** of the bearing **106** by a shaft **112** having a first end **114** pressed into the outer race **110** and an opposite threaded second end **116** for receiving a threaded central aperture **118** of the hub **22**. The second end **116** of the shaft **112** terminates in a pin **120** extending into and rotatably and resiliently mounting the handle **32** thereon. As described hereafter the shaft **112** combines with the threaded central aperture **118** of the hub **22** to provide for the precise positioning of the seed disk **28** relative to the first half shell **14** of the housing **12**. Such precise positioning enables the gap **74** between the outer peripheral portion **68** of the housing **12** and the outer peripheral **72** of the seed disk **28** to be of desired size and also to be relatively uniform in size around the entire outer edge **62** of the housing **12**. As previously noted the proper expulsion of debris such as the particles **82** to the exclusion of the full seeds **80** is dependent upon the gap **74** being of desired uniform size.

FIG. **7** depicts the successive steps in a method of precisely positioning a seed disk within the housing of a seed meter in accordance with the invention.

The method of FIG. **7** begins with a first step **122** in which a shaft is mounted for rotation within the housing of the seed meter. In a following second step **124** a hub for mounting a seed disk is initially positioned on the shaft. The initial positioning of the hub on the shaft is accomplished with the seed disk removed from the hub in order to facilitate such initial positioning of the hub. Following initial positioning of the hub on the shaft, the seed disk is mounted on the hub in a following third step **126**. With the seed disk mounted on the hub as provided for in the third step **126**, the hub and included seed disk are advanced along the shaft to a desired position in a fourth step **128**.

Movement of the hub and included seed disk along the shaft in accordance with the fourth step **128** of the method of FIG. **7** provides for variation in the position of the seed disk relative to the seed meter housing. Accordingly, the gap **74** between the outer peripheral portion **72** of the seed disk **28** and the outer peripheral portion **68** of the housing **12** can be provided with a selected size defined by the desired position of the hub on the shaft.

In a final fifth step **130** of the method of FIG. **7** the hub is secured to the shaft in the desired position. The securing of the hub to the shaft may be permanent but is preferably done in releasable fashion to enable the hub to be positioned at other desired locations on the shaft

such as where it is desired to change the size of the gap **74**.

FIG. **8** provides a detailed example of the method of FIG. **7** as applied to the particular vacuum seed meter **10** of FIGS. **1–6**.

In the method of FIG. **8** the mounting of the shaft in the housing in accordance with the first step **122** of FIG. **7** is accomplished by a step **132** in which the shaft **112** is pressed into the outer race **110** of the bearing **106** in the first half shell **14** of the seed meter housing **12**. This is an interference type of force fit which provides for the rotatable mounting of the shaft **112** within the housing **12**. As shown in FIG. **3** the first end **114** of the shaft **112** is pressed into the outer race **110**. This operation can be performed by hand but is preferably done by machine which provides for a more uniform and consistent mounting of the shaft **112**. The bearing **106** with its outer race **110** and the shaft **112** are shown in FIG. **9** as well as in FIG. **3**.

In a next step **134** of the method of FIG. **8** the second step **124** of the method of FIG. **7** is accomplished by starting to thread the hub **22** onto the shaft **112**. As previously noted the outer surface of the shaft **112** is threaded along a portion thereof at the second end **116**. The hub **22** has the threaded central aperture **118** therein. The step **134** is accomplished by engaging the hub **22** with the second end **116** of the shaft **112** and then turning the hub **22** in the appropriate direction to begin threading the hub **22** onto the shaft **112**.

In a next step **136** of the method of FIG. **8** the apparatus used in mounting the seed disk **28** is installed on the hub **22** in preparation for mounting the seed disk **28** on the hub **22**. In the disk mounting mechanism described in the previously referred to co-pending application Ser. No. 546,831 of Webber, the handle is rotatably and resiliently secured to the hub by a keeper mounted on the outer end of a pin extending from the hub and a coil spring encircling the pin and disposed between the keeper at one end thereof and an annular ridge within a central aperture in the handle at the other end thereof. A similar arrangement is as shown in FIGS. **3** and **9** where the handle **32** is rotatably and resiliently mounted on the pin **120** extending from the second end **116** of the shaft **112**. As shown in FIG. **3** a coil spring **138** which encircles the pin **120** extends between an annular surface **140** within the handle **32** and a keeper **142** pressed onto an outer end of the pin **120**.

Following the initial positioning of the hub **22** on the shaft **112** in the step **134**, the step **136** is begun by installing the handle **32** on the pin **120**. The pin **110** is inserted into the central aperture in the handle **32**, following which the spring **138** is placed on the pin **120** and the keeper **142** is pressed onto the outer end of the pin **120**. The handle **32** as so mounted is then ready to mount the seed disk **28** on the hub **22**.

In a next step **137** of the method of FIG. **8** which corresponds to the third step **126** in the method of FIG. **7** the seed disk **28** is mounted on the hub **22**. As shown in FIG. **9** the hub **22** which is generally disk shaped has a knob **144** at the center thereof which extends outwardly from the opposite sides of the disk-shaped portion of the hub **22** and has the threaded central aperture **118** therein. A pair of elongated elements **146** and **148** extend outwardly from the knob **144** on opposite sides thereof on the side of the hub **22** opposite the shaft **112** and receive opposite elongated elements **150** and **152** respectively of the handle **32** when the handle **32** is aligned with the elongated elements **146** and **148** of the hub **22**. With the handle **32** in this position, the seed disk **28** is mounted on the hub **22** by inserting the handle **32** through the elongated aperture **30** in the seed disk **28** so that the spacer ring **102** of the seed disk **28** is seated on the disk-shaped portion of the hub **22** on an outer rim **153** with the knob **144** and the opposite elongated elements **146** and **148** disposed within the elongated aperture **30**. With the seed disk **28** so positioned, the handle **32** is rotated relative to the hub **22** so that the opposite elongated elements **150** and **152** of the handle **32** ride up on opposite ramps **154** and **156** at the sides of the elongated aperture **30** against the resistance of the coil spring **138**. The ramps **154** and **156** are shown in FIGS. **2** and **3**. Eventually, the opposite elongated elements **150** and **152** of the handle **32** seat within recesses in the ramps **154** and **156**, and the mounting of the seed disk **28** on hub **22** is completed with the seed disk **28** so mounted, the axis of rotation **76** thereof coincides with the central axis of the hub **22**.

With the seed disk **28** mounted on the hub **22** as provided for in the step **137**, a following step **158** in the method of FIG. **8** which corresponds to the fourth step **128** in the method of FIG. **7** is performed. The step **158** is performed by continuing to thread the hub **22** onto the shaft **112** until the seed disk **28** is a desired distance from the housing **12**. More specifically, the hub **22** and the seed disk **28** which is mounted thereon are rotated about the shaft **112** in a direction to advance the hub **22** along the threaded portion of the shaft **112** until the gap **74** between the outer peripheral portion **72** of the seed disk **28** and the outer peripheral portion **68** of the first half shell **14** of the housing **12** has a desired size. Desired gap size can be determined by any appropriate technique including the use of a Spacer element. With such a spacer element placed against the outer surface **70** of the cleanout and seed sealing member **66**, the hub **22** and seed disk **28** are rotated about the shaft **112** until the seed disk **28** contacts the spacer element, whereupon the spacer element is removed from the gap **74**.

In a following step **160** of the method of FIG. **8** the seed disk **28** is removed from the hub **22**. This is accomplished by rotating the handle **32** so that the opposite elongated elements **150** and **152** thereof slide down and then off of the ramps **154** and **156** on the seed disk **28** and onto the elongated elements **146** and **148** of the hub **22**. With the handle **32** so aligned with the elongated elements **146** and **148** of the hub **22**, the seed disk **28** may simply be pulled off of the hub **22**. Removal of the seed disk **28** from the hub **22** in the step **160** is necessary in order to carry out a following step **162** in the method of FIG. **8**.

In the step **162** of the method of FIG. **8** which corresponds to the final step **130** in the method of FIG. **7**, the hub **22** is secured to the shaft **112** by installing a locking pin in the hub **22** and the shaft **112**. Installation of the locking pin **164** releasably secures the hub **22** in the desired position on the shaft **112**.

The locking pin **164** which is shown in FIGS. **3**, **9** and **12** includes a straight portion **166** thereof and an adjoining curved portion **168**. The curved portion **168** terminates in an outer curved end **170**. Installation of the locking pin **164** on the hub **22** is accomplished by inserting the straight portion **166** thereof through an opposite pair of slots **172** in the knob **144** of the hub **22** and through an aperture **174** in the shaft **112**. The aperture **174** is shown in dotted outline in FIG. **9**. The knob **144** is provided with four of the slots **172**. The slots **172** are located generally equidistantly or approximately 90

degrees apart about the threaded central aperture **118**. The aperture **174** extends through the shaft **112** at the threaded portion thereof adjacent the second end **116** and is generally perpendicular to the central axis of the shaft **112**.

Following the desired positioning of the seed disk **28** in the step **158** and the removal of the seed disk **28** from the hub **22** in the step **160**, the hub **22** is rotated on the shaft **112** by a slight amount as necessary to align an opposite pair of the slots **172** with the aperture **174** prior to installation of the locking pin **164**. Upon insertion of the straight portion **166** of the locking pin **164** through the aperture **174** and the opposite pair of the slots **172**, the outer curved end **170** of the locking pin **164** engages a third one of the slots **172** located midway between the opposite pair of the slots **172** through which the straight portion **166** of the locking pin **164** extends. This biasas the curved portion **168** of the locking pin **164** so as to resiliently seat the outer curved end **170** within the third one of the slots **172** to thereby releasably hold the locking pin **164** in the installed position. With the locking pin **164** so installed, the hub **22** cannot rotate on the shaft **112** and the seed disk **28** is held in the desired position.

As shown in FIG. **3** the spacer ring **102** of the seed disk **28** which seats on the rim **153** of the hub **22** provides a small amount of space between the hub **22** and the adjacent portion of the seed disk **28** in the region of the elongated aperture **30**. This space accommodates those portions of the locking pin **164** that protrude from the knob **144**.

In a final step **176** of the method of FIG. **8** the seed disk **28** is once again mounted on the hub **22**. This is accomplished in essentially the same manner as previously described in connection with the step **137**.

It will be appreciated from the method of FIG. **8** described in conjunction with the apparatus of FIGS. **1–6** and **9–12** that precise positioning of the seed disk **28** within the seed meter **10** is provided. The threaded outer surface of the shaft **112** in combination with the threaded central aperture **118** of the hub **22** and the locking pin **164** enables the hub **22** to be positioned at any of a plurality of selected positions along a portion of the length of the shaft **112**. The shaft **112** can therefor be mounted within the outer race **110** of the bearing **106** without regard to precise positioning of the shaft **112** therein. The locking pin **164** provides for the releasable securing of the hub **22** on the shaft **112** when a desired position has been reached. Should it become necessary or desirable to reposition the seed disk **28** within the housing **12**, it is only necessary to remove the locking pin **164** following removal of the seed disk **28** from the hub **22**, after which the hub **22** can be rotated on the shaft **112** to a new desired position, with the seed disk **28** remounted thereon. With the seed disk **28** again removed, the locking pin **164** is then inserted through the aperture **174** and through an opposite pair of the slots **172** to releasably secure the hub **22** on the shaft **112** in the new position.

As seen in FIG. **3** the axis of rotation **76** of the seed disk **28** coincides with the central axis of the hub **22** when the seed disk **28** is mounted on the hub **22**. The generally circular outer peripheral portion **68** of the housing **12** lies within a plane. The axis of rotation **76** is desirably perpendicular to this plane. Such perpendicularity provides for uniformity in the size of the gap **74**. It frequently happens that the shaft **112** is installed in the outer race **110** so that the central axis of the shaft **112** is not precisely perpendicular to the plane of the outer peripheral portion **68** of the housing **12**. This would normally result in non-uniformity of the gap **74**, which previously noted is undesirable in that it provides for non-uniform retention of full seeds **80** within the housing and non-uniform expulsion of debris such as particles **82** from the housing **12**.

In accordance with a feature of the invention, perpendicularity of the axis of rotation **76** of the seed disk **28** to the plane of the outer peripheral portion **68** of the housing **12** is maintained by providing a small amount of tolerance or play between the threaded portion of the shaft **112** and the threaded central aperture **118** of the hub **22**. More specifically the outer diameter of the threaded portion of the shaft **112** is made smaller than the inner diameter of the threaded central aperture **118** of the hub **22** by an amount which provides the desired tolerance or play. This allows the axis of rotation **76** of the seed disk **28** to form relatively small angles with the central axis of the shaft **112** as necessary to maintain perpendicularity. It has been found that such tolerance or play allows the desired perpendicularity to be achieved upon rotation of the seed disk **28** relative to the housing **12** during operation of the seed meter **10**. This is most likely due to aerodynamic effects in which the layer of air in the gap **74** causes the angle of the axis of rotation **76** to continually change relative to the plane of the outer peripheral portion **68** of the housing **12** as the seed disk **28** rotates so as to maintain uniformity of the gap **74**.

While the invention has been particularly shown and described with reference to preferred embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. In a seed meter an arrangement for rotatably mounting a seed disk within a housing of the seed meter comprising the combination of a shaft rotatably mounted within the housing and having a length thereof extending outwardly from the housing and an aperture therein, a hub disposed on and movable along a portion of the length of the shaft and adapted to mount a seed disk thereon, the hub having an aperture therein receiving the shaft and a plurality of openings therein spaced around the aperture, and means for releasably securing the hub at any of a plurality of different locations along the portion of the length of the shaft, said means comprising a pin extending through the aperture in the shaft and an opposite pair of the openings in the hub.

2. The invention set forth in claim **1**, wherein the pin has an outer end thereof engaged in one of the plurality of openings in the hub other than the opposite pair of openings in the hub through which the pin extends.

3. A seed meter comprising the combination of a housing having a peripheral portion thereof extending around a central axis, a shaft rotatably mounted within the housing and extending along the central axis, the shaft having a threaded outer surface thereof extending along a portion of the shaft from an outer end thereof opposite the housing, a hub having a threaded aperture therein receiving and threaded onto the threaded outer surface of the shaft, means for releasably locking the hub at one of a plurality of possible locations of the hub along the shaft, and a seed disk releasably mounted on the hub and having a peripheral portion thereof spaced apart from the peripheral portion of the housing by a

distance determined by the location along the shaft at which the hub is releasably locked.

4. The invention set forth in claim 3, wherein the shaft has an aperture extending therethrough generally perpendicular to the central axis, the hub has a plurality of slots therein spaced around the threaded aperture therein, and the means for releasably locking comprises a pin extending through the aperture in the shaft and an opposite pair of the slots in the hub.

5. The invention set forth in claim 4, wherein the plurality of slots in the hub comprises four slots substantially equally spaced around the hub.

6. A seed meter comprising the combination of a housing having a peripheral portion thereof extending around a central axis, a shaft mounted within the housing and extending along the central axis, the shaft having a threaded outer surface thereof extending along a portion of the shaft from an outer end thereof opposite the housing, a hub having a threaded aperture therein receiving and threaded onto the threaded outer surface of the shaft and means for releasably locking the hub at one of a plurality of possible locations of the hub along the shaft, the hub having an axis extending through the threaded aperture and nominally coincident with the central axis and the threaded aperture being larger than the threaded outer surface of the shaft by an amount sufficient to permit movement of the hub relative to the shaft so that the axis of the hub forms small angles with the central axis.

7. A seed meter comprising the combination of a housing having a peripheral portion thereof extending around a central axis, a shaft rotatably mounted within the housing and extending along the central axis, the shaft having a threaded outer surface thereof extending along a portion of the shaft from an outer end thereof opposite the housing, a hub having a threaded aperture therein receiving and threaded onto the threaded outer surface of the shaft and means for releasably locking the hub at one of a plurality of possible locations of the hub along the shaft, the shaft having an aperture extending therethrough generally perpendicular to the central axis, the hub having a plurality of slots therein spaced around the threaded aperture therein, the means for releasably locking comprising a pin extending through the aperture in the shaft and an opposite pair of the slots in the hub, the pin having a relatively straight portion extending through the aperture in the shaft and the opposite pair of the plurality of slots in the hub and a curved portion extending outwardly from the straight portion and terminating in an outer curved end resiliently residing in one of the plurality of slots in the hub disposed between the opposite pair of the plurality of slots.

8. In a seed meter having a housing, a method of mounting a seed disk at a desired location within the housing comprising the steps of:

rotatably mounting a shaft within the housing;

positioning a seed disk mounting hub on the shaft so that the seed disk when mounted thereon is at a desired location within the housing; and

securing the hub on the shaft as so positioned;

the step of positioning a seed disk mounting hub on the shaft comprising the steps of:

initially positioning the seed disk mounting hub on the shaft;

mounting the seed disk on the hub so that the seed disk is immovable relative to the hub; and thereafter

advancing the hub along the shaft until the seed disk is at the desired location within the housing.

9. The invention set forth in claim 8, wherein the shaft and the hub are threaded, the step of initially positioning comprises initially threading the hub onto the shaft and the step of advancing the hub comprises rotating the hub relative to the shaft until the seed disk is at the desired location within the housing.

10. The invention set forth in claim 9, wherein the shaft has an aperture therethrough, the hub has an opposite pair of slots therein and the step of securing the hub comprises inserting a pin through the aperture in the shaft and the opposite pair of slots in the hub.

11. In a seed meter comprising a shaft, a housing rotatably mounting the shaft and having a peripheral portion thereof extending around the shaft, a hub mounted on and movable along the shaft and a seed disk having a peripheral portion thereof, a method of locating the peripheral portion of the seed disk a desired distance from the peripheral portion of the housing comprising the steps of:

mounting the seed disk on the hub;

advancing the hub along the shaft in a direction toward the housing to a position in which the peripheral portion of the seed disk is the desired distance from the peripheral portion of the housing; and

securing the hub to the shaft;

and including the further steps of removing the seed disk from the hub following the step of advancing the hub along the shaft and before the step of securing the hub to the shaft, and mounting the seed disk on the hub following the step of securing the hub to the shaft.

12. The invention set forth in claim 11, wherein the shaft has a threaded outer portion, the hub has a threaded inner portion, and the step of advancing the hub along the shaft comprises rotating the threaded inner portion of the hub about the threaded outer portion of the shaft.

13. In a seed meter having a housing with a peripheral portion thereof extending around a central axis and a seed disk, a method of rotatably mounting the seed disk within the housing so that a peripheral portion thereof is a desired distance from the peripheral portion of the housing comprising the steps of:

providing a shaft having a threaded outer portion;

mounting the shaft within the housing for rotation about the central axis;

providing a hub having a threaded aperture therein;

rotating the threaded aperture of the hub onto the threaded outer portion of the shaft to initially mount the hub on the shaft;

mounting the seed disk on the hub;

rotating the hub relative to the shaft to advance the hub and the seed disk along the shaft until the peripheral portion of the seed disk is a desired distance from the peripheral portion of the housing; and

locking the hub on the shaft to prevent rotation of the hub relative to the shaft;

and including the further steps of removing the seed disk from the hub following the step of rotating the hub relative to the shaft to advance the hub and the seed disk and before the step of locking the hub on the shaft, and mounting the seed disk on the hub following locking the hub on the shaft.

14. The invention set forth in claim 13, wherein the shaft has an aperture therethrough, the hub has a plurality of slots therein spaced about the threaded aperture thereof, and the step of locking the hub on the shaft comprises inserting a pin through the aperture in the shaft and an opposite pair of the plurality of slots in the hub.

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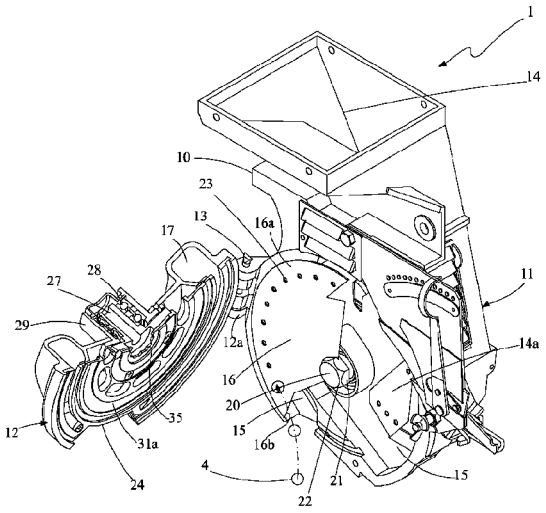


fig. 1

(57) Abstract: A seed distribution element (1) includes: -a sowing disc (16) rotated by a motor-driven transmission shaft (20) -a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) movable relative to the fixed portion and can be closed against it, with a seed collection chamber (15) in the fixed portion (11) and a pneumatic suction chamber (17) in the movable portion(12), -the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces (16a, 16b) delimiting the chambers, and provided with a ring of selector holes (23) extending between the opposed surfaces, -means for producing a pressure differential between the opposed surfaces in the region of a circumferential segment of the ring of holes, including the pneumatic suction chamber, and -a seal (24) on the movable portion (12) capable of sliding contact with the facing surface (16a) of the disc (16) when the portions are closed against one another, -a thrust -bearing element (26) of the sowing disc (16), supported rotatably in the movable portion (12), to withstand the axial load produced by the disc (16) on the seal (24).

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"Seed distribution element for precision seed drills, seed drill including said element"

DESCRIPTION

The subject of the present invention is a seed distribution element for precision pneumatic seed drills, a sowing element for such machines and a seed drill including a plurality of such sowing elements.

In precision pneumatic seed drills it is known to use sowing elements which are each equipped with a seed distribution element (hereinafter, in brief, distributor) for distributing one seed at a time in a controlled delivery while the sowing element moves along a sowing track.

It is equally known to use seed distributors which use an air pressure differential between opposed faces of a sowing disc (or selector) provided with one or more rings of through holes. The operating principle is based on the fact that, as a result of the pressure differential between the opposed faces of the disc, a seed adheres to each hole and is then transported by the rotation of the sowing disc from the seed selection zone to the point at which the pressure differential ceases and the seed is released to drop through a sowing pipe into the furrow or sowing track. In practice, on one of the faces of the disc a strong air suction is exerted which retains the seeds on the opposite face in the region of the respective holes. An example of such devices is disclosed in US 7 228 807.

For the correct functioning of such distributors it is necessary to ensure an effective pneumatic seal between the face of the disc that is subjected to suction and a seal which delimits the pneumatic suction chamber. The

suction effect itself effects a substantial compression of the disc against the seal. If on the one hand this ensures adequate adherence of the seal to the disc surface which is subjected to negative pressure, on the other hand it involves severe abrasion of the seal which limits the effective service life thereof. It is therefore necessary periodically to replace the seal in order to prevent sowing errors arising from insufficient depressurization of the suction chamber.

On the other hand, even if replacing the seal is a simple operation, in each case it entails an unwanted machine stoppage, besides the cost of the spare part itself.

In order to remedy this drawback, seed drills have been developed which are equipped with a thrust-bearing element which relieves the heavy load on the seal. In all cases, however, the thrust-bearing element, which must be rotated with the disc, is mounted on the fixed portion of the housing, that is to say, that portion which is fixed to the framework of the sowing elements. This means that the disc must be attached to the thrust-bearing element; therefore an attachment system must be provided which in the stage of replacement of the disc must be removed, consequently lengthening the operation. This is inevitable in the known machines since it is obligatory to mount on the fixed portion the transmission which drives in rotation the motor-driven shaft which rotates the disc.

However, positioning the thrust-bearing element on the fixed portion entails the pneumatic suction chamber being provided on the fixed portion, or on the same side at which the thrust-bearing element is placed, while the seed collection chamber must be provided in the

movable portion. This is the source of numerous drawbacks, including the fact that the opening of the housing necessarily involves the removal of the portion containing the seed collection chamber from the hopper type store located above, which must necessarily be fixed to the framework of the sowing element.

Furthermore, for the replacement of the sowing disc it is necessary to remove some parts of the distributor, such as the adjustable seed selector, and the seed ejector, where provided.

The problem underlying the present invention is that of providing a seed distribution element structurally and functionally designed to make it possible to remedy all the drawbacks mentioned with reference to the prior art cited.

This problem is solved by the invention by means of a seed distribution element produced in accordance with one or more of the attached claims.

The features and advantages of the invention will become clearer from the following detailed description of a preferred exemplary embodiment thereof, illustrated by way of non-limiting example with reference to the appended drawings, in which:

- Fig. 1 is a perspective view of a seed distribution element produced according to the present invention;
- Fig. 2 is an exploded perspective view of a detail of the element of Fig. 1;
- Fig. 3 is a perspective view of a seed drill equipped with sowing elements with a seed distribution element according to the invention.

In the drawings the reference 1 indicates as a whole a seed distribution

element intended for equipping a sowing element 2 of a precision pneumatic seed drill 3.

The distribution element 1 is the device intended to deposit one seed 4 at a time at a predetermined adjustable spacing in a sowing furrow opened by a coulter 5. The sowing element 2, besides the distribution element 1, comprises a frame 6 and a seed store or hopper 7, besides other devices which are known per se and not necessary for the understanding of the present invention. The seed drill 3 itself comprises a bearing structure 8 on which a plurality of sowing elements 2 are mounted, all connected to a pneumatic suction device 9.

The sowing element 1 itself comprises a housing 10 with a fixed portion 11 fixed in a stable manner on the frame 6 and a movable portion 12 hinged in the region of a hinge 12a on the fixed portion 11 by means of a removable hinge pin 13. The fixed portion includes a throat 14 by means of which it is connected below an outflow mouth of the store or hopper 7 in such a way as to be fed directly by the latter.

From the throat 14 the seed flows through a gate 14a through which the seed flows into a seed collection chamber 15.

A sowing disc 16 separates the seed collection chamber 15 from a suction chamber 17 provided in the movable portion 12. A suction device 18 mounted on the bearing structure 8 is connected to the suction chamber 17 by means of pipes 19 for producing a pressure differential between the opposed surfaces 16a, 16b of the selector disc 16.

The sowing disc 16 is removably mounted on a motor-driven drive shaft 20, supported in the fixed portion 11 and driven in rotation at

predetermined adjustable speeds by a transmission which is not shown. The presence of the transmission requires the shaft 20 to be mounted on the fixed portion 11 of the housing 10. The keying between the shaft 20 and the disc 16 is obtained by means of a polygonal profile 21 at the free end of the shaft 20 which protrudes beyond the disc 16 and preferably has chamfers 22 which serve to facilitate the functions explained hereinafter.

At the periphery of the disc 16 is/are provided one (or several) ring(s) of holes 23 passing between the opposed faces of the sowing disc 16.

A seal 24 is fitted in the suction chamber 17 and is placed in sliding contact with the facing surface of the disc 16, when the movable portion 11 is closed on the fixed portion 12, to delimit a circumferential segment in which the holes 23 are subjected to the aforesaid pressure differential. The circumferential segment extends between the seed collection chamber 15 and a seed fall pipe 25 in which the seeds are released one at a time into the furrow formed by the coulter 5.

By reason of the pressure differential between the two opposed surfaces of the sowing disc, the seeds 4 are held, one to each hole 23, when the holes pass in the seed collection chamber 15, and are released in the region of the pipe 25 when the pneumatic effect of the pressure differential ceases or owing to the presence of a seed ejector (not shown).

In order to limit the wear on the seal 24 resulting from sliding against the surface of the disc 16, a thrust-bearing element indicated as a whole by 26 is mounted on the movable portion.

The thrust-bearing element 26 comprises a shaft 27 rotatably mounted by means of bearings 28 in a seat 29 of the movable portion 12. The shaft 27

has flanging 30 by means of which it is fixed to a thrust-bearing plate 31 which can bear on that surface of the disc which faces the seal 24 in a zone radially inside the ring of holes 23 in order to withstand at least some of the axial load produced by the disc 16 on the seal 24.

The bearing between the thrust-bearing plate 31 and the disc 16 takes place in the region of a ring 31a in relief on the surface of the plate which faces the disc 16.

The thrust-bearing element 26 is driven in rotation with the sowing disc 16 when the fixed and movable portions 11, 12 are closed against one another by means of a drive element 32 which comprises a coupling device constrained for rotation with the thrust-bearing plate but with radial and/or circumferential clearance in such a way as to be self-centred in the rotational coupling with the drive shaft of the disc 16. For this purpose, in the present form of embodiment, the drive element 32 is coupled with limited radial and/or circumferential clearance to the element 26 by means of one (or more) appendage(s) 33 protruding radially towards the outside and fitted into corresponding seats 34 of the plate. The drive element 32 is coupled by means of an internal polygonal profile 35 (similar to that adopted for box-end wrenches) to the polygonal profile 21 of the free end of the shaft 20, the chamfers 22 of which serve to facilitate the centring of the two profiles and the respective engagement.

The drive element 32 is thus self-centring relative to the drive shaft 20 by which it is driven. The positioning between seal 24 and plate 31 is such that the rotation of the latter will not be hindered by the presence of the seal 24 and, at the same time, both will be kept bearing against the disc

16.

Provision is also made for the thrust-bearing element 26 to be made idle and not driven in rotation by the shaft 20.

The whole of the movable portion 12 complete with thrust-bearing element 26 and seal 24 lends itself advantageously to the production of a kit for the retrofitting of existing seed drills. It is sufficient in this case to separate the old type of movable portion by removing the hinge pin 13 and replacing the old movable portion with the aforesaid kit. By re-connecting the pneumatic pipes previously disconnected, the seed drill becomes ready for use.

Among the principal advantages of the distribution element according to the invention is the fact that the wear on the seal resulting from the sliding contact with the seed selector disc is substantially reduced, if not eliminated; the thrust-bearing element is self-centring, thereby allowing easy opening and closing of the movable portion on the fixed portion of the housing; the system additionally lends itself to easy retrofitting, all without removing movable parts and/or operations of disconnecting the sowing disc.

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

- a seed collection chamber (15) being defined in the fixed portion (11),

- a pneumatic suction chamber (17) being defined in the movable portion (12),

- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the

movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
- a seed collection chamber (15) being defined in the fixed portion (11),
- a pneumatic suction chamber (17) being defined in the movable portion (12),
- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),
- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and
- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed

surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the kit comprises:

- the movable portion (12) pre-assembled with:

- a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

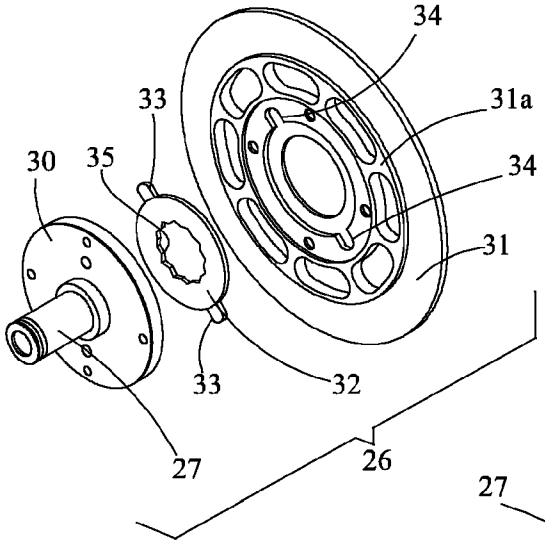

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fig. 2

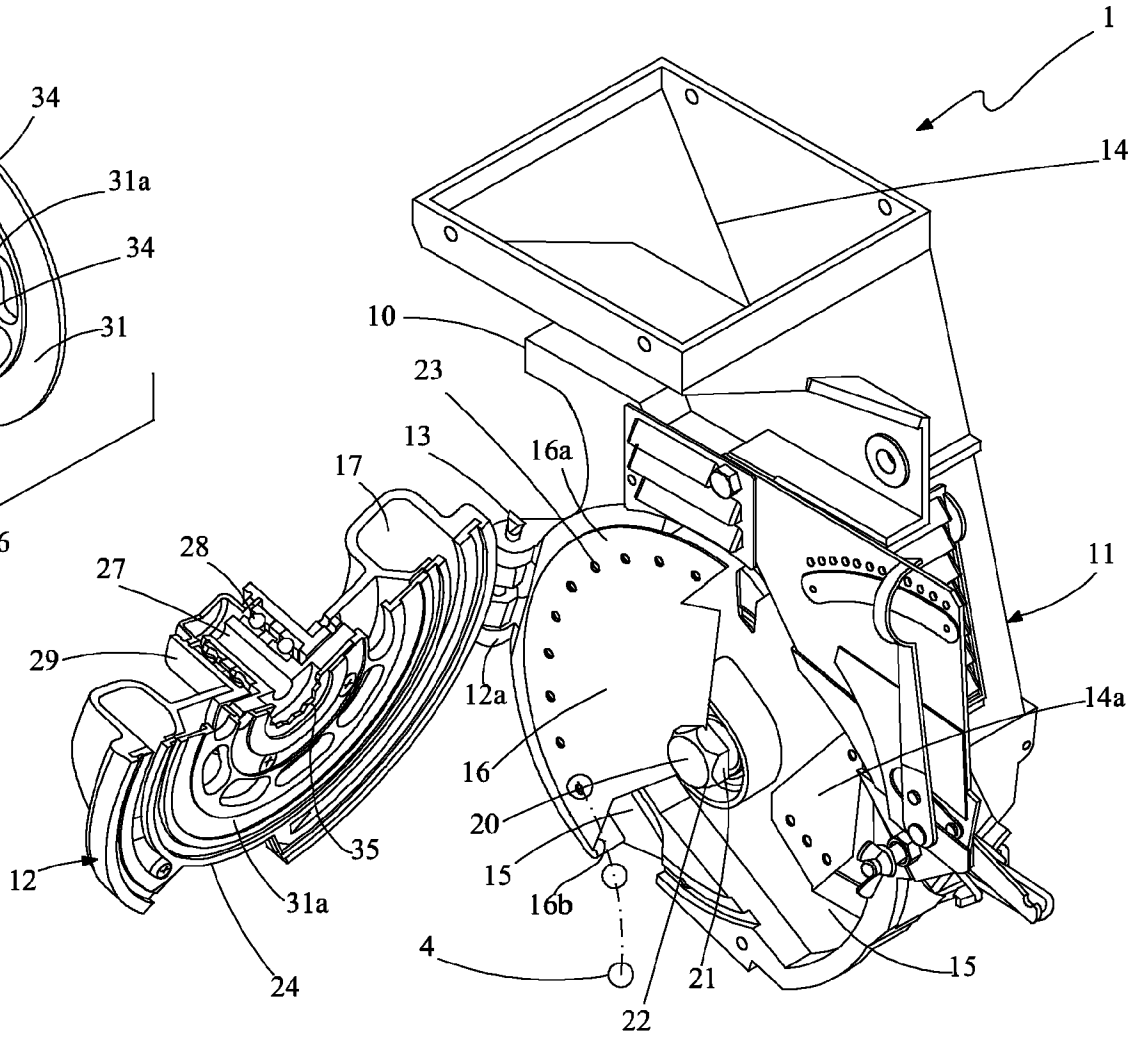

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fig. 1

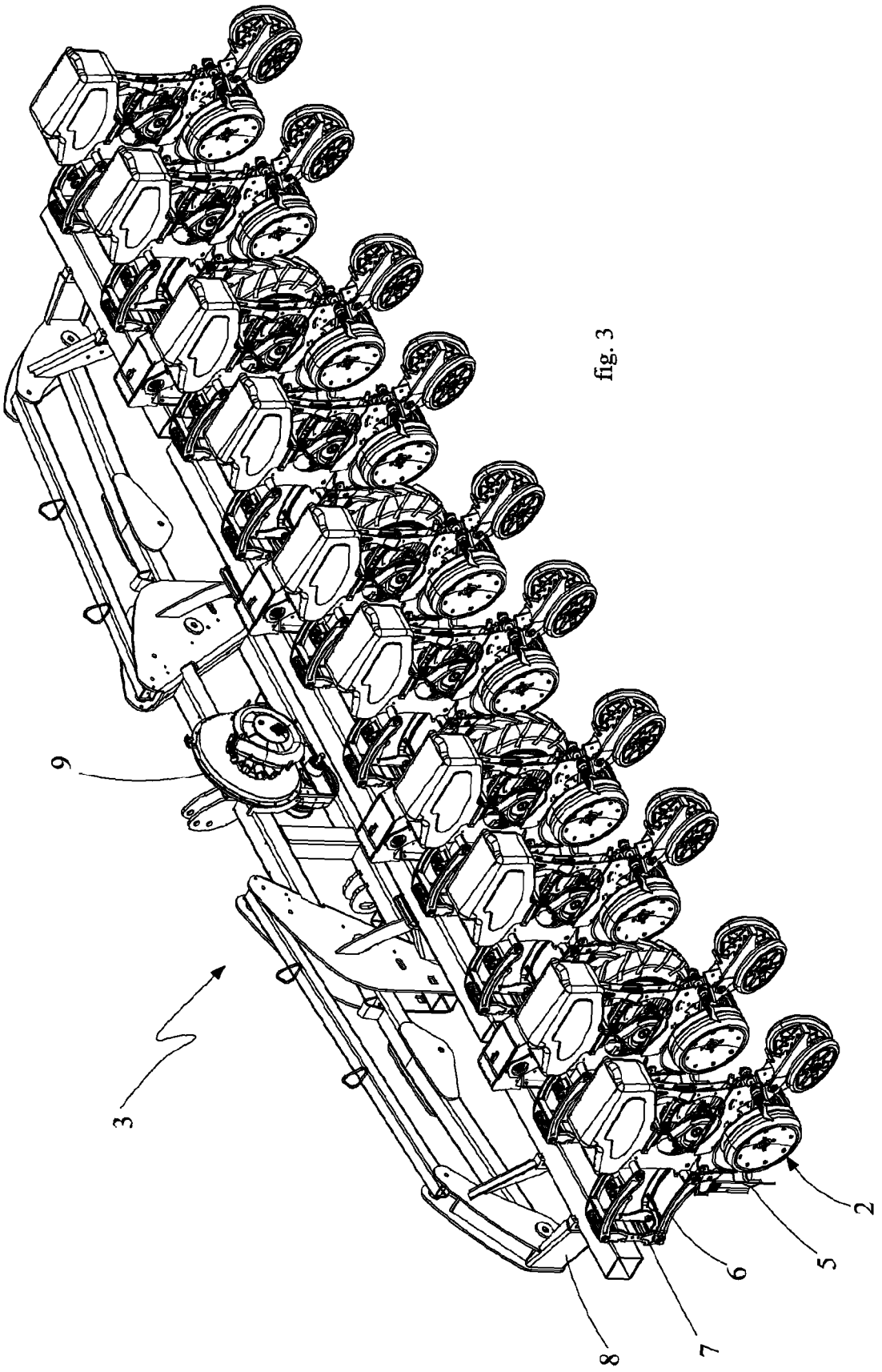


fig. 3

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2011/069875

A. CLASSIFICATION OF SUBJECT MATTER
INV. A01C7/04
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A01C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 7 228 807 B1 (VENHUIZEN DALE [US]) 12 June 2007 (2007-06-12) column 5, line 59 - column 7, line 37; figures 6-10	1
A	EP 0 536 543 A1 (MATERMACC SRL [IT]) 14 April 1993 (1993-04-14) column 5, line 7 - column 8, line 6; figures	1

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
9 February 2012	17/02/2012

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Bunn, David

1

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2011/069875

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 7228807 B1	12-06-2007	NONE	
EP 0536543 A1	14-04-1993	EP 0536543 A1	14-04-1993
		IT 1253373 B	08-08-1995
		US 5325801 A	05-07-1994

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 848 109 A1

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A01C 7/04 *(2006.01)*

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(30) Priority: **12.11.2010 IT PD20100338**

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11779702.7 / 2 637 492

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Remarks:
This application was filed on 30-09-2014 as a divisional application to the application mentioned under INID code 62.

(54) Seed distribution element for precision seed drills, seed drill including said element

(57) A seed distribution element (1) for precision pneumatic seed drills, includes:
- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20), at controlled speed, jointly with the shaft,
- a housing (10) with a fixed portion (11) in which the shaft is supported and a portion (12) which is movable relative to the fixed portion and can be closed against it, with a seed collection chamber (15) in the fixed portion and a pneumatic suction chamber (17) in the movable portion,
- the sowing disc (16) being interposed between the portions and having opposed surfaces (16a,16b) delimiting the chambers, and being provided with at least one ring of selector holes (23) extending between the opposed surfaces,
- means (9) for producing a pressure differential between the opposed surfaces in the region of a circumferential segment of the ring of holes, including the pneumatic suction chamber, and
- a seal (24) on the movable portion capable of sliding contact with the facing surface of the disc when the portions are closed against one another,
- a thrust-bearing element (26) of the sowing disc, supported rotatably in the movable portion, in order to withstand at least some of the axial load produced by the disc on the seal.

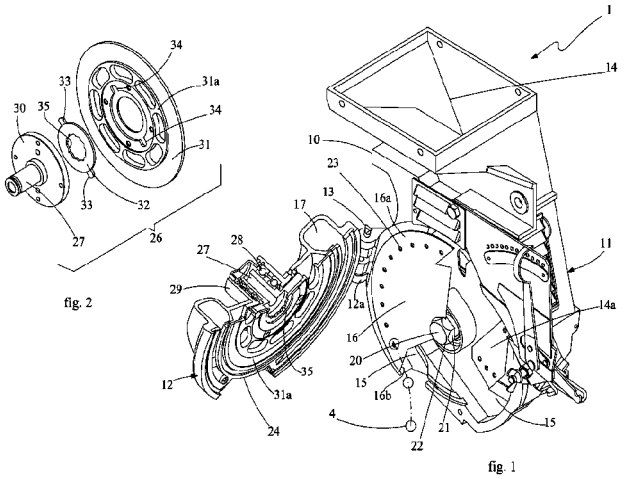


fig. 2

fig. 1

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EP 2 848 109 A1

Description

[0001] The subject of the present invention is a seed distribution element for precision pneumatic seed drills, a sowing element for such machines and a seed drill including a plurality of such sowing elements.

[0002] In precision pneumatic seed drills it is known to use sowing elements which are each equipped with a seed distribution element (hereinafter, in brief, distributor) for distributing one seed at a time in a controlled delivery while the sowing element moves along a sowing track.

[0003] It is equally known to use seed distributors which use an air pressure differential between opposed faces of a sowing disc (or selector) provided with one or more rings of through holes. The operating principle is based on the fact that, as a result of the pressure differential between the opposed faces of the disc, a seed adheres to each hole and is then transported by the rotation of the sowing disc from the seed selection zone to the point at which the pressure differential ceases and the seed is released to drop through a sowing pipe into the furrow or sowing track. In practice, on one of the faces of the disc a strong air suction is exerted which retains the seeds on the opposite face in the region of the respective holes. An example of such devices is disclosed in US 7 228 807.

[0004] For the correct functioning of such distributors it is necessary to ensure an effective pneumatic seal between the face of the disc that is subjected to suction and a seal which delimits the pneumatic suction chamber. The suction effect itself effects a substantial compression of the disc against the seal. If on the one hand this ensures adequate adherence of the seal to the disc surface which is subjected to negative pressure, on the other hand it involves severe abrasion of the seal which limits the effective service life thereof. It is therefore necessary periodically to replace the seal in order to prevent sowing errors arising from insufficient depressurization of the suction chamber.

[0005] On the other hand, even if replacing the seal is a simple operation, in each case it entails an unwanted machine stoppage, besides the cost of the spare part itself.

[0006] In order to remedy this drawback, seed drills have been developed which are equipped with a thrust-bearing element which relieves the heavy load on the seal. In all cases, however, the thrust-bearing element, which must be rotated with the disc, is mounted on the fixed portion of the housing, that is to say, that portion which is fixed to the framework of the sowing elements. This means that the disc must be attached to the thrust-bearing element; therefore an attachment system must be provided which in the stage of replacement of the disc must be removed, consequently lengthening the operation. This is inevitable in the known machines since it is obligatory to mount on the fixed portion the transmission which drives in rotation the motor-driven shaft which rotates the disc.

[0007] However, positioning the thrust-bearing element on the fixed portion entails the pneumatic suction chamber being provided on the fixed portion, or on the same side at which the thrust-bearing element is placed, while the seed collection chamber must be provided in the movable portion. This is the source of numerous drawbacks, including the fact that the opening of the housing necessarily involves the removal of the portion containing the seed collection chamber from the hopper type store located above, which must necessarily be fixed to the framework of the sowing element.

[0008] Furthermore, for the replacement of the sowing disc it is necessary to remove some parts of the distributor, such as the adjustable seed selector, and the seed ejector, where provided.

[0009] The problem underlying the present invention is that of providing a seed distribution element structurally and functionally designed to make it possible to remedy all the drawbacks mentioned with reference to the prior art cited.

[0010] This problem is solved by the invention by means of a seed distribution element produced in accordance with one or more of the attached claims. The features and advantages of the invention will become clearer from the following detailed description of a preferred exemplary embodiment thereof, illustrated by way of non-limiting example with reference to the appended drawings, in which:

- Fig. 1 is a perspective view of a seed distribution element produced according to the present invention;
- Fig. 2 is an exploded perspective view of a detail of the element of Fig. 1;
- Fig. 3 is a perspective view of a seed drill equipped with sowing elements with a seed distribution element according to the invention.

[0011] In the drawings the reference 1 indicates as a whole a seed distribution element intended for equipping a sowing element 2 of a precision pneumatic seed drill 3.

[0012] The distribution element 1 is the device intended to deposit one seed 4 at a time at a predetermined adjustable spacing in a sowing furrow opened by a coulter 5. The sowing element 2, besides the distribution element 1, comprises a frame 6 and a seed store or hopper 7, besides other devices which are known per se and not necessary for the understanding of the present invention. The seed drill 3 itself comprises a bearing structure 8 on which a plurality of sowing elements 2 are mounted, all connected to a pneumatic suction device 9.

[0013] The sowing element 1 itself comprises a housing 10 with a fixed portion 11 fixed in a stable manner on the frame 6 and a movable portion 12 hinged in the region of a hinge 12a on the fixed portion 11 by means of a removable hinge pin 13. The fixed portion includes a throat 14 by means of which it is connected below an

outflow mouth of the store or hopper 7 in such a way as to be fed directly by the latter.

[0014] From the throat 14 the seed flows through a gate 14a through which the seed flows into a seed collection chamber 15.

[0015] A sowing disc 16 separates the seed collection chamber 15 from a suction chamber 17 provided in the movable portion 12. A suction device 18 mounted on the bearing structure 8 is connected to the suction chamber 17 by means of pipes 19 for producing a pressure differential between the opposed surfaces 16a, 16b of the selector disc 16.

[0016] The sowing disc 16 is removably mounted on a motor-driven drive shaft 20, supported in the fixed portion 11 and driven in rotation at predetermined adjustable speeds by a transmission which is not shown. The presence of the transmission requires the shaft 20 to be mounted on the fixed portion 11 of the housing 10. The keying between the shaft 20 and the disc 16 is obtained by means of a polygonal profile 21 at the free end of the shaft 20 which protrudes beyond the disc 16 and preferably has chamfers 22 which serve to facilitate the functions explained hereinafter. At the periphery of the disc 16 is/are provided one (or several) ring(s) of holes 23 passing between the opposed faces of the sowing disc 16.

[0017] A seal 24 is fitted in the suction chamber 17 and is placed in sliding contact with the facing surface of the disc 16, when the movable portion 11 is closed on the fixed portion 12, to delimit a circumferential segment in which the holes 23 are subjected to the aforesaid pressure differential. The circumferential segment extends between the seed collection chamber 15 and a seed fall pipe 25 in which the seeds are released one at a time into the furrow formed by the coulter 5.

[0018] By reason of the pressure differential between the two opposed surfaces of the sowing disc, the seeds 4 are held, one to each hole 23, when the holes pass in the seed collection chamber 15, and are released in the region of the pipe 25 when the pneumatic effect of the pressure differential ceases or owing to the presence of a seed ejector (not shown). In order to limit the wear on the seal 24 resulting from sliding against the surface of the disc 16, a thrust-bearing element indicated as a whole by 26 is mounted on the movable portion.

[0019] The thrust-bearing element 26 comprises a shaft 27 rotatably mounted by means of bearings 28 in a seat 29 of the movable portion 12. The shaft 27 has flanging 30 by means of which it is fixed to a thrust-bearing plate 31 which can bear on that surface of the disc which faces the seal 24 in a zone radially inside the ring of holes 23 in order to withstand at least some of the axial load produced by the disc 16 on the seal 24.

[0020] The bearing between the thrust-bearing plate 31 and the disc 16 takes place in the region of a ring 31a in relief on the surface of the plate which faces the disc 16.

[0021] The thrust-bearing element 26 is driven in rotation with the sowing disc 16 when the fixed and movable portions 11, 12 are closed against one another by means of a drive element 32 which comprises a coupling device constrained for rotation with the thrust-bearing plate but with radial and/or circumferential clearance in such a way as to be self-centred in the rotational coupling with the drive shaft of the disc 16. For this purpose, in the present form of embodiment, the drive element 32 is coupled with limited radial and/or circumferential clearance to the element 26 by means of one (or more) appendage(s) 33 protruding radially towards the outside and fitted into corresponding seats 34 of the plate. The drive element 32 is coupled by means of an internal polygonal profile 35 (similar to that adopted for box-end wrenches) to the polygonal profile 21 of the free end of the shaft 20, the chamfers 22 of which serve to facilitate the centring of the two profiles and the respective engagement.

[0022] The drive element 32 is thus self-centring relative to the drive shaft 20 by which it is driven. The positioning between seal 24 and plate 31 is such that the rotation of the latter will not be hindered by the presence of the seal 24 and, at the same time, both will be kept bearing against the disc 16.

[0023] Provision is also made for the thrust-bearing element 26 to be made idle and not driven in rotation by the shaft 20.

[0024] The whole of the movable portion 12 complete with thrust-bearing element 26 and seal 24 lends itself advantageously to the production of a kit for the retrofitting of existing seed drills. It is sufficient in this case to separate the old type of movable portion by removing the hinge pin 13 and replacing the old movable portion with the aforesaid kit. By reconnecting the pneumatic pipes previously disconnected, the seed drill becomes ready for use.

[0025] Among the principal advantages of the distribution element according to the invention is the fact that the wear on the seal resulting from the sliding contact with the seed selector disc is substantially reduced, if not eliminated; the thrust-bearing element is self-centring, thereby allowing easy opening and closing of the movable portion on the fixed portion of the housing; the system additionally lends itself to easy retrofitting, all without removing movable parts and/or operations of disconnecting the sowing disc.

Claims

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

   - a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
   - a housing (10) with a fixed portion (11) and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
   - a seed collection chamber (15) being defined

in the fixed portion (11),
- a pneumatic suction chamber (17) being defined in the movable portion (12),
- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),
- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and
- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a suction device produces a pressure differential between the opposed surfaces in the region of a circumferential segment of the ring of holes (23), the seed distribution element (1) further comprising a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
- a seed collection chamber (15) being defined in the fixed portion (11),
- a pneumatic suction chamber (17) being defined in the movable portion (12),
- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),
- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and
- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),
characterized in that the kit comprises:

- the movable portion (12) pre-assembled with:
- a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

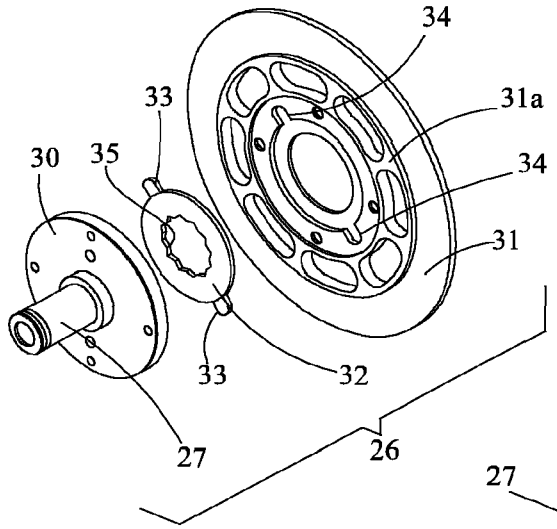

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fig. 2

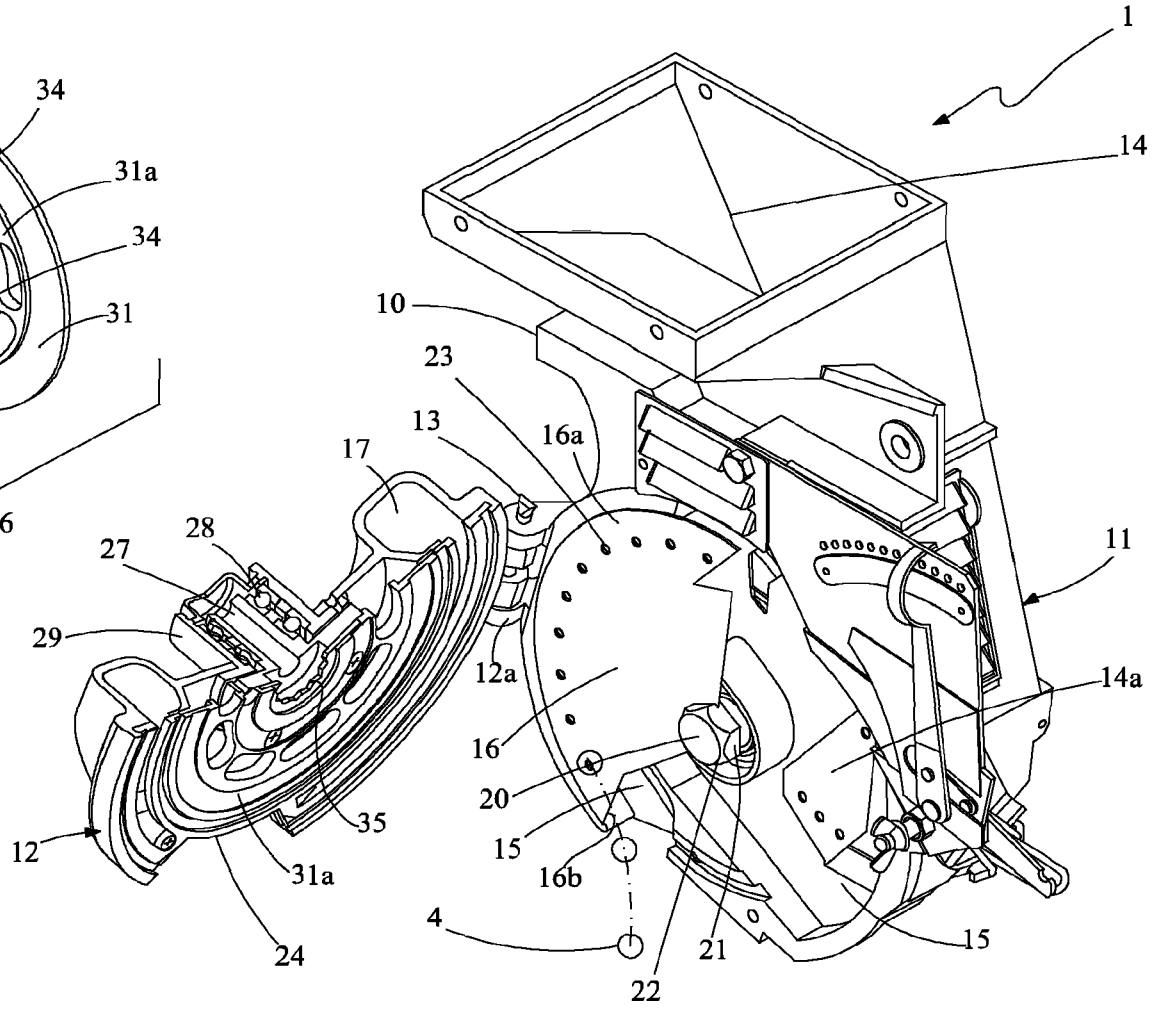

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fig. 1

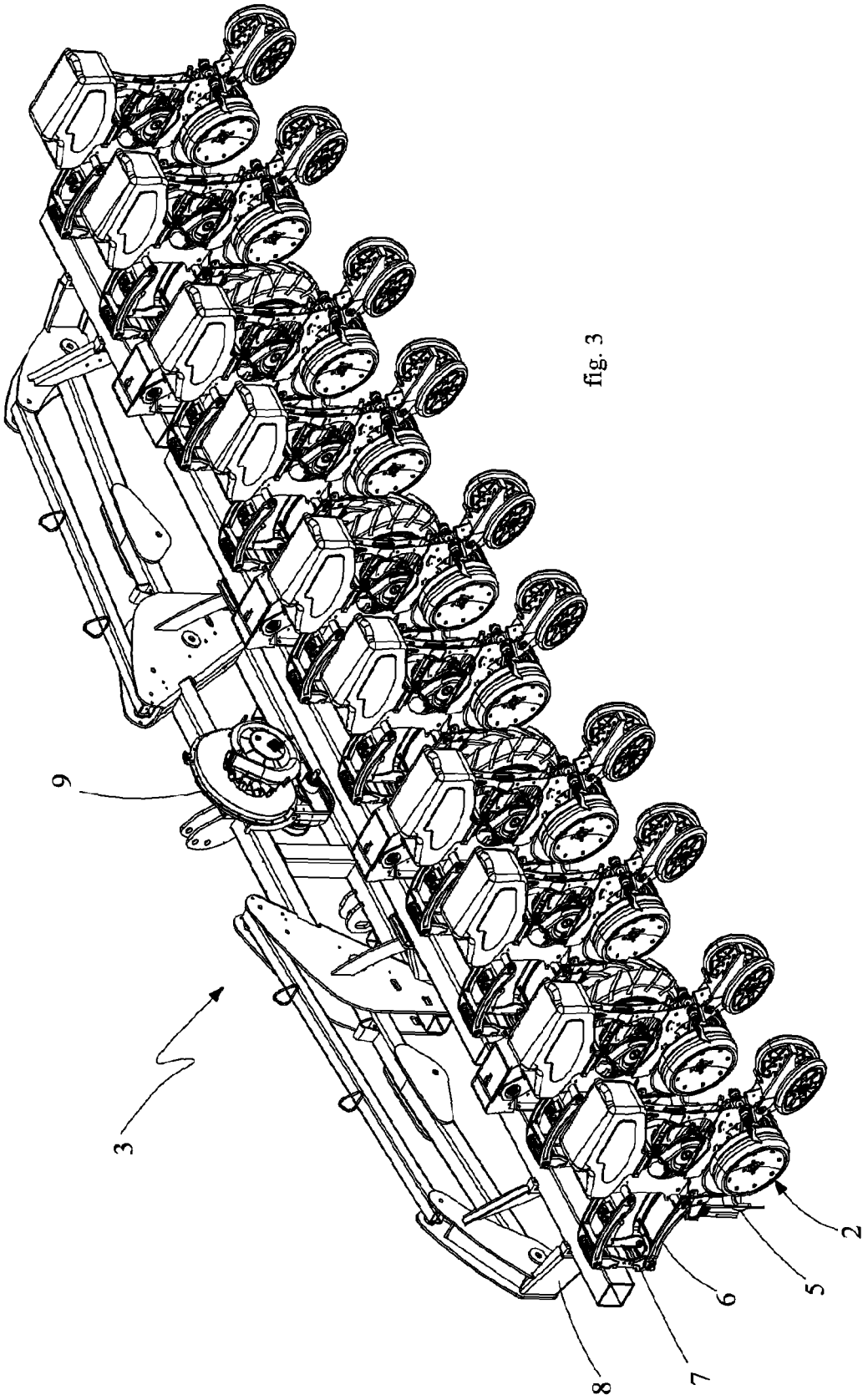


fig. 3

Europäisches Patentamt
European Patent Office
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EUROPEAN SEARCH REPORT

Application Number
EP 14 18 7190

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 7 228 807 B1 (VENHUIZEN DALE [US]) 12 June 2007 (2007-06-12) * column 5, line 59 - column 7, line 37; figures 6-10 *	1	INV. A01C7/04
A	EP 0 536 543 A1 (MATERMACC SRL [IT]) 14 April 1993 (1993-04-14) * column 5, line 7 - column 8, line 6; figures *	1	

TECHNICAL FIELDS SEARCHED (IPC)
A01C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	5 February 2015	Bunn, David

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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P : intermediate document

T : theory or principle underlying the invention
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D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 14 18 7190

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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05-02-2015

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 7228807 B1	12-06-2007	NONE	
EP 0536543 A1	14-04-1993	EP 0536543 A1	14-04-1993
		IT 1253373 B	08-08-1995
		US 5325801 A	05-07-1994

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 7228807 B **[0003]**

(19) BUNDESREPUBLIK DEUTSCHLAND

DEUTSCHES PATENTAMT

(12) Übersetzung der europäischen Patentschrift

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(10) DE 689 16 976 T 2

(51) Int. Cl.[6]: A 01 C 7/04

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(86) Europäisches Aktenzeichen: 92 117 272.2
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(30) Unionspriorität: (32) (33) (31)
22.04.88 FR 8805398

(73) Patentinhaber:
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(84) Benannte Vertragstaaten:
AT, BE, DE, ES, GB, GR, IT, NL, SE

(72) Erfinder:
Ribouleau, Michel, F-75015 Paris, FR

(54) Verteiler für eine Einzelkörnersämaschine.

Anmerkung: Innerhalb von neun Monaten nach der Bekanntmachung des Hinweises auf die Erteilung des europäischen Patents kann jedermann beim Europäischen Patentamt gegen das erteilte europäische Patent Einspruch einlegen. Der Einspruch ist schriftlich einzureichen und zu begründen. Er gilt erst als eingelegt, wenn die Einspruchsgebühr entrichtet worden ist (Art. 99 (1) Europäisches Patentübereinkommen).

Die Übersetzung ist gemäß Artikel II § 3 Abs. 1 IntPatÜG 1991 vom Patentinhaber eingereicht worden. Sie wurde vom Deutschen Patentamt inhaltlich nicht geprüft.

DE 689 16 976 T 2

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Beschreibung

Einzelkornsämaschinen werden von Landwirten wegen der Regelmäßigkeit und der Genauigkeit, die mit ihnen möglich ist, mehr und mehr geschätzt.

Diese Sämaschinen sind im allgemeinen mit einem Verteiler versehen, der ein im wesentlichen zylindrisches Gehäuse, in dem auf einer horizontalen Achse eine Verteilerscheibe drehbar angebracht ist, welche mit in Umfangsrichtung im Abstand liegenden Öffnungen versehen ist und einen Kornbehälter von einer Ansaugvorrichtung trennt, welche mit einem Element zur Ansaugregulierung versehen ist derart, daß die Öffnungen einem Unterdruck zum Festenhalten der aus dem Behälter entnommenen Körner während wenigstens eines Teils von deren Winkelversetzung unterworfen werden; Mittel zur Beseitigung von Doppelkörnern, die durch eine Ablenkeinrichtung gebildet sind, und, im unteren Teil des Gehäuses, eine Abgabeöffung für die Körner aufweist.

Verteiler dieser Art, wie die in FR-A-2 135 702 und 2 174 341 beschriebenen, weisen eine Scheibe auf, die mit Flügeln versehen ist, welche die Speisung der Öffnung mit Körnern sowie das Führen und das genaue Loslassen dieser Körner erleichtern, was eine sehr einfache automatische Auswahl der Körner bei gleichzeitigem Erfordernis eines nur schwachen Unterdrucks gestattet. Da jedoch die Scheiben nur eine begrenzte Anzahl von Flügeln, d.h. Zellen, die jeweils ein Korn enthalten, aufweisen können, kann nur eine Steigerung der Drehgeschwindigkeit der Scheibe die Sädichte steigern, was ein Säen mit hoher Dichte verbietet.

Weitere Verteiler (FR-A-1 585 445) weisen eine Scheibe ohne Flügel auf, die folglich von einer großen Anzahl von Öffnungen durchsetzt sein kann und die sich aus diesem Grund gut einer hohen Sädichte anpaßt. Leider erfordern diese Verteiler einen hohen Unterdruck, ohne den die Körner nicht mitgenommen werden, so daß sie schweren und großkalibrigen Körnern wenig angepaßt sind.

Der Landwirt, der im allgemeinen mehrere Arten von Aussaaten durchführen muß, sieht sich daher mit einer schwierigen Wahl konfrontiert oder in der Notwendigkeit, über mehrere Sämaschinen

verfügen zu müssen.

Aufgabe der Erfindung ist es, diesen Nachteil zu beseitigen und einen Verteiler für eine Einzelkornsämaschine zu schaffen, welcher auf verschiedene Arten von Körnern eingestellt werden kann.

Gegenstand der Erfindung ist also ein Verteiler der oben genannten Art, bei welchem die Ablenkeinrichtung beweglich ist und ein Bedienelement vorgesehen ist, welches sowohl das Element zur Ansaugregulierung als auch die Stellung der Ablenkeinrichtung steuert.

Gemäß einem weiteren Merkmal der Erfindung ist das Bedienelement schwenkbar.

Vorzugsweise ist die bewegliche Ablenkeinrichtung schwenkbar angebracht, wobei das eine ihrer Enden auf einer beweglichen Achse sitzt, die durch das Schwenken des Bedienelements zur Steuerung des Elements zur Ansaugregulierung verschoben wird.

Die abnehmbare Verschließeinrichtung, die ihre Wirkungen mit derjenigen des Bedienelements zur Regulierung der Außenluftabnahme und ggf. derjenigen des Selektors kombiniert, ermöglicht eine Veränderung des Unterdrucks und somit die Verwendung des Verteilers mit einer Flügelscheibe und einer einfachen Scheibe, je nach Art des vorzunehmenden Säens.

Die folgende Beschreibung von als nicht einschränkendes Beispiel gegebenen und in den beigefügten Zeichnungen dargestellten Ausführungsformen wird überdies die Vorteile und Merkmale der Erfindung deutlich werden lassen. Auf diesen Zeichnungen ist bzw. zeigt

Fig. 1 eine perspektivische Explosionsansicht eines Verteilers für eine Einzelkornsämaschine gemäß der Erfindung, versehen mit einer Flügelscheibe,

Fig. 2 den Verteiler der Fig. 1 einmal montiert im Schnitt gemäß Linie 2-2 der Fig. 3,

Fig. 3 eine Schnittansicht gemäß Linie 3-3 der Fig. 2,

Fig. 4 eine Schnittansicht gemäß Linie 4-4 der Fig. 2,

Fig. 5 eine Teilansicht entsprechend Fig. 2, die eine Abwandlung der Ausführung der Mittel zur Beseitigung von Doppelkörnern zeigt,

Fig. 6 eine Fig. 2 entsprechende Ansicht eines mit einer einfachen Scheibe versehenen Verteilers.

Ein Verteiler für eine Einzelkornsämaschine weist, wie dies im einzelnen Fig. 1 zeigt, einen Kasten allgemein zylinderischer Form auf, der durch ein Gehäuse 1, welches in seinem oberen Teil mit einem Kamin 2 zum Anschluß an eine Ansaugeinrichtung oder eine andere geeignete Unterdruckquelle versehen ist, und durch einen Deckel 4 gebildet ist, welcher einen Kornbehälter 6 bildet, der von einem Kragen 8 umgeben ist, welcher an seinem Umfang mit einem zum Gehäuse 1 gerichteten Rand 10 versehen ist. Der Kragen 8 ist in seinem oberen Teil bei 12 unterbrochen, damit die Verbindung seines Innenvolumens mit Außenatmosphäre gewährleistet ist, und in seinem unterem Teil bei 14, damit eine Abgabeöffnung für die Körner gebildet ist. Das Gehäuse 1 und der Deckel 4 sind auf der gleichen Welle 16 über zylindrische Auflageflächen 17 bzw. 19 gehaltert, die dieser Welle eine Drehung in Bezug auf sie gestatten (Fig. 3).

Die Welle 16 ist mit einer Verteilerscheibe 18 fest verbunden, die in dichtendem Kontakt mit der Wand des Gehäuses 1 ist und gegen die der Deckel 4 mit irgendwelchen geeigneten Mitteln gehalten wird. Beispielsweise weisen in der dargestellten Ausführungsform das Gehäuse 1 und der Deckel 4 jeweils zwei seitliche Lappen 20 bzw. 21 auf, die von zwei Schrauben 22 durchsetzt und mittels Muttern 23 gegeneinander gedrückt werden.

Im Inneren des Gehäuses 1 begrenzt eine Trennwand 24 zusammen mit der Wand dieses Gehäuses einen Unterdruckkanal 26, der mit dem Ansaugkamin 2 in Verbindung steht. Da die Trennwand 24 in ihrem oberen Teil im wesentlichen die Form eines umgedrehten V hat, weist der Unterdruckkanal 26 im Bereich des Ansaugkamins einen weiten oberen Teil 27, im wesentlichen halbmondförmig, auf. Jedes der Enden dieses Halbmonds setzt sich in einem

engen Umfangschenkel 28 bzw. 30 fort, wobei diese beide Schenkel sich gegeneinander richten, sich aber nicht verbinden. Die Enden dieser Schenkel 28 und 30 sind vielmehr im unteren Teil des Gehäuses 1 an der Abgabeöffnung der Körner aus dem Deckel 4 verschlossen. Ihre Enden 29, 31 sind in dieser Ausführungsform gegenüber dieser Öffnung 14 leicht verschoben, so daß das Ende 29 des Schenkels 28 höher liegt als das Ende 31 des Schenkels 30. Das Ende 31 des im Drehsinne der Verteilerscheibe 18, der durch den Pfeil F in Fig. 2 angegeben ist, absteigenden Schenkels ist normalerweise der tiefste Punkt des Verteilers.

Im oberen Teil des Schenkels 30, d.h. des absteigenden Schenkels, weist die Wand des Gehäuses 1 sowie die gegenüberliegende Seite der Trennwand 24 jeweils eine gekrümmte Ausnehmung 32 und 33 auf, die zusammen einen Hohlraum zur Aufnahme eines Verschließelements begrenzen, das in der dargestellten Ausführungsform durch einen zylindrischen Stopfen 34 gebildet ist, aber auch durch eine Klappe, einen Schiebedeckel oder irgendeine andere geeignete Einrichtung gebildet sein kann. Dieser Stopfen 34 hat eine axiale Länge, die gleich der Tiefe des Gehäuses 1 ist, so daß, wenn er in dem Hohlraum 32, 33 aufgenommen ist, er den Eingang des Schenkels 30 des Unterdruckkanals vollständig veschließt und diesen vom Ansaugkamin 2 isoliert. Der Stopfen 34 ist jedoch lösbar und kann leicht zurückgezogen werden, wenn der Schenkel 30 einem Unterdruck unterworfen werden muß. Der Boden 36 des Gehäuses 1 ist ferner im Bereich des Ansaugkamins 2 mit einem Lüftungsloch 38 versehen, welchem ein Bedienelement bzw. Bedienhebel 40 zugeordnet ist, der hinter dem Boden 36 auf einer Welle 42 schwenkbar ist, die einen äußeren Buckel 44 der Wand des Gehäuses 1 durchsetzt (Fig. 4).

Bei der in Fig. 1 bis 4 dargestellten Ausführungsform ist die Verteilerscheibe 18 mit einer Reihe von Flügeln 46 versehen, die ganz in Richtung des Deckels 4 vorspringen und regelmäßig über den Umfang verteilt sind, und weist zwei Umfangsreihen von zwei Löchern 48, 50 auf, wobei ein Loch jeder Reihe in einer

Zelle 47 enthalten ist, die durch zwei benachbarte Flügel 46 begrenzt wird. Der Durchmesser der Öffnungen 48, 50 sowie ihre Radiallage sind so, daß die Löcher 48 der radial äußeren Reihe sich vor den engen Schenkeln 28 oder 30 des Unterdruckkanals befinden, während sich die Löcher 50 der inneren Reihe vor dem zylindrischen Abschnitt 24a, 24b der Trennwand 24 anordnen, die diese engen Schenkel 28 und 30 begrenzt. Im oberen Teil des Gehäuses münden die beiden Reihen von Löchern 48, 50 im weitem Teil 28 des Unterdruckkanals, wie dies im einzelnen in Fig. 2 gezeigt ist. Auf der Seite der Scheibe, die dem Unterdruckkanal gegenüberliegt, sind die durch die benachbarten Flügel 46 begrenzten Zellen 47 radial außen durch den Rand 10 des Kragens 8 und innen durch eine zylindrische Fortsetzung 52 der Wand des Kornbehälters abgeschlossen, die sich vor dem absteigenden Teil des Unterdruckkanals über etwas mehr als die Hälfte eines Umfangs, d.h. bis zu einem Punkt jenseits der Öffnung 14 zur Abgabe der Körner erstreckt.

Auf der anderen Seite des Verteilers, d.h. im Bereich des ansteigenden Abschnitts des Unterdruckkanals stehen die Zellen mit dem Behälter 6 in Verbindung. Ferner trägt der Buckel 44 über zwei Achsen 56 und 57 ein Ablenkelement 58, an welchem die Seite der Verteilerscheibe 18 gleitet, die dem Unterdruckkanal abgewandt liegt. Das Element 58 ist vorzugsweise eine Platte, deren Unterrand geradlinig ist und die ein solches Profil hat, daß sie teilweise, dann vollständig, die Öffnungen 48 der äußeren Reihe nach Maßgabe der Zunahme der Breite des Unterdruckkanals 26 abdeckt.

Der so aufgebaute Verteiler gewährleistet mit Präzision unter Verwendung eines geringen Unterdrucks Aussaaten, deren Dichte nicht sehr hoch ist. Wenn nämlich nach Anordnung die Körner 60 im Behälter 6 die Welle 16, beispielsweise über ein Kettenrad 62 gedreht wird, dringen Körner in die Zellen 47 ein, die im unteren Teil des Gehäuses jenseits der Wand 52 liegen, und werden durch den in dem Kanal 26 und besonders im ansteigen-

den Schenkel 28 herrschenden Unterdruck mitgenommen. Danach werden die Körner, im allgemeinen in Gruppen von zweien oder dreien, gegen jedes der Löcher 48, die diesem ansteigenden Schenkel entsprechen, angelegt und in Richtung des breiten Abschnitts 27 des Kanals 26 mitgenommen. Bei ihren Eintritt in diesen erweiterten Abschnitt schlägt jede Gruppe von Körnern gegen den Ablenker 58 an, der sie in Richtung der Öffnungen 50 der Innenreihe drückt, so daß nur eines der Körner verbleibt und die anderen in den zentralen Behälter 6 zurückfallen. Ein Korn wird so durch den Unterdruck gegen jedes der Löcher 50 gelegt und durch die Verteilerscheibe 18 bis an den Stopfen 34 mitgenommen. An diesem Punkt wird die Unterdruckwirkung unterbrochen und ein Korn fällt durch einfache Schwerkraft in die Zelle 47, die es enthält, wo es durch den Flügel 46 und den Rand 10 des Deckels bis zu dem Zeitpunkt zurückgehalten wird, zu dem es die Abgabeöffung 14 erreicht, die ihm erlaubt, in die einzusäende Furche zu fallen.

Während dieses Vorgangs ist das Bedienelement 40 in seiner in Fig. 2 dargestellten Stellung gehalten worden, in der es das Luftloch 38 vollständig verschließt, derart, daß im Inneren des Unterdruckkanals 26 ein maximaler Unterdruck gewährleistet und die Verteilung von verhältnismäßig schweren Körner, wie Maiskörnern oder ähnlichen, möglich ist, oder versetzt worden, derart, daß ein mehr oder weniger großer Teil dieses Luftlochs freigegeben und so die Größe des Unterdrucks im Inneren des Kanals 26 vermindert ist, um die Verteilung von leichten Körnern, wie von Zuckerrüben, zu erleichtern.

Da die leichten Körner oft auch kleine Körner sind, kann es vorteilhaft sein, den Ablenker zu verschieben, um den geradlinigen Rand 64 des Ablenkers schneller an die Löcher 50 heranzurücken, wenn man das Luftloch 38 öffnet. Man verwendet also vorzugsweise in diesem Fall als Ablenker eine Platte 66, die einerseits auf einer festen Achse 57 und andererseits auf einer beweglichen Achse 67, die auf der Schwenkachse 42 des Bedienele-

ments 40 exzentriert ist, wie dies die Fig. 4 und 5 zeigen. Auf diese Weise bewirkt ein Schwenken des Endes des Bedienhebels 40, nach links bei Betrachtung der Fig. 5, gleichzeitig eine Zunahme der Öffnung des Luftloches 38 und ein Absenken des oberen Endes der Platte 66 derart, daß diese an die Löcher 50 heranrückt, die sie teilweise verschließen kann. Natürlich hebt ein Verschwenken des Bedienhebels 40 im entgegengesetzten Sinne zum Verschließen des Luftloches umgekehrt das obere Ende der Platte 60 an und ermäglicht, daß Körner größerer Abmessungen in wirksamer Weise durch einen höhren Unterdruck, der sich durch die Löcher 50 hindurch entfaltet, festgehalten werden.

Der Verteiler kann also durch einfaches Einstellen der Stellung des Bedienelements 40 verschiedenen Arten von Körnern angepaßt werden und ihre Einzelablegung in extrem zuverlässiger und regelmäßiger Weise gewährleisten.

Dieser Verteiler kann auch anstelle der Verteilerscheibe 18 eine von Flügeln freie Verteilerscheibe 68 aufweisen (Fig. 6), die nur eine einzige Umfangsreihe von Löchern 70 aufweist. In diesem Fall sind die Löcher 70 so ausgebildet, daß sie mit dem Unterdruckkanal 26 korrespondieren und insbesondere dem Innenvolumen der engen Schenkel 28 und 30. Ferner ist der Stopfen 34 zurückgezogen, so daß die Gesamtheit des Kanals 26 dem Unterdruck unterworfen ist, und daß lediglich die Löcher 70, die sich in dem zwischen den Enden 29 und 31 der engen Schenkel 28 und 30 freigelassenen Raum befinden, nicht eben diesem Unterdruck unterworfen sind.

Am Eintritt des aufgeweiteten Teils 27 des Unterdruckkanals 26 trägt der Buckel 44 als Ablenker eine Platte 72, deren unterer Rand gezahnt ist und infolgedessen eine Aufeinanderfolge von Rampen 73, 74, 75 bildet, die in Bezug auf den durch die Löcher 70 gebildeten Umfang geneigt sind. Die Platte 72 ist vorzugsweise auf der festen Achse 57 und der beweglichen Achse 67 angebracht derart, daß sie in Bezug auf die Reihe von Löchern 70 in Abhängigkeit von der Stellung des Bedienhebels 40, d.h. der

Öffnung des Luftlochs 38, versetzt werden kann. Auf diese Weise kann, wie bei der vorstehenden Ausführungsform, die Stellung der Platte 72 gleichzeitig mit der Größe des im Kanal 26 herrschenden Unterdrucks variiert werden.

Dieser Unterdruck muß jedoch stets groß und in der gesamten Ausdehnung des Kanals 26 vorhanden sein. Bei der Drehung der Scheibe 68 werden die Körner 60 durch den Ansaugefekt, der sich durch die Löcher 70, die sich vor dem engen Schenkel 28 befinden, hindurch entfaltet, aus dem Behälter 6 entnommen. Sie ballen sich im allgemeinen in Gruppen von zweien oder dreien gegen jedes dieser Löcher zusammen und werden durch letztere in Richtung der Platte 72 oder genauer der Rampen 73, 74 und 75 mitgenommen. Unter aufeinanderfolgendem Anschlagen gegen diese Rampen wird die Gruppe von Körnern versetzt und nur eines von letzteren bleibt gegen das Loch 70 angelegt, während die anderen in den zentralen Behälter zurückfallen. Das am Loch 70 verbliebene Korn 60 wird über die gesamt Länge des Unterdruckkanals 26 bis zum Ende 31 des engen Schenkels 30, d.h. praktisch bis zu dem Augenblick, wo es sich vor der Abgabeöffnung 14 befindet, versetzt. Es fällt dann auf den Boden.

Wie bei der vorstehenden Ausführungsform können die Größe des Unterdrucks sowie die Stellung der Ablenkeinrichtung bzw. Selektionsplatte in extrem einfacher Weise in Abhängigkeit von der Natur der Körner reguliert werden. Ferner kann der Verteiler leicht an verschiedenen Arten von Samen angepaßt werden, weil der Austausch der Scheibe 18 gegen die Scheibe 68 oder umgekehrt einfach das Öffnen des Deckels 4 erforderlich macht, damit die erste Scheibe von der Achse 16 abgezogen, der Stopfen 34 zurückgezogen oder wieder aufgesetzt, dann die neue Scheibe auf die Achse 16 gesteckt werden kann, bevor der Deckel 4 angebracht wird. Solche Vorgänge können leicht vom Landwirt durchgeführt werden, so daß der Besitz einer Sämaschine und mehrerer Verteilerscheiben für ihn ausreichend ist, um in wirksamer Weise jeder Art von Saat auszubringen, indem er über den Unterdruck

und den Sätakt, die am geeignesten sind, verfügen kann.

Es liegt auf der Hand, daß der Verteiler auch eine Scheibe aufweisen kann, die mit Flügeln versehen und von einer einzigen Lochreihe für eine Aussaat von schweren Körnern geringer Dichte durchsetzt ist. Eine solche Scheibe wird vorzugsweise mit angebrachter Verschließeinrichtung 34 zur Begrenzung des Unterdruckabrufs verwendet.

Ebenso könnte die Verteilerscheibe auch mehr als zwei Lochreihen aufweisen.

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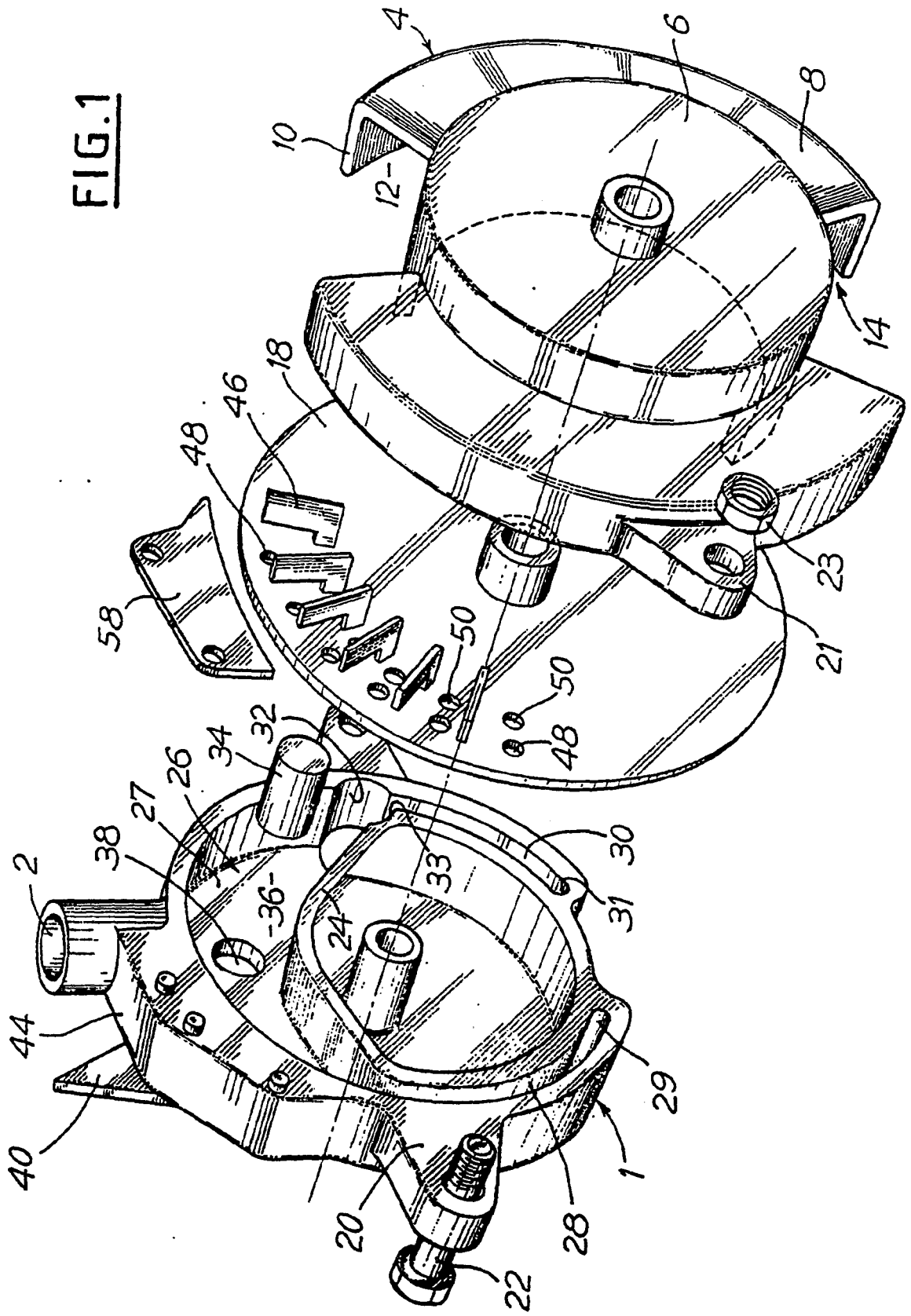
Patentansprüche

1. Verteiler für eine Einzelkornsämaschine, mit einem im wesentlichen zylinderförmigen Gehäuse, in dem auf einer horizontalen Achse eine Verteilerscheibe (18, 68) drehbar angebracht ist, welche mit in Umfangrichtung im Abstand liegenden Öffnungen versehen ist und einen Kornbehälter (6) von einer Ansaugvorrichtung trennt, welche mit einem Element (38) zur Ansaugregulierung versehen ist derart, daß die Öffnungen einem Unterdruck zum Festhalten der aus dem Behälter entnommenen Körner während wenigstens eines Teils von deren winkelmäßiger Versetzung unterworfen werden; Mitteln zur Beseitigung von Doppelkörnern, die durch eine Ablenkeinrichtung (66, 72) gebildet sind, und, im unteren Teil des Gehäuses, einer Abgabeöffnung für die Körner, dadurch gekennzeichent, daß die Ablenkeinrichtung (66, 72) beweglich ist, und daß ein Bedienelement (40) vorgesehen ist, welches sowohl das Element (38) zur Ansaugregulierung als auch die Stellung der Ablenkeinrichtung (66, 72) steuert.

2. Verteiler nach Anspruch 1, dadurch gekennzeichnet, daß das Bedienelement (40) schwenkbar ist.

3. Verteiler nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß die bewegliche Ablenkeinrichtung (66, 72) schwenkbar angebracht ist, wobei das eine ihrer Enden auf einer beweglichen Achse (67) sitzt, die durch das Schwenken des Bedienelements (40) zur Steuerung des Elements (38) zur Ansaugregulierung verschoben wird.

FIG.1


4
6
8
10
12
14
18
46
48
58
50
23
21
32
34
26
27
38
2
36
33
30
31
24
44
40
29
1
20
28
22

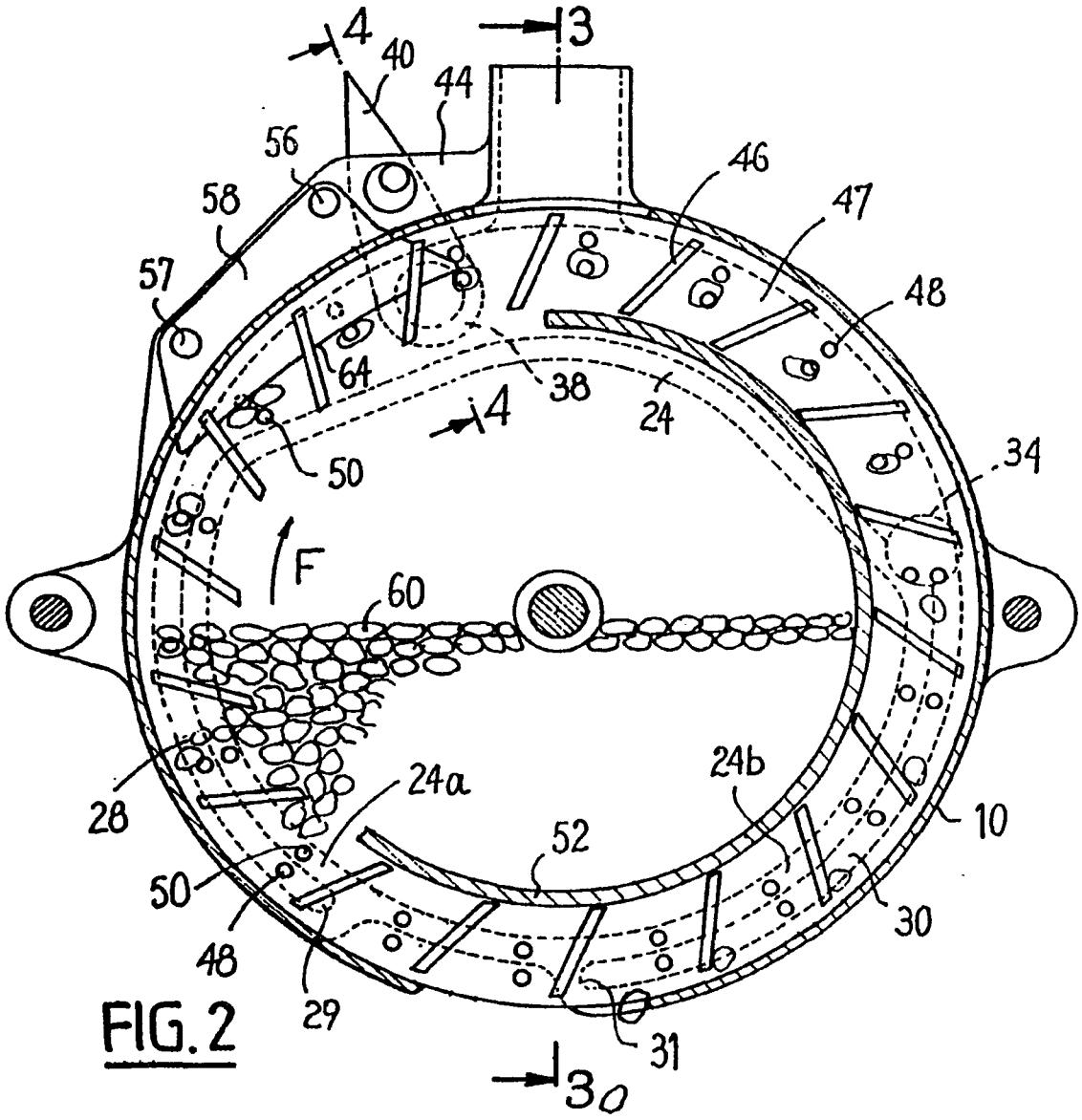

4
3
40
44
56
58
57
46
47
48
64
38
24
4
50
34
F
60
28
24a
24b
52
10
50
48
29
30
31
3
0

FIG. 2

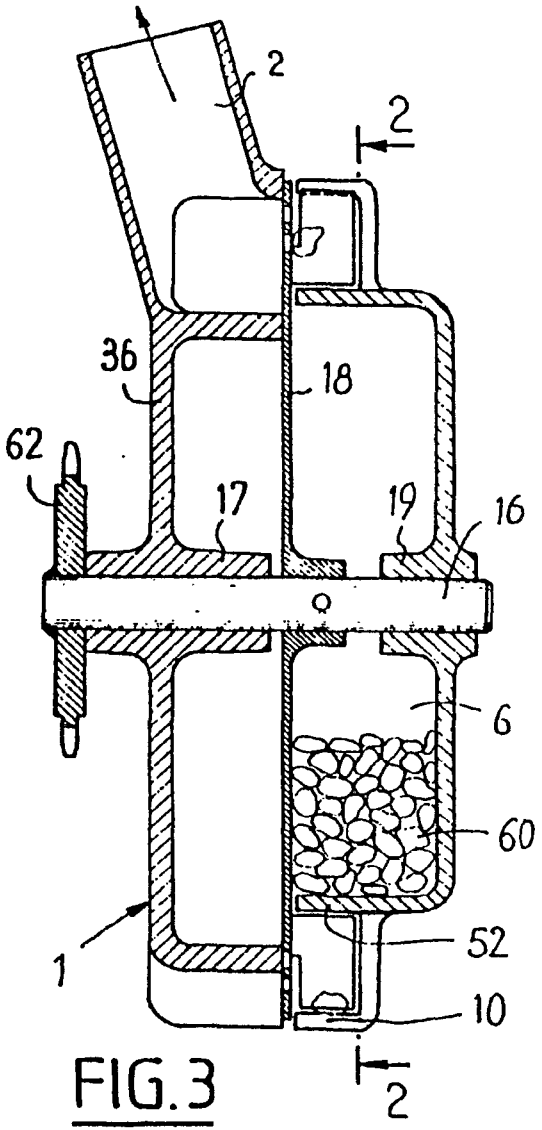

2
2
36
18
62
17
19
16
6
60
1
52
10
2

FIG. 3

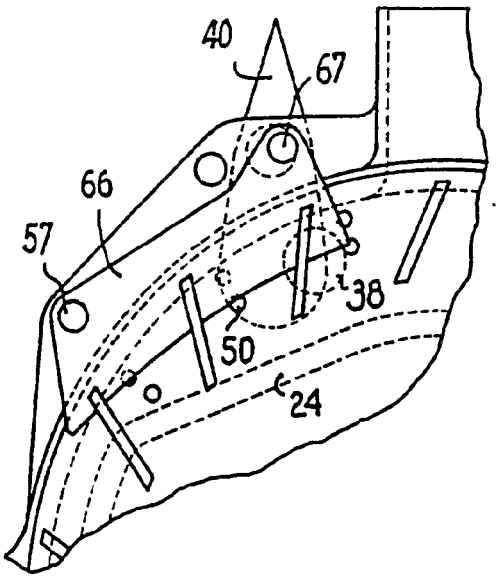


FIG.5

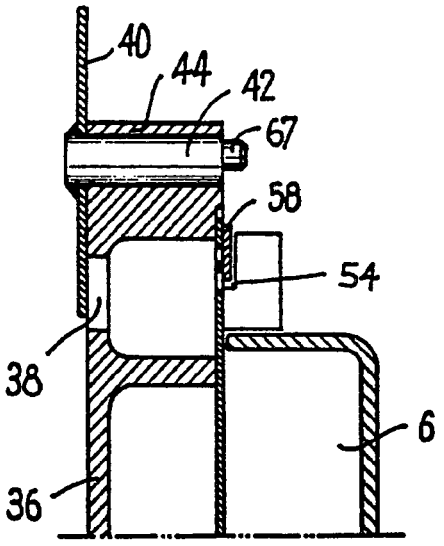


FIG.4

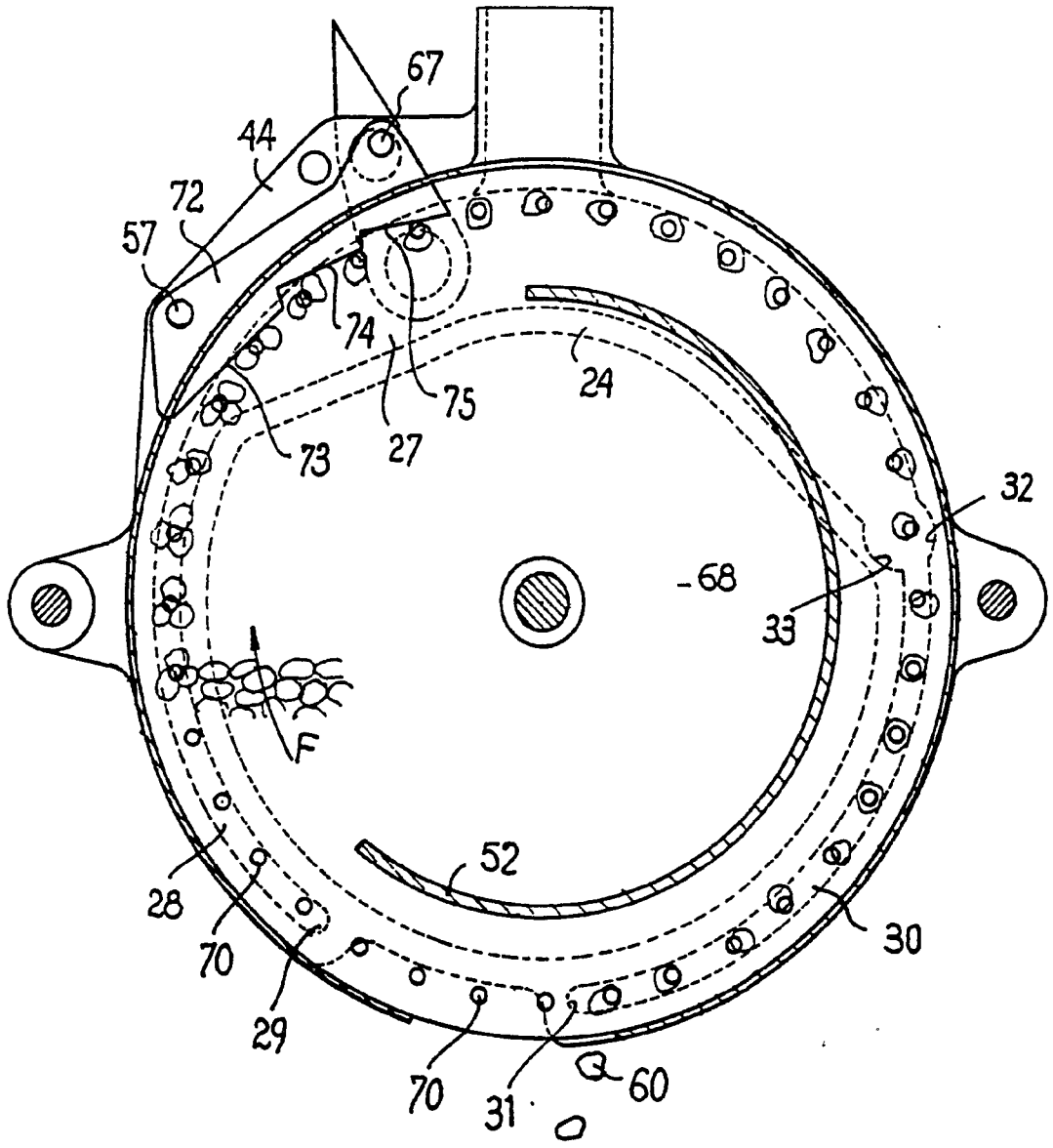


FIG. 6

DESCRIPTION

The present invention relates to a distributor element of the seed for pneumatic seed drill precision, a seeding element for such machinery and a seed drill including a plurality of such sowing elements.

In the pneumatic seed drill precision sowing elements are known to be used each fitted with an element of the seed distributor (hereinafter, in short, distributor) to distribute one seed at a time in the controlled delivery while the seeding element moves along a track of sowing.

It 'also known backstop devices of distributors of the seed which use a differential air pressure between opposing faces of a sowing disc (or selector) provided with one or more rings of through holes. The principle of operation is based on the fact that, due to the pressure differential between the opposing faces of the disc, a seed adheres to each hole and is then transported with the rotation of the seeding disc from the area of seed selection fi no to the point which ceases the pressure differential and the seed is released to fall through a duct in the sowing furrow or track seeding. In practice, on one of the faces of the disk is exerted a strong air suction that holds the seeds on the opposite face at the respective holes.

For the good functioning of such distributors it is necessary to ensure a pneumatic seal ef fi cient between the disk face subject to suction and a gasket that delimits the suction chamber pneumatic. The same suction effect leads to a substantial compression of the disk against the seal. If the one hand this guarantees an adequate adherence of the gasket to the disc surface subject to depression, on the other hand this leads to a strong abrasion of the seal which limits the duration ef fi cient. E 'therefore necessary to periodically replace the gasket to prevent sowing errors arising from an insufficient depressurization of the suction chamber.

On the other hand, even if replace this seal it is a simple operation, in each case it involves an undesired machine downtime, besides the cost itself of the parts.

To overcome this drawback it has been developed seeding machines equipped with a thrust element which relieves the load on the gasket. In all cases, however, the thrust element, which must be driven in rotation with the disc, is mounted on the part of the fixed | 'casing, that is to say one that is fixed aII'intelaiatura of the seeding units. This entails that the disc must be hooked to the element thrust bearing; so it must be provided a coupling system that in phase of disc replacement must be switched off by stretching consequently that operation. This is inevitable in the known machines because on the fixed must be mounted transmission which leads in rotation the motorized shaft that leads in rotation the disc.

Place the thrust element on the fixed part entails, however, that the suction chamber is realized on the pneumatic part fixed, ie on the same side in which is placed the element of thrust, while the collection chamber of the seed must be realized in the mobile part. This is a source of numerous drawbacks, including the fact that the opening of the housing necessarily involves the removal of the part containing the collection chamber of the seed from the hopper storage above which must necessarily be fixed to the frame element of sowing .

In addition to the replacement of the seeding disc it is necessary to remove some parts of the dispenser, such as the adjustable selector of the seed, and the seed epulsore, where provided. The problem underlying the present invention is to make available a distributor element of the seed designed structurally and functionally so as to overcome all of the problems complained of with reference to the prior art mentioned. This problem is solved by | to the invention by means of an element of the seed distributor formed in accordance with one or more of the appended claims.

The characteristics and advantages of the invention will become clearer from the detailed description that follows of a preferred example of embodiment illustrated, by way of indication and not of limitation with reference to the accompanying drawings in which:

- Fig. 1 is a view in perspective of a distributor element of the seed produced in accordance with the present invention;

- The fi g. 2 is a perspective view with parts separated of a detail of the element of Fig. 1;

- Fig. 3 is a perspective view of a seed drill with sowing elements with the seed distributor element according to the invention.

In the figures, 1 generally indicates a distributor element of the seed is intended to equip a sowing element 2 of a pneumatic seed drill Precision 3.

The distributor 1 is the body intended to deposit a seed 4 at a time at a predetermined adjustable distance in a furrow opened by a furrow opener 5. The seeding element 2, in addition to the distributor element 1 comprises a frame 6 and a warehouse of the seed or hopper 7, in addition to other organs known in themselves and not necessary for an understanding of the present invention; The seed drill 3 in turn comprises a supporting structure 8 on which is mounted a plurality of sowing elements 2, all connected to a suction pneumatic 9.

The seeding element 1 in turn comprises a casing 10 with a part 11 fixed fixed firmly on the frame 6 and a movable part 12 hinged at a hinge 12a on the fixed 11 via a hinge pin 13 removable. The part fixed includes a mouth 14 through which it is connected to below a outflow mouth of the warehouse or hopper 7 so as to be powered directly from this.

Dall'imboccatura 14 the seed flows through a port 14a of inflow of the seed in a chamber 15 for collecting the seed.

A sowing disc 16 separates the chamber 15 for collecting the seed from a suction chamber 17 formed in the movable part 12. A vacuum cleaner 18 mounted on the supporting structure 8 is connected to the suction chamber 17 through piping 19 to generate a pressure differential between the opposing surfaces 16a, b of the selector disc 16.

The seed disc 16 is mounted in a removable manner on a driving shaft 20 powered, supported nellaparte fixing 11 and driven in rotation at speeds pre fixed and

adjustable by a transmission not shown. The presence of such transmission requires that the shaft 20 is mounted on the fixed part 11 of the casing 10. The shrink fit between the shaft 20 and disk 16 is obtained by means of a pro fi polygon 21 to the free end of the shaft 20 that protrudes beyond the disc 16 and preferably it has chamfers 22 which serve as invitation for the functions clarified below.

At the periphery of the disc 16 is formed a (or more) crown of holes 23 passing through the opposing faces of the seeding disc 16.

A gasket 24 is applied in the suction chamber 17 and is placed in sliding contact with the surface facing the disc 16, when the movable part 11 is closed on the fixed 12, to delimit a segment circumferential in which the holes 23 are subject to the pressure differential aforesaid. This circumferential segment extends between the chamber 15 and a duct collection of the semen of fall of the seed 25 in which the seeds are released one at a time in the path traced by the | 'assolcatore 5.

By reason of the pressure differential between the two super fi opposing sowing disc, the seeds 4 are retained, one for each hole 23, when the holes pass in the chamber 15 for collecting the seed and are released at the duct 25 when the operator stops 'pneumatic effect of the differential pressure or for the presence of an ejector of the seed (not shown).

To limit the wear of the gasket 24 as a result of sliding against the surface of the disc 16 on the mobile part is mounted a thrust element indicated overall by 26.

The thrust element 26 comprises a shaft 27 rotatably mounted by means of bearings 28 in a seat 29 of the mobile part 12. The shaft 27 bears a flange 30 via which it is fixed to a thrust plate 31 susceptible of support to the surface of the disc facing to the seal 24 at a radially internal to the crown of holes 23 to support at least part of the axial load generated by the disc 16 on the seal 24.

The support between the thrust plate 31 and the disc 16 takes place in correspondence of a crown 31a in relief on the surface of the plate facing the disc 16.

The thrust element 26 is driven in rotation with the seed disc 16 when the parts fixed and mobile 11,12 are closed on one another by means of a drive element 32 which comprises a coupler secured to the thrust plate in rotation but with radial and / or circumferential so self-centered in coupling with the rotational drive shaft of the disc 16. For this purpose, in the present embodiment, the drive element 32 is coupled with limited radial play and / or circumferential element 26 via one (or more) appendix 33 projecting radially outwards and nested in corresponding seats 34 of the plate. The element day drive 32 is coupled via a pro fi polygonal inner 35 (similar to that adopted for key star or box-end wrench) to pro fi polygon 21 of the free end of the shaft 20, whose bevels 22 serve as a call for facilitate the centering of the two profiles and the respective clutch.

The driving element 32 is thus self-centering with respect all'albero drag 20 from which it is conducted. The positioning between gasket 24 and plate 31 will be such that the rotation of the latter will not be hindered by the presence of the seal 24 and, at the same time, both will be maintained in support of the disc 16.

It is also envisaged that the thrust element 26 can be realized neutral and not driven in rotation from the shaft 20.

The assembly of the movable part 12 full thrust element 26 and gasket 24 lends itself advantageously to the realization of a kit for retro fi tting of existing seeders. It is suf fi cient in this case separate the movable part of the old type by removing the hinge pin 13 and replace it with the kit aforesaid. Reconnecting the pneumatic lines previously dropped the drill is ready to work.

Among the main advantages of the distributor according I'invenzione there is the fact that is greatly reduced, if not eliminated, the seal wear due to the sliding contact with the selector disc of the seed; the element is self-centering thrust bearing which allows a facilitated opening and closing of the mobile part on the fixed wrap; the system also lends itself to easy retrofitting, all without removal of mobile parts and / or operations of release of the sowing disc.

CLAIMS

1. Element distributor of seed for precision pneumatic seed drill, the type including:
• a sowing disc driven by a motorized shaft transmission in rotation at a controlled speed in solid with said shaft,
• a casing with a fixed part in which is supported on said shaft and a movable part with respect to said part fixed and closable on it,
• in that party being fixed defined a collection chamber of the seed,
• in it said mobile part being defined a pneumatic suction chamber,
• said seed plate being interposed between those parties and having super fi opposing delimiting said chambers
• said seed plate having at least one circle pattern selectors passing between those surfaces opposing us,
• means for generating a pressure differential between said opposing surfaces in correspondence of a segment of said circumferential crown of holes,
• said means including said suction chamber pneumatic and
• a gasket on the mobile part capable of sliding contact with the surface facing the disc when said parts are closed upon one another,
• characterized in that it comprises
• a thrust element of the seed disc rotatably supported in said movable part, to support at least part of the axial load generated by the disc of said gasket.

2. Element distributor of the seed according to claim 1 in which said thrust element is driven in rotation with said disk when said parts are closed upon one another.

3. Element distributor of the seed according to claim 1 or 2, wherein said thrust bearing comprises a thrust plate susceptible of support to the surface of the seeding disc facing said gasket zone to the radially inner crown of holes.

4. An element of the seed distributor according to claim 3 wherein the thrust bearing comprises a drive element for rotation with the plate and susceptible of coupling with the drive shaft of the disc when said parts are closed upon one another.

5. Element distributor of the seed according to claim 4 wherein the entrainment element is self-centering relative to the shaft of dragging.

6. Element distributor of the seed according to claim 4 or 5, wherein the entrainment element comprises a coupler secured to the thrust plate in rotation but with radial play and / or circumferential so self-centered in the rotational coupling with the shaft entrainment of the disc.

7. An element of the seed distributor according to one or more of the preceding claims, wherein the movable part is hinged to the fixed part.

8. Seeding element for precision drills including a frame on which is mounted a distributor element of the seed according to one or more of the preceding claims.

9. Seed drill comprising a supporting structure on which is mounted a plurality of sowing elements according to claim 8.

10. Kit for retrofitting of the elements of the seed distributors of precision pneumatic sowers in which the distributor elements are of the type including:
• a sowing disc driven by a motorized shaft transmission in rotation at a controlled speed in solid with said shaft,
• a casing with a part fixed in which said shaft is supported and a movable part with respect to said part fixed and closable on it,
• in the said part fixed being defined a collection chamber of the semen,
• in it said movable part being defined a suction chamber pneumatic,
• said seed plate being interposed between those parties and having super fi opposing delimiting said chambers
• said seed disc having at least a crown of holes selectors loops between said opposing surfaces, means for generating a pressure differential between said opposing surfaces in correspondence of a segment of said circumferential crown of holes,
• said means including said suction chamber pneumatic and
• a gasket on the mobile part capable of sliding contact with the surface facing

the disc when said parts are closed upon one another,

characterized in that it comprises:

• said mobile part with pre-assembled

• a thrust element of the seed disc rotatably supported in said movable part, to support at least part of the axial load generated by the disc of said gasket.

11. Kit according to claim 10 wherein said movable part and said thrust element comprise one or more of the features of claims 2 to 7.

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Acknowledgement of receipt

We hereby acknowledge receipt of the Notice of Opposition:

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Application number	EP11779702.7
Patent number	EP2637492
Date of receipt	02 September 2015
Your reference	E 98381
Opponent	Precision Planting LLC
Title	SEED DISTRIBUTION ELEMENT FOR PRECISION SEED DRILLS, SEED DRILL INCLUDING SAID ELEMENT

Documents submitted

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Betriebsanleitung

AMAZONE

Einzelkorn-Sämaschine

ED 302 ED 452
ED 452-K ED 602-K ED 902-K



MG 1234
BAH0002 10.05
Printed in Germany

Lesen und beachten Sie diese Betriebsanleitung vor der ersten Inbetriebnahme! Für künftige Verwendung aufbewahren!

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Leipzig-Plagwitz 1872. Rud. Sark.

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Maschinen-Ident-Nr.:	
Typ:	**ED**
Zulässiger Systemdruck bar:	Maximal 200 bar
Baujahr:	
Werk:	
Grundgewicht kg:	
Zulässiges Gesamtgewicht kg:	
Maximale Zuladung kg:	

Hersteller-Anschrift

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Ersatzteil-Katalog-Online: www.amazone.de

Bei der Bestellung von Ersatzteilen bitte immer die Maschinen-Nummer Ihrer Maschine angeben.

Formales zur Betriebsanleitung

Dokumenten-Nummer:	MG 1234
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Vorwort

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1 Benutzerhinweise

Das Kapitel Benutzerhinweise liefert Informationen zum Umgang mit der Betriebsanleitung.

1.1 Zweck des Dokumentes

Die hier vorliegende Betriebsanleitung

- beschreibt die Bedienung und die Wartung für die Maschine
- gibt wichtige Hinweise für einen sicherheitsgerechten und effizienten Umgang mit der Maschine
- ist Bestandteil der Maschine und immer an der Maschine bzw. im Zugfahrzeug mitzuführen
- für künftige Verwendung aufbewahren.

1.2 Ortsangaben in der Betriebsanleitung

Alle Richtungsangaben in dieser Betriebsanleitung sind immer in Fahrtrichtung gesehen.

1.3 Verwendete Darstellungen

Handlungsanweisungen und Reaktionen

Vom Bediener auszuführende Tätigkeiten sind als nummerierte Handlungsanweisungen dargestellt. Halten Sie die Reihenfolge der vorgegebenen Handlungsanweisungen ein. Die Reaktion auf die jeweilige Handlungsanweisung ist gegebenenfalls durch einen Pfeil markiert. Beispiel:

1. Handlungsanweisung 1

→ Reaktion der Maschine auf Handlungsanweisung 1

2. Handlungsanweisung 2

Aufzählungen

Aufzählungen ohne zwingende Reihenfolge sind als Liste mit Aufzählungspunkten dargestellt. Beispiel:

- Punkt 1
- Punkt 2

Positionszahlen in Abbildungen

Ziffern in runden Klammer verweisen auf Positionszahlen in Abbildungen. Die erste Ziffer verweist auf die Abbildung, die zweite Ziffer auf die Positionszahl in der Abbildung.

Beispiel (Fig. 3/6):

- Figur 3
- Position 6.

2 Allgemeine Sicherheitshinweise

Dieses Kapitel enthält wichtige Hinweise, um die Maschine sicherheitsgerecht zu betreiben.

2.1 Verpflichtungen und Haftung

Hinweise in der Betriebsanleitung beachten

Die Kenntnis der grundlegenden Sicherheitshinweise und der Sicherheitsvorschriften ist Grundvoraussetzung für den sicherheitsgerechten Umgang und den störungsfreien Betrieb der Maschine.

Verpflichtung des Betreibers

Der Betreiber verpflichtet sich, nur Personen mit/an der Maschine arbeiten zu lassen, die

- mit den grundlegenden Vorschriften über Arbeitssicherheit und Unfallverhütung vertraut sind
- in die Arbeiten mit/an der Maschine eingewiesen sind
- diese Betriebsanleitung gelesen und verstanden haben.

Der Betreiber verpflichtet sich

- alle Warnbildzeichen an der Maschine in lesbarem Zustand zu halten
- beschädigte Warnbildzeichen zu erneuern.

Verpflichtung des Bedieners

Alle Personen, die mit Arbeiten mit/an der Maschine beauftragt sind, verpflichten sich, vor Arbeitsbeginn

- die grundlegenden Vorschriften über Arbeitssicherheit und Unfallverhütung zu beachten
- das Kapitel "Allgemeine Sicherheitshinweise" in dieser Betriebsanleitung zu lesen und zu beachten
- das Kapitel "Warnbildzeichen und sonstige Kennzeichnungen an der Maschine", Seite 17 in dieser Betriebsanleitung zu lesen und die Sicherheitsanweisungen der Warnbildzeichen beim Maschinenbetrieb zu befolgen
- Offene Fragen richten Sie bitte an den Hersteller.

Gefahren im Umgang mit der Maschine

Die Maschine ist gebaut nach dem Stand der Technik und den anerkannten sicherheitstechnischen Regeln. Dennoch können bei der Verwendung der Maschine Gefahren und Beeinträchtigungen entstehen

- für Leib und Leben der Bediener oder Dritter
- für die Maschine selbst
- an anderen Sachwerten.

Benutzen Sie die Maschine nur

- für die bestimmungsgemäße Verwendung
- in sicherheitstechnisch einwandfreiem Zustand.

Beseitigen Sie umgehend Störungen, die die Sicherheit beeinträchtigen können.

Gewährleistung und Haftung

Grundsätzlich gelten unsere "Allgemeinen Verkaufs- und Lieferbedingungen". Diese stehen dem Betreiber spätestens seit Vertragsabschluß zur Verfügung. Gewährleistungs- und Haftungsansprüche bei Personen- und Sachschäden sind ausgeschlossen, wenn sie auf eine oder mehrere der folgenden Ursachen zurückzuführen sind:

- nicht bestimmungsgemäße Verwendung der Maschine
- unsachgemäßes Montieren, Inbetriebnehmen, Bedienen und Warten der Maschine
- Betreiben der Maschine mit defekten Sicherheitseinrichtungen oder nicht ordnungsgemäß angebrachten oder nicht funktionsfähigen Sicherheits- und Schutzvorrichtungen
- Nichtbeachten der Hinweise in der Betriebsanleitung bezüglich Inbetriebnahme, Betrieb, und Wartung
- eigenmächtige bauliche Veränderungen an der Maschine
- mangelhafte Überwachung von Maschinenteilen, die einem Verschleiß unterliegen
- unsachgemäß durchgeführte Reparaturen
- Katastrophenfälle durch Fremdkörpereinwirkung und höhere Gewalt.

2.2 Darstellung von Sicherheits-Symbolen

Gekennzeichnet sind Sicherheitshinweise durch das dreieckige Sicherheits-Symbol und dem vorstehenden Signalwort. Das Signalwort (Gefahr, Warnung, Vorsicht) beschreibt die Schwere der drohenden Gefahr und hat folgende Bedeutung:



Gefahr!

<u>Unmittelbar</u> drohende Gefahr für das Leben und die Gesundheit von Personen (schwere Verletzungen oder Tod).

Das Nichtbeachten dieser Hinweise hat schwere gesundheitsschädliche Auswirkungen zur Folge, bis hin zu lebensgefährlichen Verletzungen.



Warnung!

<u>Möglicherweise</u> drohende Gefahr für das Leben und die Gesundheit von Personen.

Das Nichtbeachten dieser Hinweise kann schwere gesundheitsschädliche Auswirkungen zur Folge haben, bis hin zu lebensgefährlichen Verletzungen.



Vorsicht!

<u>Möglicherweise</u> gefährliche Situation (leichte Verletzungen oder Sachschäden).

Das Nichtbeachten dieser Hinweise kann leichte Verletzungen zur Folge haben oder zu Sachbeschädigungen führen.



Wichtig!

Verpflichtung zu einem besonderen Verhalten oder einer Tätigkeit für den sachgerechten Umgang mit der Maschine.

Das Nichtbeachten dieser Hinweise kann zu Störungen an der Maschine oder in der Umgebung führen.



Hinweis!

Anwendungs-Tipps und besonders nützliche Informationen.

Diese Hinweise helfen Ihnen, alle Funktionen an Ihrer Maschine optimal zu nutzen.

2.3 Organisatorische Maßnahmen

Der Betreiber muss die erforderlichen persönlichen Schutzausrüstungen bereitstellen, wie z.B.:

- Schutzbrille
- Sicherheitsschuhe
- Schutzanzug
- Hautschutzmittel, etc.



Wichtig!

Die Betriebsanleitung

- **immer am Einsatzort der Maschine aufbewahren!**
- **muss jederzeit für Bediener und Wartungspersonal frei zugänglich sein!**

Überprüfen Sie regelmäßig alle vorhandenen Sicherheitseinrichtungen!

2.4 Sicherheits- und Schutzeinrichtungen

Vor jeder Inbetriebnahme der Maschine müssen alle Sicherheits- und Schutzeinrichtungen sachgerecht angebracht und funktionsfähig sein. Alle Sicherheits- und Schutzeinrichtungen regelmäßig prüfen.

Fehlerhafte Sicherheitseinrichtungen

Fehlerhafte oder demontierte Sicherheits- und Schutzeinrichtungen können zu gefährlichen Situationen führen.

2.5 Informelle Sicherheitsmaßnahmen

Berücksichtigen Sie neben allen Sicherheitshinweisen in dieser Betriebsanleitung die allgemeingültigen, nationalen Regelungen zur Unfallverhütung und zum Umweltschutz.

Beachten Sie beim Verkehr auf öffentlichen Straßen und Wegen die gesetzlichen Straßenverkehrsvorschriften.

2.6 Ausbildung der Personen

Nur geschulte und eingewiesene Personen dürfen mit / an der Maschine arbeiten. Klar festzulegen sind die Zuständigkeiten der Personen für das Bedienen und Warten.

Eine anzulernende Person darf nur unter Aufsicht einer erfahrenen Person mit / an der Maschine arbeiten.

Personen / Tätigkeit	Für die Tätigkeit speziell ausgebildete Person	Unterwiesener Bediener	Personen mit fachspezifischer Ausbildung (Fachwerkstatt*)
Verladen/Transport	X	X	X
Inbetriebnahme	--	X	--
Einrichten, Rüsten	--	--	X
Betrieb	--	X	--
Wartung	--	--	X
Störungssuche und -beseitigung	X	--	X
Entsorgung	X	--	--

Legende: X..erlaubt --..nicht erlaubt

*) Alle Wartungs- und Reparaturarbeiten müssen von einer Fachwerkstatt ausgeführt werden, wenn sie mit dem Zusatz "Fachwerkstatt" gekennzeichnet sind. Das Personal einer Fachwerkstatt verfügt über erforderliche Kenntnisse sowie geeignete Hilfsmittel (Werkzeuge, Hebe- und Abstützvorrichtungen) zur sach- und sicherheitsgerechten Ausführung dieser Wartungs- und Reparaturarbeiten.

2.7 Sicherheitsmaßnahmen im Normalbetrieb

Betreiben Sie die Maschine nur, wenn alle Sicherheits- und Schutzeinrichtungen voll funktionsfähig sind.

Überprüfen Sie die Maschine mindestens einmal pro Tag auf äußerlich erkennbare Schäden und Funktionsfähigkeit der Sicherheits- und Schutzeinrichtungen.

2.8 Gefahren durch Restenergie

Beachten Sie das Auftreten mechanischer, hydraulischer, pneumatischer und elektrischer/elektronischer Restenergien an der Maschine.

Treffen Sie hierbei entsprechende Maßnahmen bei der Einweisung des Bedienpersonals. Detaillierte Hinweise werden nochmals in den jeweiligen Kapiteln dieser Betriebsanleitung gegeben.

2.9 Wartung und Instandhaltung, Störungsbeseitigung

Führen Sie vorgeschriebene Einstell-, Wartungs- und Inspektionsarbeiten fristgemäß durch.

Sichern Sie alle Betriebsmedien wie Druckluft und Hydraulik gegen unbeabsichtigte Inbetriebnahme.

Befestigen und sichern Sie größere Baugruppen beim Austausch sorgfältig an Hebezeugen.

Kontrollieren Sie gelöste Schraubverbindungen auf festen Sitz. Nach Beendigung der Wartungsarbeiten Sicherheitseinrichtungen auf Funktion überprüfen.

2.10 Bauliche Veränderungen

Ohne Genehmigung der **AMAZONEN-WERKE** dürfen Sie keine Veränderungen sowie An- oder Umbauten an der Maschine vornehmen. Dies gilt auch für das Schweißen an tragenden Teilen.

Alle An- oder Umbau-Maßnahmen bedürfen einer schriftlichen Genehmigung der **AMAZONEN-WERKE**. Verwenden Sie nur die von den **AMAZONEN-WERKEN** freigegebenen Umbau- und Zubehörteile, damit z. B. die Betriebserlaubnis nach nationalen und internationalen Vorschriften ihre Gültigkeit behält.

Fahrzeuge mit einer behördlichen Betriebserlaubnis oder mit einem Fahrzeug verbundene Einrichtungen und Ausrüstungen mit einer gültigen Betriebserlaubnis oder Genehmigung für den Straßenverkehr nach den Straßenverkehrsvorschriften müssen sich in dem durch die Erlaubnis oder Genehmigung bestimmten Zustand befinden.



Wichtig!

Grundsätzlich verboten ist

- **das Bohren am Rahmen bzw. Fahrgestell.**
- **das Aufbohren bestehender Löcher am Rahmen bzw. Fahrgestell.**
- **das Schweißen an tragenden Teilen.**

2.10.1 Ersatz- und Verschleißteile sowie Hilfsstoffe

Tauschen Sie Maschinenteile in nicht einwandfreiem Zustand sofort aus.

Verwenden Sie nur Original-**AMAZONE**-Ersatz- und Verschleißteile oder die von den **AMAZONEN-WERKEN** freigegebenen Teile, damit die Betriebserlaubnis nach nationalen und internationalen Vorschriften ihre Gültigkeit behält. Bei Einsatz von Ersatz- und Verschleißteilen von Drittherstellern ist nicht gewährleistet, dass sie beanspruchungs- und sicherheitsgerecht konstruiert und gefertigt sind.

Die **AMAZONEN-WERKE** übernehmen keine Haftung für Schäden aus der Verwendung von nicht freigegebenen Ersatz- und Verschleißteilen oder Hilfsstoffen.

2.11 Reinigen und Entsorgen

Verwendete Stoffe und Materialien sachgerecht handhaben und entsorgen, insbesondere

- bei Arbeiten an Schmiersystemen und -einrichtungen
- beim Reinigen mit Lösungsmitteln.

2.12 Arbeitsplatz des Bedieners

Bedienen darf die Maschine ausschließlich nur eine Person vom Fahrersitz des Traktors.

2.13 Warnbildzeichen und sonstige Kennzeichnungen an der Maschine

Wichtig!

Halten Sie alle Warnbildzeichen der Maschine immer sauber und in gut lesbarem Zustand! Erneuern Sie unlesbare Warnbildzeichen. Fordern Sie die Warnbildzeichen anhand der Bestell-Nummer (z.B. MD 075) beim Händler an.

Warnbildzeichen - Aufbau

Warnbildzeichen kennzeichnen Gefahrenbereiche an der Maschine und warnen vor Restgefahren. In diesen Bereichen sind permanent gegenwärtige oder unerwartet auftretende Gefährdungen vorhanden.

Ein Warnbildzeichen besteht aus 2 Feldern:



Feld 1

zeigt die bildhafte Gefahrenbeschreibung umgeben von einem dreieckigen Sicherheits-Symbol.

Feld 2

zeigt die bildhafte Anweisung zur Gefahrenvermeidung.

Warnbildzeichen – Erläuterung

Die Spalte **Bestell-Nummer und Erläuterung** liefert die Beschreibung zum nebenstehenden Warnbildzeichen. Die Beschreibung der Warnbildzeichen ist immer gleich und nennt in der folgenden Reihenfolge:

1. Die Gefahrenbeschreibung.

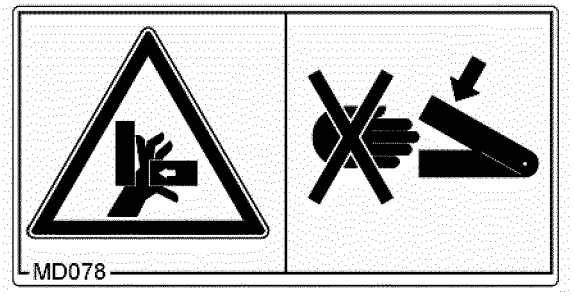
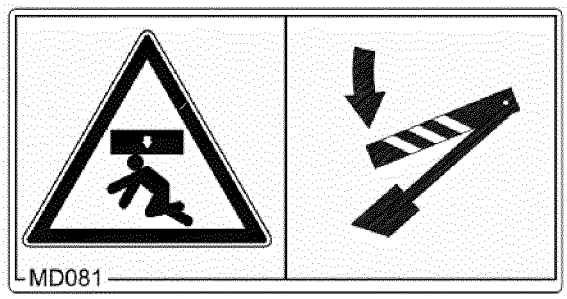
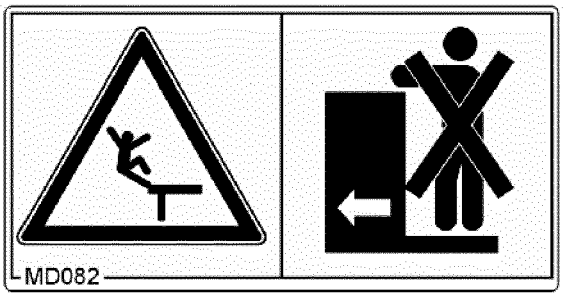
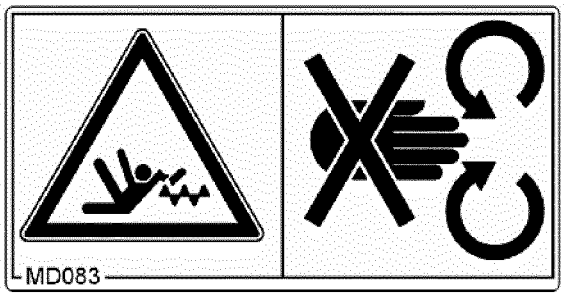
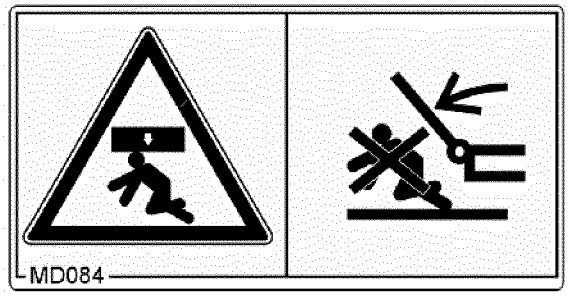
   Zum Beispiel: Gefährdung durch Schneiden oder Abschneiden!

2. Die Folgen bei Missachtung der Anweisung(en) zur Gefahrenvermeidung.

   Zum Beispiel: Verursacht schwere Verletzungen an Finger oder Hand.

3. Die Anweisung(en) zur Gefahrenvermeidung.

   Zum Beispiel: Berühren Sie Maschinenteile nur dann, wenn sie vollständig zum Stillstand gekommen sind.

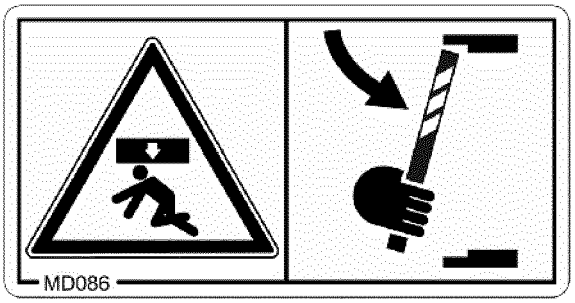
Bestell-Nummer und Erläuterung	Warnbildzeichen
MD 078 Quetschgefahr! Verursacht schwere Verletzungen an Finger oder Hand. Greifen Sie niemals in den Quetschgefahrenbereich, solange sich dort Maschinenteile bewegen können.	
MD 081 Quetschgefahr! Verursacht schwere Verletzungen am gesamten Körper bis hin zum Tod. Sichern Sie den Hubzylinder angehobener Maschinenteile gegen unbeabsichtigtes Absenken, bevor Sie sich unter angehobenen Maschinenteilen aufhalten. Benutzen Sie hierzu die mechanische Hubzylinder-Abstützung oder die hydraulische Absperreinrichtung	
MD 082 Sturzgefahr von Personen! Verursacht schwere Verletzungen am gesamten Körper. Verboten ist die Mitfahrt von Personen auf der Maschine und/oder das Besteigen von laufenden Maschinen. Dies Verbot gilt auch für Maschinen mit Trittflächen oder Plattformen.	
MD 083 Gefährdung durch Einziehen oder Fangen! Verursacht schwere Verletzungen an Arm oder oberen Torso. Öffnen oder entfernen Sie niemals Schutzeinrichtungen von Förderschnecken, solange der Traktormotor bei angeschlossener Gelenkwelle / gekuppeltem Hydraulikantrieb läuft.	
MD 084 Quetschgefahr! Verursacht schwere Verletzungen am gesamten Körper bis hin zum Tod. Verboten ist der Aufenthalt von Personen im Schwenkbereich von Maschinenteilen.	

MD 086

Quetschgefahr!

Verursacht schwere Verletzungen am gesamten Körper bis hin zum Tod.

Sichern Sie angehobene Maschinenteile gegen unbeabsichtigtes Absenken, bevor Sie sich unter angehobenen Maschinenteilen aufhalten. Benutzen Sie hierzu die mechanische Abstützung oder die hydraulische Absperreinrichtung.

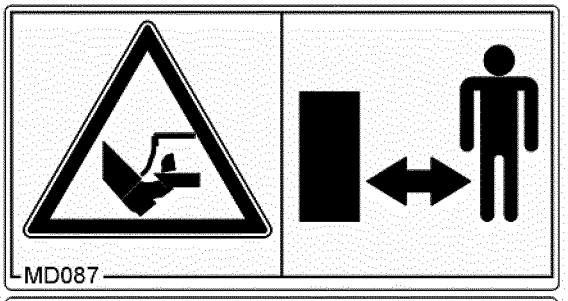


MD 087

Gefährdung durch Schneiden oder Abschneiden!

Verursacht schwere Verletzungen an Zehen oder Fuß.

Halten Sie einen ausreichenden Sicherheitsabstand zur Maschine, solange der Traktormotor bei angeschlossener Gelenkwelle läuft.

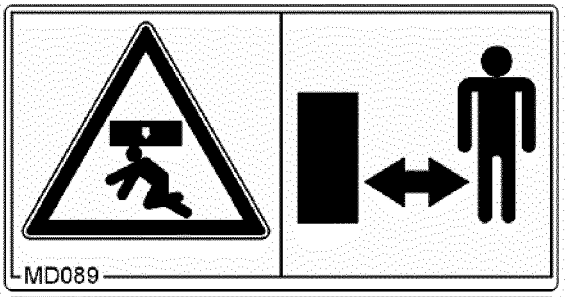


MD 089

Quetschgefahr!

Verursacht schwere Verletzungen am gesamten Körper bis hin zum Tod.

Halten Sie einen ausreichenden Sicherheitsabstand zu angehobenen, ungesicherten Maschinen.

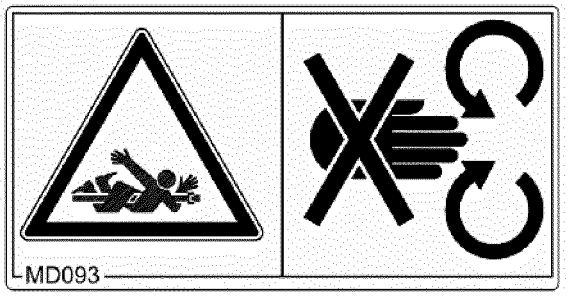


MD 093

Gefährdung durch Erfassen oder Aufwickeln!

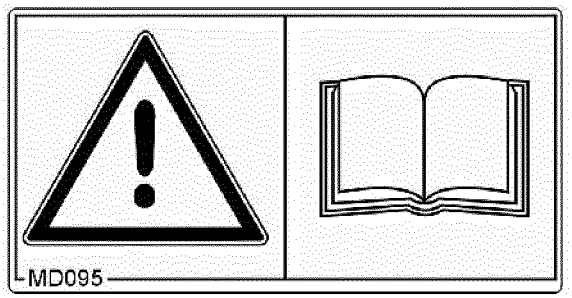
Verursacht schwere Verletzungen am gesamten Körper bis hin zum Tod.

- Halten Sie einen ausreichenden Sicherheitsabstand zur Gelenkwelle, solange der Traktormotor bei angeschlossener Gelenkwelle läuft.
- Öffnen oder entfernen Sie niemals Schutzeinrichtungen von Antriebswellen, solange der Traktormotor bei angeschlossener Gelenkwelle / gekuppeltem Hydraulikantrieb läuft.



MD 095

Lesen und beachten Sie die Betriebsanleitung und Sicherheitshinweise, bevor Sie die Maschine in Betrieb nehmen!



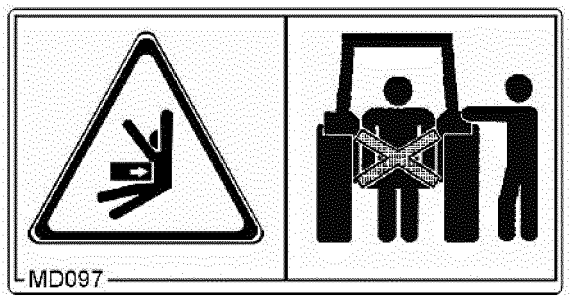
MD 097

Quetschgefahr!

Verursacht schwere Verletzungen am Torso bis hin zum Tod.

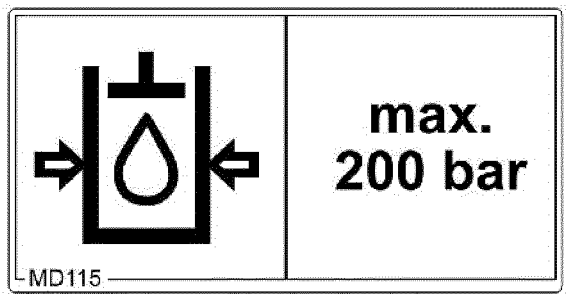
Bleiben Sie bei Betätigung des Krafthebers außerhalb des Hubbereichs der Dreipunktaufhängung.

Verboten ist der Aufenthalt von Personen im Hubbereich der Dreipunkt-Aufhängung bei Betätigung des Dreipunkt-Hubwerkes!



MD 115

Maximaler Hydrauliköl-Betriebsdruck 200 bar.



2.13.1 Platzierung der Warnbildzeichen und sonstigen Kennzeichnungen

Warnbildzeichen

Die folgenden Abbildungen zeigen die Anordnung der Warnbildzeichen an der Maschine.

Einzelkorn-Sämaschine ED 302

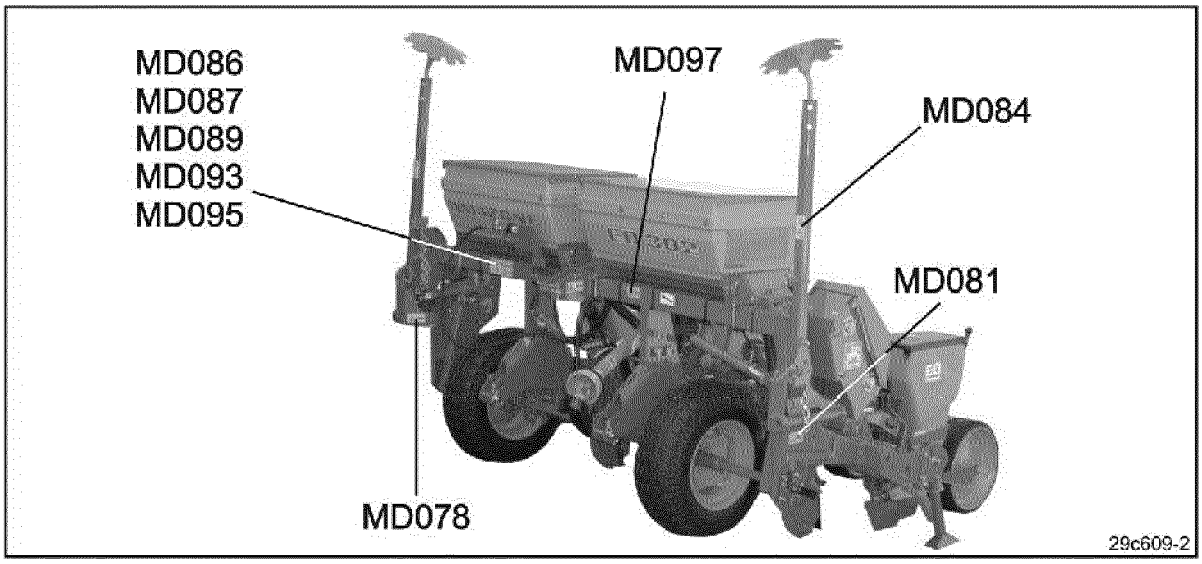


Fig. 1



Fig. 2

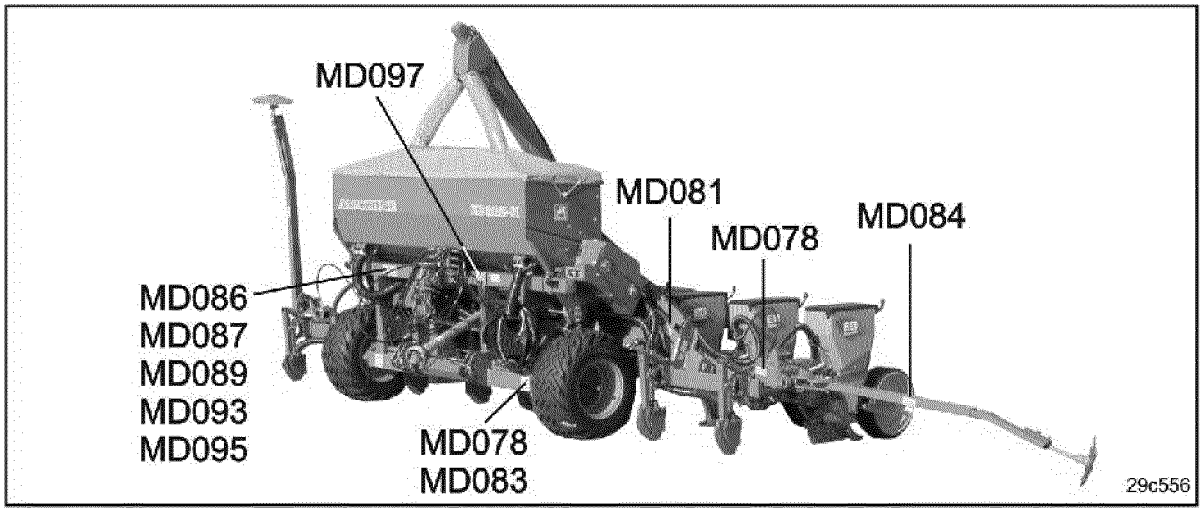

MD097
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Fig. 3

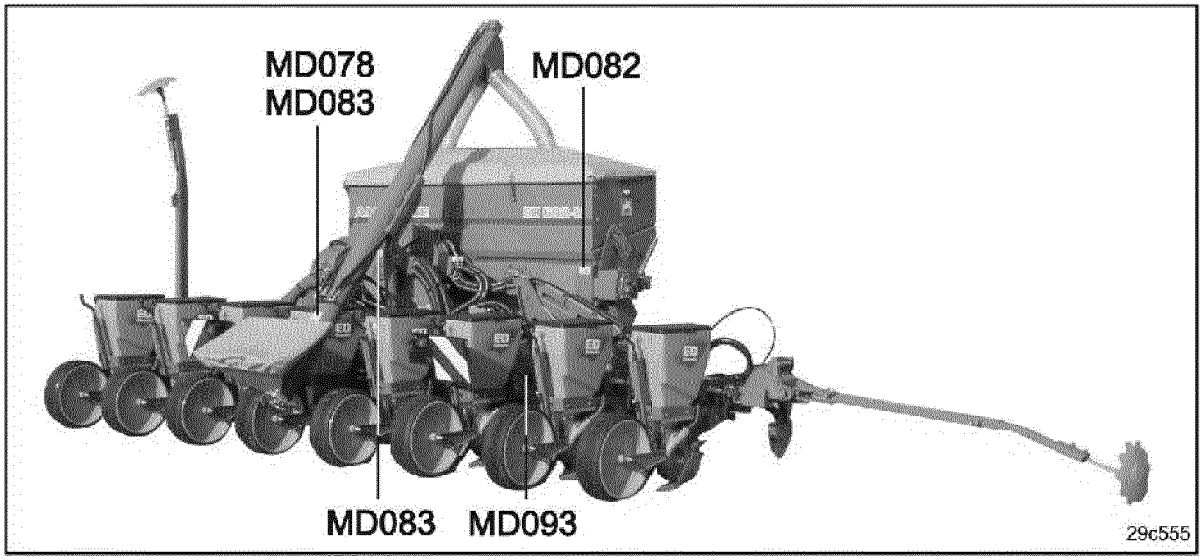

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Fig. 4

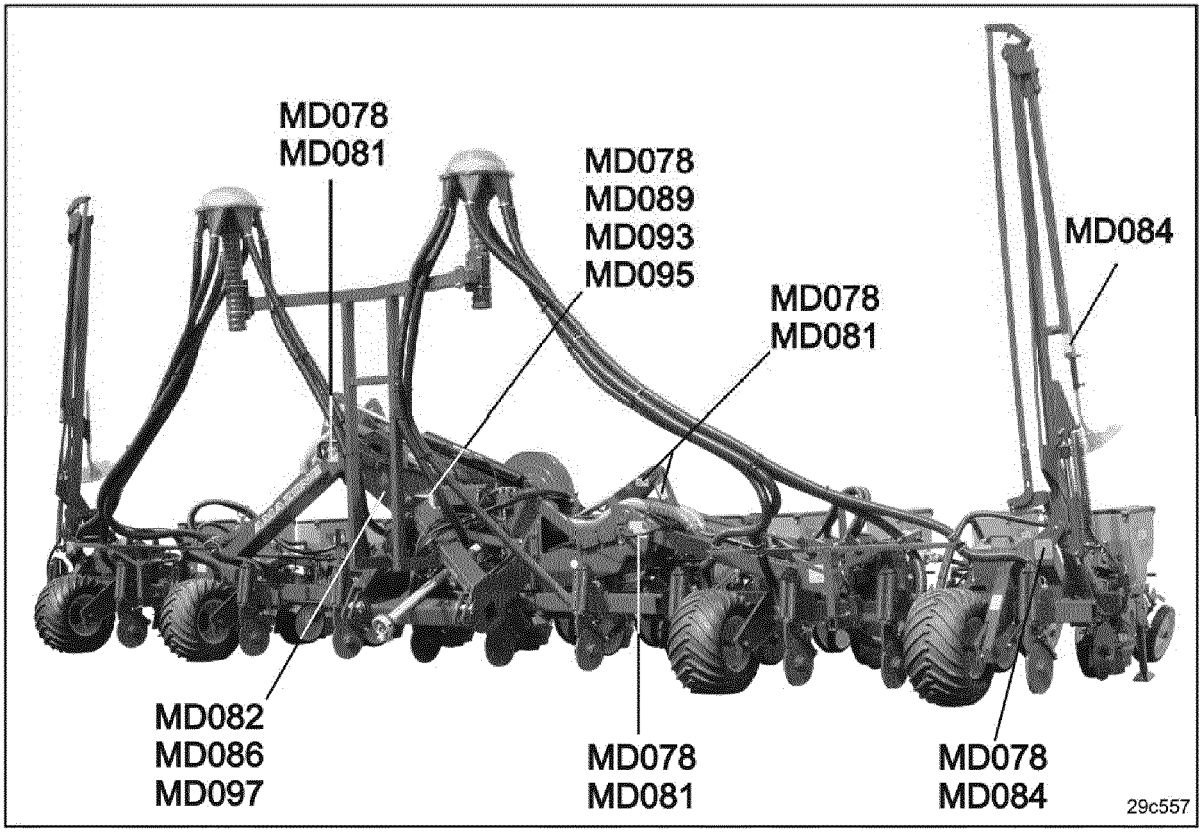

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Fig. 5

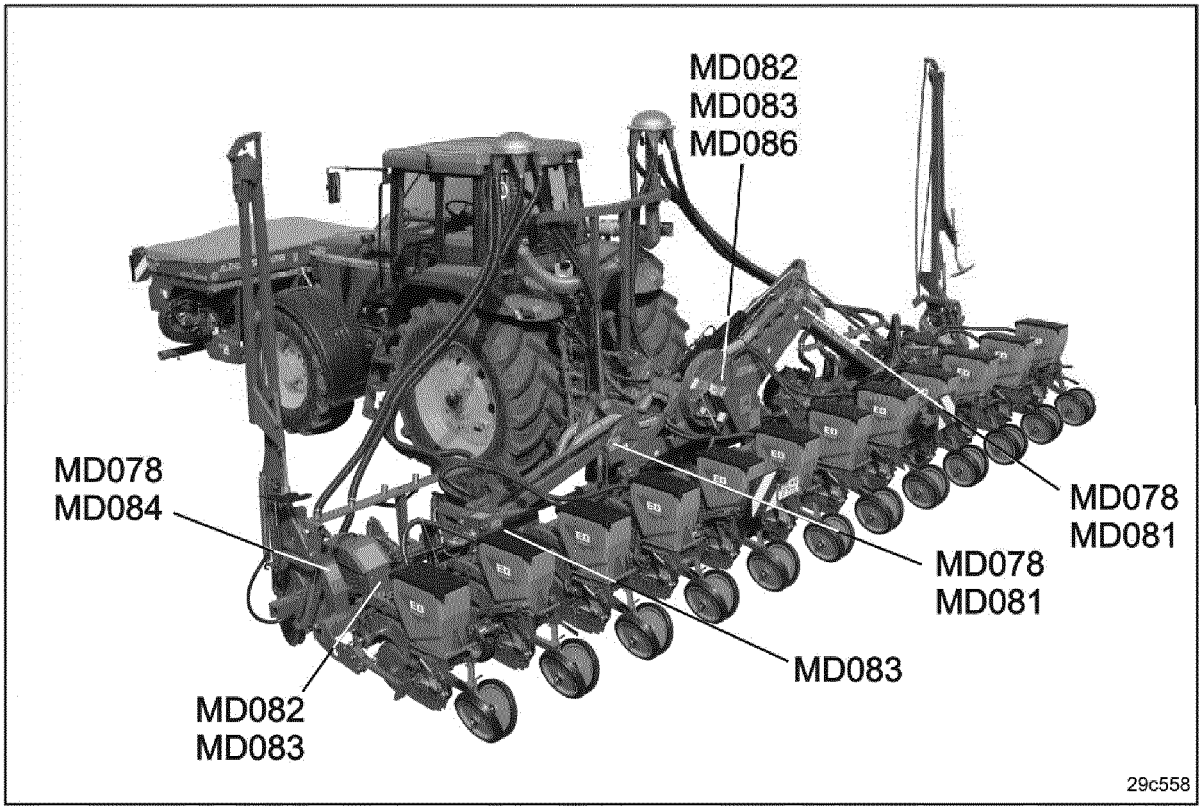

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Fig. 6

2.14 Gefahren bei Nichtbeachtung der Sicherheitshinweise

Die Nichtbeachtung der Sicherheitshinweise

- kann sowohl eine Gefährdung für Personen als auch für Umwelt und Maschine zur Folge haben
- kann zum Verlust jeglicher Schadenersatzansprüche führen.

Im Einzelnen kann die Nichtbeachtung der Sicherheitshinweise beispielsweise folgende Gefährdungen nach sich ziehen:

- Gefährdung von Personen durch nicht abgesicherte Arbeitsbereiche
- Versagen wichtiger Funktionen der Maschine
- Versagen vorgeschriebener Methoden zur Wartung und Instandhaltung
- Gefährdung von Personen durch mechanische und chemische Einwirkungen
- Gefährdung der Umwelt durch Leckage von Hydrauliköl.

2.15 Sicherheitsbewusstes Arbeiten

Neben den Sicherheitshinweisen dieser Betriebsanleitung sind die nationalen, allgemeingültigen Arbeitsschutz- und Unfallverhütungsvorschriften bindend.

Befolgen Sie die auf den Warnbildzeichen aufgeführten Anweisungen zur Gefahrenvermeidung.

Halten Sie bei Verkehr auf öffentlichen Straßen und Wegen die jeweiligen gesetzlichen Straßenverkehrsvorschriften ein.

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2.16 Sicherheitshinweise für den Bediener



Warnung!

Überprüfen Sie vor jeder Inbetriebnahme die Maschine und den Traktor auf Verkehrs- und Betriebssicherheit!

2.16.1 Allgemeine Sicherheits- und Unfallverhütungshinweise

- Beachten Sie neben diesen Hinweisen auch die allgemein gültigen nationalen Sicherheits- und Unfallverhütungsvorschriften!
- Die an der Maschine angebrachten Warnbildzeichen und sonstigen Kennzeichnungen geben wichtige Hinweise für den gefahrlosen Betrieb der Maschine. Die Beachtung dieser Hinweise dient Ihrer Sicherheit!
- Kontrollieren Sie vor dem Anfahren und vor der Inbetriebnahme den Nahbereich der Maschine (Kinder)! Auf ausreichende Sicht achten!
- Verboten sind das Mitfahren und der Transport auf der Maschine!

An- und Abkuppeln der Maschine

- Sie dürfen die Maschine nur mit einem Traktor kuppeln und transportieren, wenn der Traktor die leistungsmäßigen Voraussetzungen erfüllt!
- Beim Ankuppeln von Maschinen an die Traktor-Dreipunkt-Hydraulik müssen die Anbaukategorien von Traktor und Maschine unbedingt übereinstimmen!
- Durch das Ankuppeln von Maschinen im Front- und/oder Heckanbau eines Traktors dürfen nicht überschritten werden
  - o das zulässige Traktor-Gesamtgewicht
  - o die zulässigen Traktor-Achslasten
  - o die zulässigen Reifentragfähigkeiten der Traktor-Reifen
- Sichern Sie den Traktor und die Maschine gegen unbeabsichtigte Fortbewegung, bevor Sie die Maschine an- oder abkuppeln!
- Verboten ist der Aufenthalt von Personen zwischen der zukuppelnden Maschine und dem Traktor; während der Traktor an die Maschine heranfährt!

  Anwesende Helfer dürfen sich nur als Einweiser neben den Fahrzeugen betätigen und erst bei Stillstand zwischen die Fahrzeuge treten.
- Sichern Sie den Bedienungshebel der Traktor-Hydraulik in der Position, in der unbeabsichtigtes Heben oder Senken ausgeschlossen ist, bevor Sie die Maschine an die Traktor-Dreipunkt-Hydraulik anbauen oder von der Traktor-Dreipunkt-Hydraulik abbauen!
- Bringen Sie beim An- und Abkuppeln von Maschinen die Abstützeinrichtungen (falls vorgesehen) in die jeweilige Stellung (Standsicherheit)!
- Bei der Betätigung von Abstützeinrichtungen besteht Verletzungsgefahr durch Quetsch- und Scherstellen!
- Seien Sie beim An- und Abkuppeln von Maschinen an oder vom

Traktor besonders vorsichtig! Zwischen dem Traktor und der Maschine gibt es Quetsch- und Scherstellen im Bereich der Kuppelstelle!

- Verboten ist der Aufenthalt von Personen zwischen Traktor und Maschine bei Betätigung der Dreipunkt-Hydraulik!
- Kuppeln Sie die Maschine vorschriftsmäßig an die vorgeschriebenen Vorrichtungen!
- Auslöseseile für Schnellkupplungen müssen lose hängen und dürfen in der Tieflage nicht selbst auslösen!
- Stellen Sie abgekuppelte Maschinen immer standsicher ab!

Einsatz der Maschine

- Machen Sie sich vor Arbeitsbeginn vertraut mit allen Einrichtungen und Betätigungselementen der Maschine sowie mit deren Funktionen. Während des Arbeitseinsatzes ist es dazu zu spät!
- Tragen Sie eng anliegende Kleidung! Locker getragene Kleidung erhöht die Gefährdung durch Erfassen oder Aufwickeln an Antriebswellen!
- Nehmen Sie die Maschine nur in Betrieb, wenn alle Schutzvorrichtungen angebracht und in Schutzstellung sind!
- Beachten Sie die maximale Zuladung der angebauten / angehängten Maschine und die zulässigen Achs- und Stützlasten des Traktors! Fahren Sie gegebenenfalls nur mit teilbefülltem Vorratsbehälter.
- Verboten ist der Aufenthalt von Personen im Arbeitsbereich der Maschine!
- Verboten ist der Aufenthalt von Personen im Dreh- und Schwenkbereich der Maschine!
- An fremdkraftbetätigten Maschinenteilen (z.B. hydraulisch) befinden sich Quetsch- und Scherstellen!
- Sie dürfen fremdkraftbetätigte Maschinenteile nur betätigen, wenn Personen einen ausreichenden Sicherheitsabstand zur Maschine einhalten!
- Bevor Sie den Traktor verlassen müssen Sie
  - o die Maschine auf dem Boden absetzen
  - o den Traktormotor abstellen
  - o den Zündschlüssel abziehen

Transportieren der Maschine

- Beachten Sie bei Benutzung öffentlicher Verkehrswege die jeweiligen nationalen Straßenverkehrsvorschriften!
- Achten Sie immer auf eine ausreichende Lenk- und Bremsfähigkeit des Traktors!

  An einen Traktor angebaute oder angehängte Maschinen und Front- oder Heckgewichte beeinflussen das Fahrverhalten sowie die Lenk- und Bremsfähigkeit des Traktors.
- Verwenden Sie gegebenenfalls Frontgewichte!

  Die Traktor-Vorderachse muss immer mit mindestens 20% des

Traktor-Leergewichtes belastet sein, damit eine ausreichende Lenkfähigkeit gewährleistet ist.

- Befestigen Sie Front- oder Heckgewichte immer vorschriftsmäßig an den dafür vorgesehenen Befestigungspunkten!
- Beachten Sie die maximale Nutzlast der angebauten / angehängten Maschine und die zulässigen Achs- und Stützlasten des Traktors!
- Der Traktor muss die vorgeschriebene Bremsverzögerung für den beladenen Zug (Traktor plus angebaute / angehängte Maschine) sichern!
- Prüfen Sie die Bremswirkung vor Fahrtantritt!
- Berücksichtigen Sie bei Kurvenfahrten mit angebauter oder angehängter Maschine die weite Ausladung und die Schwungmasse der Maschine!
- Achten Sie vor Transportfahrten auf eine ausreichende seitliche Arretierung der Traktor-Unterlenker, wenn die Maschine in der Dreipunkt-Hydraulik bzw. den Unterlenkern des Traktors befestigt ist!
- Bringen Sie vor Transportfahrten alle schwenkbaren Maschinenteile in Transportstellung!
- Sichern Sie vor Transportfahrten schwenkbare Maschinenteile in Transportstellung gegen gefahrbringende Lageveränderungen. Benutzen Sie hierzu die dafür vorgesehenen Transportsicherungen!
- Verriegeln Sie vor Transportfahrten den Bedienungshebel des Dreipunkt-Hydraulik gegen unbeabsichtigtes Heben oder Senken der angebauten oder angehängten Maschine!
- Überprüfen Sie vor Transportfahrten, ob die erforderliche Transportausrüstung korrekt an der Maschine montiert ist, wie z. B. Beleuchtung, Warneinrichtungen und Schutzeinrichtungen!
- Passen Sie Ihre Fahrgeschwindigkeit den jeweils vorherrschenden Bedingungen an!
- Schalten Sie vor Bergabfahrten in einen niedrigeren Gang!
- Schalten Sie die Einzelradbremsung vor Transportfahrten grundsätzlich aus (Pedale verriegeln)!

2.16.2 Hydraulik-Anlage

- Die Hydraulikanlage steht unter hohem Druck!
- Achten Sie auf korrektes Anschließen der Hydraulikschlauch-Leitungen!
- Achten Sie beim Anschließen der Hydraulikschlauch-Leitungen darauf, dass die Hydraulik-Anlage sowohl traktor- als auch maschinenseitig drucklos ist!
- Es ist Verboten, Steuergeräte auf dem Traktor zu blockieren, wenn über diese Steuergeräte hydraulische Funktionen direkt ausgeführt werden, z. B. Klapp-, Schwenk- und Schiebevorgänge. Die jeweilige Hydraulik-Funktion muss automatisch stoppen, wenn das entsprechende Steuergerät losgelassen wird.
- Vor Arbeiten an der Hydraulik-Anlage
  - Maschine absetzen
  - Hydraulik-Anlage drucklos machen
  - Traktormotor abstellen
- Lassen Sie Hydraulikschlauch-Leitungen mindestens einmal jährlich durch einen Sachkundigen auf ihren arbeitssicheren Zustand prüfen! Tauschen Sie Hydraulikschlauch-Leitungen bei Beschädigungen und Alterung aus! Verwenden Sie nur Original-**AMAZONE** Hydraulikschlauch-Leitungen!
- Die Verwendungsdauer der Hydraulikschlauch-Leitungen sollte sechs Jahre nicht überschreiten, einschließlich einer eventuellen Lagerzeit von höchstens zwei Jahren. Auch bei sachgemäßer Lagerung und zulässiger Beanspruchung unterliegen Schläuche und Schlauchverbindungen einer natürlichen Alterung, dadurch ist ihre Lagerzeit und Verwendungsdauer begrenzt. Abweichend hiervon kann die Verwendungsdauer entsprechend den Erfahrungswerten, insbesondere unter Berücksichtigung des Gefährdungspotentials, festgelegt werden. Für Schläuche und Schlauchleitungen aus Thermoplasten können andere Richtwerte maßgebend sein.
- Infektionsgefahr! Unter hohem Druck austretende Flüssigkeiten (Hydrauliköl) können die Haut durchdringen und schwere Verletzungen verursachen! Suchen Sie bei Verletzungen sofort einen Arzt auf!
- Verwenden Sie bei der Suche nach Leckstellen geeignete Hilfsmittel, wegen der möglichen schweren Verletzungsgefahr!

2.16.3 Elektrische Anlage

- Bei Arbeiten an der elektrischen Anlage grundsätzlich Batterie (Minuspol) abklemmen!
- Verwenden Sie nur die vorgeschriebenen Sicherungen. Bei Verwendung zu starker Sicherungen wird die elektrische Anlage zerstört - Brandgefahr!
- Achten Sie auf richtiges Anschließen der Batterie - zuerst den Pluspol und dann den Minuspol anklemmen! Beim Abklemmen zuerst den Minuspol und dann den Pluspol abklemmen!
- Versehen Sie den Pluspol der Batterie immer mit der vorgesehenen Abdeckung. Bei Masseschluss besteht Explosionsgefahr!

- Explosionsgefahr! Vermeiden Sie Funkenbildung und offene Flammen in der Nähe der Batterie!
- Die Maschine kann mit elektronischen Komponenten und Bauteilen ausgestattet werden, deren Funktion durch elektromagnetische Aussendungen anderer Geräte beeinflusst werden kann. Solche Beeinflussungen können zu Gefährdungen von Personen führen, wenn die folgenden Sicherheitshinweise nicht befolgt werden.
  - Bei einer nachträglichen Installation von elektrischen Geräten und/oder Komponenten an der Maschine, mit Anschluss an das Bordnetz, muss der Benutzer eigenverantwortlich prüfen, ob die Installation Störungen der Fahrzeugelektronik oder anderer Komponenten verursacht.
  - Achten Sie darauf, dass die nachträglich installierten elektrischen und elektronischen Bauteile der EMV-Richtlinie 89/336/EWG in der jeweils geltenden Fassung entsprechen und das CE-Kennzeichen tragen.

2.16.4 Wartung, Instandsetzung und Pflege

- Führen Sie Wartungs-, Instandsetzungs- und Reinigungsarbeiten grundsätzlich nur durch bei
  - ausgeschaltetem Antrieb
  - stillstehendem Traktormotor
  - abgezogenem Zündschlüssel
  - vom Bordcomputer abgezogenen Maschinenstecker
- Muttern und Schrauben regelmäßig auf festen Sitz prüfen und gegebenenfalls nachziehen!
- Sichern Sie die angehobene Maschine bzw. angehobene Maschinenteile gegen unbeabsichtigtes Absenken, bevor Sie Wartungs-, Instandsetzungs- und Reinigungsarbeiten vornehmen!
- Benutzen Sie beim Auswechseln von Arbeitswerkzeugen mit Schneiden geeignetes Werkzeug und Handschuhe!
- Entsorgen Sie Öle, Fette und Filter ordnungsgemäß!
- Klemmen Sie das Kabel an Generator und Batterie des Traktors ab, bevor Sie elektrische Schweißarbeiten an Traktor und angebauten Maschinen ausführen!
- Ersatzteile müssen mindestens den festgelegten technischen Anforderungen der **AMAZONEN-WERKE** entsprechen! Dies ist gegeben bei Verwendung von Original-**AMAZONE**-Ersatzteilen!

2.16.5 Angebaute Arbeitsgeräte

- Beim Anbau müssen die Anbaukategorien von Traktor und Maschine unbedingt übereinstimmen oder abgestimmt werden!
- Hersteller-Vorschriften beachten!
- Vor dem An- und Abbau von Maschinen an die Dreipunktaufhängung Bedienungseinrichtung in die Stellung bringen, bei der unbeabsichtigtes Heben oder Senken ausgeschlossen sind!
- Im Bereich des Dreipunktgestänges besteht Verletzungsgefahr durch Quetsch- oder Scherstellen!
- Die Außenbedienung für die Traktorunterlenker dürfen nicht betätigt werden! Traktorunterlenker nur von der Traktorkabine aus betätigen!
- Die Maschine darf nur mit den dafür vorgesehenen Traktoren transportiert und gefahren werden!
- Beim An- und Abkuppeln von Geräten an den Traktor besteht Verletzungsgefahr!
- Bei Betätigung der Außenbedienung für den Dreipunktanbau nicht zwischen Fahrzeug und Maschine treten!
- Bei der Betätigung von Stützeinrichtungen Gefahr durch Quetsch- und Scherstellen!
- Durch den Anbau von Geräten im Front- und/oder Heckanbau eines Traktors darf nicht überschritten werden
  - o das zulässige Traktor-Gesamtgewicht
  - o die zulässigen Traktor-Achslasten
  - o die zulässigen Reifentragfähigkeiten der Traktor-Reifen.
- Maximale Nutzlast des angebauten Gerätes und die zulässigen Achslasten des Traktors beachten!
- Vor dem Transport der Maschine immer auf ausreichende seitliche Arretierung der Traktorunterlenker achten!
- Bei Straßenfahrt muss der Bedienungshebel der Traktorunterlenker gegen Senken verriegelt sein!
- Alle Einrichtungen vor Straßenfahrt in Transportstellung bringen!
- An einen Traktor angebaute Geräte und Ballastgewichte beeinflussen das Fahrverhalten sowie die Lenk- und Bremsfähigkeit des Traktors!
- Die Traktor-Vorderachse muss immer mit mindestens 20% des Traktor-Leergewichtes belastet sein, damit eine ausreichende Lenkfähigkeit gewährleistet ist. Gegebenenfalls Frontgewichte verwenden!
- Instandsetzungs-, Wartungs- und Reinigungsarbeiten und die Beseitigung von Funktionsstörungen grundsätzlich nur bei abgezogenem Zündschlüssel durchführen!
- Schutzeinrichtungen angebracht lassen und immer in Schutzstellung bringen!

2.16.6 Zapfwellen-Betrieb

- Verwenden dürfen Sie nur die von den AMAZONEN-WERKEN vorgeschriebenen, mit vorschriftsmäßigen Schutzvorrichtungen ausgestatteten Gelenkwellen!
- Beachten Sie auch die Betriebsanleitung des Gelenkwellen-Herstellers!
- Schutzrohr und Schutztrichter der Gelenkwelle müssen unbeschädigt sowie das Schutzschild der Traktor- und Maschinen-Zapfwelle müssen angebracht sein und sich in einem ordnungsgemäßen Zustand befinden!
- Verboten ist das Arbeiten mit beschädigten Schutzvorrichtungen!
- Sie dürfen den An- und Abbau der Gelenkwelle nur vornehmen bei
  - bei ausgeschalteter Zapfwelle
  - abgeschaltetem Traktormotor
  - abgezogenem Zündschlüssel
- Achten Sie immer auf die richtige Montage und Sicherung der Gelenkwelle!
- Beim Einsatz von Weitwinkel-Gelenkwellen das Weitwinkelgelenk immer am Drehpunkt zwischen Traktor und Maschine anbringen!
- Sichern Sie den Gelenkwellenschutz durch Einhängen der Kette(n) gegen Mitlaufen!
- Achten Sie bei Gelenkwellen auf die vorgeschriebenen Rohrüberdeckungen in Transport- und Arbeitsstellung! (Beachten Sie die Bedienungsanleitung des Gelenkwellenherstellers!)
- Beachten Sie bei Kurvenfahrten die zulässige Abwinklung und den Schiebeweg der Gelenkwelle!
- Kontrollieren Sie vor dem Einschalten der Zapfwelle ob
  - sich Personen im Gefahrenbereich der Maschine befinden
  - die gewählte Zapfwellendrehzahl des Traktors mit der zulässigen Antriebs-Drehzahl der Maschine übereinstimmt
- Bei Arbeiten mit der Zapfwelle darf sich keine Person
  - im Bereich der drehenden Zapf- oder Gelenkwelle aufhalten
  - im Gefahrenbereich der Maschine aufhalten
- Schalten Sie die Zapfwelle niemals bei abgeschaltetem Traktormotor ein!
- Schalten Sie die Zapfwelle immer ab, wenn zu große Abwinkelungen auftreten oder sie nicht benötigt wird!
- Achtung! Nach dem Abschalten der Zapfwelle besteht Verletzungsgefahr durch die nachlaufende Schwungmasse rotierender Maschinenteile!

  Während dieser Zeit nicht zu nahe an die Maschine herantreten! Erst wenn alle Maschinenteile vollständig zum Stillstand gekommen sind, dürfen Sie an der Maschine arbeiten!
- Sie dürfen zapfwellengetriebene Maschinen oder Gelenkwellen nur reinigen, schmieren oder einstellen, bei

- bei abgeschalteter Zapfwelle
- abgeschaltetem Traktormotor
- abgezogenem Zündschlüssel

- Legen Sie die abgekuppelte Gelenkwelle auf die vorgesehene Halterung ab!
- Stecken Sie nach Abbau der Gelenkwelle die Schutzhülle auf den Zapfwellenstummel!
- Beachten Sie bei Verwendung der wegabhängigen Zapfwelle, dass die Zapfwellen-Drehzahl fahrgeschwindigkeitsabhängig ist und die Drehrichtung sich bei Rückwärtsfahrt umkehrt!

2.16.7 Sämaschinen-Betrieb

- Während der Abdrehprobe auf Gefahrenstellen durch rotierende und oszillierende Maschinenteile achten!
- Plattform nur zum Befüllen betreten.
  Während des Betriebes ist das Mitfahren verboten!
- Beim Straßentransport sind die Spurscheiben des Fahrgassen-Markier-Gerätes zu entfernen!
- Beim Befüllen des Saatgut-Behälters Hinweise des Geräteherstellers beachten!
- Spuranreißer (bauartbedingt) in Transportstellung verriegeln!
- Keine Teile in den Saatgut-Behälter legen!
- Zulässige Füllmenge beachten!

3 Ver- und Entladen

Gefahr!

Nicht unter der mit einem Kran angehobenen Maschine aufhalten.

3.1 Verladen der Einzelkorn-Sämaschinen ED 302 und ED 452

Die Einzelkorn-Sämaschinen ED 302 und ED 452 mit einem Kran (Fig. 7) verladen.

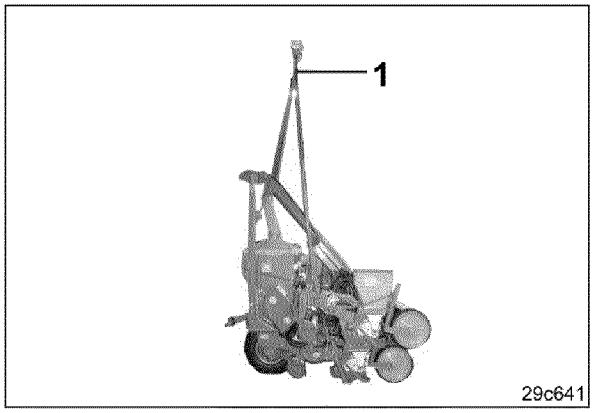


Fig. 7

Die Transportseile (Fig. 8/1) beidseitig an den Halterungen der Spuranreißer und der Abstellstützen befestigen.

Die Maschine vorschriftsmäßig auf dem Transportfahrzeug sichern.

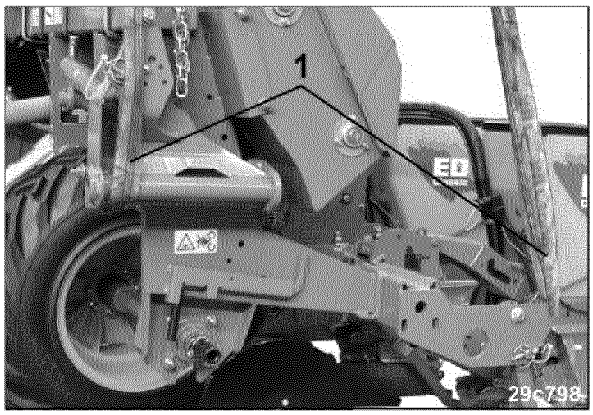


Fig. 8

3.2 Verladen der Einzelkorn-Sämaschine ED 452-K und ED 602-K

Die Einzelkorn-Sämaschinen ED 452-K und ED 602-K einklappen und mit einem Kran verladen.

Die Transportseile (Fig. 9/1) an den Ösen der Maschine befestigen.

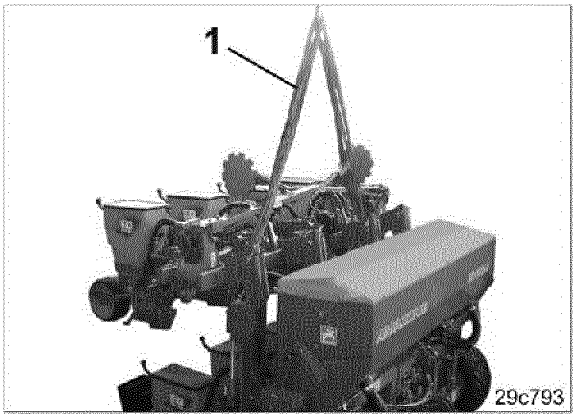


Fig. 9

Die Ösen sind gekennzeichnet mit dem Aufkleber (Fig. 10).

Die Maschine vorschriftsmäßig auf dem Transportfahrzeug sichern.

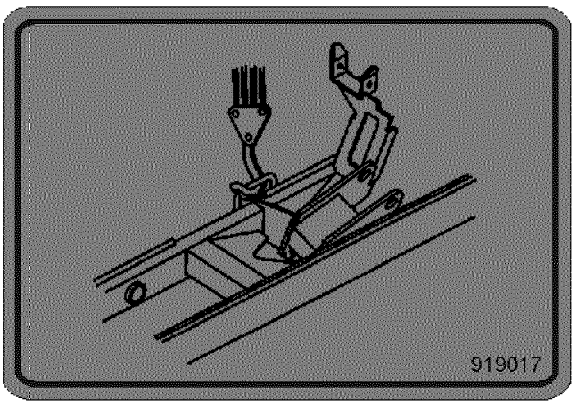


Fig. 10

3.3 Verladen der Einzelkorn-Sämaschine ED 902-K

Gefahr!

- **Kuppeln Sie die Maschine vorschriftsmäßig an den Traktor, bevor Sie die Maschine auf ein Transportfahrzeug verladen oder von einem Transportfahrzeug entladen!**
- **Sie dürfen die Maschine zum Ent- und Verladen nur mit einem Traktor kuppeln und transportieren, wenn der Traktor die leistungsmäßigen Voraussetzungen erfüllt!**

Zum Verladen, die ausgeklappte Einzelkorn-Sämaschine ED 902-K im Dreipunkt mit einem ausreichend dimensionierten Traktor oder Gabelstapler aufnehmen.

Erforderlich ist die Ausrüstung des Gabelstaplers mit Anlenkpunkten zum Kuppeln der Maschine.

Die Maschine ankuppeln (siehe Kapitel „Maschine an- und abkuppeln“, Seite 77). Die Versorgungsleitungen und die Gelenkwelle nicht anschließen.

Beim Be- und Entladen ist ein Einweiser erforderlich.

Die Maschine vorschriftsmäßig auf dem Transportfahrzeug sichern.

4 Produktbeschreibung

Dieses Kapitel

- gibt einen umfassenden Überblick über den Aufbau der Maschine
- liefert die Benennungen der einzelnen Baugruppen und Stellteile.

Lesen Sie dieses Kapitel möglichst direkt an der Maschine. So machen Sie sich optimal vertraut mit der Maschine.

4.1 Übersicht – Baugruppen

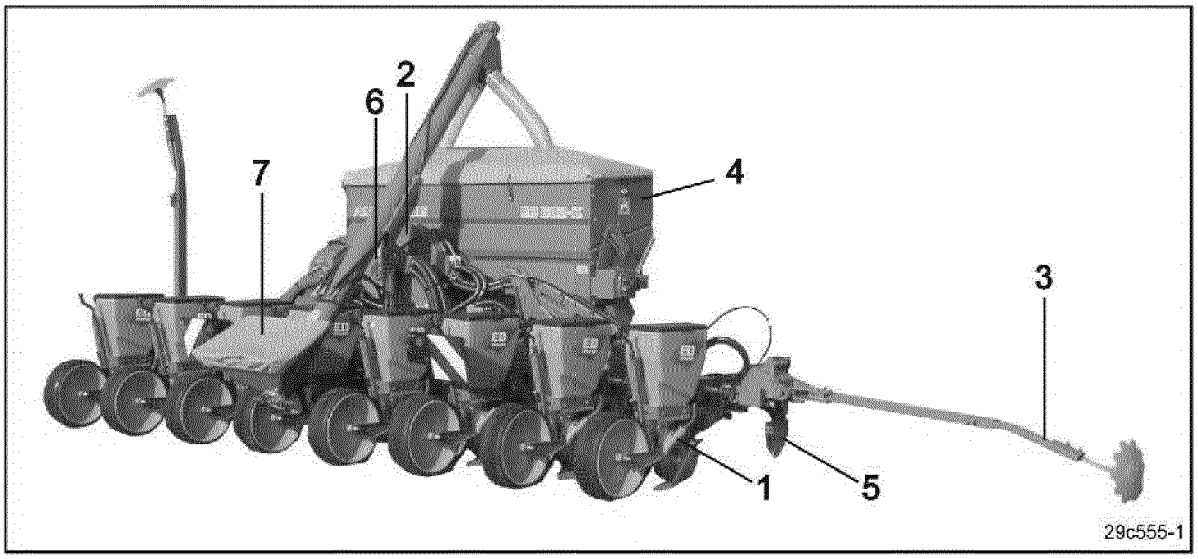


Fig. 11

Fig. 11/...

(1) Säaggregat
(2) Saugluft-Gebläse
(3) Spuranreißer
(4) 900- / 1100-Liter Dünger-Vorratsbehälter (Option)
(5) Dünger-Schar (Option)
(6) Druckluft-Gebläse (Option)
(7) Dünger-Befüllschnecke (Option)

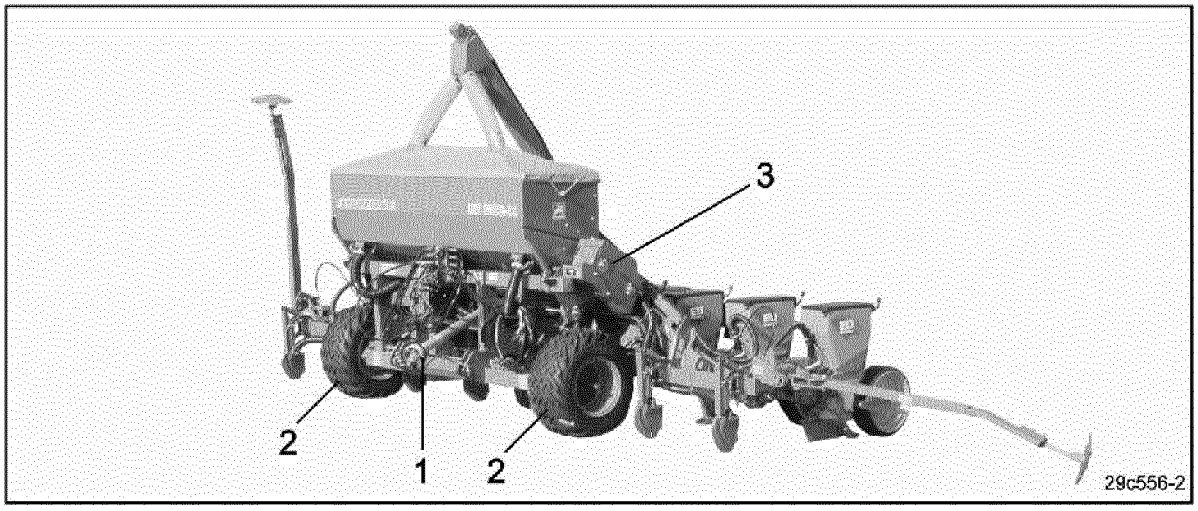


Fig. 12

Fig. 12/...

(1) Gelenkwelle für Gebläse-Antrieb

(2) Antriebsräder

(3) Verstellgetriebe

Classic-Säaggregat

Fig. 13/...

(1) Saatgut-Vorratsbehälter

(2) Einstellung Saatgutablagetiefe

(3) Sägehäuse

(4) Säschar

(5) Walkgummireifen

(6) Zustreicher vorlaufend

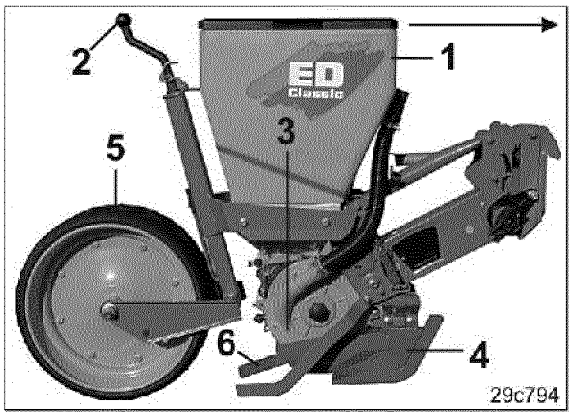


Fig. 13

Contour-Säaggregat

Fig. 14/...

(1) Saatgut-Vorratsbehälter

(2) Einstellung Saatgutablagetiefe

(3) Sägehäuse

(4) Säschar

(5) Druckrolle, vorlaufend

(6) V-Druckrolle

(7) Klutenräumer (Option)

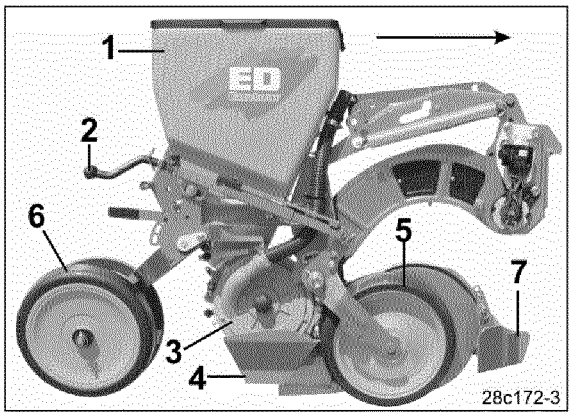


Fig. 14

Fig. 15/...

(1) 2 x 220-Liter Dünger-Vorratsbehälter (Option)

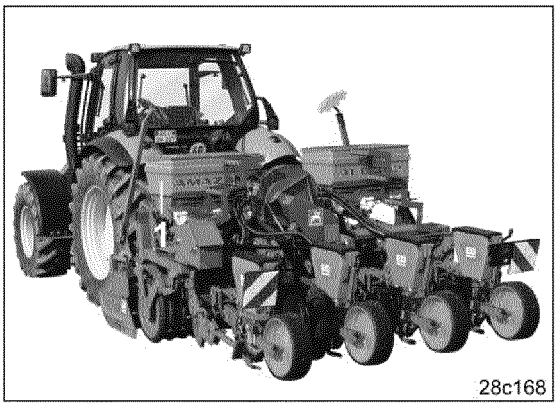


Fig. 15

Fig. 16/...

(1) Fronttank (Dünger)

(2) Spornrad

(3) Dosierer

(4) Injektorschleuse

(5) Gebläse

(6) Auffangbehälter zur Abdrehprobe

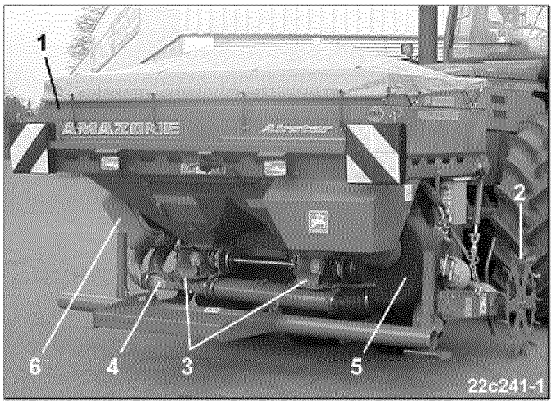


Fig. 16

Fig. 17

Bedienterminal-AMASCAN+ (Option)

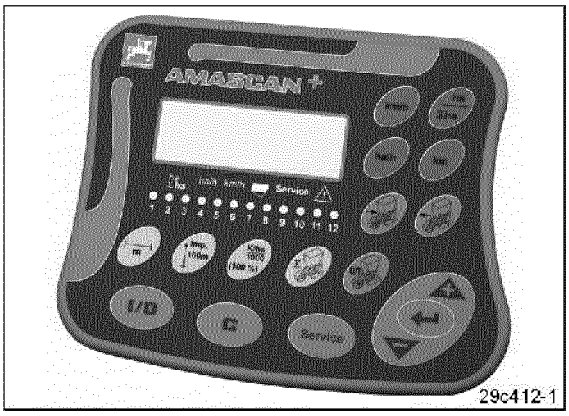


Fig. 17

Fig. 18

Bedienterminal **AMASCAN-PROFI** (Option)

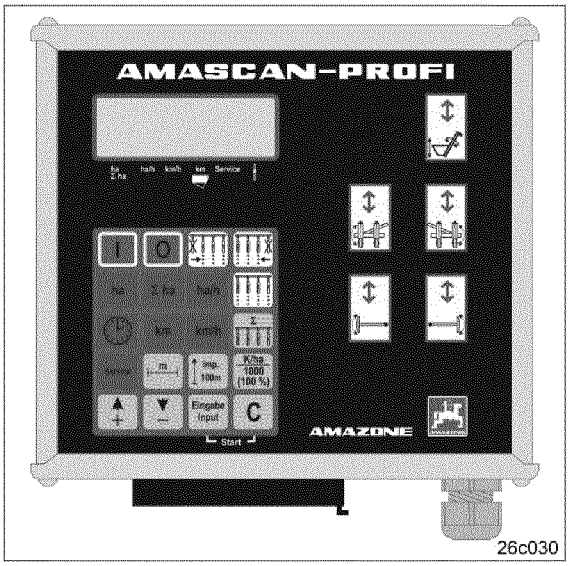


Fig. 18

Fig. 19

Bedienterminal **ED-CONTROL** (Option)

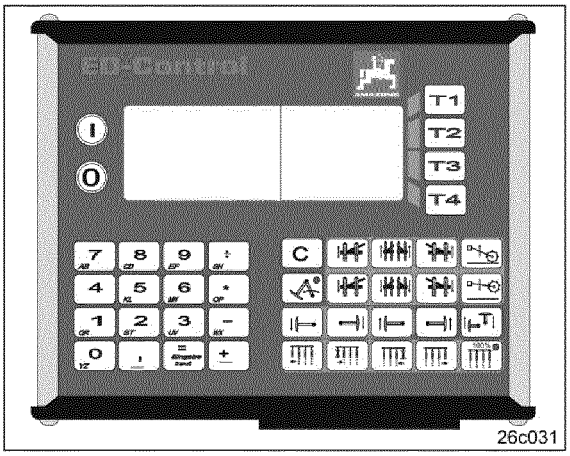


Fig. 19

4.2 Übersicht – Versorgungsleitungen zwischen Traktor und Maschine

Hydraulische Anschlüsse

Traktor-Steuergeräte*	Funktion
Traktor-Steuergerät 1	Spuranreißerbetätigung
Traktor-Steuergerät 2	Auslegerklappung, links (ED 02-K)
Traktor-Steuergerät 3**	Auslegerklappung, rechts (ED 02-K)
Traktor-Steuergerät 4	Hydraulikmotor Befüllschnecke (Option)
Traktor-Steuergerät 5	Gebläse-Hydraulikmotor (Option)
Traktor-Steuergerät 6	Spornradanhebung (Fronttank)

* Ausführung der Steuergeräte, siehe Kap. 7.1.1.1, Seite 80

** nicht erforderlich bei ED 902-K. Die Auslegerklappungen erfolgt mit dem Traktor-Steuergerät 2.

Hydraulische Anschlüsse für Maschinen mit Profischaltung (Option)

Traktor-Steuergeräte*	Funktion
Traktor-Steuergerät 1 (optional mit Load-Sensing-Funktion)	• Spuranreißerbetätigung • Auslegerklappung, links (ED 02-K) • Auslegerklappung, rechts (ED 02-K) • Hydraulikmotor Befüllschnecke (Option) • Spornradanhebung, Fronttank (nur in Verbindung mit **ED-Control**)
Traktor-Steuergerät 2	Gebläse-Hydraulikmotor (Option)
Traktor-Steuergerät 3	Spornradanhebung (Fronttank)

* Ausführung der Steuergeräte, siehe Kap. 7.1.1.3, Seite 82

Elektrische Anschlüsse

Elektrische Anschlüsse	Funktion
Stecker (7-polig)	Beleuchtungsanlage (Option) für Straßenverkehrslichtanlage

4.3 Verkehrstechnische Ausrüstung (Option)

Fig. 20/...

(1) 2 Schlussleuchten

(2) 2 Bremsleuchten

(3) 2 Fahrtrichtungsanzeiger

(4) 2 rote Rückstrahler
(rund, recht- oder dreieckig)

(5) 1 Kennzeichenhalter mit Beleuchtung

(6) 2 nach hinten gerichtete Warntafeln.

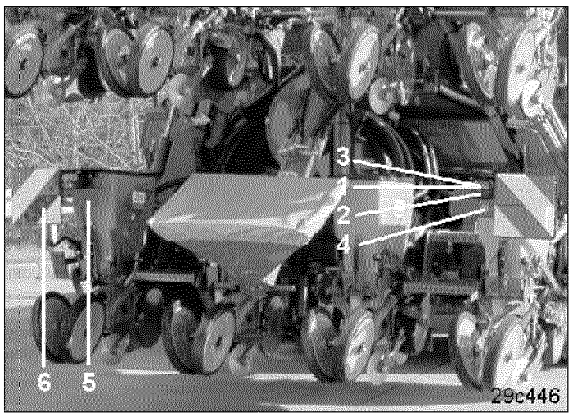


Fig. 20

Fig. 21/...

(1) 2 nach vorne gerichtete
Begrenzungsleuchten

(2) 2 nach vorne gerichtete Warntafeln.



Fig. 21

4.4 Bestimmungsgemäße Verwendung

Die Einzelkorn-Sämaschine ED

- ist gebaut zum Dosieren und Ausbringen bestimmter handelsüblicher Saatgüter und Düngersorten
- wird über den Dreipunktanschluss an einen Traktor angekuppelt und von einer Bedienungsperson bedient.

Befahren werden können Hanglagen in

- Schicht-Linie

  Fahrtrichtung nach links 10 %

  Fahrtrichtung nach rechts 10 %.
- Fall-Linie

  hang aufwärts 10 %

  hang abwärts 10 %.

Zur bestimmungsgemäßen Verwendung gehört auch:

- das Beachten aller Hinweise dieser Betriebsanleitung
- die Einhaltung der Inspektions- und Wartungsarbeiten
- die ausschließliche Verwendung von Original-**AMAZONE**-Ersatzteilen.

Andere Verwendungen als oben aufgeführt sind verboten und gelten als nicht bestimmungsgemäß.

Für Schäden aus nicht bestimmungsgemäßer Verwendung

- trägt der Betreiber die alleinige Verantwortung
- übernehmen die **AMAZONEN-WERKE** keinerlei Haftung.

4.5 Gefahrenbereiche

In den Gefahrenbereichen an der Maschine sind permanent gegenwärtige oder unerwartet auftretende Gefährdungen vorhanden. Warnbildzeichen kennzeichnen diese Gefahrenbereiche und warnen vor Restgefahren, die konstruktiv nicht zu beseitigen sind. Hier gelten spezielle Sicherheitsvorschriften. Hierzu siehe Kapitel "Allgemeine Sicherheitshinweise", Seite 25.

Gefahrenbereiche bestehen:

- zwischen Traktor und Maschine, insbesondere beim An- und Abkuppeln und beim Beladen der Saatgut und Dünger-Vorratsbehälter
- im Bereich beweglicher Bauteile
- durch das Besteigen der Maschine
- im Schwenkbereich der Spuranreißer
- im Schwenkbereich der Maschinen-Ausleger
- unter angehobenen, nicht gesicherten Maschinen und Maschinenteilen
- beim Aus- und Einklappen der Maschinen-Ausleger im Bereich von Freilandleitungen.

4.6 Konformität

	Richtlinien- / Normen-Bezeichnung
Die Maschine erfüllt die:	• Maschinen-Richtlinie 98/37/EG • EMV-Richtlinie 89/336/EWG

4.7 Typenschild und CE-Kennzeichnung

Die folgenden Abbildungen zeigen die Anordnung vom Typenschild und der CE-Kennzeichnung.

Das Typenschild (Fig. 22) sowie die CE-Kennzeichnung befinden sich, wie unten dargestellt, an der Maschine.

Auf dem Typenschild sind angegeben:

- Masch.-Ident-Nr.
- Typ
- Zul. Gesamtgewicht kg
- Baujahr
- Grundgewicht kg
- Werk.



Fig. 22

Die CE-Kennzeichnung (Fig. 23) an der Maschine signalisiert die Einhaltung der Bestimmungen der gültigen EU-Richtlinien.

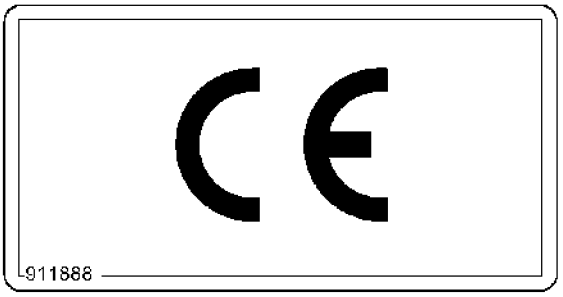


Fig. 23

ED 302, ED 452 (-K):

Befestigung des Typenschildes und der CE-Kennzeichnung (Fig. 24) oberhalb der Gelenkwellenauflage.

ED 602-K:

Befestigung des Typenschildes und der CE-Kennzeichnung (Fig. 25) am Verstellgetriebe.

ED 902-K:

Befestigung des Typenschildes und der CE-Kennzeichnung (Fig. 26) an der Gebläsekonsole.



Fig. 24

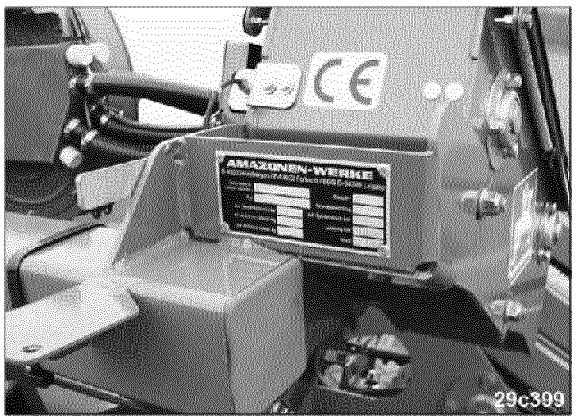


Fig. 25

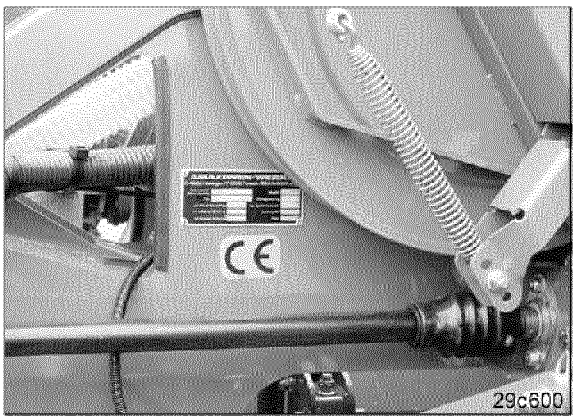


Fig. 26

4.8 Technische Daten

Einzelkorn-Sämaschine		ED 302		ED 452		ED 452-K	
Säaggregate		Classic	Contour	Classic	Contour	Classic	Contour
Mögliche Bereifungen		10.0/75-15 oder 31x15,5/15					
Transportbreite (siehe auch Tabelle, Seite 55)	[m]	3,00		4,00		3,00	3,00
Transportlänge	[m]	2,40		2,40		2,80	
Anzahl der Säaggregate in Standardausführung (Reihenabstand 75cm)		4		6			
max. Anzahl der Säaggregate ohne/mit Unterfußdüngung		10/6	6/6	12/6	9/6	7/6	
Antrieb		Kettenradgetriebe 54 Stufen					
Kornabstand (siehe auch Tabellen, Seite 57)	[cm]	3,1 bis 86,9 abhängig von der verwendeten Vereinzelungsscheibe					
Gebläseantrieb		Gelenkwelle mit Freilauf Gelenkwellendrehzahl 540 U/min., 710 U/min. oder 1000 U/min., wahlweise hydraulischer Antrieb					
Vereinzelungsscheiben		Kunststoffvereinzelungsscheiben für Mais, Bohnen, Erbsen, Sojabohnen, Sonnenblumen, usw.					
Düngerbehälterinhalt	[l]	2 x 220		2 x 220 / 900			
Einfüllhöhe Düngerbehälter	[m]	1,60		1,60 / 1,68			
Leergewicht ohne Reihendüngerstreuer ab	[kg]	662	798	824	1028	903	1107
Leergewicht mit Reihendüngerstreuer ab	[kg]	814	986	1021	1225	1100	1350

Technische Daten zur Berechnung der Traktorgewichte und Traktorachslasten (siehe Seite 69)		Gesamtgewicht G_H	Abstand d
ED 302 ohne Dünger-Vorratsbehälter	4-reihig Classic	802 kg	885 mm
	4-reihig Contour	942 kg	1076 mm
	10-reihig Classic	1372 kg	1070 mm
	6-reihig Contour	1202 kg	1180 mm
ED 302 mit 2 x 220-Liter Dünger-Vorratsbehälter	4-reihig Classic	1422 kg	745 mm
	4-reihig Contour	1602 kg	899 mm
	6-reihig Classic	1642 kg	824 mm
	6-reihig Contour	1912 kg	1006 mm
ED 452 ohne Dünger-Vorratsbehälter	6-reihig Classic	1034 kg	950 mm
	6-reihig Contour	1244 kg	1157 mm
	10-reihig Classic	1414 kg	1052 mm
	9-reihig Contour	1634 kg	1252 mm
ED 452 mit 2 x 220-Liter Dünger-Vorratsbehälter	6-reihig Classic	1684 kg	815 mm
	6-reihig Contour	1954 kg	995 mm
ED 452 mit 900-Liter Dünger-Vorratsbehälter	6-reihig Classic	2260 kg	731 mm
	6-reihig Contour	2530 kg	878 mm
ED 452-K ohne Dünger-Vorratsbehälter	6-reihig Classic	1113 kg	917 mm
	6-reihig Contour	1323 kg	1117 mm
	7-reihig Classic	1208 kg	950 mm
	7-reihig Contour	1453 kg	1156 mm
ED 452-K mit 2 x 220-Liter Dünger-Vorratsbehälter	6-reihig Classic	1763 kg	800 mm
	6-reihig Contour	2033 kg	975 mm
ED 452-K mit 900-Liter Dünger-Vorratsbehälter	6-reihig Classic	2339 kg	722 mm
	6-reihig Contour	2609 kg	866 mm

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Einzelkorn-Sämaschine		ED 602-K		ED 902-K	
Säaggregate		Classic	Contour	Classic	Contour
Mögliche Bereifungen		31x15,5/15		26x12,0/12	
Transportbreite (siehe auch Tabelle, Seite 55)	[m]	3,05		3,05 [3]	
Transportlänge	[m]	2,90		2,75 [4]	
Anzahl der Säaggregate in Standardausführung (Reihenabstand 75cm)		8		12	
max. Anzahl der Säaggregate ohne/mit Unterfußdüngung		12/8-12 [1]		18/18 [1]	
Antrieb		Kettenradgetriebe 54 Stufen (Serie)		Kettenradgetriebe Antrieb über 2 Getriebe	
Kornabstand (siehe auch Tabellen, Seite 57)	[cm]	3,1 – 86,9 (abhängig von der Vereinzelungsscheibe)			
Gebläseantrieb		Gelenkwelle mit Freilauf Gelenkwellendrehzahl 540 U/min., 710 U/min. oder 1000 U/min., wahlweise hydraulischer Antrieb.			
Vereinzelungsscheiben		Kunststoffvereinzelungsscheiben für Mais, Bohnen, Erbsen, Sojabohnen, Sonnenblumen, usw.			
Düngerbehälterinhalt	[l]	1100		1500 [2]	
Leergewicht ohne Reihendüngerstreuer ab	[kg]	1337	1606	2975	3312
Leergewicht mit Reihendüngerstreuer ab	[kg]	1697	2112	3227	3564
Leergewicht Fronttank	[kg]	640			

[1] nur in Verbindung mit Fronttank
[2] Fronttank FRS 203
[3] als 18-reihige Ausführung mit Unterfußdüngung 3,15 m Transportbreite
[4] Unterfußdüngung nur in Verbindung mit Fronttank möglich.

Technische Daten zur Berechnung der Traktorgewichte und Traktorachslasten (siehe Seite 69)		Gesamtgewicht G_H	Abstand d
ED 602-K ohne Dünger-Vorratsbehälter	8-reihig Classic	1617 kg	881 mm
	8-reihig Contour	1897 kg	1072 mm
	12-reihig Classic	1997 kg	967 mm
	12-reihig Contour	2417kg	1177 mm
ED 602-K mit 1100-Liter Dünger-Vorratsbehälter	8-reihig Classic	3127 kg	722 mm
	8-reihig Contour	3487 kg	865 mm
ED 602-K mit Reihendünger-Anbausatz für Fronttank	12-reihig Classic	2422 kg	945 mm
	12-reihig Contour	2962 kg	1158 mm
ED 902-K ohne Reihendünger-Anbausatz	12-reihig Classic	2975 kg	850 mm
	12-reihig Contour	3312 kg	900 mm
	18-reihig Classic	3335 kg	950 mm
	18-reihig Contour	3880 kg	1000 mm
ED 902-K mit Reihendünger-Anbausatz für Fronttank	12-reihig Classic	3227 kg	800 mm
	12-reihig Contour	3564 kg	850 mm
	18-reihig Classic	3780 kg	900 mm
	18-reihig Contour	4490 kg	950 mm
Technische Daten zur Berechnung der Traktorgewichte und Traktorachslasten (siehe Seite 69)		**Gesamtgewicht G_V**	**Abstand a_2**
• **Fronttank FRS 103 (ohne Aufsatz)** • **Fronttank FRS 203(ohne Aufsatz)**		2150 kg	0,9 m
• **Fronttank FPS 103 (ohne Aufsatz)** • **Fronttank FPS 203(ohne Aufsatz)**		2675 kg	0,85 m

4.9 Erforderliche Traktor-Ausstattung

Der Traktor muss die leistungsmäßigen Voraussetzungen erfüllen und mit den erforderlichen Hydraulik-, Elektro- und Druckluftanschlüssen ausgerüstet sein um mit der Maschine arbeiten zu können.

Traktor-Motorleistung

	ohne Dünger-Vorratsbehälter	mit Dünger-Vorratsbehälter
ED 302	ab 44 kW (60 PS)	ab 55 kW (75 PS)
ED 452, ED452-K	ab 55 kW (75 PS)	ab 66 kW (90 PS)
ED 602-K	ab 66 kW (90 PS)	ab 88 kW (120 PS)
ED 902-K	ab 132 kW (180 PS)	ab 176 kW (240 PS)

Elektrik

Batterie-Spannung: 12 V (Volt)

Steckdose für Beleuchtung: 7-polig

Hydraulik

Maximaler Betriebsdruck: 200 bar

Traktor-Pumpenleistung:

- 20 l/min. bei 150 bar
  - o ohne hydr. Gebläseantrieb
  - o ohne Befüllschnecke
- 45 l/min. bei 150 bar
  - o mit hydr. Gebläseantrieb
  - o mit Befüllschnecke.

Hydrauliköl der Maschine: Getriebe-/Hydrauliköl Utto SAE 80W API GL4

Das Hydraulik-/Getriebeöl der Maschine ist für die kombinierten Hydraulik-/Getriebeöl-Kreisläufe aller gängigen Traktorfabrikate geeignet.

Traktor-Steuergerät 1:	einfach wirkend	(Spuranreißerbetätigung)
Traktor-Steuergerät 2:	doppelt wirkend	(Auslegerklappung, links [ED 02-K])
Traktor-Steuergerät 3*:	doppelt wirkend	(Auslegerklappung, rechts [ED 02-K])
Traktor-Steuergerät 4:	einfach wirkend	(Hydraulikmotor Befüllschnecke [Option])
Traktor-Steuergerät 5:	siehe Kapitel 7.1.1.1	(Gebläse-Hydraulikmotor [Option])
Traktor-Steuergerät 6:	doppelt wirkend	(Spornradanhebung [Fronttank])

* nicht erforderlich bei ED 902-K. Die Auslegerklappungen erfolgt mit dem Traktor-Steuergerät 2



Hinweis!

Erforderliche Traktor-Steuergräte für Maschinen mit Profischaltung (Option), siehe Kapitel 7.1.1.3, Seite 82.



Wichtig!

Kontrollieren Sie die Verträglichkeit der Hydrauliköle, bevor Sie die Maschine an Ihre Traktor-Hydraulikanlage anschließen.

Mineralöle und Bioöle nicht mischen!



Warnung!

Es ist Verboten, die Steuergeräte 1, 2, 3 und 6 auf dem Traktor zu blockieren. Die jeweilige Hydraulik-Funktion muss automatisch stoppen, wenn das entsprechende Steuergerät losgelassen wird.

4.10 Angaben zur Geräuschentwicklung

Der arbeitsplatzbezogene Emissionswert (Schalldruckpegel) beträgt 74 dB(A), gemessen im Betriebszustand bei geschlossener Kabine am Ohr des Traktorfahrers.

Messgerät: OPTAC SLM 5.

Die Höhe des Schalldruckpegels ist im wesentlichen vom verwendeten Fahrzeug abhängig.

5 Aufbau und Funktion

Das folgende Kapitel informiert Sie über den Aufbau der Maschine und die Funktionen der einzelnen Bauteile.

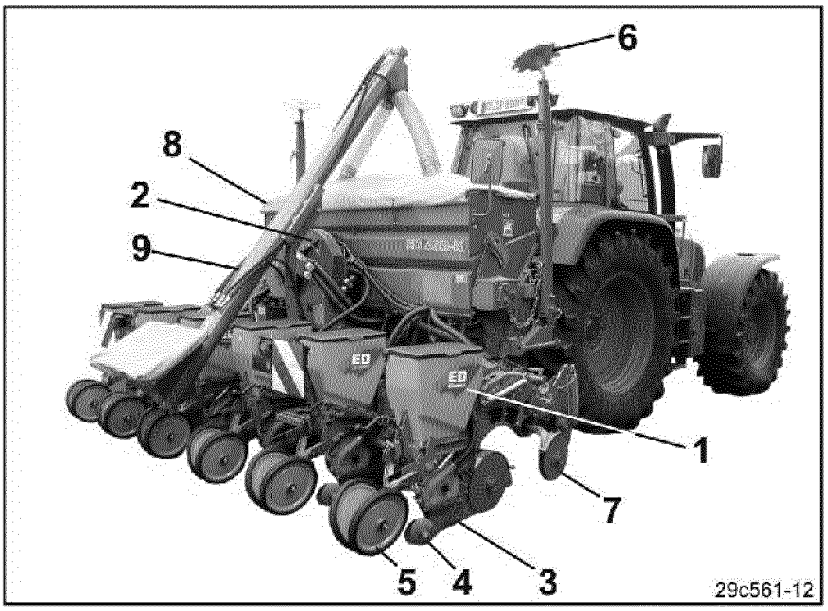


Fig. 27

Einzelkorn-Sämaschinen legen die Saatgutkörner einzeln in gleichmäßig einstellbaren Abständen im Boden ab. In jeder Reihe arbeitet ein Säaggregat mit eigenem Saatgut-Vorratsbehälter (Fig. 27/1).

Das Saatgut wird an den Bohrungen der rotierenden Vereinzelungsscheiben angesaugt. Ein Saugluft-Gebläse (Fig. 27/2) erzeugt den erforderlichen Unterdruck. Am tiefsten Punkt der Vereinzelungsscheibe bricht der Unterdruck ab und das Saatgut-Korn fällt in die vom Säschar (Fig. 27/3) gezogene Saatfurche.

Nach der Aussaat wird das Saatgut von den Zustreichern (Fig. 27/4) und den Andruckrollen (Fig. 27/5) gleichmäßig mit Erde bedeckt und angedrückt.

Die Antriebsräder der Einzelkorn-Sämaschine treiben die Vereinzelungsscheiben an. Die Drehzahl der Vereinzelungsscheiben wird am Verstellgetriebe und am Sekundärgetriebe eingestellt. Getriebe-Drehzahländerungen bewirken Abstandsänderungen der Körner im Boden. Einzelne Säaggregate können elektronisch abgeschaltet werden, z.B. mit dem Bordcomputer **AMASCAN+** (Option).

Das Saugluft-Gebläse (Fig. 27/2) wird über die Zapfwelle oder von einem Hydraulikmotor angetrieben.

Spuranreißer (Fig. 27/6) markieren die Feldanschlussfahrt entweder in Traktormitte oder in der Traktorspur (außer ED 302 und ED 902-K).

Zur Unterfußdüngung (Option) sind Einzelkorn-Sämaschinen mit Düngerscharen (Fig. 27/7) ausgestattet, die den Dünger in der Regel 6 cm (einstellbar) neben den Säscharen (Fig. 27/3) im Boden ablegen.

Die Düngerablagetiefe ist einstellbar. Der Dünger wird im Dünger-Vorratsbehälter (Fig. 27/8) oder im Fronttank mitgeführt.

Mit der Befüllschnecke (Fig. 27/9, Option) werden die Dünger-Vorratsbehälter bequem befüllt.

5.1 Classic-Säaggregat

Das Classic-Säaggregat wird eingesetzt zur Aussaat auf gepflügten Böden.

Saatgüter, die mit dem Classic-Säaggregat ausgebracht werden:

- Mais
- Bohnen
- Sonnenblumen
- Erbsen
- Baumwolle
- Sorghum

Die Saatgutablagetiefe wird mit einer Kurbel (Fig. 28/1) eingestellt.

Die maximale Saatgutablagetiefe beträgt 10 cm.

Der nachlaufende Walkgummireifen (Fig. 28/2)

- führt das Säaggregat in der Tiefe
- drückt die Saatfurche an.

Wird die gewünschte Ablagetiefe nicht erreicht, kann das Säaggregat durch Federdruckbelastung (Fig. 28/3) zusätzlich belastet werden.

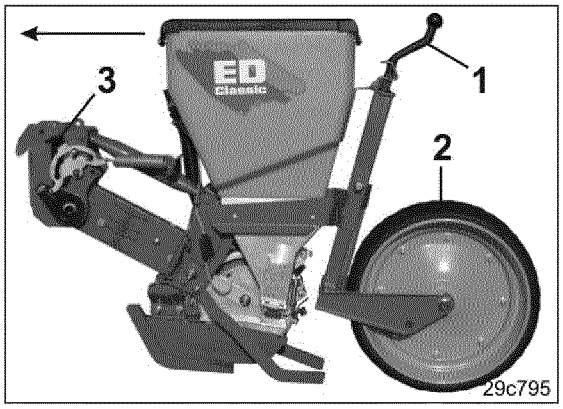


Fig. 28

Die einstellbaren, vorlaufenden Zustreicher (Fig. 29/1) schließen die Säfurche.

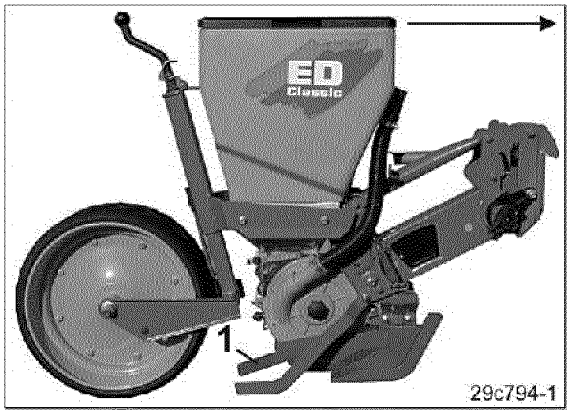


Fig. 29

5.2 Contour-Säaggregat

Aussaat-Verfahren mit dem Contour-Säaggregat:

- Pflugsaat
- Mulchsaat

Saatgüter, die mit dem Contour-Säaggregat ausgebracht werden:

- Mais
- Bohnen
- Sonnenblumen
- Erbsen
- Baumwolle
- Sorghum
- Zuckerrüben
- Rüben
- Wassermelonen
- Raps

Das Contour-Säaggregat stützt sich ab auf der vorlaufenden, einseitig angeordneten Druckrolle (Fig. 30/1) und der nachlaufenden V-Druckrolle (Fig. 30/2).

Die Druckrollen sind über die Tiefeneinstellspindel (Fig. 30/3) miteinander verbunden und bilden ein Längstandem.

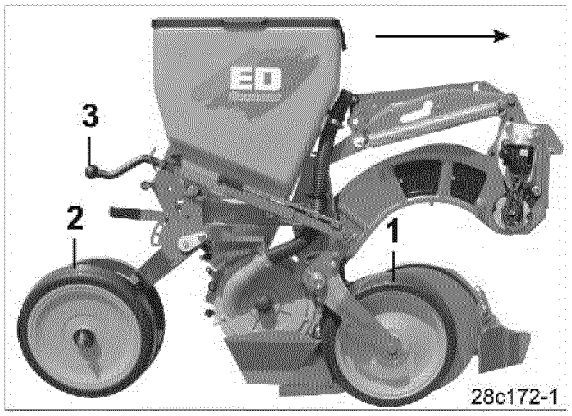


Fig. 30

Das Contour-Säaggregat passt sich dem Verlauf der Oberfläche an (Fig. 31).

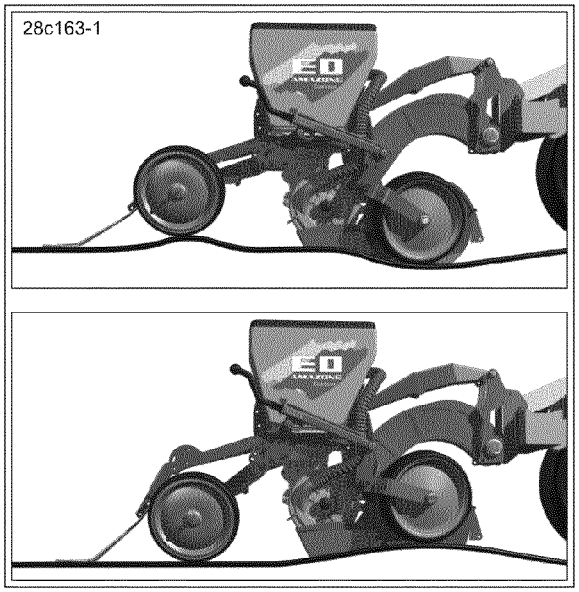


Fig. 31

Die großen Doppelscheiben (Fig. 32/1) räumen auf Feldern mit organischer Masse die Pflanzenreste vor dem Säschar (Fig. 32/2).

Die Gummi-V-Druckrolle (Fig. 32/3) und die Super-V-Druckrolle eignet sich zur Pflug- und Mulchsaat.

Die Gummi-V-Druckrolle

- hält in Verbindung mit der vorderen Andruckrolle die Saatgutablagetiefe ein
- schließt die Saatfurche
- drückt die Saatfurche an.

Die Super-V-Druckrolle (Option)

- erhöht den Bodenandruck neben der Saatfurche durch ein besonderes Gummiprofil mit integriertem Drahtseil.

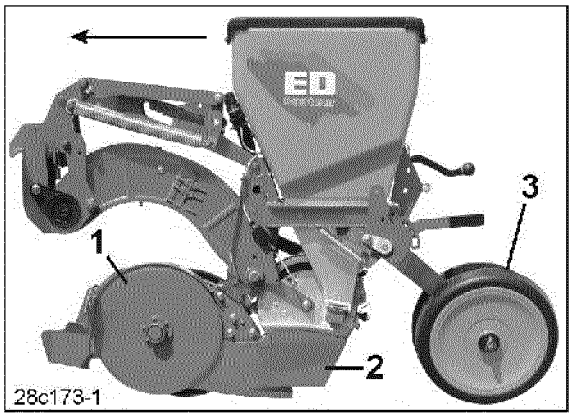


Fig. 32

Die Saatgutablagetiefe wird mit einer Spindel (Fig. 33/1) eingestellt und an einer Skala (Fig. 33/2) angezeigt. Der Skalenwert ist ein relativer Wert, der zum einfachen Einstellen der anderen Aggregate dient.

Die maximale Saatgutablagetiefe beträgt 12 cm.

Die Säaggregate einer Maschine sind aufeinander abgestimmt. Der an einem Säaggregat ermittelte Skalenwert (Fig. 33/2) kann auf alle anderen Säaggregate übertragen werden.

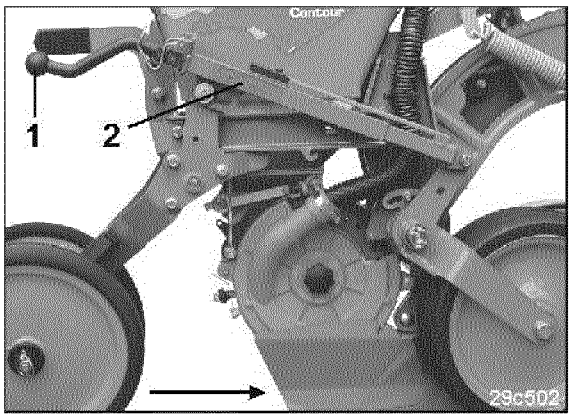


Fig. 33

Wird die gewünschte Ablagetiefe nicht erreicht, kann das Säaggregat durch Federverstellung (Fig. 34/1) zusätzlich belastet werden.

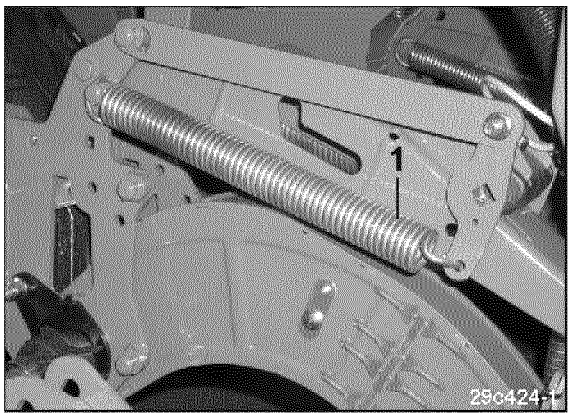


Fig. 34

Die Klutenräumer (Fig. 35/1) ermöglichen den ruhigen Lauf der Säaggregate auf Böden mit groben Oberflächenstrukturen.

Die Klutenräumer nicht zu tief abstecken. Die Klutenräumer sollten nur die groben Kluten zur Seite räumen. Eine vollständige Erdbewegung durch die Klutenräumer führt zu Nachteilen beim Schließen der Saatfurchen.

Bei ungleichmäßiger Ablagetiefe die Klutenräumer im Verstellsegment ein Loch tiefer abstecken und die Ablagetiefe erneut prüfen.

Klutenräumer ganz oben abstecken, wenn sie nicht benötigt werden.

Die einstellbaren, vorlaufenden Zustreicher (Fig. 35/2) schließen die Säfurche. Sie eignen sich zur Einsaat in die Pflugfurche.

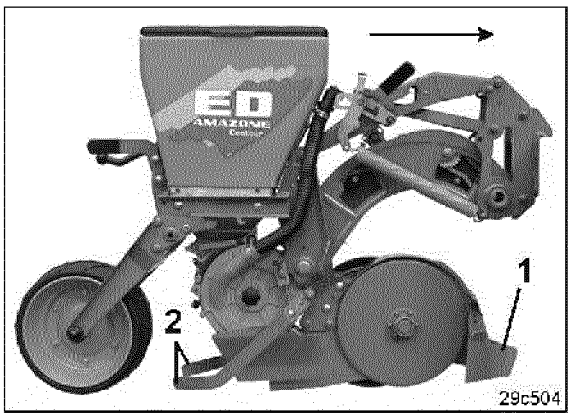


Fig. 35

Scheibenzustreicher (Option, Fig. 36/1) schließen die Säfurche und sind sowohl nach dem Pflug als auch zur Einsaat in Mulch geeignet.

Die nachlaufenden Rollen schließen die Saatfurche und drücken den Boden an.

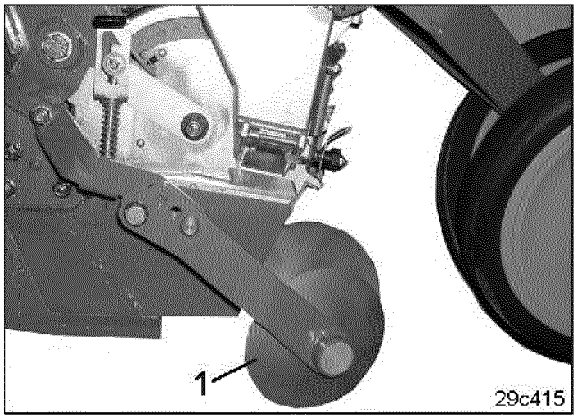


Fig. 36

Die Zwischenandruckrolle (Option) kommt bei kleinen Saatgütern zum Einsatz.

Die Zwischenandruckrolle (Fig. 37/1) drückt das Saatgut an. Auf Grund des besseren Bodenschlusses steht mehr Feuchtigkeit zum Keimen zur Verfügung.

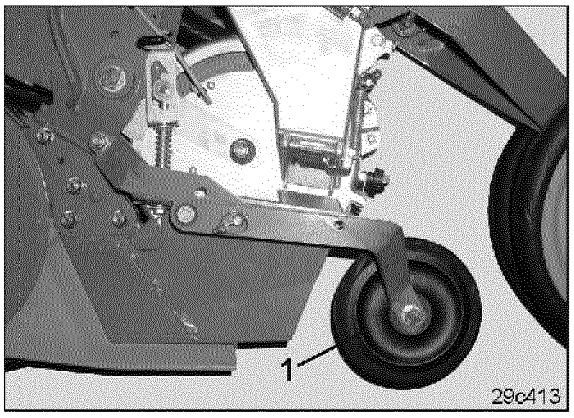


Fig. 37

5.3 Saatgut-Dosierung

Gewünscht wird die Aussaat einer bestimmten Anzahl „Körner pro m^2“ oder „Körner pro ha“ bei eingestelltem Reihenabstand.

Daraus errechnet sich der erforderliche Kornabstand, der durch Drehzahländerung der Vereinzelungsscheiben eingestellt wird

- im Verstellgetriebe (Fig. 38/1) in 18 Stufen
- im Sekundärgetriebe (Fig. 38/2) in 3 Stufen.

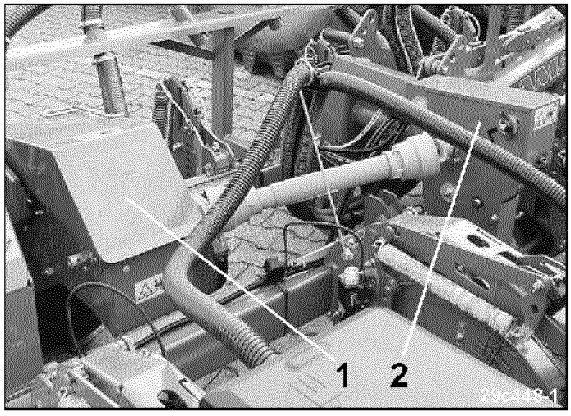


Fig. 38

Das Saatgut rutscht aus dem Saatgut-Behälter durch die Zulauföffnung (Fig. 39/1) in den Saatgut-Vorrats-Bereich (Fig. 39/2) der Vereinzelungsscheibe.

Der Saatgut-Vorrats-Bereich darf weder überlaufen noch zu wenig Saatgut beinhalten.

Mit der Reduzierklappe (Fig. 39/3) wird die richtige Öffnungsgröße eingestellt.

Ein Gebläse erzeugt den Unterdruck hinter den Bohrungen (Fig. 39/4) der sich drehenden Vereinzelungsscheibe. Die Körner aus dem Saatgut-Vorrats-Bereich werden an die Bohrungen (Fig. 39/4) gesaugt.

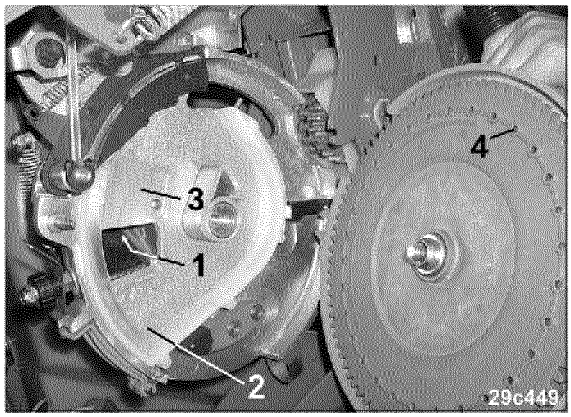


Fig. 39

Die Luft verlässt das Sägehäuse durch die Schlitze (Fig. 40/1) der Saugniere.

Am tiefsten Punkt (Fig. 40/2) der Vereinzelungsscheibe bricht der Unterdruck ab und das Korn fällt in die vom Säschar gezogene Saatfurche.

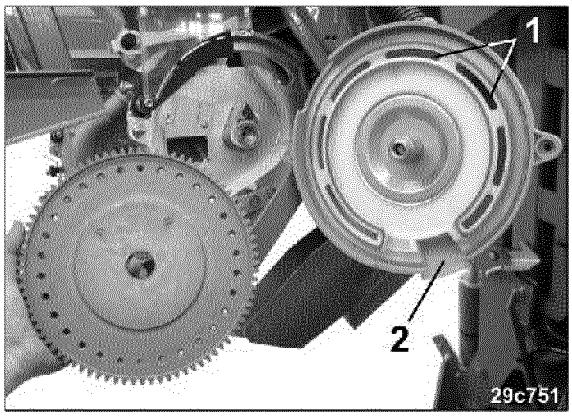


Fig. 40

Ein Auswerfer (Fig. 41/1) löst ggf. Bruchkörner, die die Bohrungen der Vereinzelungsscheibe verstopfen könnten.

Werden mehrere Saatgut-Körner gleichzeitig an eine Bohrung angesaugt, löst ein in 5 Positionen einstellbarer Abstreifer (Fig. 41/2) die überzähligen Saatgut-Körner schonend ab, die dann zurück in den Saatgut-Vorrats-Bereich (Fig. 41/3) fallen.

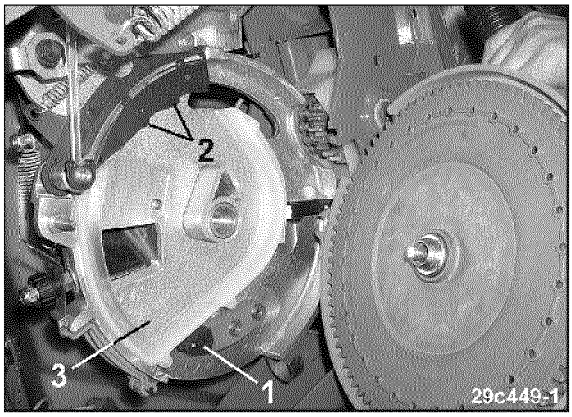


Fig. 41

Das Saugluft-Gebläse (Fig. 42/1) erzeugt den Unterdruck, der die Saatgut-Körner an die Bohrungen der Vereinzelungsscheiben saugt.

Angetrieben wird das Saugluft-Gebläse

- von der Traktor-Zapfwelle oder
- von einem Hydraulik-Motor.

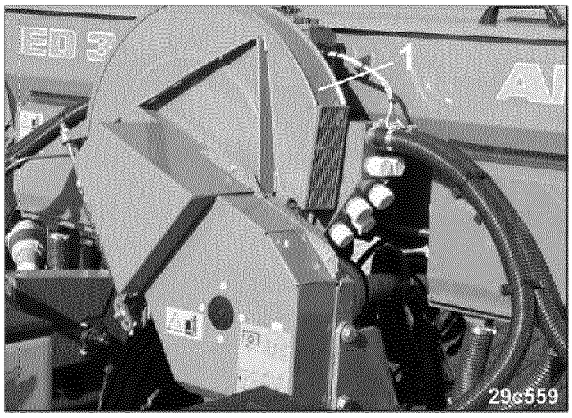


Fig. 42

Den Unterdruck zeigt ein Manometer (Fig. 43/1) in der Traktorkabine an.

Eine Drehzahländerung des Saugluft-Gebläses bewirkt eine Veränderung des Unterdruckes.

Die erforderliche Gebläsedrehzahl anhand des Manometers einstellen.

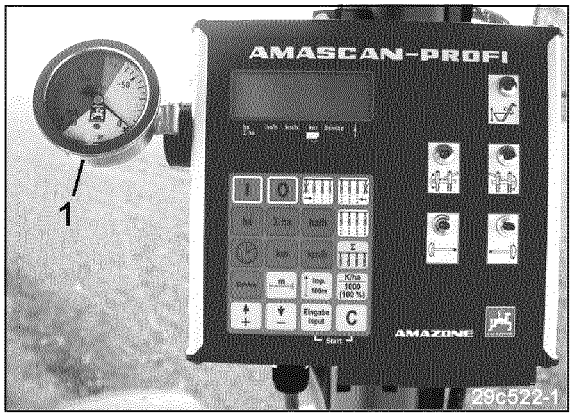


Fig. 43

Die Bohrungen der Vereinzelungsscheiben (Fig. 44) stehen in Relation zu den Saatguteigenschaften (Größe, Form und Gewicht). Die Vereinzelungsscheiben sind entsprechend zu wechseln.

Die Kennzeichnung der Vereinzelungsscheiben gibt die Anzahl der Bohrungen, den Bohrungs-Durchmesser und die Farbe der Vereinzelungsscheibe an, z.B. 30/5,0 grün:

30 Bohrungen / Durchmesser 5,0 mm, Farbe grün.

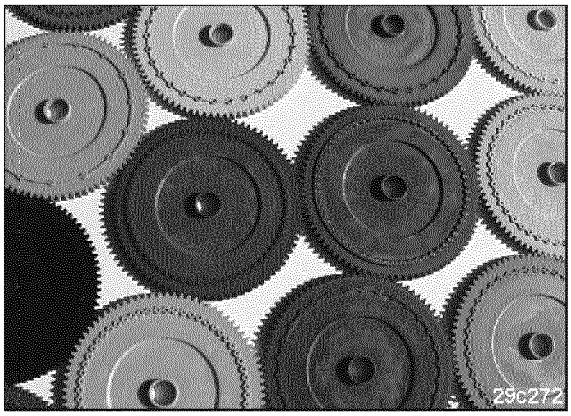


Fig. 44

5.4 Einstellbare Reihenabstände

Reihen-zahl	X	Reihen-abstand	mit Classic-Säaggregaten				mit Contour-Säaggregaten			
			Anzahl der Sä-aggregate	Reihendün-gung mög-lich	Arbeits-breite (m)	Transport-breite (m)	Anzahl der Säaggre-gate	Reihen-düngung möglich	Arbeits-breite (m)	Transport-breite (m)
ED 302										
4	x	70	4	Ja	2,80	3,00	2 rechts / 2 links	Ja	2,80	3,00
4	x	75	4	Ja	3,00	3,00	2 rechts / 2 links	Ja	3,00	3,00
4	x	80	4	Ja	3,20	3,00	2 rechts / 2 links	Ja	3,20	3,00
5	x	60	5	Ja	3.00	3,00	3 rechts / 2 links	Ja	3.00	3,00
6	x	45	6	Ja	2,70	3,00	3 rechts / 3 links	Ja	2,70	3,00
6	x	50	6	Ja	3,00	3,00	3 rechts / 3 links	Ja	3,00	3,00
7	x	45	7	Nein	3,15	3,00	4 rechts / 3 links	Nein	3,15	3,00
8	x	40	8	Nein	3,20	3,00	4 rechts / 3 links	Nein	3,20	3,00
10	x	30	10	Nein	3,00	3,00				
ED 452										
6	x	70	6	Ja	4,20	4,00	3 rechts / 3 links	Ja	4,20	4,00
6	x	75	6	Ja	4,50	4,00	3 rechts / 3 links	Ja	4,50	4,00
6	x	80	6	Ja	4,80	4,25	3 rechts / 3 links	Ja	4,80	4,25
7	x	60	7	Nein	4,20	4,00	4 rechts / 3 links	Nein	4,20	4,00
8	x	50	8	Nein	4,00	4,00	4 rechts / 4 links	Nein	4,00	4,00
9	x	45	9	Nein	4,05	4,00	5 rechts / 4 links	Nein	4,05	4,00
10	x	40	10	Nein	4,00	4,00				
ED 452-K										
6	x	70	6	Ja	4,20	3,00	3 rechts / 3 links	Ja	4,20	3,00
6	x	75	6	Ja	4,50	3,00	3 rechts / 3 links	Ja	4,50	3,00
6	x	80	6	Ja	4,80	3,00	3 rechts / 3 links	Ja	4,80	3,00
7	x	60	7	Nein	4,20	3,00	4 rechts / 3 links	Nein	4,20	3,00
ED 602-K										
8	x	70	8	mit Fronttank	5,60	3,05	4 rechts / 4 links	mit Fronttank	5,60	3,05
8	x	75	8	Ja	6,00	3,05	4 rechts / 4 links	Ja	6,00	3,05
8	x	80	8	Ja	6,40	3,12	4 rechts / 4 links	Ja	6,40	3,12
9	x	60	9	Nein	5,40	3,05	5 rechts / 4 links	Nein	5,40	3,05
12	x	45	12	mit Fronttank	5,40	3,15	6 rechts / 6 links	mit Fronttank	5,40	3,15
12	x	45	12	Nein	5,40	3,05	6 rechts / 6 links	mit Fronttank	5,40	3,05
12	x	50	12	mit Fronttank	6,00	3,15	6 rechts / 6 links	Nein	6,00	3,15
12	x	50	12	Nein	6,00	3,05	6 rechts / 6 links	Nein	6,00	3,05
ED 902-K										
12	x	70	12	mit Fronttank	8,40	3,05	6 rechts / 6 links	mit Fronttank	8,40	3,05
12	x	75	12	mit Fronttank	9,00	3,05	6 rechts / 6 links	mit Fronttank	9,00	3,05
12	x	80	12	mit Fronttank	9,60	3,05	6 rechts / 6 links	mit Fronttank	9,60	3,05
15	x	60	15	Nein	9,00	3,05	8 rechts / 7 links	Nein	9,00	3,05
18	x	45	18	mit Fronttank	8,10	3,15	9 rechts / 9 links	mit Fronttank	8,10	3,15
18	x	45	18	Nein	8,10	3,05	9 rechts / 9 links	Nein	8,10	3,05
18	x	50	18	mit Fronttank	9,00	3,15	9 rechts / 9 links	mit Fronttank	9,00	3,15
18	x	50	18	Nein	9,00	3,05	9 rechts / 9 links	Nein	9,00	3,05

Fig. 45

5.5 Kornabstand

Gewünscht wird die Aussaat einer bestimmten Anzahl „Körner pro m^2„ bzw. „Körner pro Hektar“ bei eingestelltem Reihenabstand und vorgegebener Vereinzelungsscheibe.

5.5.1 Kornabstand (tabellarisch)

Entnehmen Sie den erforderlichen Kornabstand den Tabellen, ab Seite 57.

Beispiel:

Vereinzelungsscheiben:	30 Bohrungen
Reihenabstand:	75 cm
Gewünschte Anzahl Körner pro Hektar:	95000

Die Beispielwerte (schwarz unterlegt) in Tabelle (Fig. 46) aufsuchen und den Kornabstand 13,9 cm ablesen.

Vereinzelungsscheiben mit 30 Bohrungen

	Korn-abstand a (cm)	Körner/m	Reihenabstand 80 cm	75 cm	70 cm	60 cm	50 cm	45 cm	37,5 cm	30 cm
			Körnerzahl pro Hektar							
Y	6,1	16,4	204918	218579	234204	273224	327869	364299	437158	546448
	6,6	15,2	189394	202020	216462	252525	303030	336700	404040	505051
	7,1	14,1	176056	187793	201218	234742	281690	312989	375586	469484
	7,5	13,3	166667	177778	190487	222222	266667	296296	355556	444444
	8,0	12,5	156250	166667	178581	208333	250000	277778	333334	416667
	8,5	11,8	147059	156863	168077	196078	235294	261438	313726	392157
	8,7	11,5	143678	153257	164213	191571	229885	255428	306514	383142
	9,3	10,8	134409	143369	153618	179211	215054	238949	286738	358423
	10,0	10,0	125000	133333	142864	166667	200000	222222	266666	333333
	10,7	9,3	116822	124611	133519	155763	186916	207684	249222	311526
	11,3	8,8	110619	117994	126429	147493	176991	196657	235988	294985
	12,0	8,3	104167	111111	119054	138889	166667	185185	222222	277778
	12,2	8,2	102459	109290	117103	136612	163934	182149	218580	273224
	13,1	7,6	95420	101781	109057	127226	152672	169635	203562	254453
	13,9	7,2	89928	95923	102780	119904	143885	159872	191846	239808
	14,8	6,8	84459	90090	96530	112613	135135	150150	180180	225225
	15,7	6,4	79618	84926	90997	106157	127389	141543	169852	212314

Fig. 46

Vereinzelungsscheiben mit 15 Bohrungen

	Korn-abstand a (cm)	Körner/m	Reihenabstand							
			80 cm	75 cm	70 cm	60 cm	50 cm	45 cm	37,5 cm	30 cm
			Körnerzahl pro Hektar							
Y	12,2	8,2	102459	109290	117103	136612	163934	182149	218580	273224
	13,2	7,6	94697	101010	108231	126263	151515	168350	202020	252525
	14,2	7,0	88028	93897	100609	117371	140845	156495	187794	234742
	15,0	6,7	83333	88889	95243	111111	133333	148148	177778	222222
	16,0	6,3	78125	83333	89290	104167	125000	138889	166666	208333
	17,0	5,9	73529	78431	84038	98039	117647	130719	156862	196078
	17,2	5,8	72674	77519	83061	96899	116279	129199	155038	193798
	18,6	5,4	67204	71685	76809	89606	107527	119474	143370	179211
	20,0	5,0	62500	66667	71433	83333	100000	111111	133334	166667
	21,4	4,7	58411	62305	66759	77882	93458	103842	124610	155763
	22,6	4,4	55310	58997	63214	73746	88496	98328	117994	147493
	24,0	4,2	52083	55556	59527	69444	83333	92593	111112	138889
	24,4	4,1	51230	54645	58551	68306	81967	91075	109290	136612
	26,2	3,8	47710	50891	54529	63613	76336	84818	101782	127226
	27,8	3,6	44964	47962	51391	59952	71942	79936	95924	119904
	29,6	3,4	42230	45045	48265	56306	67568	75075	90090	112613
	31,4	3,2	39809	42463	45499	53079	63694	70771	84926	106157
X	21,0	4,8	59524	63492	68031	79365	95238	105820	126984	158730
	22,6	4,4	55310	58997	63214	73746	88496	98328	117994	147493
	24,2	4,1	51653	55096	59035	68871	82645	91827	110192	137741
	25,8	3,9	48450	51680	55374	64599	77519	86133	103360	129199
	27,4	3,6	45620	48662	52141	60827	72993	81103	97324	121655
	29,0	3,4	43103	45977	49264	57471	68966	76628	91954	114943
	29,6	3,4	42230	45045	48265	56306	67568	75075	90090	112613
	32,0	3,1	39063	41667	44646	52083	62500	69444	83334	104167
	34,2	2,9	36550	38986	41773	48733	58480	64977	77972	97466
	36,6	2,7	34153	36430	39034	45537	54645	60716	72860	91075
	38,4	2,6	32552	34722	37204	43403	52083	57870	69444	86806
	41,0	2,4	30488	32520	34845	40650	48780	54201	65040	81301
	41,8	2,4	29904	31898	34178	39872	47847	53163	63796	79745
	44,8	2,2	27902	29762	31890	37202	44643	49603	59524	74405
	47,8	2,1	26151	27894	29888	34868	41841	46490	55788	69735
	50,8	2,0	24606	26247	28123	32808	39370	43745	52494	65617
	53,8	1,9	23234	24783	26555	30979	37175	41305	49566	61958
Z	33,9	3,0	36857	39315	42125	49143	58973	65524	78630	98287
	36,6	2,8	34197	36477	39085	45597	54716	60796	72954	91195
	39,0	2,5	32050	34187	36631	42734	51280	56978	68374	85467
	41,6	2,4	30020	32021	34310	40026	48032	53369	64042	80053
	44,3	2,2	28232	30114	32267	37642	45170	50189	60228	75284
	46,9	2,1	26644	28421	30453	35525	42631	47367	56842	71050
	47,9	2,1	26119	27861	29853	34826	41791	46435	55722	69652
	51,6	1,9	24213	25827	27673	32284	38741	43046	51654	64568
	55,2	1,8	22643	24152	25879	30190	36229	40254	48304	60381
	59,2	1,7	21128	22537	24148	28171	33806	37562	45074	56343
	62,7	1,6	19923	21251	22770	26564	31877	35419	42502	53128
	66,1	1,5	18901	20161	21602	25202	30242	33603	40322	50403
	67,5	1,5	18532	19767	21180	24709	29651	32946	39534	49418
	72,4	1,4	17277	18429	19746	23036	27644	30715	36858	46072
	77,2	1,3	16182	17260	18494	21575	25890	28767	34520	43150
	82,0	1,2	15252	16269	17432	20335	24403	27114	32538	40670
	86,9	1,2	14391	15350	16447	19189	23026	25584	30700	38376

Vereinzelungsscheiben mit 30 Bohrungen

	Korn-abstand a (cm)	Körner/m	Reihenabstand							
			80 cm	75 cm	70 cm	60 cm	50 cm	45 cm	37,5 cm	30 cm
			Körnerzahl pro Hektar							
Y	6,1	16,4	204918	218579	234204	273224	327869	364299	437158	546448
	6,6	15,2	189394	202020	216462	252525	303030	336700	404040	505051
	7,1	14,1	176056	187793	201218	234742	281690	312989	375586	469484
	7,5	13,3	166667	177778	190487	222222	266667	296296	355556	444444
	8,0	12,5	156250	166667	178581	208333	250000	277778	333334	416667
	8,5	11,8	147059	156863	168077	196078	235294	261438	313726	392157
	8,7	11,5	143678	153257	164213	191571	229885	255428	306514	383142
	9,3	10,8	134409	143369	153618	179211	215054	238949	286738	358423
	10,0	10,0	125000	133333	142864	166667	200000	222222	266666	333333
	10,7	9,3	116822	124611	133519	155763	186916	207684	249222	311526
	11,3	8,8	110619	117994	126429	147493	176991	196657	235988	294985
	12,0	8,3	104167	111111	119054	138889	166667	185185	222222	277778
	12,2	8,2	102459	109290	117103	136612	163934	182149	218580	273224
	13,1	7,6	95420	101781	109057	127226	152672	169635	203562	254453
	13,9	7,2	89928	95923	102780	119904	143885	159872	191846	239808
	14,8	6,8	84459	90090	96530	112613	135135	150150	180180	225225
	15,7	6,4	79618	84926	90997	106157	127389	141543	169852	212314
X	10,5	9,5	119048	126984	136062	158730	190476	211640	253968	317460
	11,3	8,8	110619	117994	126429	147493	176991	196657	235988	294985
	12,1	8,3	103306	110193	118070	137741	165289	183655	220386	275482
	12,9	7,8	96899	103359	110748	129199	155039	172265	206718	258398
	13,7	7,3	91241	97324	104281	121655	145985	162206	194648	243309
	14,5	6,9	86207	91954	98527	114943	137931	153257	183908	229885
	14,8	6,8	84459	90090	96530	112613	135135	150150	180180	225225
	16,0	6,3	78125	83333	89290	104167	125000	138889	166666	208333
	17,1	5,8	73099	77973	83547	97466	116959	129955	155946	194932
	18,3	5,5	68306	72860	78068	91075	109290	121433	145720	182149
	19,4	5,2	64433	68729	73642	85911	103093	114548	137458	171821
	20,5	4,9	60976	65041	69691	81301	97561	108401	130082	162602
	20,9	4,8	59809	63796	68357	79745	95694	106326	127592	159490
	22,4	4,5	55804	59524	63779	74405	89286	99206	119048	148810
	23,9	4,2	52301	55788	59776	69735	83682	92980	111576	139470
	25,4	3,9	49213	52493	56246	65617	78740	87489	104986	131234
	26,9	3,7	46468	49566	53109	61958	74349	82610	99132	123916
Z	17,0	5,9	73715	78630	84251	98287	117944	131050	157260	196574
	18,3	5,5	68396	72956	78171	91195	109433	121593	145912	182388
	19,5	5,1	64100	68373	73261	85467	102560	113956	136746	170934
	20,8	4,8	60040	64042	68620	80053	96064	106737	128084	160106
	22,1	4,6	56462	60227	64532	75284	90340	100379	120454	150567
	23,5	4,2	53288	56841	60904	71050	85261	94735	113682	142102
	23,9	4,1	52240	55721	59704	69652	83583	92870	111442	139305
	25,8	3,8	48426	51655	55348	64568	77482	86091	103310	129137
	27,6	3,6	45286	48305	51758	60381	72457	80508	96610	120763
	29,6	3,4	42257	45074	48296	56343	67611	75123	90148	112686
	31,4	3,2	39847	42502	45540	53128	63754	70837	85004	106256
	33,1	3,0	37803	40323	43206	50403	60484	67205	80646	100807
	33,7	3,0	37063	39535	42361	49418	59302	65890	79070	98836
	36,2	2,8	34554	36857	39492	46072	55286	61429	73714	92145
	38,6	2,5	32363	34520	36988	43150	51780	57534	69040	86301
	41,0	2,4	30503	32536	34862	40670	48805	54228	65072	81341
	43,4	2,3	28783	30702	32897	38376	46052	51169	61404	76754

Vereinzelungsscheiben mit 45 Bohrungen

	Korn-abstand a (cm)	Körner/m	Reihenabstand							
			80 cm	75 cm	70 cm	60 cm	50 cm	45 cm	37,5 cm	30 cm
			Körnerzahl pro Hektar							
Y	4,1	24,4	304878	325203	348450	406504	487805	542005	650406	813008
	4,4	22,7	284091	303030	324692	378788	454545	505051	606060	757576
	4,7	21,3	265957	283688	303968	354610	425532	472813	567376	709220
	5,0	20,0	250000	266667	285730	333333	400000	444444	533334	666667
	5,3	18,9	235849	251572	269556	314465	377358	419287	503144	628931
	5,6	17,9	223214	238095	255115	297619	357143	396825	476190	595238
	5,7	17,5	219298	233918	250640	292398	350877	389864	467836	584795
	6,2	16,1	201613	215054	230427	268817	322581	358423	430108	537634
	6,6	15,2	189394	202020	216462	252525	303030	336700	404040	505051
	7,1	14,1	176056	187793	201218	234742	281690	312989	375586	469484
	7,6	13,2	164474	175439	187980	219298	263158	292398	350878	438596
	8,0	12,5	156250	166667	178581	208333	250000	277778	333334	416667
	8,2	12,2	152439	162602	174226	203252	243902	271003	325204	406504
	8,7	11,5	143678	153257	164213	191571	229885	255428	306514	383142
	9,3	10,8	134409	143369	153618	179211	215054	238949	286738	358423
	9,9	10,1	126263	134680	144308	168350	202020	224467	269360	336700
	10,4	9,6	120192	128205	137370	160256	192308	213675	256410	320513
X	7,0	14,3	178571	190476	204092	238095	285714	317460	380952	476190
	7,5	13,3	166667	177778	190487	222222	266667	296296	355556	444444
	8,1	12,3	154321	164609	176376	205761	246914	274348	329218	411523
	8,6	11,6	145349	155039	166122	193798	232558	258398	310078	387597
	9,1	11,0	137363	146520	156994	183150	219780	244200	293040	366300
	9,7	10,3	128866	137457	147283	171821	206186	229095	274914	343643
	9,9	10,1	126263	134680	144308	168350	202020	224467	269360	336700
	10,7	9,3	116822	124611	133519	155763	186916	207684	249222	311526
	11,4	8,8	109649	116959	125320	146199	175439	194932	233918	292398
	12,2	8,2	102459	109290	117103	136612	163934	182149	218580	273224
	12,9	7,8	96899	103359	110748	129199	155039	172265	206718	258398
	13,7	7,3	91241	97324	104281	121655	145985	162206	194648	243309
	13,9	7,2	89928	95923	102780	119904	143885	159872	191846	239808
	14,9	6,7	83893	89485	95882	111857	134228	149142	178970	223714
	15,9	6,3	78616	83857	89852	104822	125786	139762	167714	209644
	16,9	5,9	73964	78895	84535	98619	118343	131492	157790	197239
	17,9	5,6	69832	74488	79813	93110	111732	124146	148976	186220
Z	11,3	8,8	110573	117944	126375	147431	176917	196574	235888	294861
	12,2	8,3	102858	109716	117559	137145	164574	182859	219432	274289
	13,1	7,6	95459	101822	109101	127278	152734	169704	203644	254556
	13,6	7,3	92145	98287	105313	122859	147431	163812	196574	245717
	14,7	6,8	85056	90726	97212	113409	136090	151211	181452	226816
	15,6	6,4	79932	85261	91356	106577	127892	142102	170522	213152
	16,0	6,3	78051	83255	89207	104068	124882	138758	166510	208137
	17,2	5,8	72507	77341	82870	96676	116011	128901	154682	193351
	18,4	5,4	68045	72581	77770	90726	108872	120969	145162	181453
	19,7	5,1	63487	67719	72560	84649	101579	112865	135438	169299
	20,8	4,8	60040	64042	68620	80053	96064	106737	128084	160106
	22,1	4,6	56462	60227	64532	75284	90340	100379	120454	150567
	22,4	4,5	55751	59467	63718	74335	89202	99113	118934	148669
	24,0	4,1	52035	55504	59472	69379	83255	92505	111008	138758
	25,7	3,9	48604	51844	55550	64805	77765	86406	103688	129609
	27,3	3,6	45754	48805	52294	61005	73207	81341	97610	122012
	28,9	3,5	43221	46102	49398	57628	69154	76837	92204	115256

Vereinzelungsscheiben mit 60 Bohrungen

	Korn-abstand a (cm)	Körner/m	Reihenabstand							
			80 cm	75 cm	70 cm	60 cm	50 cm	45 cm	37,5 cm	30 cm
			Körnerzahl pro Hektar							
Y	3,1	32,8	409836	437158	468409	546448	655738	728597	874316	1092896
	3,3	30,3	378788	404040	432923	505051	606061	673401	808080	1010101
	3,6	28,2	352113	375587	402436	469484	563380	625978	751174	938967
	3,8	26,7	333333	355556	380973	444444	533333	592593	711112	888889
	4,0	25,0	312500	333333	357162	416667	500000	555556	666666	833333
	4,3	23,5	294118	313725	336152	392157	470588	522876	627450	784314
	4,4	23,0	287356	306513	328424	383142	459770	510856	613026	766284
	4,7	21,5	268817	286738	307236	358423	430108	477897	573476	716846
	5,0	20,0	250000	266667	285730	333333	400000	444444	533334	666667
	5,4	18,7	233645	249221	267037	311526	373832	415369	498442	623053
	5,7	17,7	221239	235988	252858	294985	353982	393314	471976	589971
	6,0	16,7	208333	222222	238108	277778	333333	370370	444444	555556
	6,1	16,4	204918	218579	234204	273224	327869	364299	437158	546448
	6,6	15,3	190840	203562	218114	254453	305344	339271	407124	508906
	7,0	14,4	179856	191847	205561	239808	287770	319744	383694	479616
	7,4	13,5	168919	180180	193060	225225	270270	300300	360360	450450
	7,9	12,7	159236	169851	181993	212314	254777	283086	339702	424628
X	5,3	19,0	238095	253968	272123	317460	380952	423280	507936	634921
	5,7	17,7	221239	235988	252858	294985	353982	393314	471976	589971
	6,1	16,5	206612	220386	236141	275482	330579	367309	440772	550964
	6,5	15,5	193798	206718	221495	258398	310078	344531	413436	516796
	6,9	14,6	182482	194647	208562	243309	291971	324412	389294	486618
	7,3	13,8	172414	183908	197055	229885	275862	306513	367816	459770
	7,4	13,5	168919	180180	193060	225225	270270	300300	360360	450450
	8,0	12,5	156250	166667	178581	208333	250000	277778	333334	416667
	8,6	11,7	146199	155945	167093	194932	233918	259909	311890	389864
	9,2	10,9	136612	145719	156136	182149	218579	242866	291438	364299
	9,7	10,3	128866	137457	147283	171821	206186	229095	274914	343643
	10,3	9,8	121951	130081	139380	162602	195122	216802	260162	325203
	10,5	9,6	119617	127592	136713	159490	191388	212653	255184	318979
	11,2	8,9	111607	119048	127558	148810	178571	198413	238096	297619
	12,0	8,4	104603	111576	119552	139470	167364	185960	223152	278940
	12,7	7,9	98425	104987	112492	131234	157480	174978	209974	262467
	13,5	7,4	92937	99133	106220	123916	148699	165221	198266	247831
Z	8,5	11,8	147431	157259	168501	196574	235889	262099	314518	393148
	9,1	10,9	136791	145911	156342	182388	218866	243184	291822	364777
	9,8	10,2	127584	136090	145819	170112	204135	226816	272180	340225
	10,5	9,6	119539	127507	136622	159384	191261	212512	255014	318768
	11,1	9,0	112447	119943	128517	149929	179916	199906	239886	299859
	11,8	8,5	106150	113227	121321	141533	169840	188711	226454	283067
	12,0	8,4	104478	111444	119411	139305	167165	185739	222888	278609
	12,9	7,7	96852	103309	110694	129137	154963	172182	206618	258273
	13,8	7,2	90264	96281	103164	120352	144421	160469	192562	240703
	14,8	6,8	84515	90149	96593	112686	135223	150248	180298	225371
	15,7	6,4	79453	84750	90808	105938	127125	141251	169500	211876
	16,6	6,1	75391	80417	86166	100521	120625	134028	160834	201042
	16,9	5,9	74127	79069	84721	98836	118604	131781	158138	197673
	18,1	5,5	69108	73715	78985	92145	110573	122859	147430	184288
	19,3	5,2	64726	69041	73976	86301	103561	115068	138082	172602
	21,5	4,7	58197	62077	66515	77595	93114	103460	124154	155190
	21,9	4,6	57193	61005	65366	76257	91509	101676	122010	152514

Vereinzelungsscheiben mit 90 Bohrungen

	Korn-abstand a (cm)	Körner/m	Reihenabstand							
			80 cm	75 cm	70 cm	60 cm	50 cm	45 cm	37,5 cm	30 cm
			Körnerzahl pro Hektar							
Y	2,1	48,8	609756	650407	696902	813008	975610	1084011	1300814	1626016
	2,2	45,5	568182	606061	649386	757576	909091	1010101	1212122	1515152
	2,4	42,6	531915	567376	607935	709220	851064	945626	1134752	1418440
	2,5	40,0	500000	533333	571459	666667	800000	888889	1066666	1333333
	2,7	37,7	471698	503145	539113	628931	754717	838574	1006290	1257862
	2,8	35,7	446429	476190	510231	595238	714286	793651	952380	1190476
	2,9	35,1	438596	467836	501280	584795	701754	779727	935672	1169591
	3,1	32,3	403226	430108	460855	537634	645161	716846	860216	1075269
	3,3	30,3	378788	404040	432923	505051	606061	673401	808080	1010101
	3,6	28,2	352113	375587	402436	469484	563380	625978	751174	938967
	3,8	26,3	328947	350877	375960	438596	526316	584795	701754	877193
	4,0	25,0	312500	333333	357162	416667	500000	555556	666666	833333
	4,1	24,4	304878	325203	348450	406504	487805	542005	650406	813008
	4,4	23,0	287356	306513	328424	383142	459770	510856	613026	766284
	4,7	21,5	268817	286738	307236	358423	430108	477897	573476	716846
	5,0	20,2	252525	269360	288615	336700	404040	448934	538720	673401
	5,2	19,2	240385	256410	274740	320513	384615	427350	512820	641026
X	3,5	28,6	357143	380952	408185	476190	571429	634921	761904	952381
	3,8	26,7	333333	355556	380973	444444	533333	592593	711112	888889
	4,1	24,7	308642	329218	352752	411523	493827	548697	658436	823045
	4,3	23,3	290698	310078	332244	387597	465116	516796	620156	775194
	4,5	22,1	276243	294659	315723	368324	441989	491099	589318	736648
	4,9	20,6	257732	274914	294567	343643	412371	458190	549828	687285
	5,0	20,2	252525	269360	288615	336700	404040	448934	538720	673401
	5,4	18,7	233645	249221	267037	311526	373832	415369	498442	623053
	5,7	17,5	219298	233918	250640	292398	350877	389864	467836	584795
	6,1	16,4	204918	218579	234204	273224	327869	364299	437158	546448
	6,5	15,5	193798	206718	221495	258398	310078	344531	413436	516796
	6,9	14,6	182482	194647	208562	243309	291971	324412	389294	486618
	7,0	14,4	179856	191847	205561	239808	287770	319744	383694	479616
	7,5	13,4	167785	178971	191765	223714	268456	298285	357942	447427
	8,0	12,6	157233	167715	179704	209644	251572	279525	335430	419287
	8,5	11,8	147929	157791	169071	197239	236686	262985	315582	394477
	9,0	11,2	139665	148976	159626	186220	223464	248293	297952	372439
Z	5,7	17,7	221145	235889	252752	294861	353833	393148	471778	589723
	6,1	16,5	205717	219431	235117	274289	329148	365720	438862	548579
	6,6	15,3	190917	203646	218204	254556	305468	339408	407292	509112
	6,8	14,8	184288	196574	210626	245717	294861	327623	393148	491435
	7,3	13,6	170112	181453	194424	226816	272179	302421	362906	453632
	7,8	12,7	159864	170523	182713	213152	255783	284204	341046	426305
	8,0	12,5	156103	166510	178413	208137	249765	277516	333020	416275
	8,7	11,6	145014	154681	165739	193351	232022	257802	309362	386703
	9,2	10,9	136090	145162	155539	181453	217743	241937	290324	362906
	9,9	10,2	126973	135439	145121	169299	203158	225731	270878	338596
	10,5	9,6	120079	128085	137241	160106	192126	213474	256170	320211
	11,1	9,0	112926	120454	129065	150567	180681	200756	240908	301135
	11,2	8,9	111502	118936	127438	148669	178403	198226	237872	297339
	12,1	8,3	104068	111006	118941	138758	166510	185011	222012	277516
	12,9	7,7	97207	103687	111099	129609	155531	172812	207374	259218
	13,7	7,3	91509	97609	104587	122012	146414	162682	195218	244023
	14,5	6,9	86441	92204	98795	115256	138306	153673	184408	230510

5.5.2 Kornabstand (rechnerisch)

$$\text{Kornabstand a [cm]} = \frac{100}{\text{Körner pro m}^2 \text{ x Reihenabstand [m]}}$$

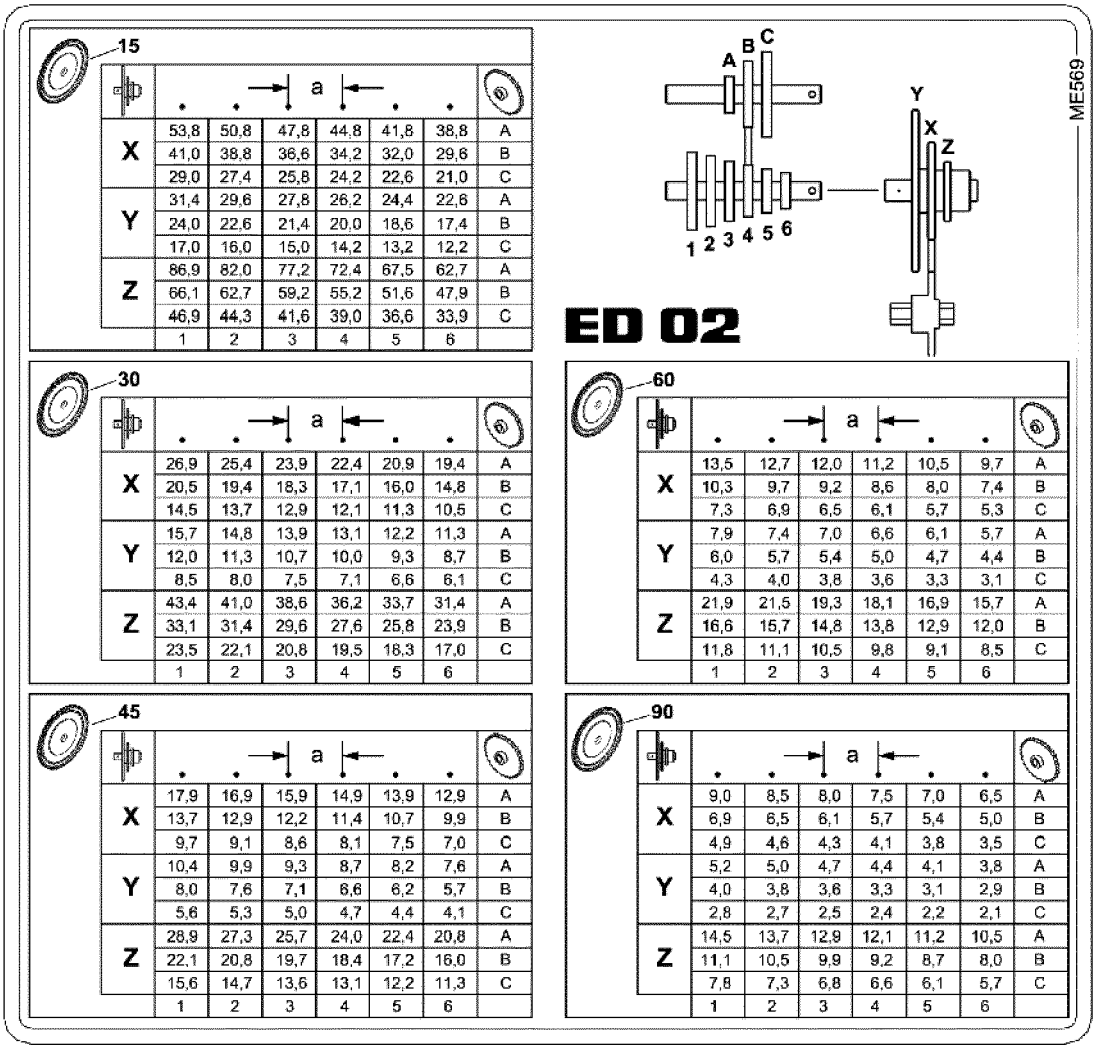
Beispiel:

Anzahl der Bohrungen der Vereinzelungsscheiben:	30 Bohrungen
Gewünschte Anzahl „Körnerzahl pro Hektar“:	95000 Körner/ha (= 9,5 Körner pro m²)
Gewählter Reihenabstand:	0,75 m

$$\text{Kornabstand a [cm]} = \frac{100}{9{,}5 \text{ x } 0{,}75 \text{ [m]}} = 14{,}04 \text{ cm}$$

Mit den Werten (30 Bohrungen/14,04 cm) in die Tabelle (Fig. 47) gehen und den nächstliegenden Wert entnehmen:
Kornabstand a = 13,9 cm.

5.5.3 Kettenradpaarungen ermitteln für die Verstell- und Sekundärgetriebe



15

	a						
X	53,8	50,8	47,8	44,8	41,8	38,8	A
	41,0	38,8	36,6	34,2	32,0	29,6	B
	29,0	27,4	25,8	24,2	22,6	21,0	C
Y	31,4	29,6	27,8	26,2	24,4	22,6	A
	24,0	22,6	21,4	20,0	18,6	17,4	B
	17,0	16,0	15,0	14,2	13,2	12,2	C
Z	86,9	82,0	77,2	72,4	67,5	62,7	A
	66,1	62,7	59,2	55,2	51,6	47,9	B
	46,9	44,3	41,6	39,0	36,6	33,9	C
	1	2	3	4	5	6	

30

	a						
X	26,9	25,4	23,9	22,4	20,9	19,4	A
	20,5	19,4	18,3	17,1	16,0	14,8	B
	14,5	13,7	12,9	12,1	11,3	10,5	C
Y	15,7	14,8	13,9	13,1	12,2	11,3	A
	12,0	11,3	10,7	10,0	9,3	8,7	B
	8,5	8,0	7,5	7,1	6,6	6,1	C
Z	43,4	41,0	38,6	36,2	33,7	31,4	A
	33,1	31,4	29,6	27,6	25,8	23,9	B
	23,5	22,1	20,8	19,5	18,3	17,0	C
	1	2	3	4	5	6	

60

	a						
X	13,5	12,7	12,0	11,2	10,5	9,7	A
	10,3	9,7	9,2	8,6	8,0	7,4	B
	7,3	6,9	6,5	6,1	5,7	5,3	C
Y	7,9	7,4	7,0	6,6	6,1	5,7	A
	6,0	5,7	5,4	5,0	4,7	4,4	B
	4,3	4,0	3,8	3,6	3,3	3,1	C
Z	21,9	21,5	19,3	18,1	16,9	15,7	A
	16,6	15,7	14,8	13,8	12,9	12,0	B
	11,8	11,1	10,5	9,8	9,1	8,5	C
	1	2	3	4	5	6	

45

	a						
X	17,9	16,9	15,9	14,9	13,9	12,9	A
	13,7	12,9	12,2	11,4	10,7	9,9	B
	9,7	9,1	8,6	8,1	7,5	7,0	C
Y	10,4	9,9	9,3	8,7	8,2	7,6	A
	8,0	7,6	7,1	6,6	6,2	5,7	B
	5,6	5,3	5,0	4,7	4,4	4,1	C
Z	28,9	27,3	25,7	24,0	22,4	20,8	A
	22,1	20,8	19,7	18,4	17,2	16,0	B
	15,6	14,7	13,6	13,1	12,2	11,3	C
	1	2	3	4	5	6	

90

	a						
X	9,0	8,5	8,0	7,5	7,0	6,5	A
	6,9	6,5	6,1	5,7	5,4	5,0	B
	4,9	4,6	4,3	4,1	3,8	3,5	C
Y	5,2	5,0	4,7	4,4	4,1	3,8	A
	4,0	3,8	3,6	3,3	3,1	2,9	B
	2,8	2,7	2,5	2,4	2,2	2,1	C
Z	14,5	13,7	12,9	12,1	11,2	10,5	A
	11,1	10,5	9,9	9,2	8,7	8,0	B
	7,8	7,3	6,8	6,6	6,1	5,7	C
	1	2	3	4	5	6	

Fig. 47

Beispiel:

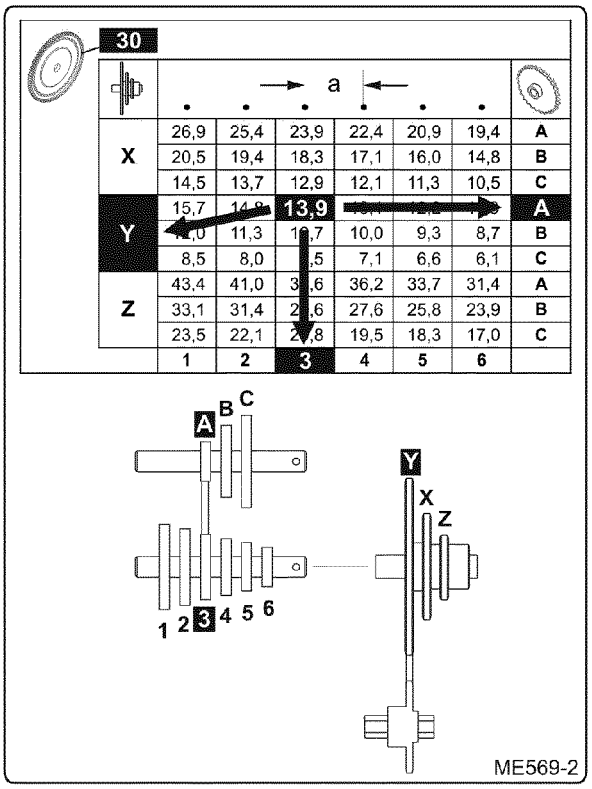
Vereinzelungsscheiben: 30 Bohrungen

Kornabstand a: 13,9 cm

Der Tabelle (Fig. 48) entnehmen:

Kettenradpaarung im Verstellgetriebe: A – 3

Kettenradpaarung im Sekundärgetriebe: Y



	1	2	3	4	5	6	
X	26,9	25,4	23,9	22,4	20,9	19,4	A
	20,5	19,4	18,3	17,1	16,0	14,8	B
	14,5	13,7	12,9	12,1	11,3	10,5	C
Y	15,7	14,9	13,9	13,1	12,2	11,4	A
	12,0	11,3	10,7	10,0	9,3	8,7	B
	8,5	8,0	7,5	7,1	6,6	6,1	C
Z	43,4	41,0	38,6	36,2	33,7	31,4	A
	33,1	31,4	29,6	27,6	25,8	23,9	B
	23,5	22,1	20,8	19,5	18,3	17,0	C

Fig. 48

5.6 Spuranreißer

Die hydraulisch betätigten Spuranreißer (Fig. 49) greifen abwechselnd rechts und links neben der Maschine in den Boden ein.

Hierbei erzeugt der aktive Spuranreißer eine Markierung. Diese Markierung dient dem Traktorfahrer als Orientierungshilfe zum korrekten Anschlussfahren nach dem Wenden am Vorgewende.

Nach dem Wenden fährt der Traktorfahrer bei der Anschlussfahrt entweder mittig über die Markierung oder mit dem Vorderreifen auf der Markierung.

Einstellbar ist

- die Länge der Spuranreißer
- die Arbeitsintensität der Spuranreißer, je nach Bodenart.



Fig. 49

5.7 Spurlockerer (Option)

Die Ausführung der Spurlockerer (Option) ist abhängig vom Maschinentyp und Einsatzgebiet.

Die Spurlockerer (Fig. 50) sind horizontal und vertikal einstellbar.

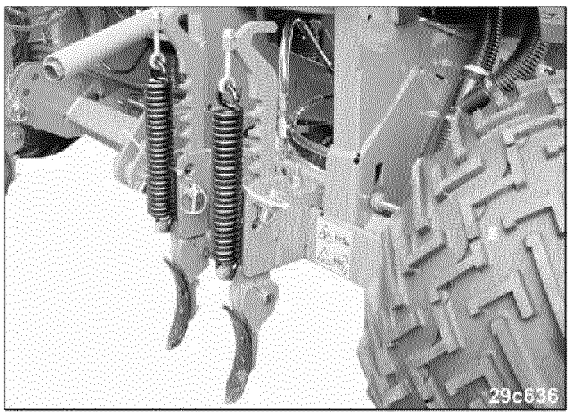


Fig. 50

5.8 Unterfußdüngung (Option)

5.8.1 Düngerschare

Die Düngerablagetiefe und der Abstand der Düngerschare zum Säschar ist einstellbar.

Hindernissen weichen die Düngerschare aus.

Die Schlepp-Düngerschare (Fig. 51) kommen zum Einsatz

- auf gepflügten Böden.

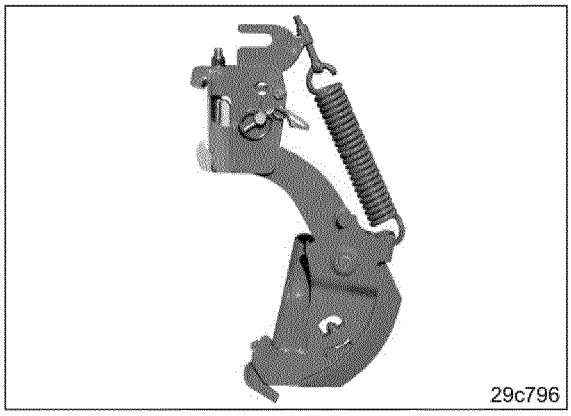


Fig. 51

Die Einscheiben-Düngerschare (Fig. 52) kommen zum Einsatz

- auf gepflügten Böden
- bei Mulchsaaten.

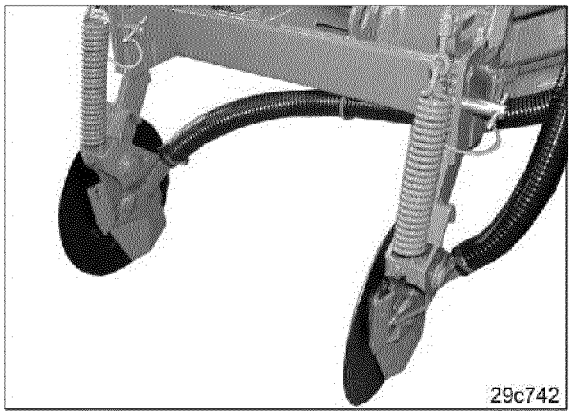


Fig. 52

5.9 Elektronische Überwachung und Bedienung (Option)

Elektronisch überwacht und bedient wird die Einzelkorn-Sämaschine von einem Bordcomputer (Option). Für die unterschiedlichen Anforderungen stehen drei Bordcomputer zur Auswahl:

- **AMASCAN+**
- **AMASCAN-PROFI**
- **ED-CONTROL**.

Die Anzeige und Betätigung erfolgt am Bedienterminal in der Traktorkabine.

5.9.1 AMASCAN+

Der **AMASCAN+**

- überwacht die Vereinzelung.
  Akustische und optische Fehlermeldung.
- zeigt die „Anzahl der Körner pro Hektar".
  Akustische und optische Fehlermeldung bei Abweichung vom Sollwert.
- Servicefunktion zum Testen der Optogeberfunktion.
- schaltet den Antrieb einzelner Säaggregate ab (Teilbreitenschaltung).
  Erforderliche Ausrüstung: Säaggregate mit elektrischer Abschaltung (Option).
- gibt Alarm (Option)
  - o bei Unterschreitung der Mindest-Füllmenge im 900 / 1100 Liter Dünger-Vorratsbehälter und im Fronttank.
  - o bei Stillstand der Dosierräder im 900 / 1100 Liter Dünger-Vorratsbehälter und im Fronttank.

  Erforderliche Ausrüstung:
  Behälterüberwachung (Option).
- zeigt die Arbeitsgeschwindigkeit [km/h] an.

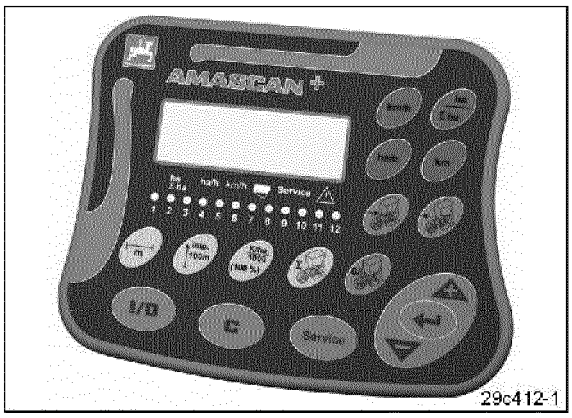


Fig. 53

Der AMASCAN+ speichert

- die bearbeitete Fläche [ha]
- die zurückgelegte Wegstrecke [km]
- die Flächenleistung [ha/h]
- die bearbeitete Gesamtfläche [ha].

5.9.2 AMASCAN-PROFI

Der **AMASCAN-PROFI** integriert die Funktionen des **AMASCAN+** und beinhaltet zusätzlich nachfolgend aufgeführte Funktionen:

- klappt die Säaggregat-Ausleger getrennt ein und aus
- klappt die Spuranreißer getrennt ein- und aus
- schaltet die Befüllschnecke ein- und aus
- speichert die Arbeitszeit [h].

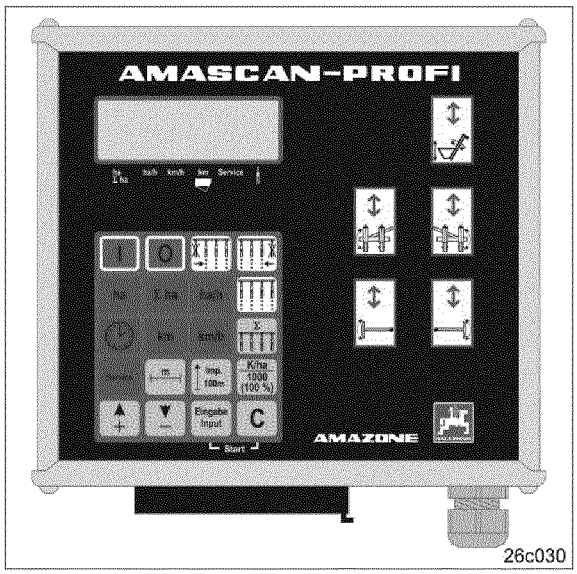


Fig. 54

5.9.3 ED-CONTROL

Der **ED-CONTROL** integriert die Funktionen des **AMASCAN-PROFI** und beinhaltet zusätzlich nachfolgend aufgeführte Funktionen:

- speichert 12 Aufträge
- schaltet automatisch den Antrieb einzelner Säaggregate ab zum Anlegen von Fahrgassen in bestimmten Rhythmen. Erforderliche Ausrüstung: Säaggregate mit elektrischer Abschaltung (Option).
- beinhaltet die Wechselautomatik für Spuranreißer am Vorgewende
- senkt/hebt das Spornrad (Fronttank).



Fig. 55

6 Inbetriebnahme

In diesem Kapitel erhalten Sie Informationen zur Inbetriebnahme Ihrer Maschine.



Gefahr!

- **Vor Inbetriebnahme der Maschine muss der Bediener die Betriebsanleitung gelesen und verstanden haben.**
- **Beachten Sie das Kapitel "Sicherheitshinweise für den Bediener", ab Seite 25 beim**
  - **An- und Abkuppeln der Maschine**
  - **Transportieren der Maschine**
  - **Einsatz der Maschine**
- **Achten Sie immer auf eine ausreichende Lenk- und Bremsfähigkeit des Traktors!**
- **Verwenden Sie gegebenenfalls Ballastgewichte!**
- **Durch das Ankuppeln von Maschinen im Front- und/oder Heckanbau eines Traktors dürfen nicht überschritten werden**
  - **das zulässige Traktor-Gesamtgewicht**
  - **die zulässigen Traktor-Achslasten**
  - **die zulässigen Reifentragfähigkeiten der Traktor-Reifen**
- **Bevor Sie die Kombination Traktor/Maschine in Betrieb nehmen, müssen Sie zunächst für die leere und dann für befüllte Maschine die tatsächlichen Werte sorgfältig ermitteln für:**
  - **das Traktor-Gesamtgewicht**
  - **die Traktor-Achslasten**
  - **die Reifentragfähigkeiten**
  - **die Mindest-Ballastierung**

  (durch Berechnung oder durch Wiegen der Traktor-Maschinen-Kombination)

  Hierzu siehe Kapitel "Berechnung der tatsächlichen Werte für Traktor-Gesamtgewicht, Traktor-Achslasten und Reifentragfähigkeiten, sowie der erforderlichen Mindest-Ballastierung", Seite 69.
- **Der Traktor muss die vorgeschriebene Bremsverzögerung für die Kombination Traktor und Maschine sichern.**
- **Traktor und Maschine müssen den Vorschriften der nationalen Straßenverkehrsvorschriften entsprechen.**
- **Fahrzeughalter wie auch Fahrzeugführer sind für Einhaltung der gesetzlichen Bestimmungen der nationalen Straßenverkehrsvorschriften verantwortlich.**
- **Beachten Sie die maximale Zuladung der angebauten / angehängten Maschine und die zulässigen Achs- und Stützlasten des Traktors. Fahren Sie gegebenenfalls nur mit teilbefülltem Vorratsbehälter.**
- **Verriegeln Sie vor Transportfahrten den Bedienungshebel der Dreipunkt-Hydraulik gegen unbeabsichtigtes Heben oder Senken der angebauten oder angehängten Maschine.**

6.1 Erst-Inbetriebnahme

6.1.1 Berechnung der tatsächlichen Werte für Traktor-Gesamtgewicht, Traktor-Achslasten und Reifentragfähigkeiten, sowie der erforderlichen Mindest-Ballastierung

6.1.1.1 Benötigte Daten für die Berechnung

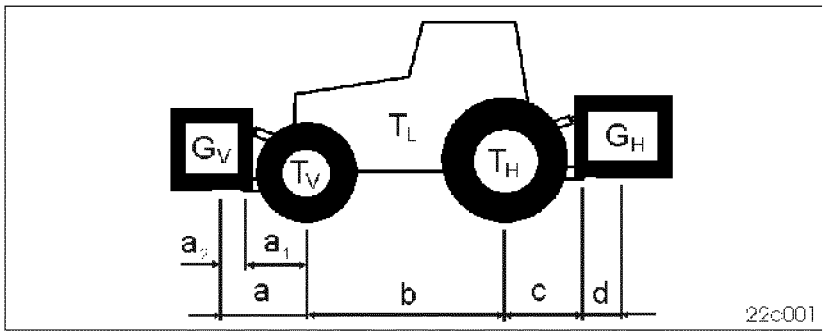


Fig. 56

T_L	[kg]	Traktor-Leergewicht	siehe Traktor Betriebsanleitung oder Fahrzeugschein
T_V	[kg]	Vorderachslast des leeren Traktors	
T_H	[kg]	Hinterachslast des leeren Traktors	
G_H	[kg]	Gesamtgewicht Heckanbau-Maschine oder Heckgewicht	siehe technische Daten Maschine oder Heckgewicht
G_V	[kg]	Gesamtgewicht Frontanbau-Maschine oder Frontgewicht	siehe technische Daten Frontanbau-Maschine oder Frontgewicht
a	[m]	Abstand zwischen Schwerpunkt Frontanbau-Maschine oder Frontgewicht und Mitte Vorderachse (Summe $a_1 + a_2$)	siehe technische Daten Traktor und Frontanbau-Maschine oder Frontgewicht oder Abmessen
a_1	[m]	Abstand Mitte Vorderachse bis Mitte Unterlenker-Anschluss	siehe Traktor Betriebsanleitung oder Abmessen
a_2	[m]	Abstand Mitte Unterlenker-Anschlusspunkt bis Schwerpunkt Frontanbau-Maschine oder Frontgewicht (Schwerpunkts-Abstand)	siehe technische Daten Frontanbau-Maschine oder Frontgewicht oder Abmessen
b	[m]	Traktor-Radstand	siehe Traktor Betriebsanleitung oder Fahrzeugschein oder Abmessen
c	[m]	Abstand zwischen Mitte Hinterachse und Mitte Unterlenker-Anschluss	siehe Traktor Betriebsanleitung oder Fahrzeugschein oder Abmessen
d	[m]	Abstand zwischen Mitte Unterlenker-Anschlusspunkt und Schwerpunkt Heckanbau-Maschine oder Heckgewicht (Schwerpunkts-Abstand)	siehe technische Daten Maschine

6.1.1.2 Berechnung der erforderlichen Mindest-Ballastierung vorne $G_{V\,min}$ des Traktors zur Gewährleistung der Lenkfähigkeit

$$G_{V\ \min} = \frac{G_H \bullet (c+d) - T_V \bullet b + 0{,}2 \bullet T_L \bullet b}{a+b}$$

Tragen Sie den Zahlenwert für die berechnete Mindest-Ballastierung $G_{V\,min}$, die an der Frontseite des Traktors benötigt wird, in die Tabelle (Seite 71) ein.

6.1.1.3 Berechnung der tatsächlichen Vorderachslast des Traktors $T_{V\,tat}$

$$T_{V\ tat} = \frac{G_V \bullet (a+b) + T_V \bullet b - G_H \bullet (c+d)}{b}$$

Tragen Sie den Zahlenwert für die berechnete tatsächliche Vorderachslast und die in der Traktor-Betriebsanleitung angegebene zulässige Traktor-Vorderachslast in die Tabelle (Seite 71) ein.

6.1.1.4 Berechnung des tatsächlichen Gesamtgewichtes der Kombination Traktor und Maschine

$$G_{tat} = G_V + T_L + G_H$$

Tragen Sie den Zahlenwert für das berechnete tatsächliche Gesamtgewicht und das in der Traktor-Betriebsanleitung angegebene zulässige Traktor-Gesamtgewicht in die Tabelle (Seite 71) ein.

6.1.1.5 Berechnung der tatsächlichen Hinterachslast des Traktors $T_{H\,tat}$

$$T_{H\ tat} = G_{tat} - T_{V\ tat}$$

Tragen Sie den Zahlenwert für die berechnete tatsächliche Hinterachslast und die in der Traktor-Betriebsanleitung angegebene zulässige Traktor-Hinterachslast in die Tabelle (Seite 71) ein.

6.1.1.6 Reifentragfähigkeit der Traktor-Bereifung

Tragen Sie den doppelten Wert (zwei Reifen) der zulässigen Reifentragfähigkeit (siehe z.B. Unterlagen der Reifenhersteller) in die Tabelle (Seite 71) ein.

6.1.1.7 Tabelle

	Tatsächlicher Wert laut Berechnung		Zulässiger Wert laut Traktor-Betriebsanleitung		Doppelte zulässige Reifentragfähigkeit (zwei Reifen)
Mindest-Ballastierung Front / Heck	/ kg		--		--
Gesamtgewicht	kg	≤	kg		--
Vorderachslast	kg	≤	kg	≤	kg
Hinterachslast	kg	≤	kg	≤	kg



Hinweis!

Entnehmen Sie dem Fahrzeugschein Ihres Traktors die zulässigen Werte für Traktor-Gesamtgewicht, Achslasten und Reifentragfähigkeiten.



Gefahr!

- **Die tatsächlichen, berechneten Werte müssen kleiner oder gleich (≤) den zulässigen Werten sein!**
- **Verboten ist das Ankuppeln der Maschine an den für die Berechnung zugrunde gelegten Traktor, wenn**
  - **auch nur einer der tatsächlich, berechneten Werte größer ist als der zulässige Wert.**
  - **an dem Traktor nicht ein Frontgewicht (falls erforderlich) für die erforderliche Mindest-Ballastierung vorne ($G_{V\,min}$) befestigt ist.**



Wichtig!

- **Ballastieren Sie Ihren Traktor mit einem Front- oder Heckgewicht, wenn die Traktor-Achslast nur auf einer Achse überschritten ist.**
- **Sonderfälle:**
  - **Erreichen Sie durch das Gewicht der Frontanbau-Maschine (G_V) nicht die erforderliche Mindest-Ballastierung vorne ($G_{V\,min}$), müssen Sie zusätzlich zu der Frontanbau-Maschine Zusatzgewichte verwenden!**
  - **Erreichen Sie durch das Gewicht der Heckanbau-Maschine (G_H) nicht die erforderliche Mindest-Ballastierung hinten ($G_{H\,min}$), müssen Sie zusätzlich zur Heckanbau-Maschine Zusatzgewichte verwenden!**

6.1.2 Gelenkwelle an den Traktor anpassen

Wichtig!

Die Gelenkwellenlänge beim ersten Ankuppeln an den Traktor und beim Traktortyp-Wechsel anpassen. Beachten Sie hierzu die Betriebsanleitung des Gelenkwellen-Herstellers.

Gefahr!

An- und Abbau der Gelenkwelle nur bei ausgeschalteter Zapfwelle, angezogener Handbremse, abgeschaltetem Motor und abgezogenem Zündschlüssel.

Die Gelenkwellenhälften auf die Zapfwellenanschlüsse von Traktor und Maschine in der vorgeschriebenen Einbaurichtung (siehe Symbol auf der Gelenkwelle) aufstecken, die Gelenkwellenrohre aber nicht ineinander stecken.

Fig. 57/…

(1) Durch Nebeneinanderhalten der beiden Gelenkwellenrohre prüfen, ob die Gelenkwellenrohre in jeder Stellung mindestens A = 185 mm ineinander greifen.

(2) In zusammengeschobener Stellung dürfen die Gelenkwellenrohre nicht gegen die Gabeln der Kreuzgelenke stoßen. Ein Sicherheitsabstand von mind. 10 mm ist einzuhalten.

(3) Zur Längenanpassung Gelenkwellenhälften in kürzester Betriebsstellung nebeneinander halten und anzeichnen.

(4) Innen- und Außenschutzrohr gleichmäßig kürzen.

(5) Inneres und äußeres Schiebeprofil um gleiche Länge wie Schutzrohr kürzen.

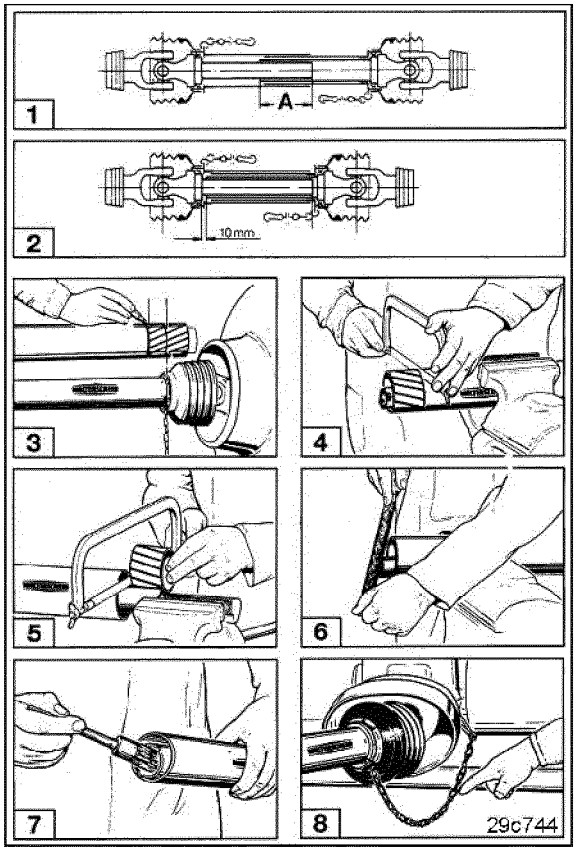


Fig. 57

(6) Trennkanten abrunden und Späne sorgfältig entfernen.

(7) Schiebeprofile einfetten und ineinander schieben.

(8) Die Schutzrohre der Gelenkwelle sind mit Halteketten versehen, die an Traktor und Maschine zu befestigen sind. Die Sicherungsketten verhindern das Mitdrehen der Schutzrohre bei laufender Gelenkwelle. Halteketten so an den vorgesehenen Bohrungen einhängen, dass ausreichender Schwenkbereich der Gelenkwelle in allen Betriebsstellungen gewährleistet ist und die Schutzrohre während des Betriebes nicht mitdrehen.

6.1.3 Montagevorschrift Anschluss hydr. Gebläseantrieb (Option)

Die Druckleitung (Fig. 58/4) an ein einfach- oder doppeltwirkendes Traktor-Steuergerät mit Vorrang anschließen.

Die Rücklaufleitung (Fig. 58/5) nur an einem drucklosen Traktor-Anschluss anschließen mit direktem Zugang zum Hydrauliköltank. Die Rücklaufleitung nicht an einem Traktor-Steuergerät anschließen. Der Staudruck darf 10 bar nicht überschreiten.

Zur Installation der Traktor-Rücklaufleitung, nur Rohre DN 16, z.B. Ø 20 x 2,0 mm verwenden mit kurzem Rücklaufweg zum Hydrauliköltank.

Fig. 58/..

(A) maschinenseitig

(B) traktorseitig

(1) Traktor-Steuergerät mit Vorrang, einfach- oder doppeltwirkend

(2) Gebläse-Hydraulikmotor

(3) Stromregelventil der Maschine

(4) Hydraulikschlauch Druckleitung (Kennzeichnung: 1 Kabelbinder rot)

(5) Hydraulikschlauch Rücklaufleitung mit großer Steckkupplung (Kennzeichnung: 2 Kabelbinder rot)

(6) Traktor-Hydraulikpumpe

(7) Ölfilter, traktorseitig

(8) Traktor-Hydrauliköltank

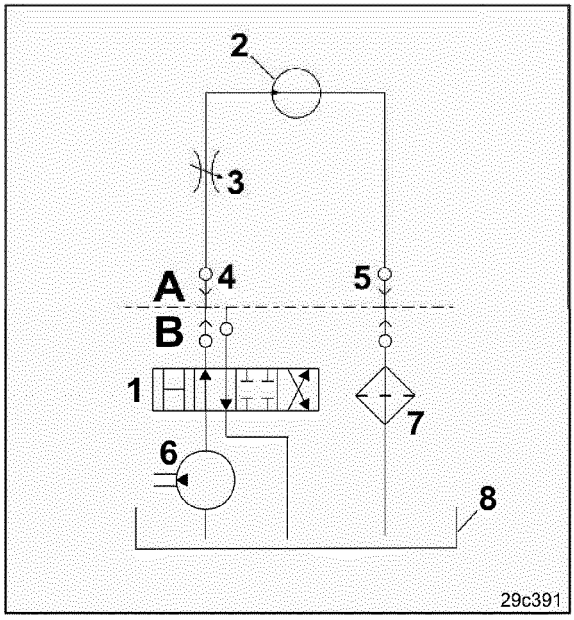


Fig. 58

Hinweis!

Das Hydrauliköl darf sich nicht zu stark erwärmen.

Große Ölfördermengen in Verbindung mit kleinen Öltanks fördern die schnelle Erwärmung des Hydrauliköles. Das Fassungsvermögen des Traktor-Öltanks (Fig. 58/8) sollte mindestens die doppelte Ölfördermenge beinhalten. Bei zu starker Erwärmung des Hydrauliköles ist der Einbau eines Ölkühlers in einer Fachwerkstatt erforderlich.

Soll ein zweiter Hydraulikmotor neben dem Gebläse-Hydraulikmotor angetrieben werden, müssen beide Motoren parallel geschaltet werden. Werden beide Motoren in Reihe geschaltet, wird der zulässige Öldruck von 10 bar hinter dem ersten Motor immer überschritten.

6.1.4 Montagevorschrift Profischaltung (Option)

Ohne „LS-Betrieb“:

- Anschluss der Druckleitung (Fig. 59/2) an ein einfach- oder doppeltwirkendes Traktor-Steuergerät mit Vorrang.

Mit „LS-Betrieb“:

- Anschluss der LS-Druckleitung
- Anschluss der LS-Steuerleitung.

Mit und ohne „LS-Betrieb“:

- Anschluss der Rücklaufleitung (Fig. 59/3) an einen drucklosen Traktor-Anschluss mit direktem Zugang zum Hydrauliköltank. Die Rücklaufleitung nicht an einem Traktor-Steuergerät anschließen. Der Staudruck darf 10 bar nicht überschreiten.

  Zur Installation der Traktor-Rücklaufleitung, nur Rohre DN 16, z.B. Ø 20 x 2,0 mm verwenden mit kurzem Rücklaufweg zum Hydraulikölтank.

Fig. 59/...

(A) maschinenseitig

(B) traktorseitig

(1) Traktor-Steuergerät mit Vorrang, einfach- oder doppeltwirkend

2. Hydraulikschlauch Druckleitung (Kennzeichnung: 1 Kabelbinder rot)

(3) Hydraulikschlauch Rücklaufleitung mit großer Steckkupplung (Kennzeichnung: 2 Kabelbinder rot)

(4) Ölfilter, maschinenseitig

(5) Traktor-Hydraulikpumpe

(6) Ölfilter, traktorseitig

(7) Traktor-Hydrauliköltank

(8) Elektr.-hydr. Steuerblock (Profischaltung)

(9) Ventil (Ausleger links klappen)

(10) Ventil (Ausleger rechts klappen)

(11) Ventil (Spuranreißer-Betätigung)

(12) Ventil (Option, Befüllschnecke ein- ausschalten)

(13) Ventil (Option, Spornrad-Betätigung, nur in Verbindung mit **ED-Control**).

(LS) Anschluss Load-Sensing-Steuerleitung (Option)

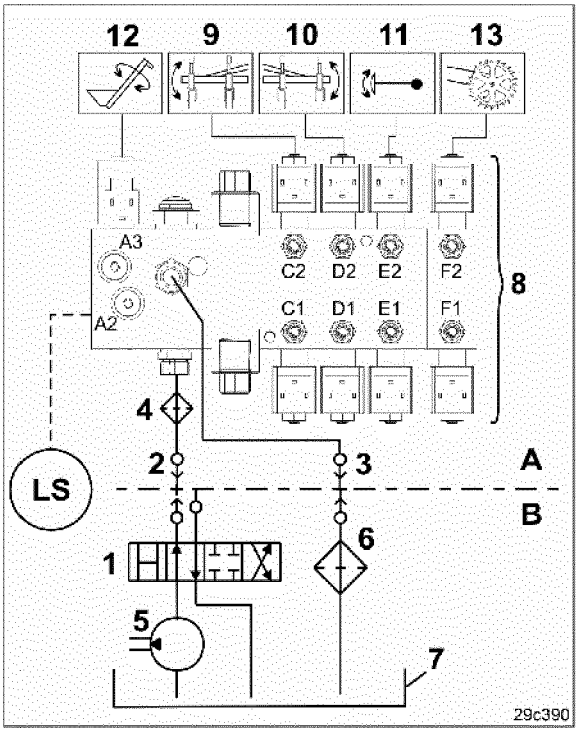


Fig. 59

Profischaltungen mit Load-Sensing-Funktion sind gekennzeichnet mit dem Aufkleber „LS“ (Fig. 60/1).

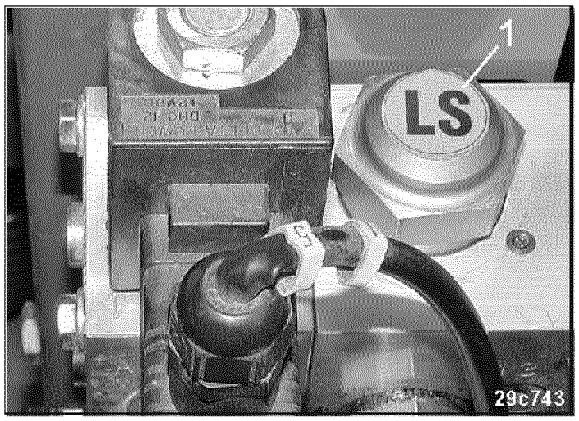


Fig. 60

6.1.5 Erstmontage des Bedienterminals (Option)

Die Erstmontage des Bedienterminals (Fig. 61) in der Traktor-Kabine entnehmen Sie der entsprechenden Betriebsanleitung.

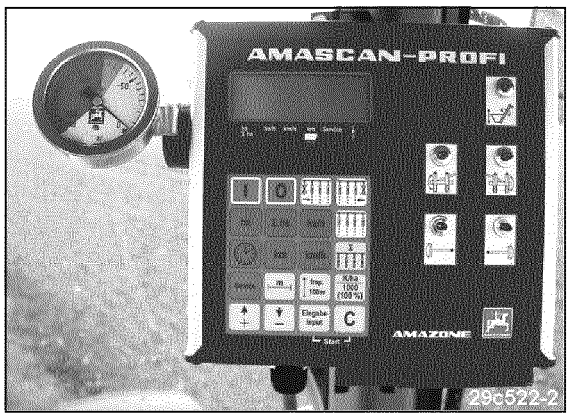


Fig. 61

6.1.6 Erstmontage des Klutenräumers (Option, Contour-Säaggregat)

1. Den Führungsbolzen (Fig. 62/1) anschrauben.

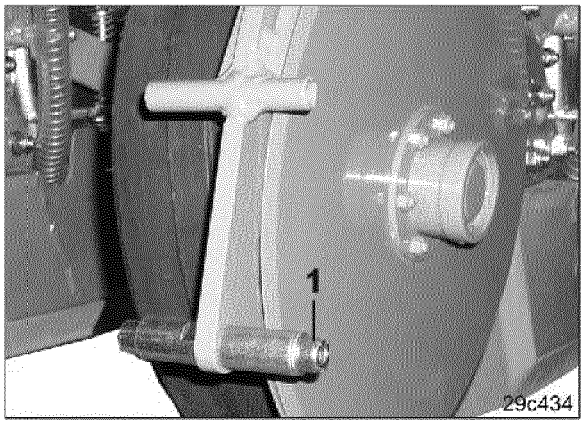


Fig. 62

2. Den Klutenräumer (Fig. 63/1) am Führungsbolzen (Fig. 62/1) einhängen, mit einem Bolzen (Fig. 63/2) abstecken und mit einem Klappstecker sichern.

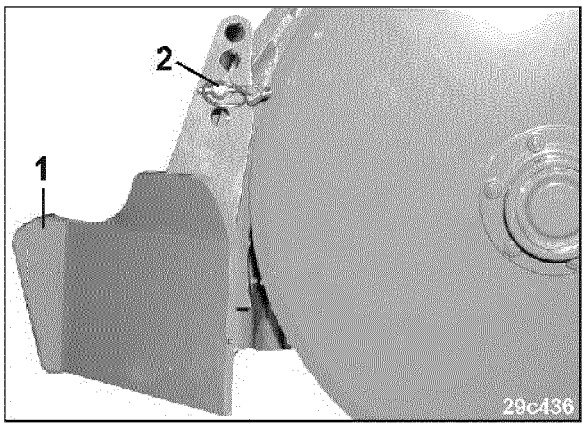


Fig. 63

6.1.7 Erstmontage der Abstellvorrichtung ED 902-K (Option)

Erstmontage der Abstellvorrichtung:

1. Zwei Trägerrohren (Fig. 64/1) mit dem Abstandshalter (Fig. 64/2) und der Zapfenkonsole (Fig. 64/3) abstecken.
2. Die Bauteile mit vier Klappsteckern (Fig. 64/4) befestigen.

Die Sicherungsstrebe (Fig. 64/5) sichert die Maschine später gegen Umfallen.

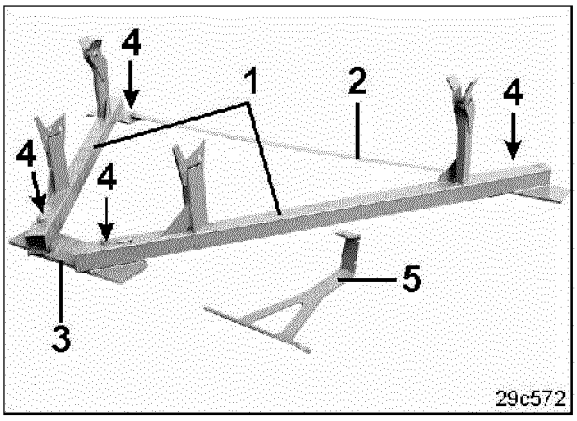


Fig. 64

7 Maschine an- und abkuppeln

Gefahr!

- **Sie dürfen die Maschine nur mit einem Traktor kuppeln und transportieren, wenn der Traktor die leistungsmäßigen Voraussetzungen erfüllt!**
- **Beim Ankuppeln der Maschine an die Traktor-Dreipunkt-Hydraulik müssen die Anbaukategorien von Traktor und Maschine unbedingt übereinstimmen!**
- **Verwenden Sie beim Kuppeln von Traktor und Maschine die dafür vorgesehenen Vorrichtungen bestimmungsgemäß!**
- **Verboten ist der Aufenthalt von Personen zwischen der zu kuppelnden Maschine und dem Traktor während der Traktor an die Maschine heranfährt!**

  Anwesende Helfer dürfen sich nur als Einweiser neben den Fahrzeugen betätigen und erst bei Stillstand zwischen die Fahrzeuge treten.
- **Beachten Sie beim An- und Abkuppeln von Maschinen das Kapitel "Sicherheitshinweise für den Bediener", Seite 25.**

Den Fronttank (Fig. 65) am Traktor anhand der Fronttank-Betriebsanleitung an- und abkuppeln.

Wichtig!

Leitende Verbindung des Fronttank-Kabelbaums (Maschinenstecker) zur Traktormasse herstellen (Gefahr statischer Aufladung).

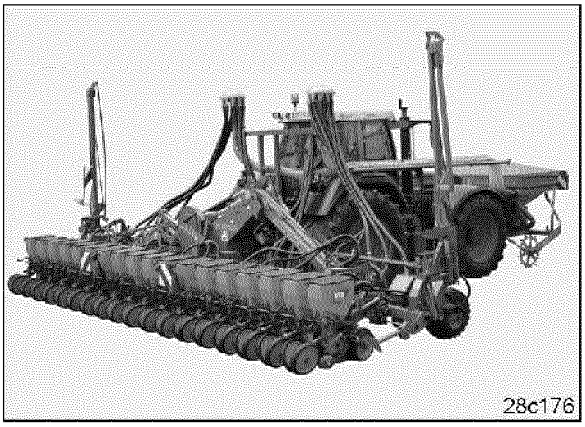


Fig. 65

7.1 Maschine ankuppeln

1. Zapfwellenanschlüsse maschinen- und traktorseitig reinigen und einfetten.
2. Die mit einem Freilauf (Fig. 66/1) ausgestattete Gelenkwellenhälfte auf den Zapfwellenanschluss der Maschine aufstecken und vorschriftsmäßig sichern (siehe Betriebsanleitung des Gelenkwellenherstellers). Verwenden Sie nur die zugelassene Walterscheid Gelenkwelle
   - o W2200, 1210 mm 1 3/8, 6-teilig mit Freilauf (Fig. 66/1) oder
   - o W2200, 1610 mm 8x32x38 mit Freilauf (für Traktoren russischer Bauart).

   Der Freilauf ermöglicht das Nachlaufen des Gebläses beim Abschalten der Gelenkwelle.

   In Fahrtrichtung gesehen dreht die Gelenkwelle rechts herum (Uhrzeigersinn).
3. Gelenkwelle auf der Gelenkwellenauflage (Fig. 66/2) abstützen.

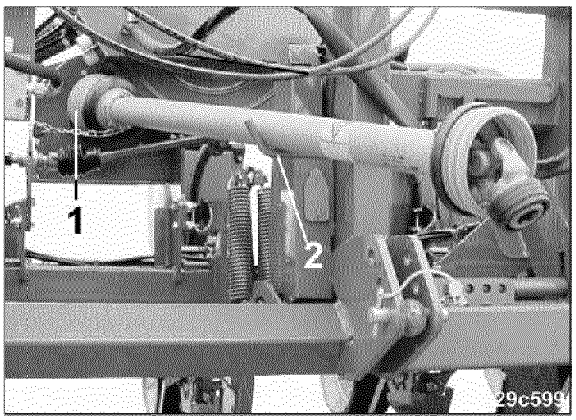


Fig. 66

4. Die mit Klappsteckern gesicherten Bolzen der Unter- und Oberlenker sind je nach Traktortyp (siehe Traktor-Betriebsanleitung) mit Fangkugeln auszurüsten. Die Maschine ist ausgerüstet mit Unter- und Oberlenkerbolzen
   - o Kat. II (alle Typen, außer ED 902-K)
   - o Kat. III (nur ED 902-K).
5. Die Traktorunterlenker-Sicherung öffnen, d.h. sie muss kuppelbereit sein.
6. Traktor vorsichtig zurücksetzen.
7. Traktorunterlenker und Maschine kuppeln.
8. Kontrollieren, ob die Sicherung der Traktorunterlenker-Arretierung geschlossen und gesichert ist (siehe Traktor Betriebsanleitung).

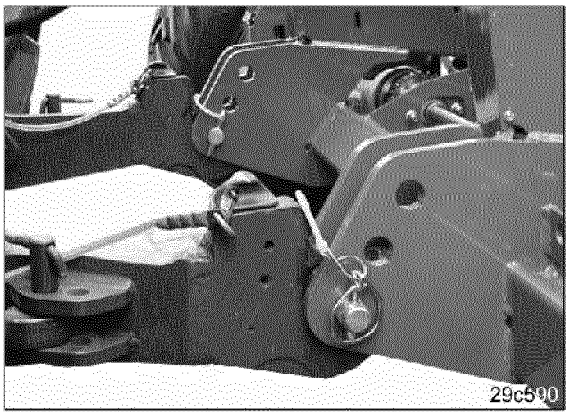


Fig. 67

Wichtig!

Die Traktor-Unterlenker müssen vertikal pendeln können.

9. Traktor-Oberlenker (Fig. 68/1) anschließen.
10. Zapfwelle ausschalten, Handbremse anziehen, Motor abschalten und Zündschlüssel abziehen.
11. Den Oberlenker gegen Verdrehen sichern (siehe Traktor-Betriebsanleitung).

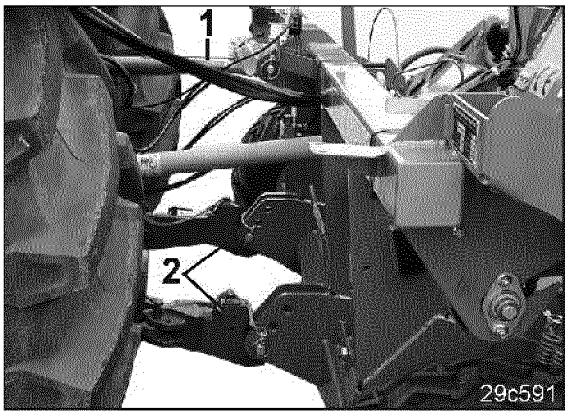


Fig. 68

12. Die Gelenkwellenhälfte auf den Zapfwellenanschluss des Traktors aufstecken und vorschriftsmäßig sichern.
13. Die Sicherungsketten (Fig. 69/1) der Gelenkwellen-Schutzrohre befestigen
    - o an der Maschine (siehe Fig. 69)
    - o am Traktor.
14. Die an der Gelenkwelle befestigten Montagehinweise des Gelenkwellenherstellers befolgen.

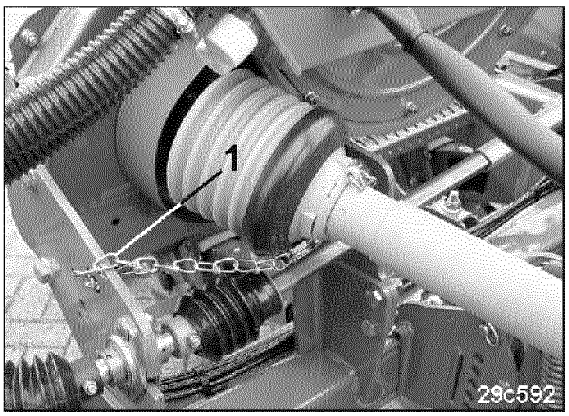


Fig. 69



Gefahr!

An- und Abbau der Gelenkwelle nur bei ausgeschalteter Zapfwelle, angezogener Handbremse, abgeschaltetem Motor und abgezogenem Zündschlüssel.

Wenn Sie sich in einer rotierenden Welle verfangen, kann dies schwere Verletzungen oder den Tod hervorrufen.

Immer auf die richtige Montage und Sicherung der Gelenkwelle achten.

15. Hydraulikanschlüsse herstellen (siehe Kapitel 7.1.1 bis Kapitel 7.1.1.3, ab Seite 80).
16. Stromanschlüsse herstellen (siehe Kapitel „Stromanschlüsse herstellen“, Seite 83).
17. Weitere Anschlüsse und Einstellungen (siehe ab Kapitel 7.1.3).

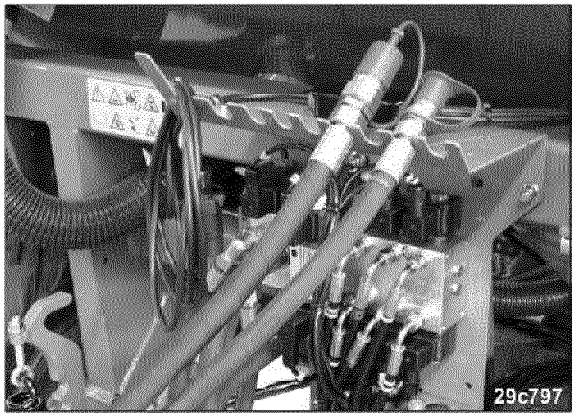


Fig. 70



Wichtig!

Den Verlauf der Versorgungsleitungen kontrollieren.

Die Versorgungsleitungen

- **müssen allen Bewegungen bei Kurvenfahrten ohne Spannung, Knickung oder Reibung leicht nachgeben**
- **dürfen nicht an Fremdteilen scheuern.**

7.1.1 Hydraulikanschlüsse



Wichtig!

Hydraulikkupplungen säubern vor dem Anschließen am Traktor.

Geringe Verschmutzungen durch Partikel im Hydrauliköl können zum Ausfall der Hydraulik führen.

Den Fronttank anhand der Fronttank-Betriebsanleitung anschließen.

7.1.1.1 Hydraulikanschlüsse

Traktoranschluss				Funktion
Steuergerät		Anschluss	Kennzeichnung	
1	einfach wirkend	Vorlauf	1 Kabelbinder gelb	Spuranreißerbetätigung

Traktoranschluss				Funktion
Steuergerät		Anschluss	Kennzeichnung	
2	doppelt wirkend	Vorlauf	1 Kabelbinder grün	Auslegerklappung links
		Rücklauf	2 Kabelbinder grün	

Traktoranschluss				Funktion
Steuergerät		Anschluss	Kennzeichnung	
3*	doppelt wirkend	Vorlauf	1 Kabelbinder blau	Auslegerklappung rechts
		Rücklauf	2 Kabelbinder blau	

* nicht erforderlich bei ED 902-K. Die Auslegerklappungen erfolgt mit dem Traktor-Steuergerät 2

Traktoranschluss				Funktion
Steuergerät		Anschluss	Kennzeichnung	
4	einfach wirkend	Vorlauf	1 Kabelbinder natur	Hydraulikmotor Befüllschnecke
		Rücklauf	2 Kabelbinder natur	

Traktor mit Konstantdruck-Hydrauliksystemen sind zum Betrieb von Hydraulikmotoren nur bedingt ausgelegt. Die Empfehlungen des Traktorherstellers beachten.

Traktoranschluss				Funktion
Steuergerät		Anschluss	Kennzeichnung	
5	einfach wirkend	Vorlauf: Druckleitung mit Vorrang*	1 Kabelbinder rot	Gebläse-Hydraulikmotor
		Rücklauf: druckfreie Leitung*	2 Kabelbinder rot	

* Montagevorschrift beachten [siehe Kapitel „Montagevorschrift Anschluss hydr. Gebläseantrieb (Option)“, Seite 73].

Front-Traktoranschluss				Funktion
Steuergerät		Anschluss	Kennzeichnung	
6	doppelt wirkend	Vorlauf	1 Kabelbinder natur	Spornradanhebung Fronttank
		Rücklauf	2 Kabelbinder natur	

7.1.1.2 Ein Steuergerät für zwei Maschinenfunktionen (Schalteinheit, Option)

Stehen weniger Traktor-Steuergeräte zur Verfügung als benötigt, kann ein Traktor-Steuergerät mit zwei Maschinenfunktionen belegt werden.

Eine der beiden gewünschten Funktionen zuerst mit dem Hebel (Fig. 71/A) anwählen und danach mit dem Traktor-Steuergerät betätigen.

Die Funktion bei Hebelstellung „A“ und „B“ prüfen vor Inbetriebnahme.

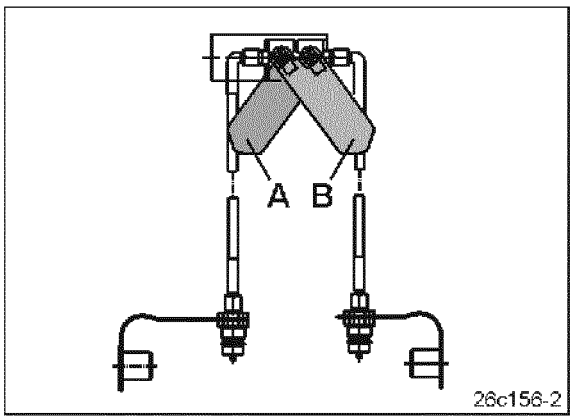


Fig. 71

Gefahr!

Verwechslungsgefahr der Funktionen! Vor dem Betätigen des Traktor-Steuergerätes die Hebelstellung der Schalteinheit (Fig. 71) prüfen.

7.1.1.3 Hydraulikanschluss Profischaltung

Profischaltung ohne Load-Sensing-Funktion

Traktoranschluss				Funktion
Steuergerät		Anschluss	Kennzeichnung	
1	einfach wirkend	Vorlauf: Druckleitung mit Vorrang*	1 Kabelbinder rot	Profischaltung ohne Load-Sensing-Funktion
		Rücklauf: druckfreie Tankleitung*	2 Kabelbinder rot	

* Montagevorschrift beachten [siehe Kapitel „Montagevorschrift Profischaltung (Option)“, Seite 74].

Traktoranschluss				Funktion
Steuergerät		Anschluss	Kennzeichnung	
2	einfach wirkend	Vorlauf: Druckleitung mit Vorrang**	1 Kabelbinder rot	Gebläse-Hydraulikmotor
		Rücklauf: druckfreie Tankleitung**	2 Kabelbinder rot	

** Montagevorschrift beachten [siehe Kapitel „Montagevorschrift Anschluss hydr. Gebläseantrieb (Option)“, Seite 73].

Front-Traktoranschluss***				Funktion
Steuergerät		Anschluss	Kennzeichnung	
3	doppelt wirkend	Vorlauf	1 Kabelbinder natur	Spornradanhebung Fronttank
		Rücklauf	2 Kabelbinder natur	

*** nicht erforderlich in Verbindung mit **ED-Control**.

Profischaltung mit Load-Sensing-Funktion

Traktoranschluss				Funktion
Steuergerät		Anschluss	Kennzeichnung	
1	„LS“	Vorlauf: LS-Druckleitung	1 Kabelbinder rot	Profischaltung mit Load-Sensing-Funktion
		Rücklauf: druckfreie Tankleitung	2 Kabelbinder rot	
		LS-Steuerleitung	_	

Erforderliche Steuergeräte 2 und 3, siehe Profischaltung ohne Load-Sensing-Funktion

7.1.2 Stromanschlüsse herstellen

Anschluss/Funktion
Stecker (7-polig) für Straßenverkehrslichtanlage (Option)
Maschinenstecker (Option) AMASCAN+
Maschinenstecker (Option) AMASCAN-PROFI
Maschinenstecker (Option) ED-CONTROL

7.1.3 Manometer anschließen

Das Manometer (Fig. 72/1) am Schlauch (Fig. 72/2) anschließen.

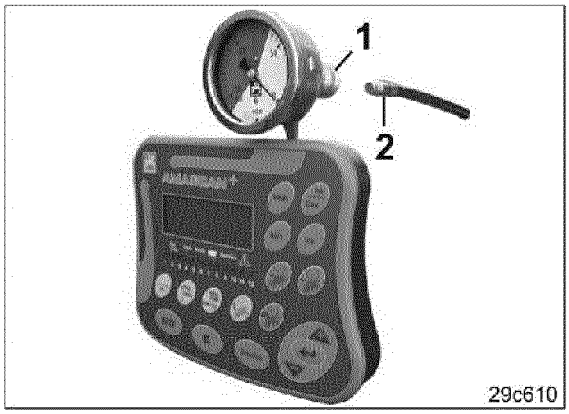


Fig. 72

7.1.4 Abstützung (alle Typen, außer eingeklappte ED 902-K)

Gefahr!

Die Maschine nur auf waagerechtem, festen Untergrund abstellen.

Vor dem Abstecken der Stützfüße, Handbremse anziehen, Traktormotor abstellen und Zündschlüssel abziehen.

Wichtig!

Die eingeklappte ED 902-K nur auf der Abstellvorrichtung abstellen (siehe „Abstellen der eingeklappten ED 902-K auf der Abstellvorrichtung“, Seite 86)

Abgestellt stützt sich die Maschine auf zwei Stützfüßen ab.

Stützstellung:

Den Stützfuß (Fig. 73/1) mit einem Bolzen (Fig. 73/2) abstecken und mit einem Federstecker sichern.

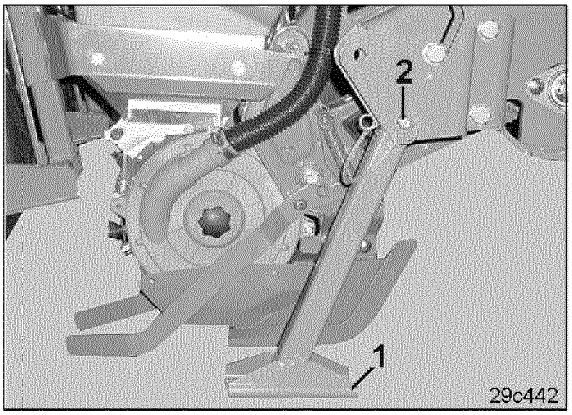


Fig. 73

Transportstellung:

Den Stützfuß (Fig. 74/1) mit einem Bolzen (Fig. 74/2) abstecken und mit einem Federstecker sichern.

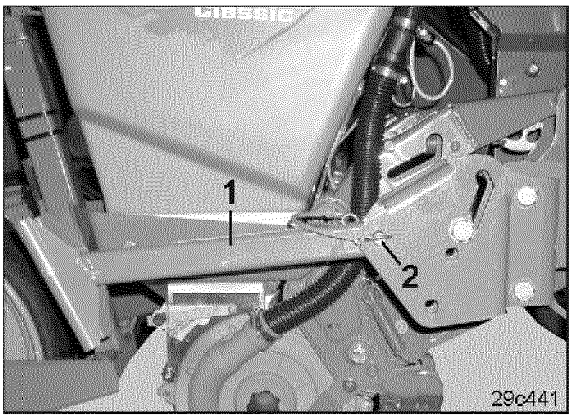


Fig. 74

7.2 Maschine abkuppeln



Warnung!

Die Maschine bzw. die Abstellvorrichtung auf waagerechtem, festen Untergrund abstellen.

Maschine abkuppeln:

1. Bedienterminal (falls vorhanden) ausschalten.
2. ED 902-K (eingeklappt) auf der Abstellvorrichtung abstellen (siehe Kapitel „Abstellen der eingeklappten ED 902-K auf der Abstellvorrichtung“, Seite 86).
3. Stützfüße in Stützstellung bringen [siehe Kapitel „Abstützung (alle Typen, außer eingeklappte ED 902-K)“, Seite 83] und die Maschine abstellen.
4. Traktor-Hydrauliksystem drucklos machen.
5. Gelenkwelle ausschalten, Handbremse anziehen, Traktormotor abstellen und Zündschlüssel abziehen.
6. Versorgungsleitungen entkuppeln.
7. Traktorseitige Gelenkwellenhälfte abkuppeln. Die Gelenkwelle auf der Gelenkwellenauflage (Fig. 66/2) ablegen.
8. Traktor Ober- und Unterlenker abkuppeln.
9. Den Traktor vorziehen.



Gefahr!

Beim Vorziehen des Traktors darf sich keine Person zwischen Traktor und Maschine aufhalten!

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7.2.1 Abstellen der eingeklappten ED 902-K auf der Abstellvorrichtung

1. Die Abstellvorrichtung (Fig. 75) auf waagerechtem, festen Untergrund abstellen.
2. Die ED 902-K auf der Abstellvorrichtung absetzen und zwar
   - o vorne in der Aufnahme (Fig. 76/1)
   - o hinten in der Aufnahme (Fig. 77/1).

Gefahr!

Maschine nur mit leerem Vorratsbehälter abstellen!

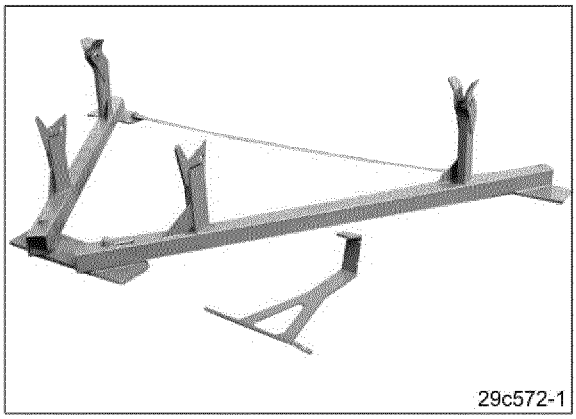


Fig. 75

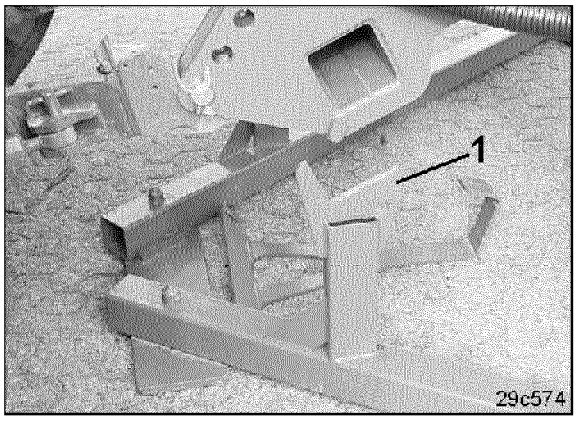


Fig. 76

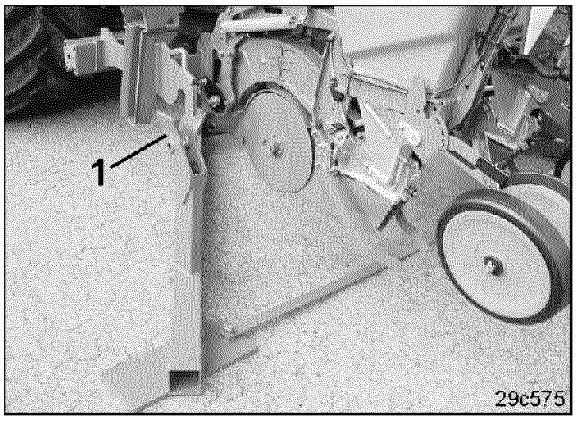


Fig. 77

3. Die Sicherungsstrebe (Fig. 78/1) am Maschinenrahmen einhängen.
4. Die Sicherungsstrebe mit zwei Klappsteckern (Fig. 78/2) befestigen.
   Die Sicherungsstrebe sichert die Maschine gegen Umfallen.

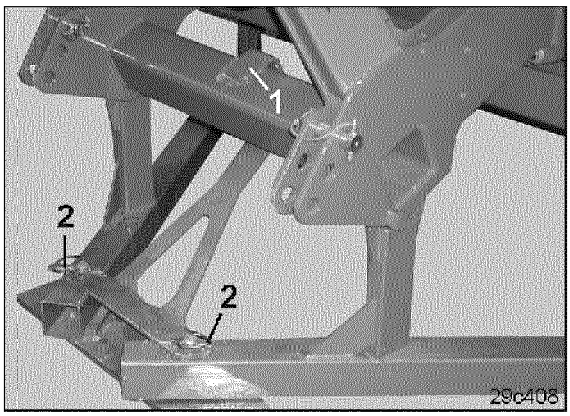


Fig. 78

Gefahr!

- **Vor dem Abkuppeln vom Traktor, die Maschine mit der Sicherungsstrebe (Fig. 78/1) an der Abstellvorrichtung befestigen**
- **Maschine am Traktor ankuppeln vor dem Entfernen der Sicherungsstrebe (Fig. 78/1).**

8 Einstellungen

8.1 Reihenabstand einstellen

1. Schrauben (Fig. 79/1) und Muttern (Fig. 79/2) lösen.
2. Maschine anheben und durch geeignete Abstützung sichern.
3. Die Säaggregate auf den gewünschten Reihenabstand einstellen durch Verschieben der Säaggregate auf der Klemmschiene (Fig. 79/3).

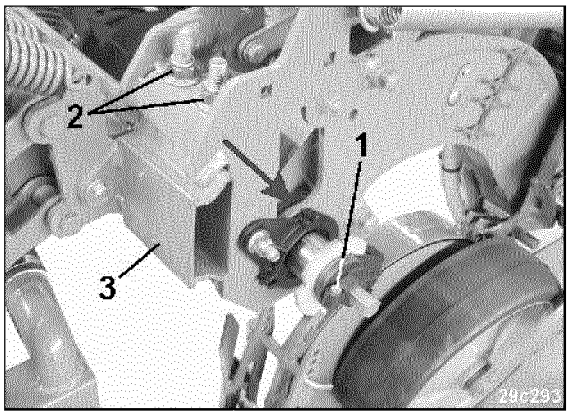


Fig. 79

Wichtig!

Die Muttern (Fig. 79/2) nach zwei Betriebsstunden auf festen Sitz überprüfen.

8.2 Säaggregate abschalten

Hinweis!

Die Düngerzufuhr (falls vorhanden) zu den dazugehörigen Düngerscharen unterbrechen.

8.2.1 Säaggregate mechanisch abschalten

1. Scherstift (Fig. 80/1) mit einer Zange aus der Kupplung herausziehen.
2. Den Scherstift bei Nichtgebrauch in die Bohrung (Fig. 80/2) im Kupplungsflansch stecken.

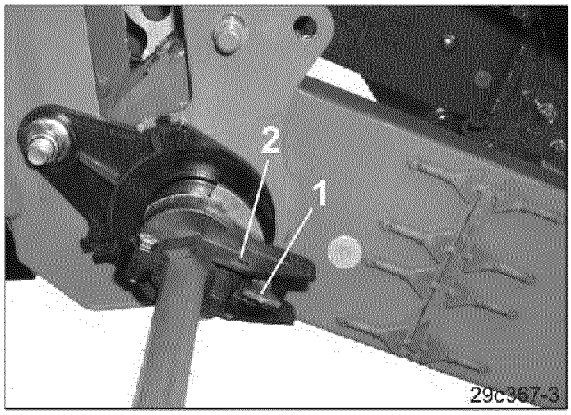


Fig. 80

8.2.2 Säaggregate elektronisch abschalten (Option)

Säaggregate elektronisch abschalten am Bedienterminal von **AMASCAN+**, **AMASCAN-PROFI** oder dem **ED-CONTROL**. Eine genaue Beschreibung der entsprechenden Betriebsanleitung entnehmen.

8.3 Kornabstand einstellen im Verstellgetriebe

Einzelkorn-Sämaschinen sind ausgestattet

- bis 6 m Arbeitsbreite
  - o mit einem Verstellgetriebe
- mit 9 m Arbeitsbreite
  - o mit zwei Verstellgetrieben (Fig. 81/1) (immer gleiche Einstellungen bei beiden Getrieben vornehmen).

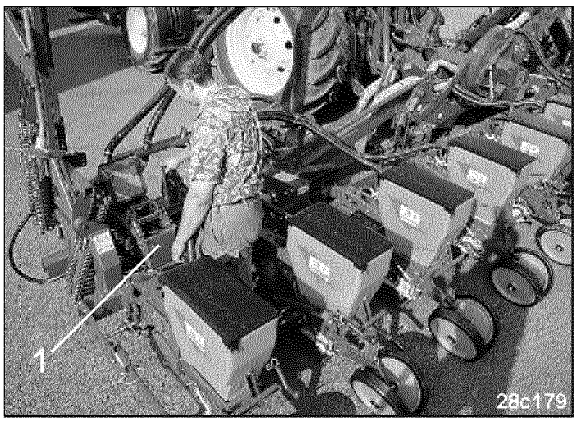


Fig. 81

Kettenradpaarung einstellen im Verstellgetriebe:

1. Haken (Fig. 82/1) aus der Halterung herausnehmen.

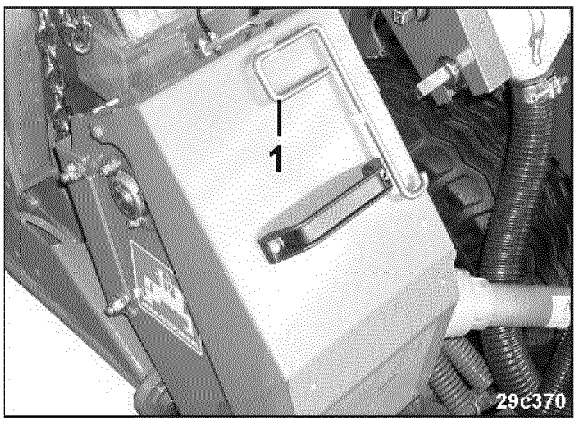


Fig. 82

2. Getriebedeckel öffnen.



Fig. 83

3. Die Abdrehkurbel (Fig. 84/1) in den Kettenspanner des Verstellgetriebes stecken.

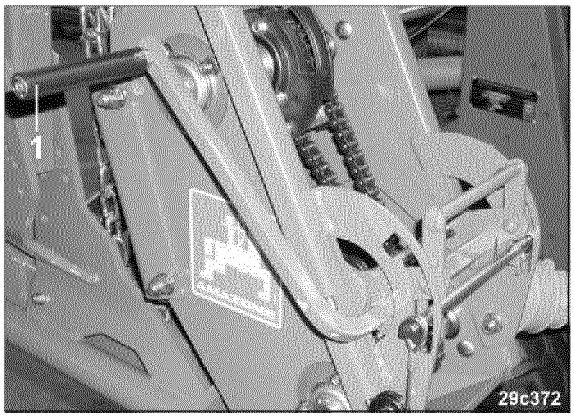


Fig. 84

Den Kettenspanner mit der Abdrehkurbel (Fig. 85) entspannen.

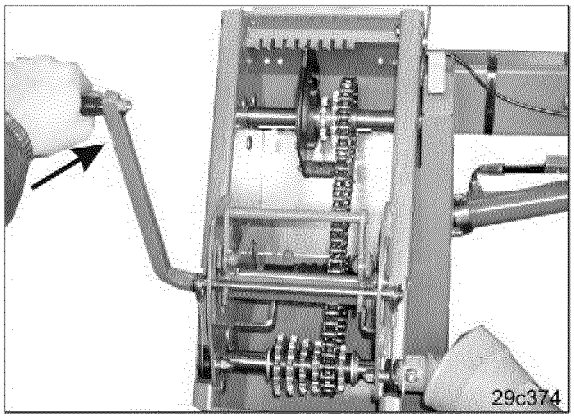


Fig. 85

Vorsicht!

Der Federdruck, der auf die Abdrehkurbel wirkt, ist sehr groß.

4. Die Abdrehkurbel (Fig. 85) so weit drücken, bis der Bolzen (Fig. 86/1) in der Aussparung (Fig. 86/2) einrastet.
5. Die Schwinge (Fig. 86/3) ggf. aushängen, um mehr Kettenlänge zum Verstellen zu erhalten.

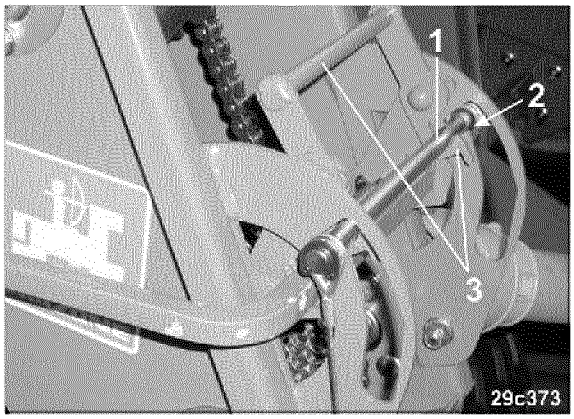


Fig. 86

6. Die Rollenkette (Fig. 87/7) mit Hilfe des Hakens (Fig. 82/1) auf die richtigen Kettenräder legen.

   Einstellwerte, siehe Kapitel „Kettenradpaarungen ermitteln für die Verstell- und Sekundärgetriebe“, Seite 62.

Beispiel:

Kettenradpaarung A – 3.

Die Rollenkette umschließt das Kettenrad (Fig. 87/A) und das Kettenrad (Fig. 87/3).

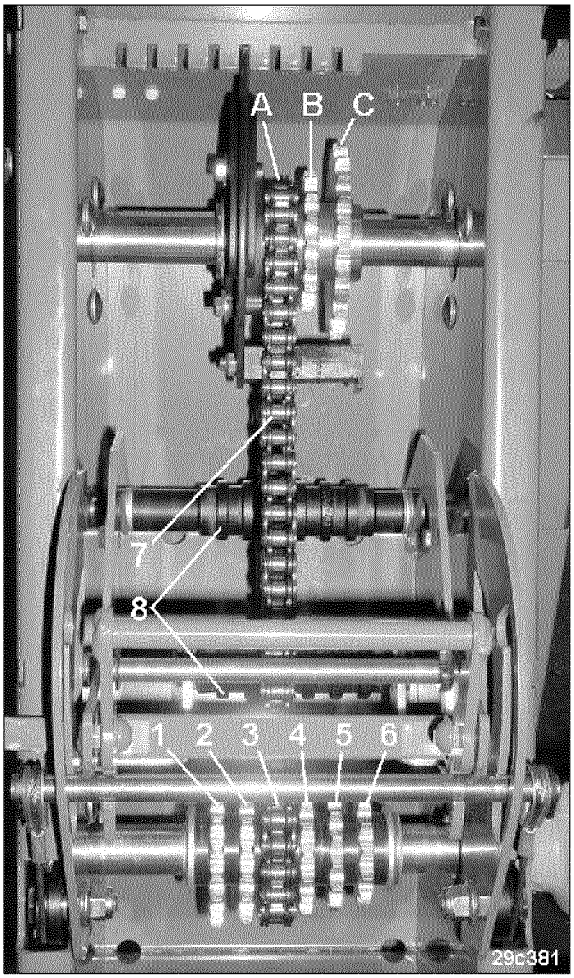


Fig. 87

Rollenkette auf eines der Kettenrädern „A”, „B” oder „C” legen:

7. Die Sicherungsscheibe (Fig. 88/1) gegen die Fahrtrichtung drehen. Der Kunststoffklotz (Fig. 88/2) hebt die Rollenkette vom Kettenrad ab.
8. Die Rollenkette auf das richtige Kettenrad legen.
9. Die Sicherungsscheibe (Fig. 88/1) soweit verschieben, bis die Rollenkette fluchtet und zurück in die axiale Sicherung drehen.

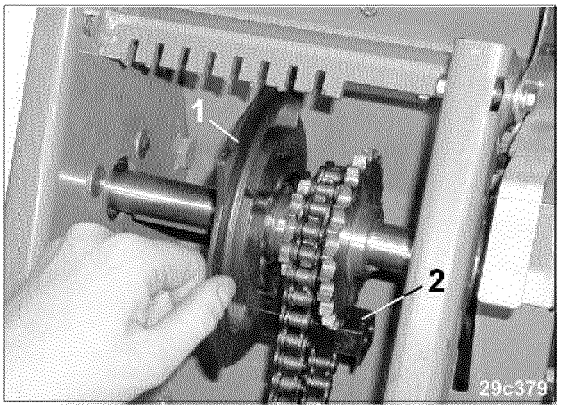


Fig. 88

Wichtig!

Die Rollenkette muss fluchten und auf den Führungen der beiden Rollen (Fig. 87/8) laufen.

Falls erforderlich die Kettenräder A bis C, wie in Figur (Fig. 88) gezeigt, auf der Welle verschieben.

10. Die Abdrehkurbel und die Klinke gleichzeitig in Pfeilrichtung (Fig. 89) drücken.

    Mit der Klinke den Bolzen aus den Aussparungen (Fig. 86/2) heraushebeln und den Federdruck mit der Abdrehkurbel entspannen.

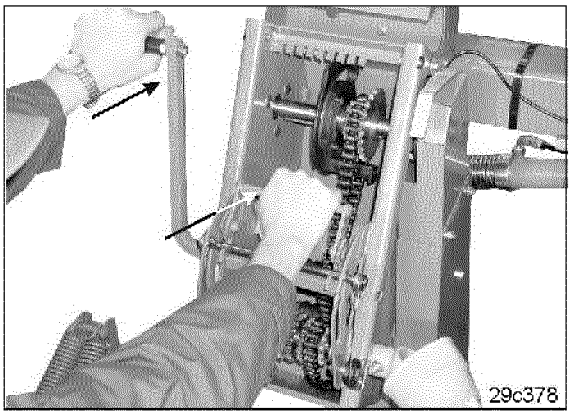


Fig. 89

Vorsicht!

Der große Federdruck wirkt unmittelbar nach dem Lösen des Bolzens auf die Abdrehkurbel.

11. Die Abdrehkurbel in die Transporthalterung stecken.
12. Den Getriebedeckel (Fig. 83) schließen.
13. Den Haken (Fig. 82) auf dem Getriebedeckel befestigen.

Wichtig!

Das Fluchten nach dem Spannen der Rollenkette prüfen.

8.4 Kornabstand einstellen im Sekundärgetriebe

Einzelkorn-Sämaschinen sind ausgestattet

- bis 6 m Arbeitsbreite
  - o mit einem Sekundärgetriebe (Fig. 90/1)
- mit 9 m Arbeitsbreite
  - o mit zwei Sekundärgetrieben (immer gleiche Einstellungen bei beiden Getrieben vornehmen).

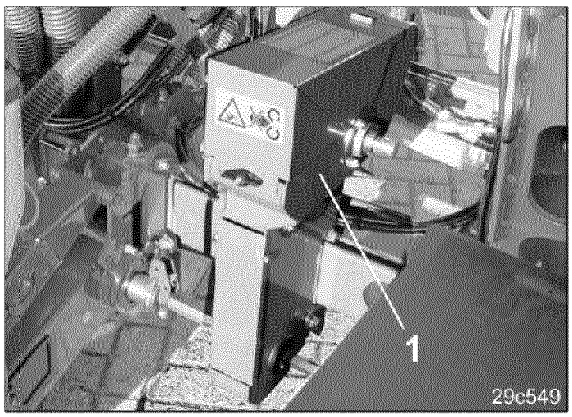


Fig. 90

Kettenradpaarung einstellen im Sekundärgetriebe:

1. Flügelmutter (Fig. 91/1) lösen.
2. Den Getriebedeckel (Fig. 91/2) entfernen.

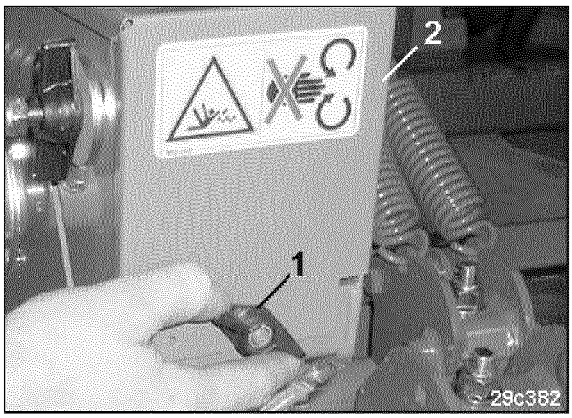


Fig. 91

3. Den Hebel (Fig. 92/1) in die Nut (Fig. 92/2) einrasten. Dadurch entspannt die Rollenkette.

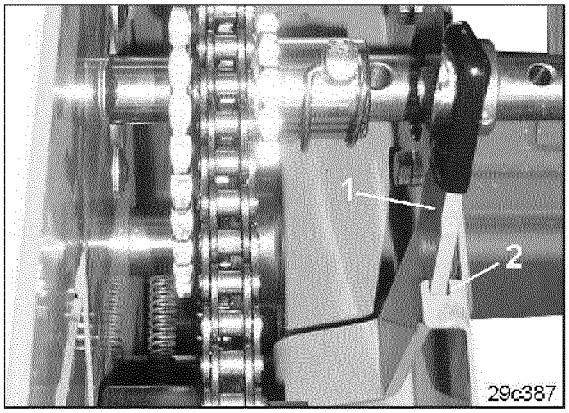


Fig. 92

4. Die Flügelmutter (Fig. 93/1) lösen und den Kettenspanner in der Kulisse in Pfeilrichtung verschieben.

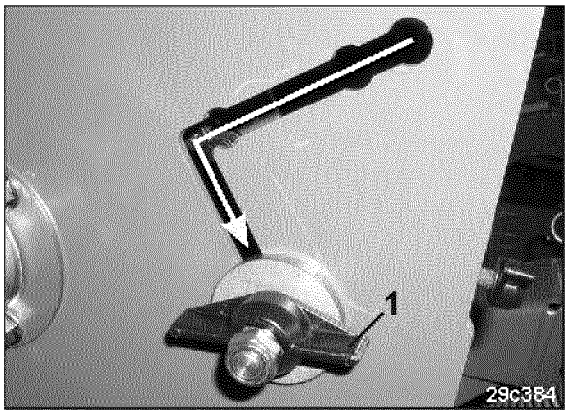


Fig. 93

5. Mit dem Haken (Fig. 82/1) die Rollenkette (Fig. 94) auf das richtige Kettenrad (X, Y oder Z) legen.
   Einstellwerte, siehe Kapitel „Kettenradpaarungen ermitteln für die Verstell- und Sekundärgetriebe“, Seite 62.
6. Verschieben Sie das Kettenrad entsprechend, wenn die Rollenkette nicht fluchtet. Nach jeder Verstellung das Kettenrad axial mit einem Klappstecker (Fig. 94/1) sichern.

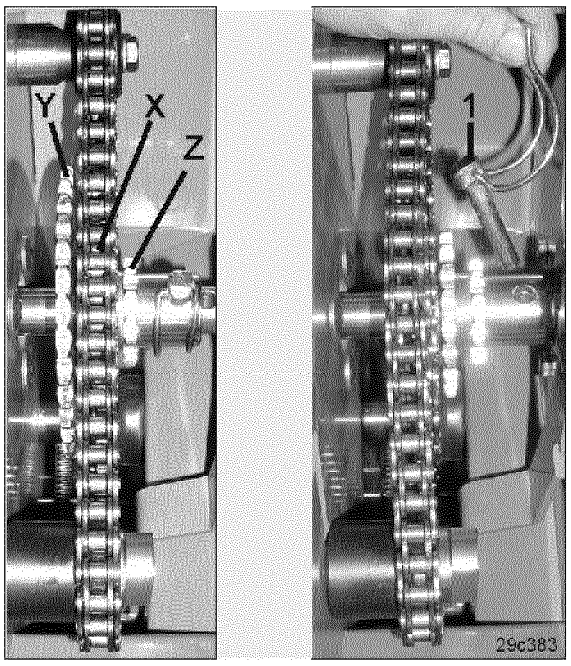


Fig. 94

7. Rollenkette spannen.
   Dazu die Flügelmutter bis zum Anschlag in Pfeilrichtung und anschließend zurück zur nächste Aussparung (Fig. 95/1) schieben. Den Kettenspanner in der Aussparung einrasten lassen.
8. Flügelmutter festziehen.
9. Den Hebel (Fig. 92/1) aus der Nut (Fig. 92/2) lösen.
10. Den Getriebedeckel schließen und mit der Flügelmutter (Fig. 91/1) befestigen.

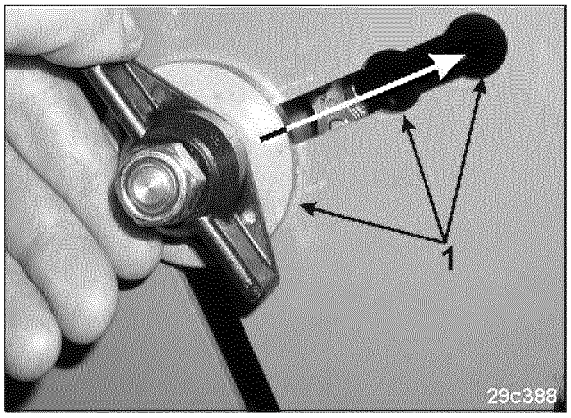


Fig. 95

8.5 Säaggregate auf das Saatgut abstimmen

Säaggregat-Einstelldaten

Saatgut	Tausend-Korn Gewicht TKG	Vereinzelungsscheibe			Auswerfer		Position		Säaggregat
		Bezeichnung	Farbe	Bestell-Nr.	Farbe	Bestell-Nr.	Abstreifer	Reduzier-klappe	
Mais	< 220 g (11 kg / 50000 K)	30/5	grün	910777	schwarz	926240	1/2	2	Classic- und Contour
	220 bis 250 g (11 bis 12,5 kg / 50000 K)	30/5	grün	910777	schwarz	926240	2/3	2	
	250 bis 280 g (12,5 bis 14 kg / 50000 K)	30/5	grün	910777	schwarz	926240	3	2	
	280 bis 320 g (14 bis 16,0 kg / 50000 K)	30/5	grün	910777	schwarz	926240	4/5	1	
	> 320 g	30/5,8	natur	910790	schwarz	926240	3/4	1	
Erbsen		60/5	dunkel-grau	924211	schwarz	926240	3	2	
Bohnen	< 400 g						5	2	
Ackerbohnen		45/6	rot	910792	schwarz	926240	5	1	
kleine Bohnen		60/2,5	schwarz	924213	schwarz	926240	2	1	
Sonnenblumen	< 70 g	30/2,2	blau	918860	gelb	926241	1	2	
	70 g bis 95 g	30/2,5	braun	910794	schwarz	926240	1	2	
	> 95 g	30/3	pink	927123	schwarz	926240	1	2	
Sojabohnen		60/4	orange	924212	schwarz	926240	3	2	
Baumwolle		60/3,2	hellgrün	915673	schwarz	926240	3	2	
Sorghum		60/2,2	bordeaux	918477	gelb	926241	1	2	
Zuckerrüben (pilliert)	< 70 g	30/2,2	blau	918860	gelb	926241	3	3	Contour
Zuckerrüben (pilliert)	> 70 g	15/2,2	türkis	920048	gelb	926241	3	3	
Rüben (nackt)		30/1,8	gelb	920049	gelb	926241	1	2	
Wassermelonen									
Raps		90/1,24	weiß	920051	rot	925912	3	3	

Wichtig!

Die Tabellenwerte (oben) sind Richtwerte, die sich durch Kornform und Korngröße ändern können.

8.5.1 Vereinzelungsscheibe und Auswerfer wechseln, Abstreifer und Reduzierklappe einstellen

Hinweis!

Die Vereinzelungsscheibe ist im Sägehäusefenster (Fig. 103) sichtbar.

Die Abstreifer-Positionen 1 bis 5 sind an der Hebelstellung (Fig. 96/A) zu erkennen. Zum Verstellen des Hebels das Säaggregat nicht öffnen.

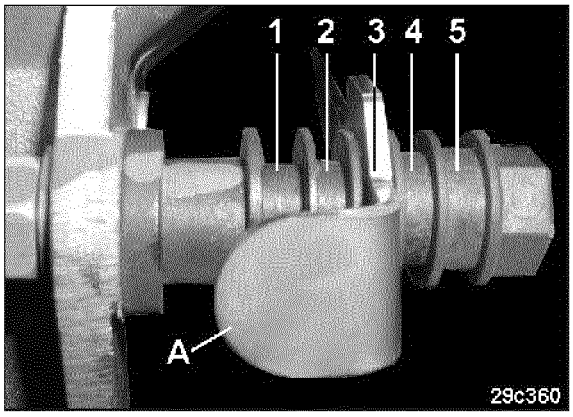


Fig. 96

Vereinzelungsscheibe und Auswerfer austauschen, Reduzierklappe einstellen:

1. Maschine anheben und durch geeignete Abstützung sichern.
2. Mutter (Fig. 97/1) lösen.
3. Das Säschar (Fig. 97/2) nach unten schwenken.
4. Mutter (Fig. 97/3) lösen.

Gefahr!

Maschine mit geeigneter Stütze gegen unbeabsichtigtes Absenken sichern!

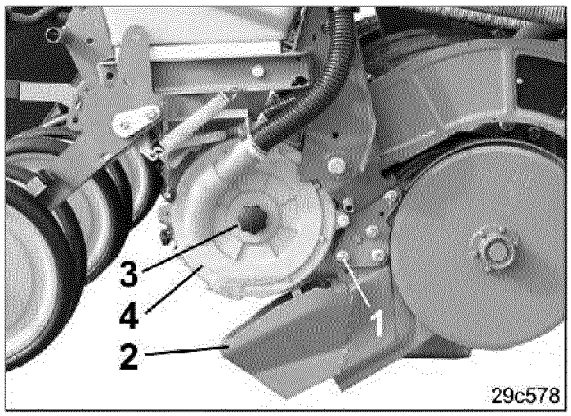


Fig. 97

5. Den Saugdeckel (Fig. 97/4) mit der Vereinzelungsscheibe (Fig. 98/1) vom Sägehäuse abziehen.
6. Die Vereinzelungsscheibe ggf. wechseln.

Wichtig!

Die Noppen (Fig. 98/2) zeigen zum Sägehäuse, nicht zum Saugdeckel.

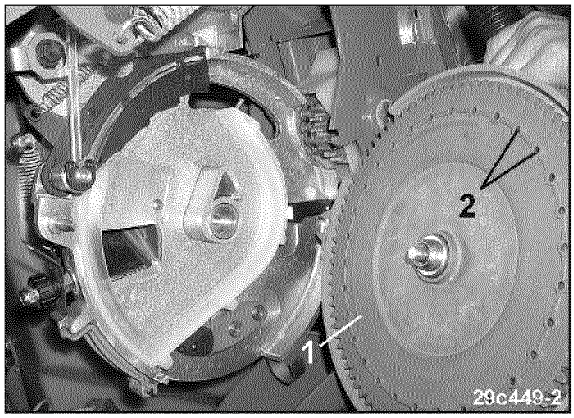


Fig. 98

7. Den Auswerfer (Fig. 99/1) ggf. wechseln.

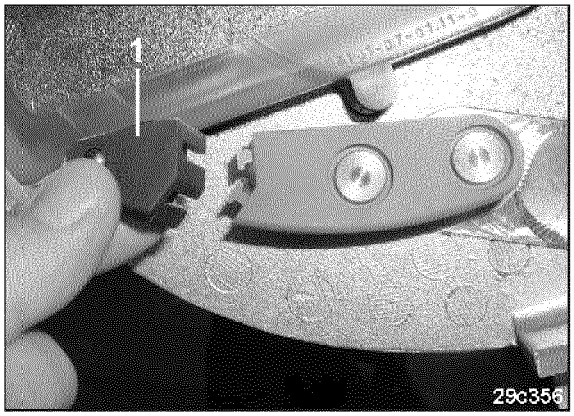


Fig. 99

8. Die Reduzierklappen-Position (Fig. 100/2) der Reduzierklappe (Fig. 100/1) ggf. ändern.

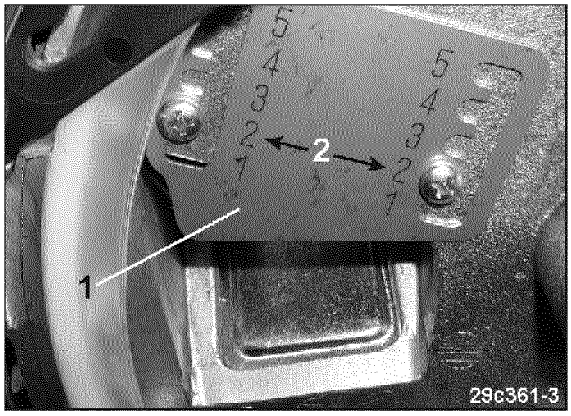


Fig. 100

9. Den Saugdeckel (Fig. 101/1) schließen.
10. Die Mutter (Fig. 101/2) handfest anziehen.
11. Das Schar (Fig. 101/3) nach oben schwenken.
12. Die Mutter (Fig. 101/4) festziehen.

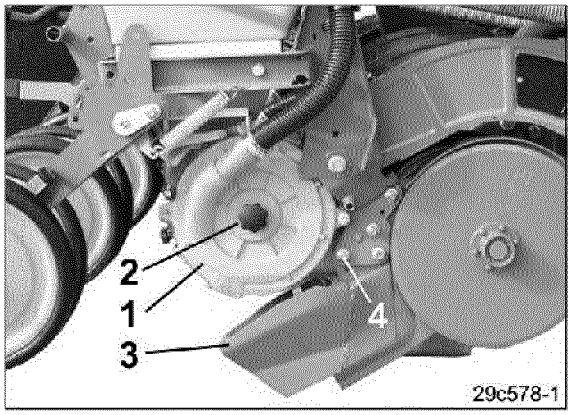


Fig. 101

13. Am Hebel (Fig. 102/1) vorsichtig ziehen und prüfen, ob der Hebel nach dem Auslenken in seine Ausgangsposition zurückkehrt.
14. Einstellung des ersten Säaggregates kontrollieren (siehe Kapitel „Abstreifer-Position und Reduzierklappen-Position kontrollieren“, Seite 97).
15. Alle Säaggregate auf die Werte des ersten Säaggregates einstellen.

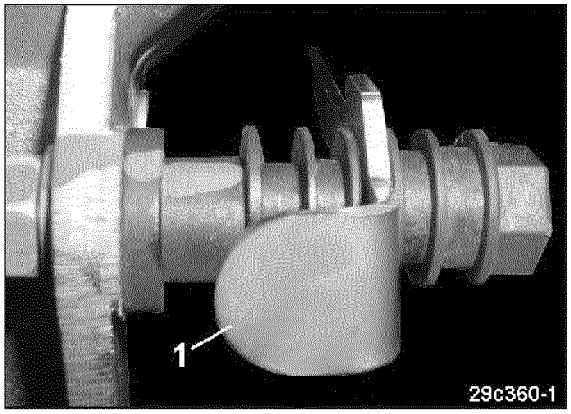


Fig. 102

8.5.2 Abstreifer-Position und Reduzierklappen-Position kontrollieren

1. Saatgut-Behälter befüllen (siehe Kapitel „Saatgut-Behälter befüllen“, Seite 98).
2. Das Gebläse einschalten (siehe Kapitel „Gebläse-Drehzahl“, Seite 100).
3. Das Antriebsrad (Fig. 180) und damit die Vereinzelungsscheiben mit der Abdrehkurbel drehen.
4. Eine zweite Person prüft, ob jede Bohrung (Fig. 103/1) mit einem Korn belegt ist.

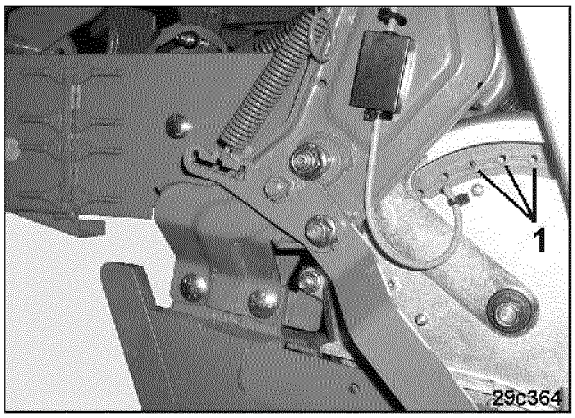


Fig. 103

5. Bei Fehlstellen den Hebel (Fig. 104/A) des Abstreifers in eine Rille mit höherer Nummer stellen.
   Bei Doppelbelegung den Hebel (Fig. 104/A) in eine Rille mit niedrigerer Nummer stellen.

   Fehlstellen können auch auftreten, wenn die Reduzierklappe (Fig. 105/2) falsch eingestellt ist und zu wenig Saatgut nachfließt.

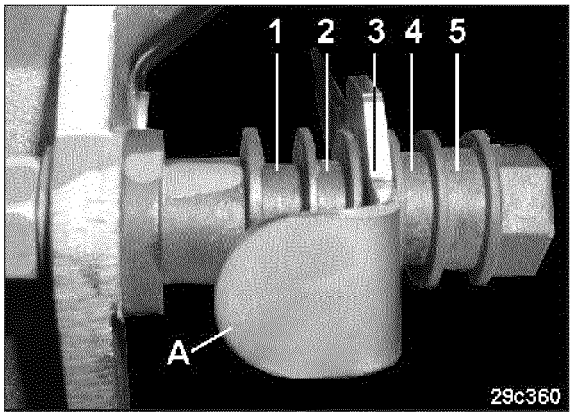


Fig. 104

6. Fehlen Körner bei richtiger Abstreifereinstellung an den Bohrungen der Vereinzelungsscheibe, die Öffnung vergrößern durch Verstellen der Reduzierklappe (Fig. 105/1) auf die nächst niedrigere Positionszahl.

   Tritt Saatgut aus der Gehäuseöffnung (Fig. 103) aus, die Zulauföffnung verkleinern durch Verstellen der Reduzierklappe auf die nächst höhere Positionszahl.

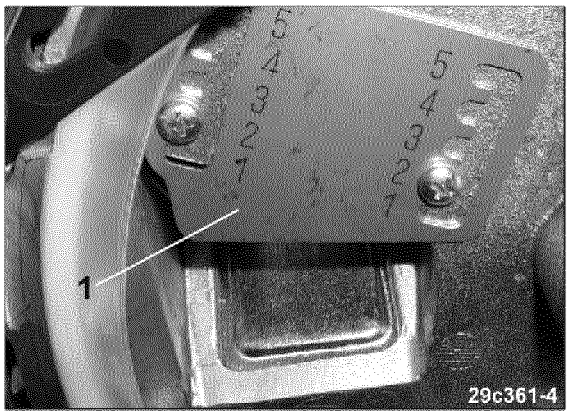


Fig. 105

Wichtig!

Der federbelastete Hebel (Fig. 104/A) muss leichtgängig sein und nach dem Auslenken in seine Ausgangsposition zurückkehren.

Hinweis!

Die Einstellungen auf dem Feld nach kurzer Fahrstrecke kontrollieren.

Doppelbelegung und Fehlstellen können von einer Person durch Freilegen des Saatgutes auf dem Feld ermittelt werden. Fehlstellen werden angezeigt vom AMASCAN+, AMASCAN-PROFI und ED-CONTROL.

8.6 Saatgut-Behälter befüllen und entleeren

8.6.1 Saatgut-Behälter befüllen

Wichtig!

- **Fremdteile aus den Saatgut-Behältern entfernen.**
- **Kein feuchtes oder klebriges Saatgut in die Saatgut-Behälter füllen.**
- **Kommt es durch Kornform und Beizung zur Brückenbildung kann die Gleitfähigkeit des Saatgutes durch Beigabe von etwa 200g Talkum auf 100 kg Saatgut verbessert werden.**

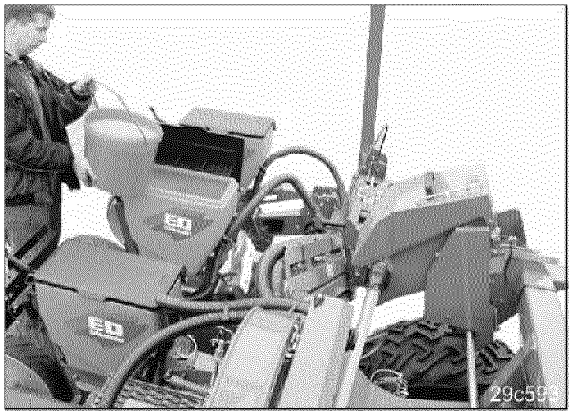


Fig. 106

8.6.2 Saatgut-Behälter und Sägehäuse entleeren

1. Die Maschine soweit anheben, bis die Säschare vom Boden freikommen.
2. Klappstecker und Bolzen (Fig. 107/1) entfernen und die Zwischenandruckrolle (Option) nach unten schwenken.

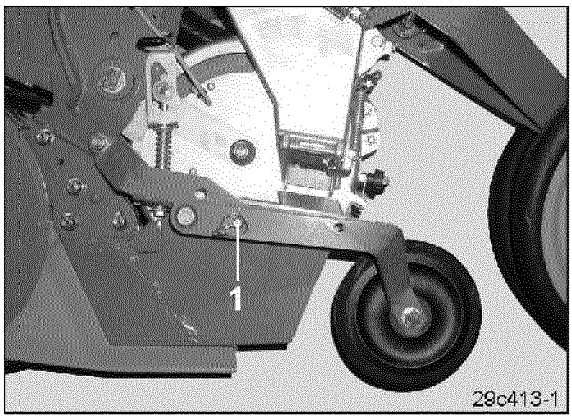


Fig. 107

3. Einen geeigneten Auffangbehälter (Fig. 108/1) unter das Säaggregat stellen.
4. Die federbelastete Klappe (Fig. 108/2) öffnen und den Saatgut-Behälter entleeren.
5. Die Klappe (Fig. 108/2) schließen.

Warnung!

Die federbelastete Klappe (Fig. 108/2) nur an der Lasche (Fig. 108/3) anfassen, sonst besteht Verletzungsgefahr beim Zuschlagen der Klappe.

Niemals mit der Hand zwischen Klappe und Sägehause fassen.

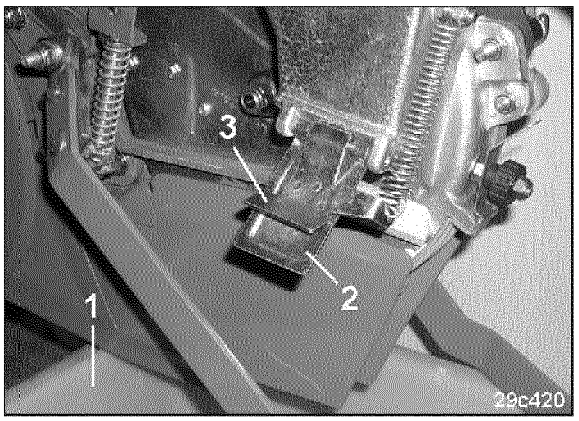


Fig. 108

Zur vollständigen Entleerung des Sägehäuses:

6. Die Mutter (Fig. 109/1) lösen.
7. Die Feder (Fig. 109/2) zur Seite schwenken.
8. Die Restentleerungsklappe (Fig. 109/3) öffnen und das Sägehäuse entleeren.
9. Die Restentleerungsklappe schließen und mit der Feder arretieren.
10. Die Mutter festziehen.

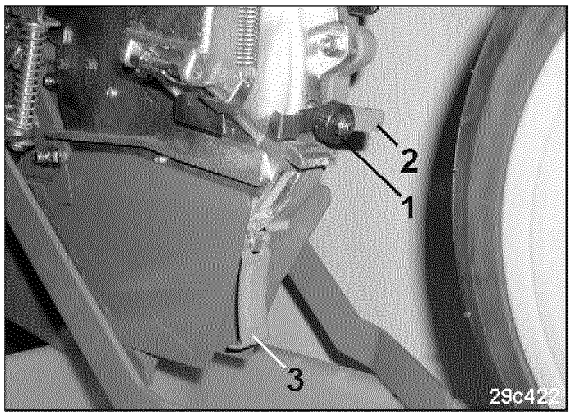


Fig. 109

8.7 Säscharspitzen

Beim Wechsel von der Maissaat zur Rübensaat sind die Säscharspitzen am Contour-Säaggregat auszutauschen (siehe Kapitel „Säscharspitzen prüfen/austauschen“, Seite 167). Die erforderlichen Säscharspitzen der Tabelle (unten) entnehmen.

Mais-Säscharspitze (für Classic- und Contour-Säaggregat)	**Rüben-Säscharspitze (für Contour-Säaggregat)**
Mais	Zuckerrüben
Bohnen	Rüben
Sonnenblumen	Wassermelonen
Erbsen	Raps
Baumwolle	
Sorghum	

8.8 Gebläse-Drehzahl

Ein Manometer (Fig. 110/1) in der Traktorkabine zeigt den Unterdruck des Saugluft-Gebläses an.

Die Gebläse-Drehzahl des Saugluft-Gebläses ist richtig eingestellt, wenn der Zeiger des Manometers mittig im grünen Skalenbereich (Fig. 110/2), d.h. zwischen 65 und 80 mbar steht.

Die Einstellung der Gebläse-Drehzahl erfolgt

- mit Zapfwellen-Antrieb
  (siehe Kapitel „Zapfwellen-Gebläseantrieb“, Seite 101)
- mit hydr. Antrieb
  (siehe Kapitel „Hydraulischer Gebläseantrieb“, Seite 101).

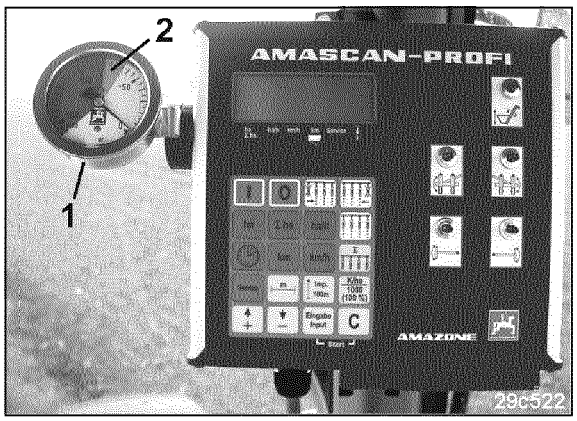


Fig. 110

Wichtig!

Auf die vorschriftsmäßige Gebläse-Drehzahl im grünen Skalenbereich achten,

- **zur Vermeidung von Doppelbelegung / Fehlstellen des Saatgutes an den Vereinzelungsscheiben**
- **zur Vermeidung von erhöhtem Verschleiß am Gebläse.**

Wichtig!

Beim Einsatz der roten Vereinzelungsscheibe für Ackerbohnen (siehe Tabelle, Seite 94) die Gebläse-Drehzahl soweit erhöhen, bis der Zeiger des Manometers (Fig. 110) unmittelbar vor dem roten Bereich steht.

Wichtig!

Hinweise zur Einstellung der Gebläse-Drehzahl am Fronttank, (siehe Kapitel „Gebläse-Drehzahl einstellen am Fronttank“, Seite 103).

Das Druckluft-Gebläse und das Saugluft-Gebläse haben die gleiche Drehzahl.

Das Manometer (Fig. 110) zeigt den Unterdruck des Saugluft-Gebläses an.

Bei richtig eingestellter Drehzahl des Saugluft-Gebläses kann der Luftdruck des Druckluft-Gebläses zu groß sein. Der Dünger wird dann aus der Düngerfurche herausgeblasen.

Die Lufteinlass-Öffnung des Druckluft-Gebläses mit dem Schieber (Fig. 111/1)

- verkleinern zur Reduzierung des Luftdruckes
- vergrößern zum Erhöhen des Luftdruckes.

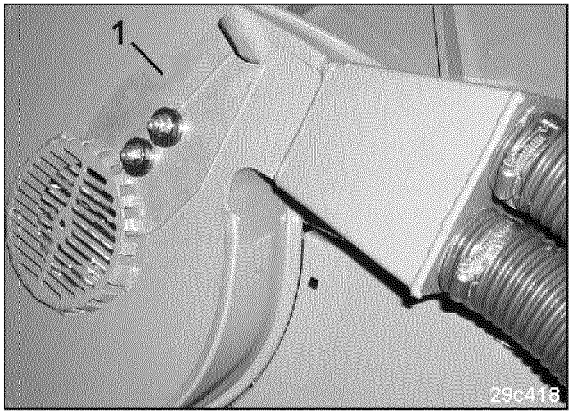


Fig. 111

Page 1178 of 1596 Precision Exhibit 1005

8.8.1 Zapfwellen-Gebläseantrieb

Der Gebläseantrieb ist eingestellt nach Ihren Bestellangaben, z.B. auf 1000 U/min. Traktor-Zapfwellen-Drehzahl. Ein Aufkleber (Fig. 112) am Gebläsegehäuse markiert die zulässige Traktor-Zapfwellen-Drehzahl.

Bei Einhaltung der zulässigen Traktor-Zapfwellen-Drehzahl steht der Zeiger des Manometers während der Arbeit im grünen Skalenbereich (Fig. 110/2).

Kleine Korrekturen können durch geringfügiges Verstellen der Traktor-Zapfwellen-Drehzahl vorgenommen werden.

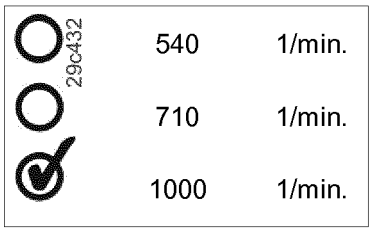


Fig. 112

8.8.2 Hydraulischer Gebläseantrieb

Die Gebläse können von einem Hydraulikmotor (Fig. 113) angetrieben werden.

Die Gebläse-Drehzahl anhand des Manometers (Fig. 110) einstellen, wahlweise

- am Stromregelventil (falls vorhanden) des Traktors (siehe Kapitel „Gebläse-Drehzahl einstellen am Stromregelventil des Traktors“, Seite 102)
- am Stromregelventil der Maschine (siehe Kapitel „Gebläse-Drehzahl einstellen am Stromregelventil der Maschine“, Seite 102).

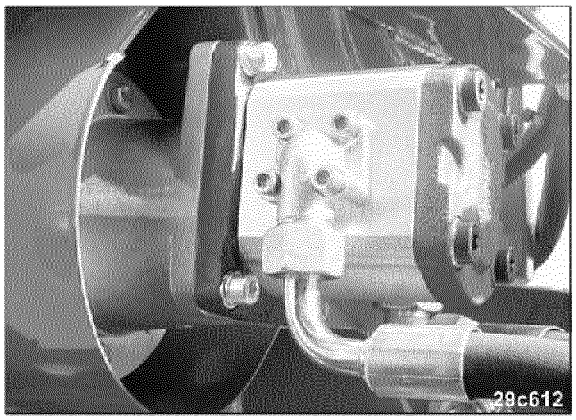


Fig. 113

Hinweis!

Nur Traktoren mit Load-Sensing-Sytem oder separatem Ölkreislauf sind geeignet, das Gebläse hydraulisch anzutreiben. Andere Traktoren müssen in der Regel zuerst das Gebläse abstellen, damit sie die Maschine am Feldende anheben können.

Hinweis!

Die Gebläse-Drehzahl verändert sich so lange, bis das Hydrauliköl seine Betriebstemperatur erreicht hat.

Bei der Erstinbetriebnahme die Gebläse-Drehzahl bis zum Erreichen der Betriebstemperatur korrigieren.

Wird das Gebläse nach längerer Stillstandszeit erneut in Betrieb genommen, wird die eingestellte Gebläse-Drehzahl erst erreicht, wenn sich das Hydrauliköl auf Betriebstemperatur erwärmt hat.

8.8.2.1 Gebläse-Drehzahl einstellen am Stromregelventil des Traktors

1. Alle Saatgut-Vorratsbehälter befüllen.
2. Kontermutter (Fig. 114/1) lösen.
3. Das Handrad (Fig. 114/2) schließen (rechts herumdrehen) und anschließend 1/2 Umdrehung öffnen damit die Ölfördermenge möglichst gering ist. Größere Ölfördermengen als unbedingt erforderlich sind zu vermeiden.
4. Handrad mit der Kontermutter (Fig. 114/1) sichern.
5. Traktormotor starten und mit erhöhter Drehzahl betreiben.
6. Das Antriebsrad mit der Abdrehkurbel solange drehen, bis alle Bohrungen der Vereinzelungsscheiben mit Saatgut-Körnern belegt sind (siehe Kapitel „Abstreifer-Position und Reduzierklappen-Position kontrollieren“, Seite 97).
7. Die Gebläse-Drehzahl anhand des Manometers (Fig. 110) einstellen am Stromregelventil des Traktors.

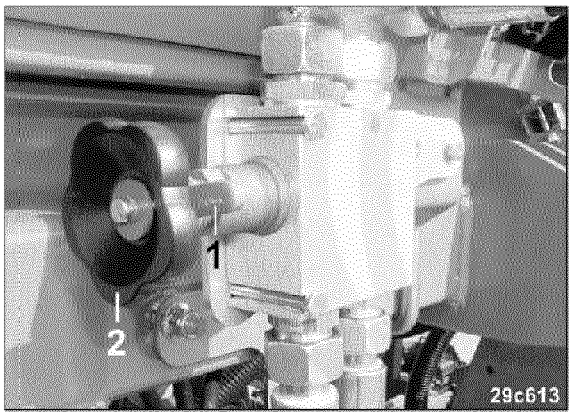


Fig. 114

8.8.2.2 Gebläse-Drehzahl einstellen am Stromregelventil der Maschine

Die Gebläse-Drehzahl nur dann am Stromregelventil der Maschine einstellen, wenn der Traktor über kein Stromregelventil verfügt.

Gebläse-Drehzahl einstellen am Stromregelventil der Maschine:

1. Alle Saatgut-Vorratsbehälter befüllen.
2. Traktormotor starten und mit erhöhter Drehzahl betreiben.
3. Kontermutter (Fig. 115/1) lösen.
4. Das Antriebsrad mit der Abdrehkurbel solange drehen, bis alle Bohrungen der Vereinzelungsscheiben mit Saatgut-Körnern belegt sind.
5. Handrad (Fig. 115/2) solange drehen, bis der Zeiger des Manometers (Fig. 110) im grünen Bereich steht.
6. Handrad mit der Kontermutter (Fig. 115/1) sichern.

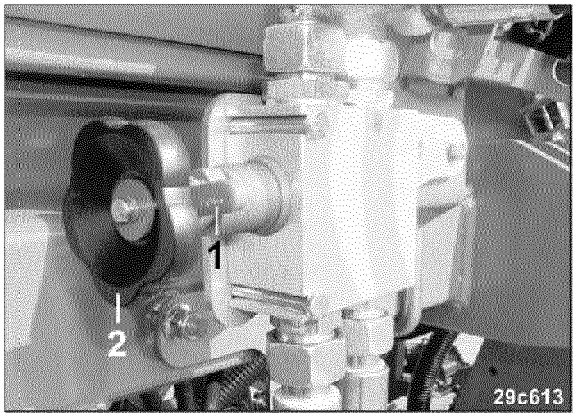


Fig. 115

8.8.2.3 Gebläse-Drehzahl einstellen am Fronttank

Kombinationen mit Fronttank haben zwei Gebläse

- das Saugluftgebläse an der Einzelkorn-Sämaschine
- das Druckluftgebläse am Fronttank.

Die Gebläse-Drehzahl des Saugluftgebläses einstellen (siehe Kapitel „Gebläse-Drehzahl“, Seite 100.)

Die Gebläse-Drehzahl des Druckluftgebläses einstellen am Fronttank anhand der Fronttank-Betriebsanleitung.

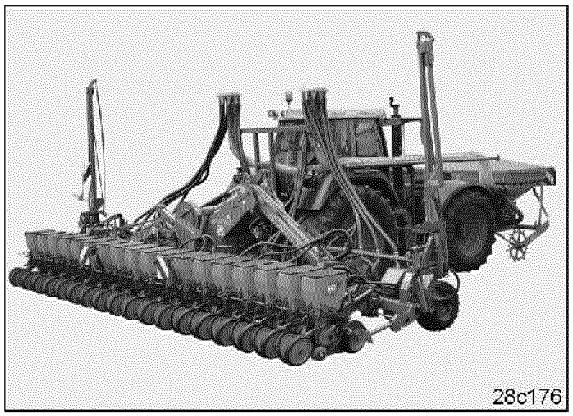


Fig. 116

Wichtig!

Gebläse-Drehzahlen des Druckluftgebläses am Fronttank:

Mindest-Gebläse-Drehzahl: 3500 U/min.
Max. Gebläse-Drehzahl: 4000 U/min.

8.9 Spuranreißer einstellen

Gefahr!

Der Aufenthalt im Schwenkbereich der Spuranreißer ist verboten.

Spuranreißer-Einstellungen nur vornehmen bei angezogener Handbremse, abgeschaltetem Motor und abgezogenem Zündschlüssel.

8.9.1 Spuranreißerlänge berechnen zum Markieren einer Spur in Traktormitte

Berechnung der Spuranreißerlänge A (Fig. 117), gemessen von Maschinenmitte bis zur Aufstandsfläche der Spuranreißerscheibe am Boden entspricht der Arbeitsbreite.

Spuranreißerlänge A	=	Reihenabstand R [cm] x Anzahl der Säaggregate

Beispiel:

Reihenabstand R: .....45 cm

Anzahl der Säaggregate:.....7

Spuranreißerlänge A = 45 cm x 7

Spuranreißerlänge A = 315 cm

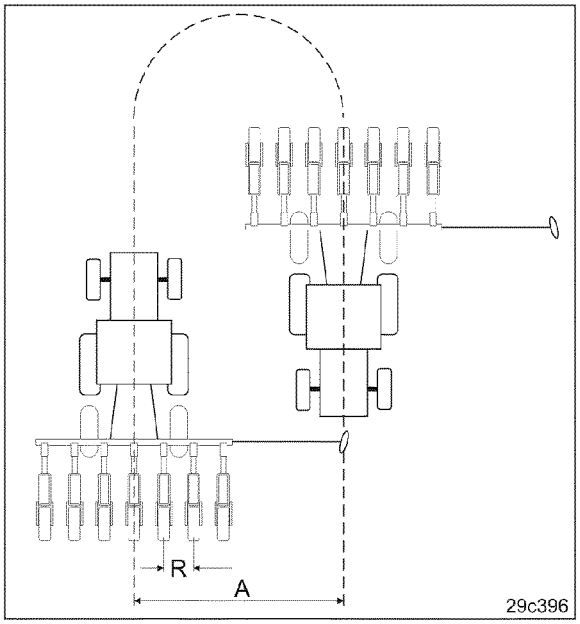


Fig. 117

8.9.2 Spuranreißerlänge berechnen zum Markieren einer Spur in der Traktorspur

Berechnung der Spuranreißerlänge A (Fig. 118), gemessen von Maschinenmitte bis zur Aufstandsfläche der Spuranreißerscheibe am Boden bei symmetrischer Anordnung der Schare.

Spuranreißerlänge A	=	Reihenabstand R [cm] x Anzahl der Säaggregate	$\frac{\text{Traktorspur S [cm]}}{200}$

Beispiel:

Reihenabstand R: ..... 45 cm

Anzahl der Säaggregate: 7

Traktorspurbreite S: ..... 150 cm

$$\text{Spuranreißerlänge A} = 45 \times 7 \frac{150}{200}$$

Spuranreißerlänge A = 236 cm

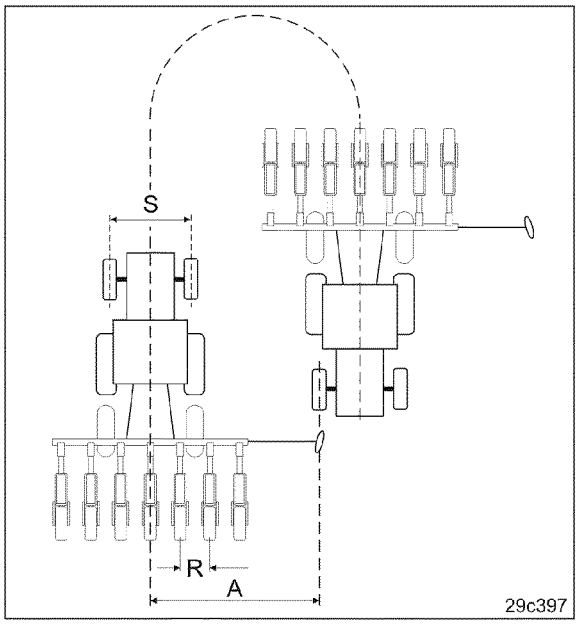


Fig. 118

8.9.3 Arbeitsintensität der Spuranreißer einstellen

1. Die Arbeitsintensität der Spuranreißer durch Verdrehen der Spuranreißerscheibe (Fig. 119/1) einstellen.

   Die Spuranreißerscheibe steht auf leichten Böden etwa parallel zur Fahrtrichtung und auf schweren Böden mehr auf Griff.

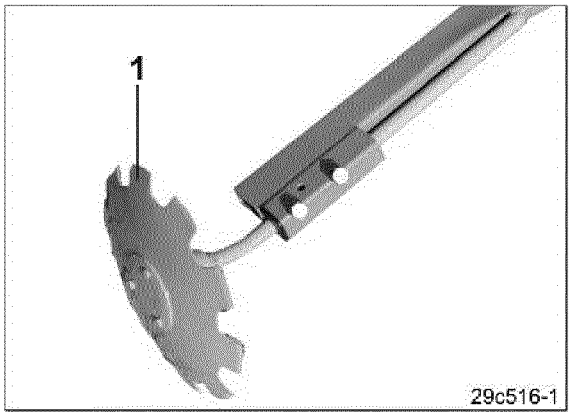


Fig. 119

8.9.4 Spuranreißer einstellen (ED 302)

Die Spuranreißer der ED 302 markieren eine Spur in Traktormitte.

Spuranreißerlänge einstellen:

1. Maschine auf dem Feld abstellen.
2. Spuranreißer entsichern (siehe Kapitel „Transportsicherung der Spuranreißer (ED 302 und ED 452 [-K])“, Seite 147).
3. Spuranreißer ausklappen (siehe Kapitel „Spuranreißer-Betätigung“, Seite 149).
4. Handbremse anziehen, Traktormotor abstellen und Zündschlüssel abziehen.
5. Zwei Schrauben (Fig. 120/1) lösen.
6. Spuranreißerlänge auf Länge „A“ (siehe Kapitel „Spuranreißerlänge berechnen zum Markieren einer Spur in Traktormitte“, Seite 104) einstellen.
7. Schrauben (Fig. 120/1) festziehen.
8. Die Arbeitstiefe der Spuranreißerscheiben auf ca. 5 cm begrenzen durch Umstecken der Kette (Fig. 121/1).
9. Kette mit einem Klappstecker (Fig. 121/2) sichern.

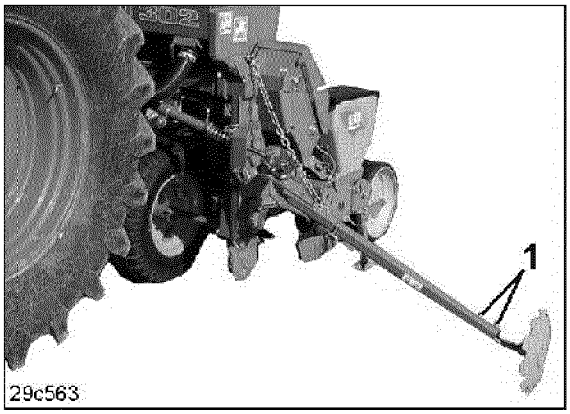


Fig. 120

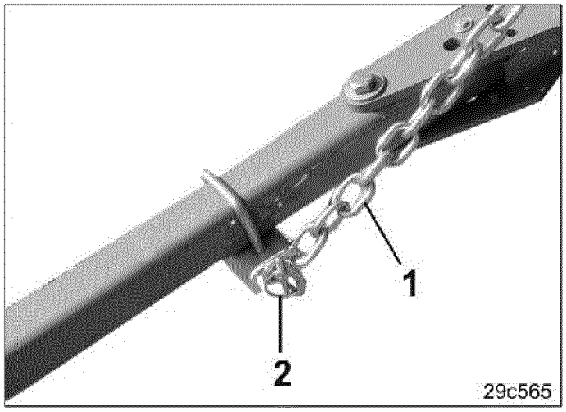


Fig. 121

8.9.5 Spuranreißer einstellen (ED 452 [-K])

Die Spuranreißer der ED 452 [-K] markieren eine Spur in Traktormitte oder in der Traktorspur.

Spuranreißerlänge einstellen:

1. Maschine auf dem Feld abstellen.
2. Spuranreißer entsichern (siehe Kapitel „Transportsicherung der Spuranreißer (ED 302 und ED 452 [-K])“, Seite 147).
3. Spuranreißer ausklappen (siehe Kapitel „Spuranreißer-Betätigung“, Seite 149).
4. Handbremse anziehen, Traktormotor abstellen und Zündschlüssel abziehen.

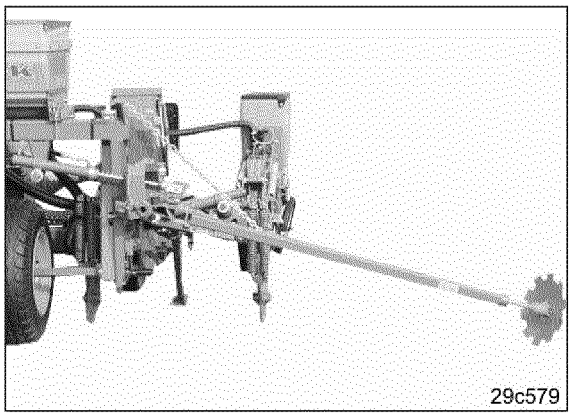


Fig. 122

5. Den federbelasteten Bolzen (Fig. 123/1) ziehen, zur Seite schwenken und arretieren.
6. Das Auslegerrohr (Fig. 123/2) bis zur ersten oder zweiten Bohrung herausziehen.

Stellung des Auslegerrohres (Fig. 123/2):

erste Bohrung: Anreißen in der Traktorspur

zweite Bohrung: Anreißen in Traktormitte.

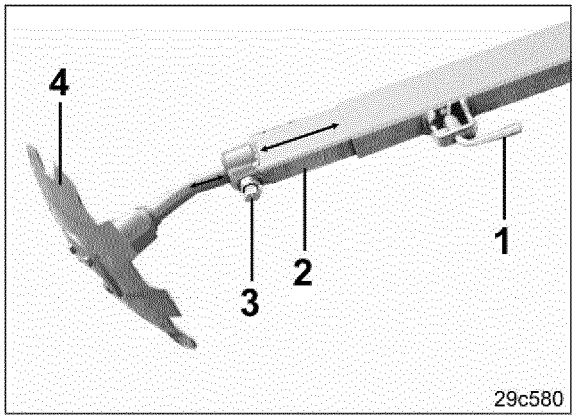


Fig. 123

7. Das Auslegerrohr (Fig. 123/2) mit dem Bolzen (Fig. 123/1) sichern.
8. Schraube (Fig. 123/3) lösen.
9. Spuranreißerlänge auf Länge „A“ einstellen
   - siehe Kapitel „Spuranreißerlänge berechnen zum Markieren einer Spur in Traktormitte“, Seite 104
   - siehe Kapitel „Spuranreißerlänge berechnen zum Markieren einer Spur in der Traktorspur“, Seite 104.
10. Schraube (Fig. 123/3) festziehen.
11. Die Arbeitstiefe der Spuranreißerscheiben auf ca. 5 cm begrenzen durch Umhängen der Kette (Fig. 124/1).
12. Kette mit einem Klappstecker (Fig. 124/2) sichern.

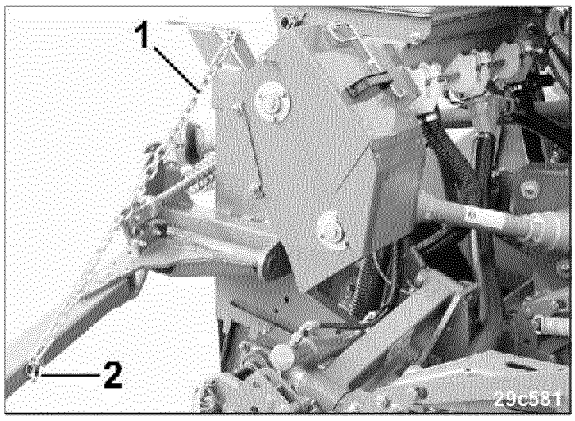


Fig. 124

8.9.6 Spuranreißer einstellen (ED 602-K)

Die Spuranreißer der ED 602-K markieren eine Spur in Traktormitte oder in der Traktorspur.

Spuranreißerlänge einstellen:

1. Maschine auf dem Feld abstellen.
2. Spuranreißer ausklappen (siehe Kapitel „Spuranreißer-Betätigung“, Seite 149).
3. Handbremse anziehen, Traktormotor abstellen und Zündschlüssel abziehen.

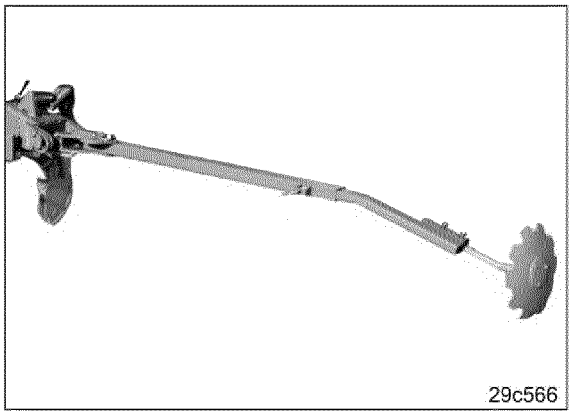


Fig. 125

4. Den federbelasteten Bolzen (Fig. 126/1) ziehen, zur Seite schwenken und arretieren.
5. Das Auslegerrohr (Fig. 126/2) bis zur ersten oder zweiten Bohrung herausziehen.

Stellung des Auslegerrohres (Fig. 126/2):

erste Bohrung: Anreißen in der Traktorspur

zweite Bohrung: Anreißen in Traktormitte.

6. Das Auslegerrohr (Fig. 126/2) mit dem federbelasteten Bolzen (Fig. 126/1) sichern.

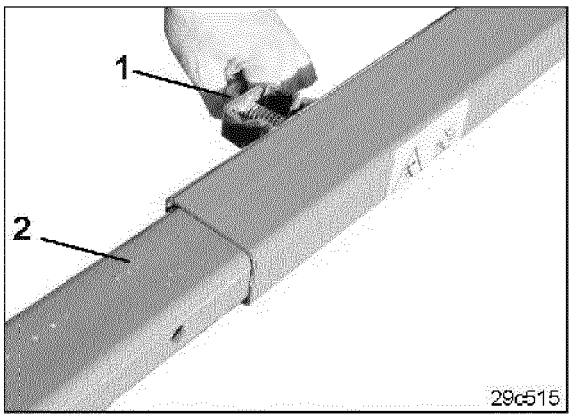


Fig. 126

7. Schrauben (Fig. 127/1) lösen.
8. Spuranreißerlänge auf Länge „A“ einstellen
   - siehe Kapitel „Spuranreißerlänge berechnen zum Markieren einer Spur in Traktormitte“, Seite 104
   - siehe Kapitel „Spuranreißerlänge berechnen zum Markieren einer Spur in der Traktorspur“, Seite 104.
9. Schrauben (Fig. 127/1) festziehen.

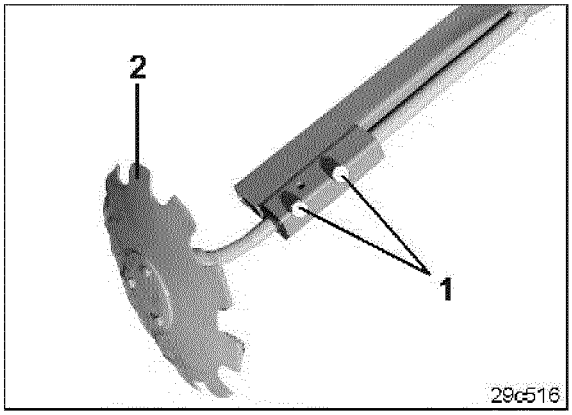


Fig. 127

10. Spannschloss-Kontermutter (Fig. 128/1) lösen.
11. Spannschloss soweit verstellen, bis die Spuranreißerscheibe (Fig. 127/2) den Boden berührt.
12. Spannschloss um eine Umdrehung kürzen, damit die Arbeitstiefe der Spuranreißerscheibe begrenzt wird auf ca. 5 cm.
13. Spannschloss-Kontermutter (Fig. 128/1) festziehen.

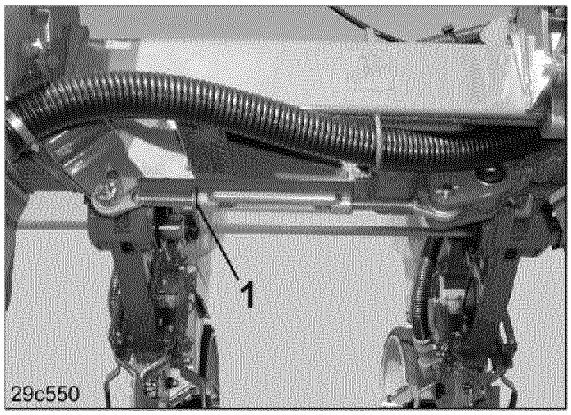


Fig. 128

8.9.7 Spuranreißer einstellen (ED 902-K)

Die Spuranreißer der ED 902-K markieren eine Spur in Traktormitte.

Spuranreißerlänge einstellen:

1. Maschine auf dem Feld abstellen.
2. Spuranreißer ausklappen (siehe Kapitel „Spuranreißer-Betätigung“, Seite 149).
3. Handbremse anziehen, Traktormotor abstellen und Zündschlüssel abziehen.
4. Schrauben (Fig. 129/1) lösen.
5. Spuranreißerlänge auf Länge „A“ einstellen (siehe Kapitel „Spuranreißerlänge berechnen zum Markieren einer Spur in Traktormitte“, Seite 104).
6. Schrauben (Fig. 129/1) festziehen.

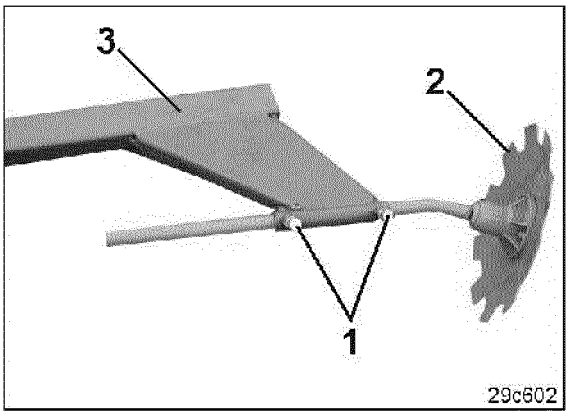


Fig. 129

7. Muttern (Fig. 130/1) lösen.
8. Strebe (Fig. 130/2) so verstellen, das die Arbeitstiefe der Spuranreißerscheibe auf ca. 5 cm begrenzt ist.
9. Muttern (Fig. 130/1) festziehen.

Hinweis!

Mit 8,1 m Arbeitsbreite kurze Endausleger (Fig. 129/3) montieren (siehe Kapitel „Kurze Endausleger montieren“, Seite 110).

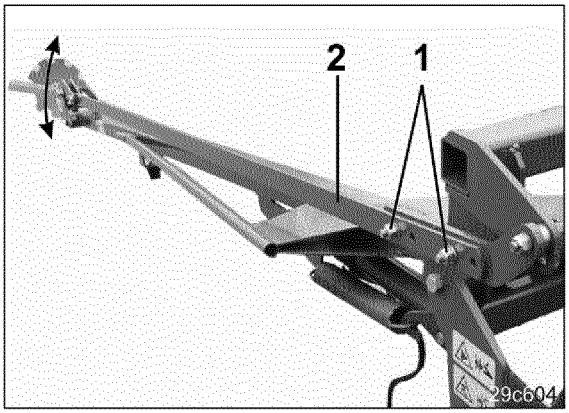


Fig. 130

8.9.7.1 Kurze Endausleger montieren

1. Kurze Endausleger (Fig. 129/3) montieren.
2. Muttern (Fig. 131/1) lösen.
3. Strebe (Fig. 131/2) in Mittelstellung stellen.
4. Muttern (Fig. 131/1) festziehen.

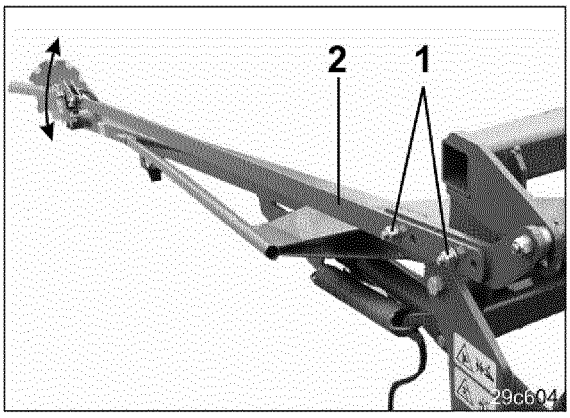


Fig. 131

5. Spuranreißerlänge einstellen [siehe Kapitel „Spuranreißer einstellen (ED 902-K)“, Seite 109].
6. Kontermutter (Fig. 132/1) lösen.
7. Anschlagmutter (Fig. 132/2) solange verdrehen bis die Arbeitstiefe der Spuranreißerscheibe (Fig. 129/2) auf ca. 5 cm begrenzt ist.
8. Kontermutter (Fig. 132/1) festziehen.

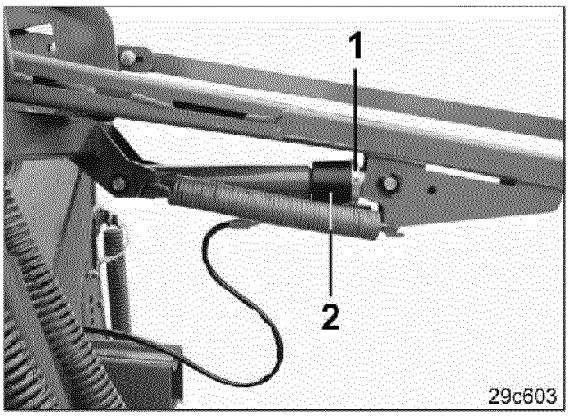


Fig. 132

8.10 Spurlockerer einstellen

Wichtig!

Die Spurlockerer erst auf dem Feld in Arbeitsstellung bringen und nach der Arbeit ganz oben befestigen, um Beschädigungen beim Abstellen der Maschine zu vermeiden.

Gefahr!

Traktor-Zapfwelle abschalten, Handbremse anziehen, Traktormotor abstellen und Zündschlüssel abziehen.

Vor dem Verschieben des Spurlockerers

- horizontal: Mutter (Fig. 133/1) lösen
- vertikal: Schraube (Fig. 133/2) lösen.

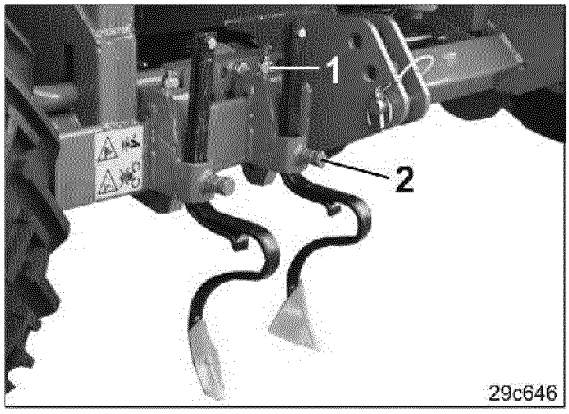


Fig. 133

Vor dem Verschieben des Spurlockerers

- horizontal: Mutter (Fig. 134/1) lösen
- vertikal: Klappstecker und Bolzen (Fig. 134/2) lösen.

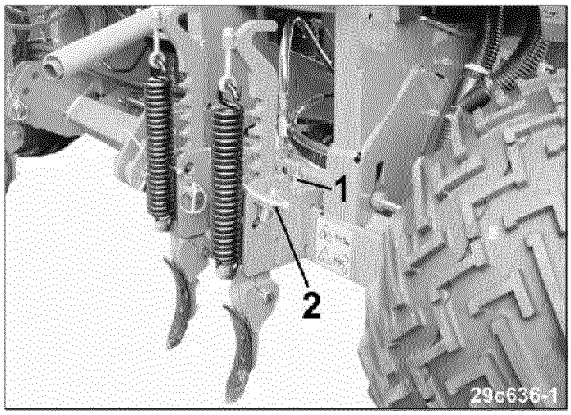


Fig. 134

Mutter (Fig. 135/1) lösen vor dem horizontalen und vertikalen Verschieben des Spurlockerers.

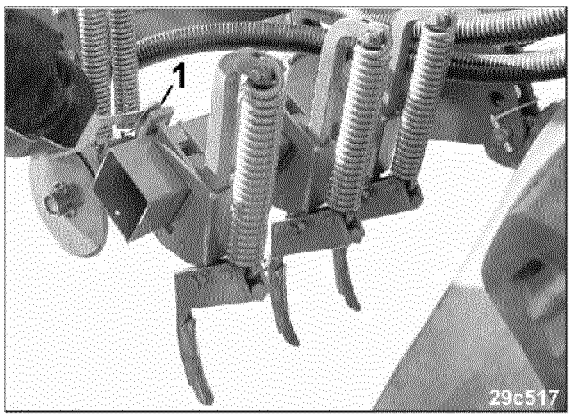


Fig. 135

8.11 Saatgutablagetiefe einstellen (Classic-Säaggregat)

1. Maschine auf dem Feld in Arbeitsstellung bringen (siehe Kapitel „Einsatz der Maschine“, Seite 146).

Wichtig!

Den Saatgut-Behälterdeckel waagerecht stellen durch Verlängern oder Verkürzen des Oberlenkers.

2. Den Federbügel (Fig. 136/1) lösen. Der Federbügel sichert die Spindel (Fig. 136/2) gegen Verdrehung.
3. Mit der Spindel (Fig. 136/2) die gewünschte Ablagetiefe einstellen.

Spindelverstellung

Drehung nach rechts: Arbeitstiefe verringern

Drehung nach links: Arbeitstiefe vergrößern.

4. Die Spindel (Fig. 136/2) mit dem Bügel (Fig. 136/1) gegen Verdrehung sichern.

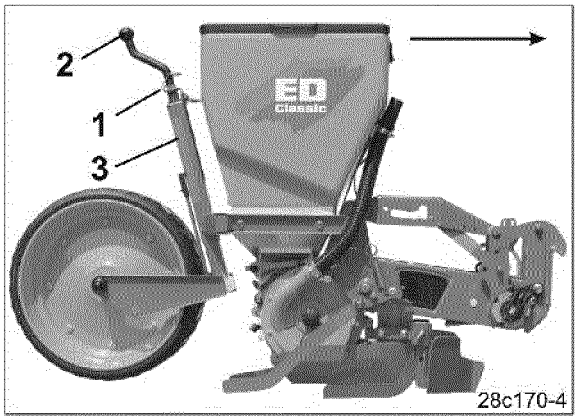


Fig. 136

5. Ablagetiefe des ersten Säaggregates prüfen (siehe Kapitel „Saatgutablagetiefe und Kornabstand kontrollieren“, Seite 118) und bei Bedarf korrigieren.

   Die maximale Ablagetiefe beträgt 10 cm.

   Wird die gewünschte Saatgutablagetiefe nicht erreicht, verstellen Sie das auf die Säschare wirkende Säaggregat-Gewicht (Belastung) [siehe Kapitel „Belastungsstufe einstellen (Classic-Säaggregat)“, Seite 113].
6. Die Belastungsstufe und die Spindelstellung des ersten Säaggregates an allen Säaggregaten einstellen. Die Spindelstellung an der Skala (Fig. 136/3) ablesen.
7. Abschließende Prüfung der Ablagetiefe aller Säaggregate (siehe Kapitel „Saatgutablagetiefe und Kornabstand kontrollieren“, Seite 118).

8.11.1 Belastungsstufe einstellen (Classic-Säaggregat)

1. Die Maschine im Traktor-Dreipunkt soweit anheben, bis die Säaggregate vom Boden freikommen.
2. Den Hebel (Fig. 137) gut festhalten und in eine der 4 Hebelstellungen (Belastungsstufen) einrasten.

Hebelstellung (Fig. 137/...)

(1) = Entlastung

(2) = neutral

(3) = 50% Belastung

(4) = 100% Belastung.

Vorsicht!

Verletzungsgefahr beim Entspannen des mit Federdruck belasteten Hebels (Fig. 137).

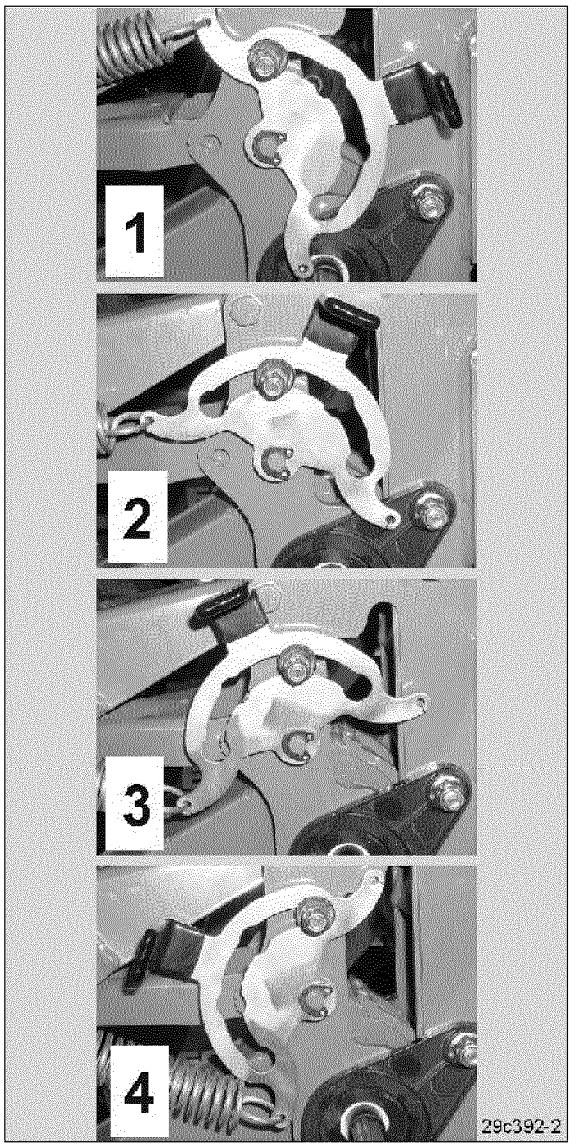


Fig. 137

8.12 Saatgutablagetiefe einstellen (Contour-Säaggregat)

1. Maschine auf dem Feld in Arbeitsstellung bringen (siehe Kapitel „Einsatz der Maschine“, Seite 146).
2. Federbügel (Fig. 138/1) lösen. Der Federbügel sichert die Spindel (Fig. 138/2) gegen Verdrehung.
3. Mit der Spindel (Fig. 138/2) die gewünschte Ablagetiefe einstellen.

Spindelverstellung

Drehung nach rechts: Arbeitstiefe verringern

Drehung nach links: Arbeitstiefe vergrößern.

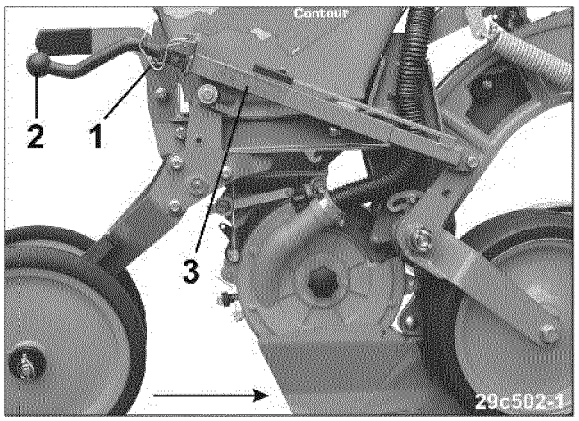


Fig. 138

4. Die Spindel (Fig. 138/2) mit dem Bügel (Fig. 138/1) gegen Verdrehung sichern.
5. Ablagetiefe des ersten Säaggregates prüfen (siehe Kapitel „Saatgutablagetiefe und Kornabstand kontrollieren“, Seite 118) und bei Bedarf korrigieren.

Die maximale Ablagetiefe beträgt 12 cm.

6. Lässt sich die gewünschte Saatgutablagetiefe nicht erreichen, die Belastung auf das Säschar verändern [siehe Kapitel „Belastungsstufe einstellen (Contour-Säaggregat)“, unten].
7. Die Belastungsstufe und die Spindelstellung des ersten Säaggregates an allen Säaggregaten einstellen. Die Spindelstellung an der Skala (Fig. 138/3) ablesen.
8. Abschließende Prüfung der Ablagetiefe aller Säaggregate (siehe Kapitel „Saatgutablagetiefe und Kornabstand kontrollieren“, Seite 118).

8.12.1 Belastungsstufe einstellen (Contour-Säaggregat)

1. Die Maschine im Traktor-Dreipunkt soweit anheben, bis die Säaggregate vom Boden freikommen.
2. Abdrehkurbel (Fig. 139/1) in die Vierkantöffnung des ersten Säaggregates stecken.
3. Abdrehkurbel entgegen der Federkraft drücken und die Strebe (Fig. 139/2) vom Bolzen (Fig. 139/3) lösen.
4. Zugfedern (Fig. 139/4) entspannen.

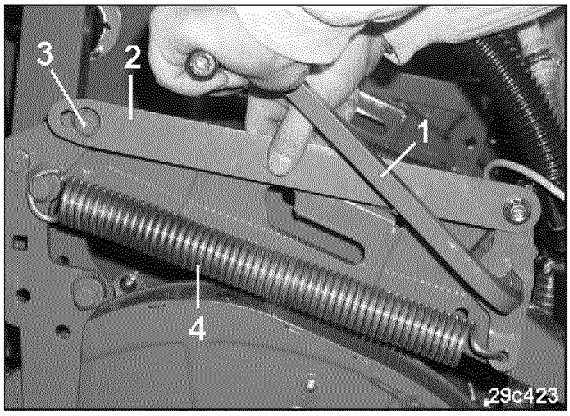


Fig. 139

5. Beide Zugfedern (Fig. 139/4) umhängen, wie in den Figuren (Fig. 140 bis Fig. 142) gezeigt.
6. Mit der Abdrehkurbel die Federn spannen und die Strebe (Fig. 139/2), wie in den Figuren (Fig. 140 bis Fig. 142) gezeigt, an einem Bolzen einhängen.
7. Die Ablagentiefen-Feineinstellung vornehmen mit der Spindel [siehe Kapitel „Saatgutablagetiefe einstellen (Contour-Säaggregat)“, Seite 114].

Belastungsstufe 1:

Befestigung der Feder (Fig. 140/1) und der Strebe (Fig. 140/2), wie dargestellt.

In Belastungsstufe 1 wirkt das geringste Gewicht auf das Säschar und vergrößert sich dann schrittweise.

Belastungsstufe 2: (siehe Fig. 141)

Belastungsstufe 3: (siehe Fig. 142).

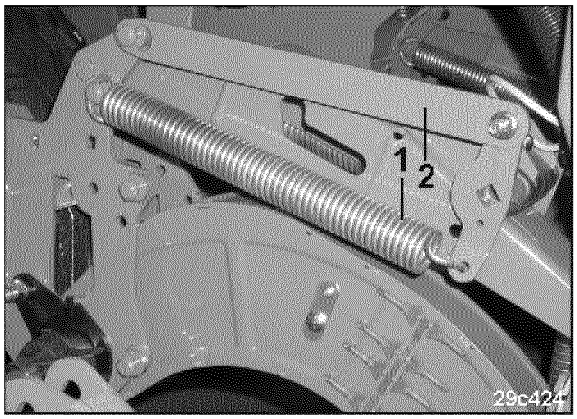


Fig. 140

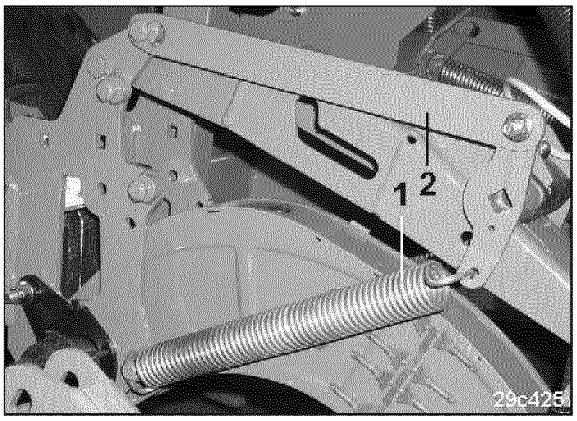


Fig. 141

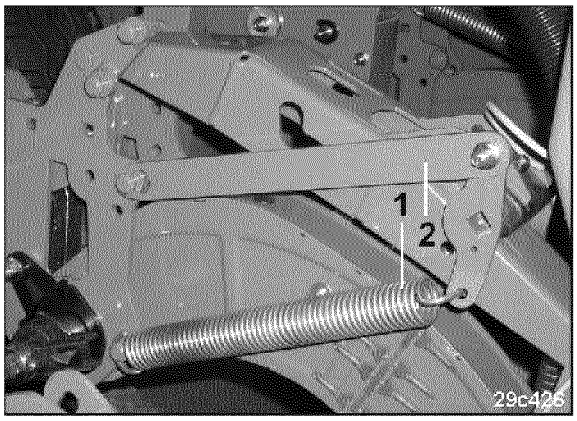


Fig. 142

Die Montagezeichnungen der drei Belastungsstufen finden Sie auf einem Aufkleber (Fig. 143) an der Maschine.

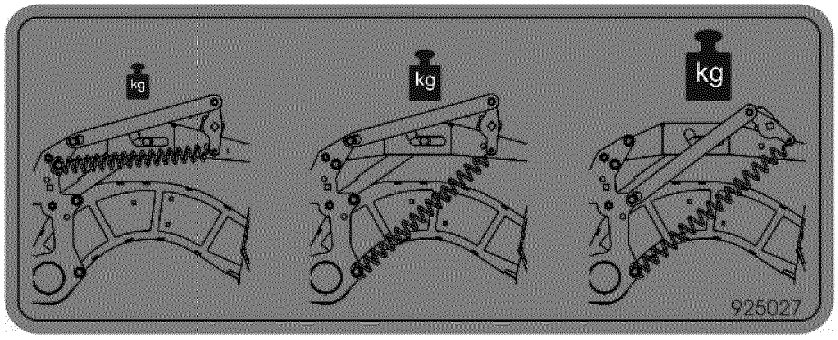


Fig. 143

8.12.2 Lastverteilung der Druckrollen verstellen (Contour-Säaggregat)

Zur Anpassung an die unterschiedlichen Bodenverhältnisse und -zustände ist die Lastverteilung zwischen der vorlaufenden (Fig. 144/1) und der nachlaufenden Druckrolle (Fig. 144/2) einstellbar.

Kann die Säfurche auf Grund des harten Bodens nicht geschlossen werden, ist mehr Last auf die hinteren Walkgummireifen zu bringen, um die Furchenränder zu brechen und die Säfurche zu schliessen.

Werkseitig ist eine gleichmäßige Lastverteilung (50/50) zwischen den Druckrollen eingestellt.

Die Lastverteilung erfolgt durch das Umstecken der Spindel (Fig. 144/3) in die Aufnahmen a bis d.

Stellung A:

Spindel-Aufnahme a und c (Fig. 144/A):

gleichmäßige Gewichtverteilung vorne und hinten (werkseitige Einstellung).

Stellung B:

Spindel-Aufnahme b und c (Fig. 144/B):

Gewichtverteilung vorne 30% und hinten 70%.

Bei Arbeiten auf sehr schweren Böden. Die nachlaufende V-Druckrolle wird belastet.

Stellung C:

Spindel-Aufnahme a und d (Fig. 144/C):

Gewichtverteilung vorne 70% und hinten 30%.

Zur Aussaat druckempfindlicher Saatgüter, z.B. Rüben. Die nachlaufende Gummi-V-Druckrolle wird weniger stark belastet.

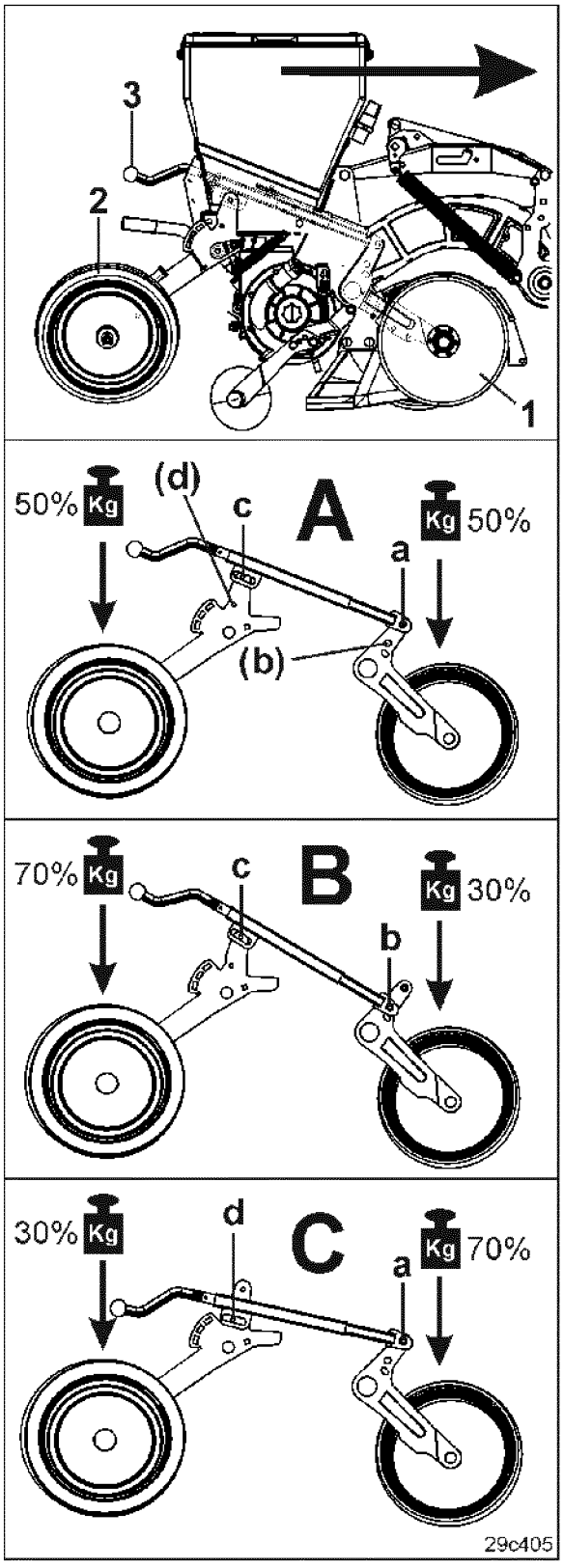


Fig. 144

In jeder der Stellungen „A“ bis „C“ kann das Gewicht, das auf die hintere V-Druckrolle (Fig. 145/1) wirkt mit dem Hebel (Fig. 145/2) verändert werden.

Je höher der Hebel in der Arretierung abgesteckt wird, desto größer ist die Kraft, die auf die nachlaufende Druckrolle wirkt.

Der Hebel rastet in eine der drei Stellungen in der Arretierung (Fig. 145/3) ein.

Hinweis!

Auf wechselnden Böden den Hebel immer ganz oben in der Arretierung befestigen!

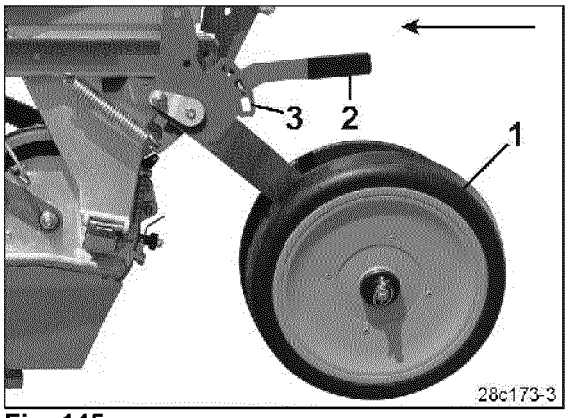


Fig. 145

8.12.3 Klutenräumer einstellen (Contour-Säaggregat)

Die Klutenräumer (Fig. 146/1) im Verstellsegment mit einem Bolzen (Fig. 146/2) nicht zu tief abstecken und mit einem Klappstecker sichern.

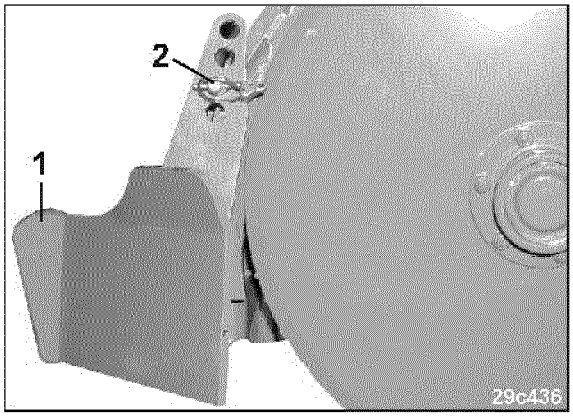


Fig. 146

8.13 Saatgutablagetiefe und Kornabstand kontrollieren

Die Saatgutablagetiefe kontrollieren

- nach jeder Einstellung der Saatgutablagetiefe
- beim Wechsel von leichtem Boden auf schweren Boden und umgekehrt. Die Druckrollen dringen bei leichten Böden tiefer in den Boden ein als bei schwereren Böden.

Saatgutablagetiefe und Kornabstand kontrollieren:

1. Ca. 30 m mit Arbeitsgeschwindigkeit säen.
2. Mit dem Multiablagetester (Option) die Körner an mehreren Stellen freilegen. Die Ablesekante einsetzen zum schichtweise Abtragen der Erde.
3. Multiablagetester (Fig. 147) waagerecht auf den Boden stellen
4. Den Zeiger (Fig. 147/1) auf das Saatgut-Korn stellen und die Saatgutablagetiefe an der Skala (Fig. 147/2) ablesen.
5. Den Kornabstand mit dem Lineal messen.

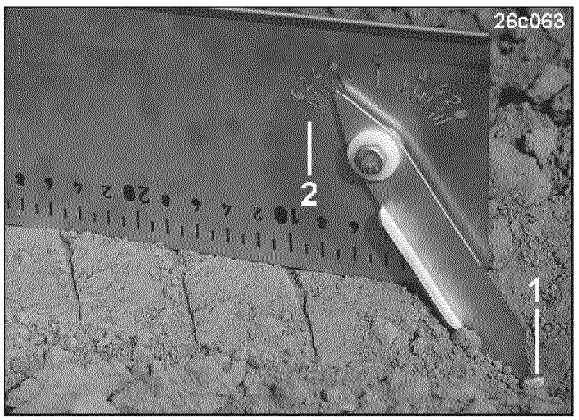


Fig. 147

8.14 Saatfurche verschließen (Classic-Säaggregat)

1. Der Maschine bei Arbeitsbeginn auf dem Feld folgen und die Saatgutbedeckung prüfen.
2. Wird die Saatfurche nicht geschlossen, die Arbeitsintensität der vorlaufenden Zustreicher (Fig. 148/1) verändern durch Einhängen der Feder (Fig. 149/1) in eine der Aussparungen A bis C.

   Die größte Arbeitsintensität wird erreicht beim Einhängen der Feder in die Aussparung C.

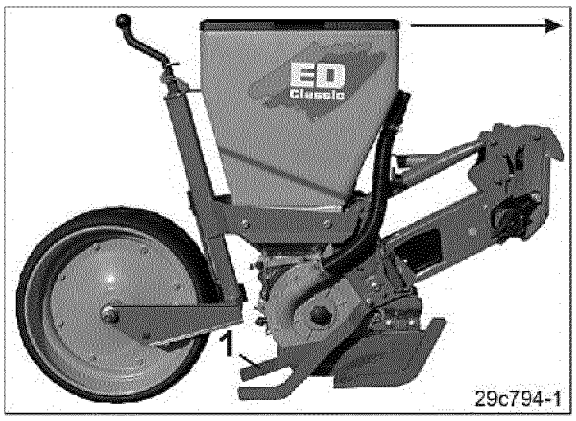


Fig. 148

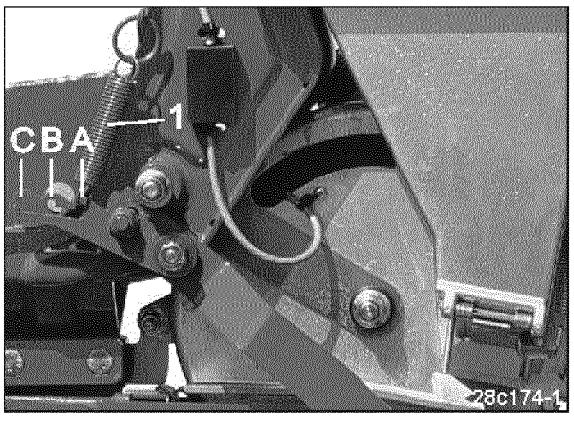


Fig. 149

8.15 Saatfurche verschließen (Contour-Säaggregat)

Die Arbeitsintensität des Zustreichers (Fig. 151/1) bzw. des Scheibenzustreichers (Fig. 152/1) steigt, je höher der Hebel (Fig. 150/1) einrastet.

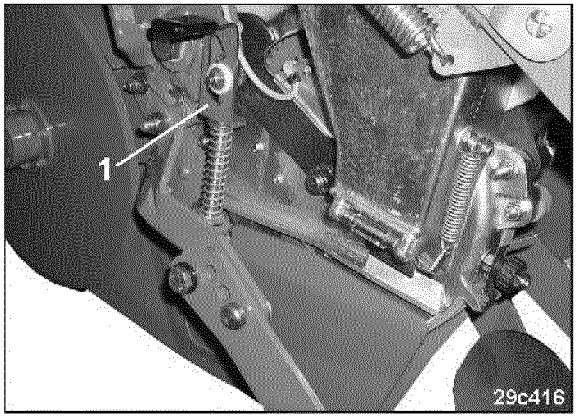


Fig. 150

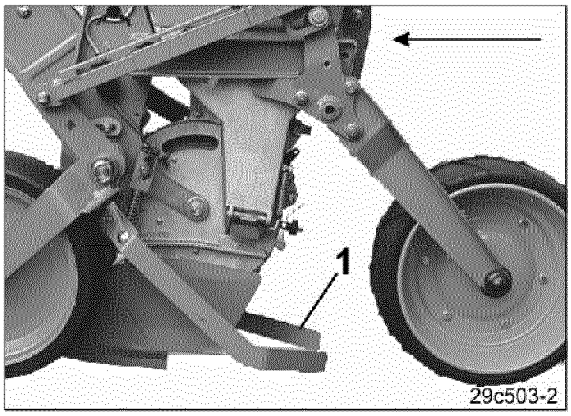


Fig. 151

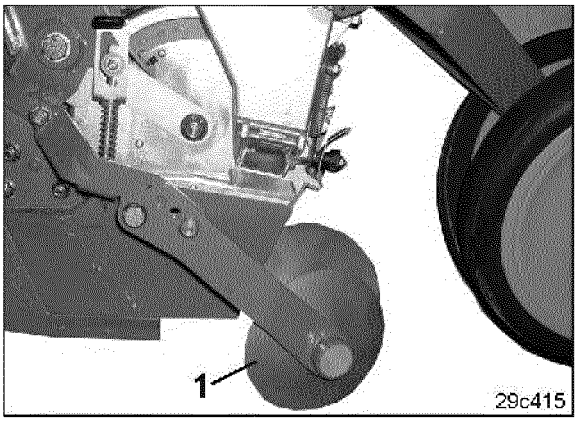


Fig. 152

Die Gummi-V-Druckrollen halten die Ablagetiefe ein und schließen die Säfurche.

Je nach Bodenbeschaffenheit lässt sich der Abstand der Gummi-V-Druckrollen zueinander so einstellen, dass die Gummi-V-Druckrollen dicht neben der Säfurchen-Schnittkante laufen, diese brechen und die Säfurche verschließen.

Jede Einstellung mit einem Klappstecker (Fig. 153/1) sichern.

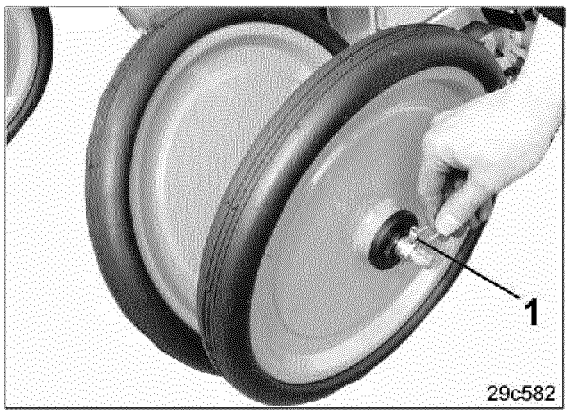


Fig. 153

Hinweis!

Damit die Klappstecker nicht verloren gehen können, darauf achten, dass die Bügel der Klappstecker (Fig. 153/1) einrasten.

Wird die Saatfurche bei richtiger Einstellung des axialen Abstandes nicht geschlossen, lässt sich die Wirkungsweise der beiden schräg zueinander angestellten Druckrollen nach Lösen der Schraubverbindung (Fig. 154/1) stufenlos mit einem Hebel (Fig. 154/2) verändern. Das profilierte Zeigerelement dient als Einstellhilfe.

Hebelverstellung:

Hebel nach oben: verstärkt die Erdbewegung

Hebel nach unten: verringert die Erdbewegung.

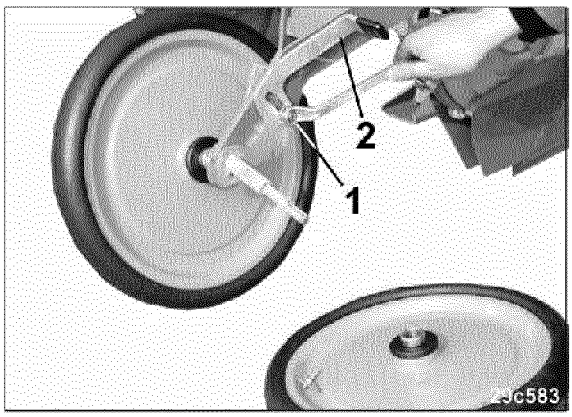


Fig. 154

Führen die Einstellmöglichkeiten der Gummi-V-Druckrollen nicht zu dem gewünschten Erfolg, ist mehr Belastung auf die Gummi-V-Druckrollen zu bringen [siehe Kapitel „Lastverteilung der Druckrollen verstellen (Contour-Säaggregat)“, Seite 116].

Beispiel:

Wird bei werkseitiger Stellung „A“ und Belastungsstufe „3“ die Saatfurche nicht geschlossen, sind die Druckrollen vorne mit 30% des Gewichtes und hinten mit 70% des Gewichtes zu belasten. Die Spindel in den Aufnahmen b bis c befestigen (siehe Stellung „B“).

8.15.1 Zwischenandruckrolle einstellen (Contour-Säaggregat)

Die Arbeitsintensität der Zwischenandruckrolle (Fig. 155/1) steigt, je höher der Hebel (Fig. 156/1) einrastet.

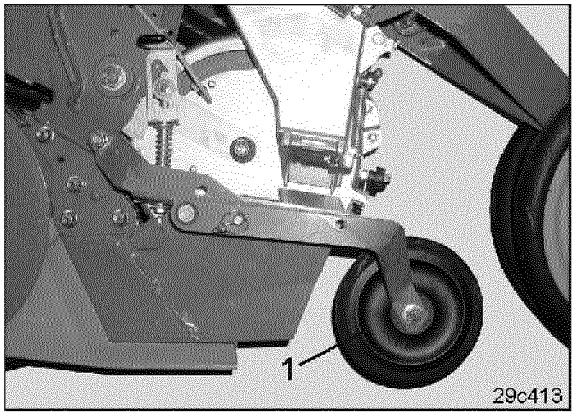


Fig. 155

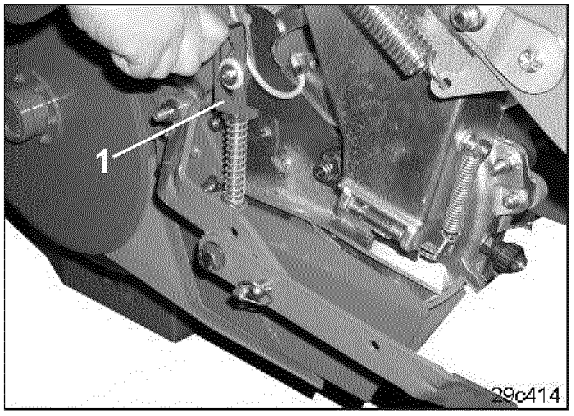


Fig. 156

8.16 Düngerschare einstellen

1. Mutter (Fig. 157/1) lösen zum horizontalen Verschieben des Düngerschares auf der Klemmschiene. Der Abstand zum Säschar beträgt werkseitig 6 cm.
2. Federstecker und Bolzen (Fig. 157/2) entfernen zum Einstellen der Ablagetiefe des Düngerschares.

Die Schläuche zu den Düngerscharen dürfen nicht durchhängen, damit sich kein Dünger im Schlauch festsetzt. Düngerschläuche ggf. kürzen.

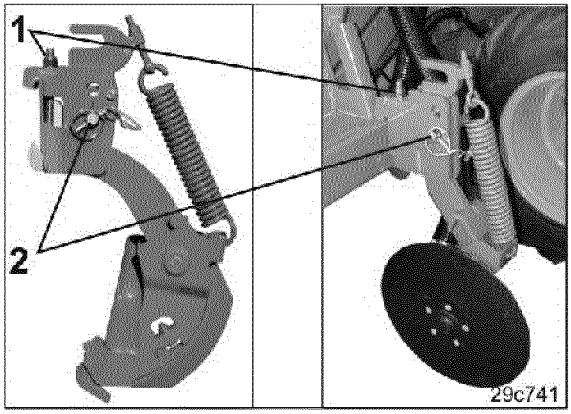


Fig. 157

8.17 Dünger-Vorratsbehälter (2 x 220 l)

Gefahr!

Maschine am Traktor ankuppeln vor dem Befüllen der Dünger-Vorratsbehälter.

Dünger-Vorratsbehälter entleeren vor dem Abkuppeln der Maschine vom Traktor.

8.17.1 Dünger-Vorratsbehälter (2 x 220 l) befüllen

1. Einzelkorn-Sämaschine am Traktor ankuppeln. Die Ausleger ausklappen.
2. Maschine auf einer ebenen Fläche abstellen.
3. Handbremse anziehen, Traktormotor abstellen und Zündschlüssel abziehen.



Fig. 158

4. Die Behälterdeckel (Fig. 159) öffnen und sichern.
5. Die Dünger-Vorratsbehälter befüllen
   - o manueller Zugang über die Trittstufen (Fig. 169/1)
   - o mit der Befüllschnecke [siehe Kapitel „Dünger-Befüllschnecke (Option)“, Seite 142].
6. Behälterdeckel entsichern und schließen.



Fig. 159

8.17.2 Düngermenge einstellen

Die Einstellwerte für die gewünschte Düngermenge den Tabellen (Seite 123) entnehmen.

Mit den Einstellwerten

- die Antriebsübersetzung einstellen (siehe Kapitel „Antriebsübersetzung einstellen“, Seite 124)
- die Dosierstellringe einstellen (siehe Kapitel „Dosierstellringe einstellen“, Seite 124).

Wichtig!

Jede Einstellung mit einer Abdrehprobe prüfen [siehe Kapitel „Abdrehprobe (2x220l-Behälter und 900l/1100l-Behälter)“, Seite 130].

Beispiel:

Düngersorte: Diammonphosphat 18-46-0

Reihenabstand: 75 cm

Dünger-Ausbringmenge: 130 kg/ha

Die Einstellwerte der Tabelle (Fig. 160) entnehmen:

Einstellwert der Dosierstellringe: F - 0

Kettenradpaarung im Dosier-Getriebe: X = 17 / Y = 24

		Diammonphosphat 18 - 46 - 0				
		0,95 kg/l				
		50 cm	60 cm	70 cm	75 cm	80 cm
	C - 0	96	80	69	64	60
	C - 5	114	95	81	75	71
	D - 0	135	113	96	90	84
	D - 5	147	123	105	98	92
	E - 0	162	135	116	108	101
X = 17	E - 5	174	145	124	116	109
Y = 24	F - 0	[illegible]	[illegible]	[illegible]	130	122
[kg/ha]	F - 5	210	175	150	140	131
	G - 0	222	185	159	148	139
	G - 5	240	200	171	160	150
	G - 10	246	205	176	164	154
	C - 0	180	150	129	120	113
	C - 5	228	190	163	152	143
	D - 0	255	213	182	170	159
	D - 5	273	228	195	182	171
	E - 0	300	250	214	200	188
X = 24	E - 5	324	270	231	216	203
Y = 17	F - 0	354	295	253	236	221
[kg/ha]	F - 5	390	325	279	260	244
	G - 0	426	355	304	284	266
	G - 5	456	380	326	304	285
	G - 10	468	390	334	312	293

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Fig. 160

Düngersorte		Diammonphosphat 18 - 46 - 0 0,95 kg/l				
Reihenabstand		50 cm	60 cm	70 cm	75 cm	80 cm
X = 17 Y = 24	C - 0	96	80	69	64	60
	C - 5	114	95	81	76	71
	D - 0	135	113	96	90	84
	D - 5	147	123	105	98	92
	E - 0	162	135	116	108	101
	E - 5	174	145	124	116	109
	F - 0	195	163	139	130	122
	F - 5	210	175	150	140	131
	G - 0	222	185	159	148	139
	G - 5	240	200	171	160	150
	G - 10	246	205	176	164	154
X = 24 Y = 17	C - 0	180	150	129	120	113
	C - 5	228	190	163	152	143
	D - 0	255	213	182	170	159
	D - 5	273	228	195	182	171
	E - 0	300	250	214	200	188
	E - 5	324	270	231	216	203
	F - 0	354	295	253	236	221
	F - 5	390	325	279	260	244
	G - 0	426	355	304	284	266
	G - 5	456	380	326	304	285
	G - 10	468	390	334	312	293
Einstellwerte		Dünger-Ausbringmenge [kg/ha]				

Fig. 161

Düngersorte		Kalkammonsalpeter 27,5% N 1,1 kg/l				
Reihenabstand		50 cm	60 cm	70 cm	75 cm	80 cm
X = 17 Y = 24	C - 0	114	95	81	76	71
	C - 5	132	110	94	88	83
	D - 0	150	125	107	100	94
	D - 5	168	140	120	112	105
	E - 0	189	158	135	126	118
	E - 5	204	170	146	136	128
	F - 0	222	185	159	148	139
	F - 5	237	198	169	158	148
	G - 0	252	210	180	168	158
	G - 5	255	213	182	170	159
	G - 10	261	218	186	174	163
X = 24 Y = 17	C - 0	216	180	154	144	135
	C - 5	249	208	178	166	156
	D - 0	276	230	197	184	173
	D - 5	321	268	229	214	201
	E - 0	348	290	249	232	218
	E - 5	387	323	276	258	242
	F - 0	414	345	296	276	259
	F - 5	456	380	326	304	285
	G - 0	474	395	339	316	296
	G - 5	507	423	362	338	317
	G - 10	510	425	364	340	319
Einstellwerte		Dünger-Ausbringmenge [kg/ha]				

Fig. 162

Düngersorte		NPK 14+7+17 1,25 kg/l				
Reihenabstand		50 cm	60 cm	70 cm	75 cm	80 cm
X = 17 Y = 24	C - 0	138	115	99	92	86
	C - 5	150	125	107	100	94
	D - 0	174	145	124	116	109
	D - 5	189	158	135	126	118
	E - 0	210	175	150	140	131
	E - 5	228	190	163	152	143
	F - 0	252	210	180	168	158
	F - 5	267	223	191	178	167
	G - 0	288	240	206	192	180
	G - 5	300	250	214	200	188
	G - 10	309	258	221	206	193
X = 24 Y = 17	C - 0	180	150	129	120	113
	C - 5	270	225	193	180	169
	D - 0	306	255	219	204	191
	D - 5	345	288	246	230	216
	E - 0	384	320	274	256	240
	E - 5	429	358	306	286	268
	F - 0	456	380	326	304	285
	F - 5	507	423	362	338	317
	G - 0	543	453	388	362	339
	G - 5	567	473	405	378	354
	G - 10	582	485	416	388	364
Einstellwerte		Dünger-Ausbringmenge [kg/ha]				

Fig. 163

Düngersorte		Harnstoff 46% N 0,82 kg/l				
Reihenabstand		50 cm	60 cm	70 cm	75 cm	80 cm
X = 17 Y = 24	C - 0	90	75	64	60	56
	C - 5	102	85	73	68	64
	D - 0	117	98	84	78	73
	D - 5	129	108	92	86	81
	E - 0	141	118	101	94	88
	E - 5	156	130	111	104	98
	F - 0	173	144	123	115	108
	F - 5	186	155	133	124	116
	G - 0	197	164	140	131	123
	G - 5	207	173	148	138	129
	G - 10	210	175	150	140	131
X = 24 Y = 17	C - 0	162	135	116	108	101
	C - 5	185	154	132	123	115
	D - 0	212	176	151	141	132
	D - 5	240	200	171	160	150
	E - 0	264	220	189	176	165
	E - 5	293	244	209	195	183
	F - 0	312	260	223	208	195
	F - 5	338	281	241	225	211
	G - 0	372	310	266	248	233
	G - 5	390	325	279	260	244
	G - 10	402	335	287	268	251
Einstellwerte		Dünger-Ausbringmenge [kg/ha]				

Fig. 164

8.17.2.1 Antriebsübersetzung einstellen

1. Handbremse anziehen, Traktormotor abstellen und Zündschlüssel abziehen.
2. Flügelmuttern (Fig. 165/1) lösen.
3. Schutzblech (Fig. 165/2) entfernen.

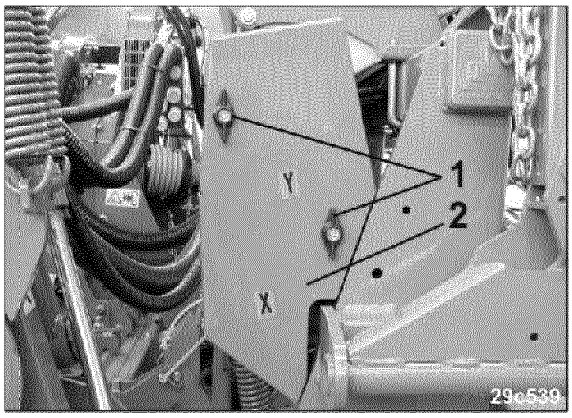


Fig. 165

4. Flügelmutter (Fig. 166/1) des Kettenspanners lösen.
5. Die richtigen Kettenräder montieren.
   Beispiel:
   Kettenrad X (Fig. 166/X) = 17 Zähne
   Kettenrad Y (Fig. 166/Y) = 24 Zähne.
6. Kettenräder mit Klappsteckern sichern.
7. Rollenkette auflegen.
8. Kettenspanner spannen und mit der Flügelmutter (Fig. 166/1) befestigen.
9. Schutzblech (Fig. 165/2) montieren.

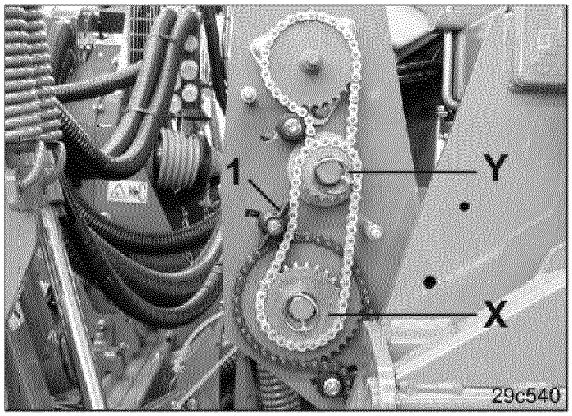


Fig. 166

8.17.2.2 Dosierstellringe einstellen

1. Alle Dosier-Stellringe (Fig. 167/1) auf den richtigen Wert einstellen.

Beispiel:

Einstellwert “E – 5“

Die Dosier-Stellringe so verdrehen, dass die Zahl „5“ (Fig. 167/2) auf der Achse im Bereich „E“ (Fig. 167/3) steht.

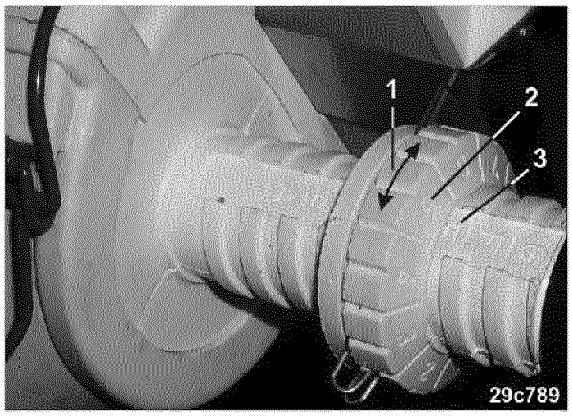


Fig. 167

8.17.2.3 Restentleerung Dünger-Vorratsbehälter (2 x 220 l)

1. Die federbelasteten Schieber öffnen und die Restdüngermenge in einen geeigneten Behälter entleeren.

Schieber-Stellungen

Schieber (Fig. 168/1) geschlossen

Schieber (Fig. 168/2) offen.

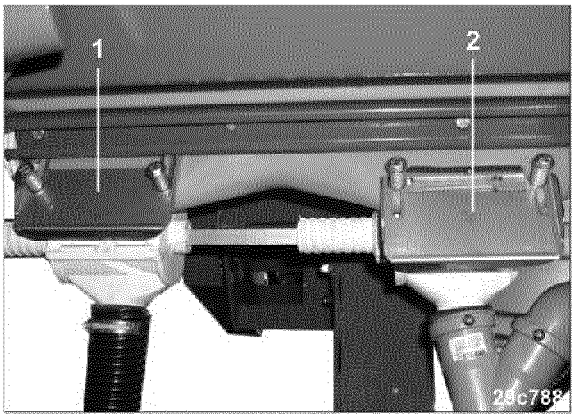


Fig. 168

8.18 Dünger-Vorratsbehälter (900 l und 1100 l)

Gefahr!

Maschine am Traktor ankuppeln vor dem Befüllen der Dünger-Vorratsbehälter.

Dünger-Vorratsbehälter entleeren vor dem Abkuppeln der Maschine vom Traktor.

8.18.1 Dünger-Vorratsbehälter (900 l und 1100 l) befüllen

1. Einzelkorn-Sämaschine am Traktor ankuppeln. Die Ausleger ausklappen.
2. Maschine auf einer ebenen Fläche abstellen.
3. Handbremse anziehen, Traktormotor abstellen und Zündschlüssel abziehen.
4. Die mit Gummischlaufen gesicherte Düngerbehälterplane (Fig. 169) öffnen.



Fig. 169

5. Zum Einstellen des Füllstandsensors (Option) Siebroste (Fig. 170/1) im Dünger-Vorratsbehälter öffnen.

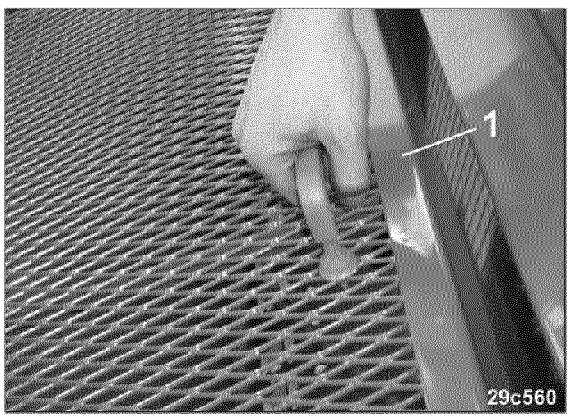


Fig. 170

6. Den Füllstandsensor (Fig. 171/1) im Dünger-Vorratsbehälter einstellen.
   Der Füllstandsensor (Option) löst Alarm aus, sobald der Sensor nicht mehr in den Dünger eintaucht.
7. Die Siebroste (Fig. 170/1) schließen.
8. Den Dünger-Vorratsbehälter befüllen
   - o manueller Zugang über die Trittstufen (Fig. 169/1)
   - o mit der Befüllschnecke [siehe Kapitel „Dünger-Befüllschnecke (Option)“, Seite 142].
9. Düngerbehälterplane schließen.

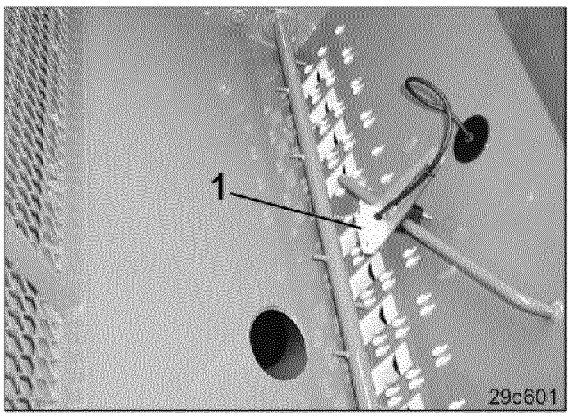


Fig. 171

8.18.2 Düngermenge einstellen

Zum Ausbringen der gewünschten Düngermenge Einstellungen vornehmen:

- an den Absperrschiebern
- an den Bodenklappen
- am Einstellgetriebe.

Wichtig!

Jede Einstellung mit einer Abdrehprobe prüfen [siehe Kapitel „Abdrehprobe (2x220l-Behälter und 900l/1100l-Behälter)“, Seite 130].

Düngermenge einstellen:

1. Den Spritzschutz (Fig. 172/1) entfernen.
   Der Spritzschutz ist an zwei Halterungen (Fig. 172/2) eingehängt.

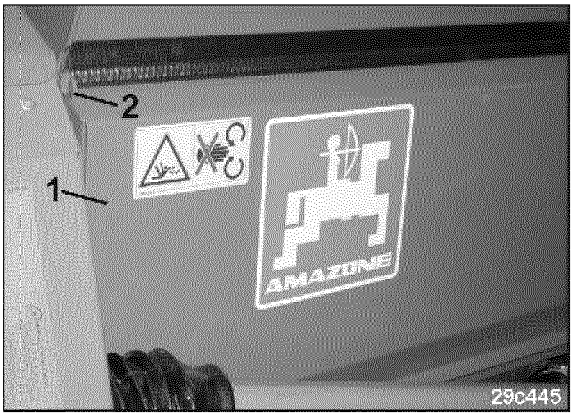


Fig. 172

2. Den Bodenklappen-Stellhebel (Fig. 173/1) in der Kulisse (Fig. 173/2) fixieren.

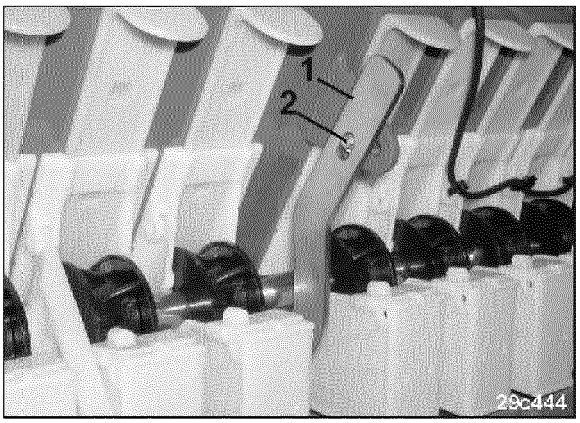


Fig. 173

3. Die aktiven Absperrschieber (Fig. 174) in Position „B“ stellen.
4. Alle anderen Absperrschieber in Position „A“ stellen. Die Düngerzufuhr zu den Düngerscharen ist unterbrochen.

Absperrschieber-Stellungen (Fig. 174):

A = geschlossen

B = 3/4 offen

C = offen

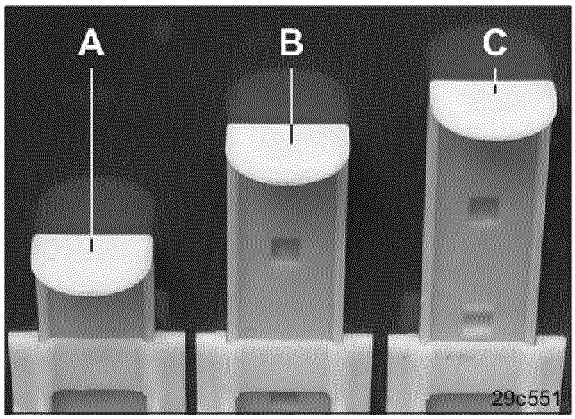


Fig. 174

5. Die Flügelmutter (Fig. 175/1) lösen.
6. Die Getriebe-Einstell-Nummer dem Kapitel „Getriebe-Einstell-Nummer ermitteln“ (Seite 128) entnehmen und an der Skala (Fig. 175/2) einstellen.
   Den Getriebehebel (Fig. 175/3) immer von unten auf den Skalenwert stellen.
7. Die Flügelmutter (Fig. 175/1) festziehen.

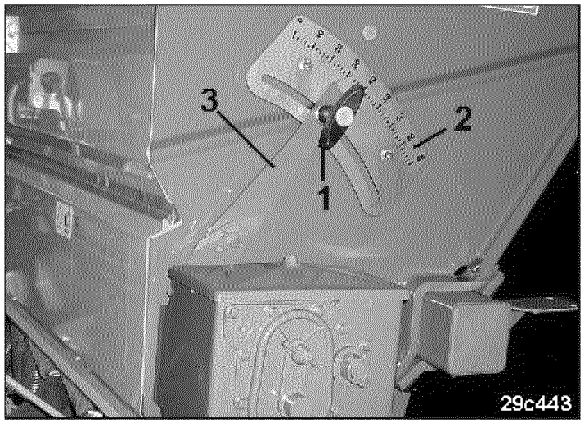


Fig. 175

8.18.2.1 Getriebe-Einstell-Nummer ermitteln

[kg/l]	Diammonphosphat 18-46-0 0,94 kg/l			Kalkammonphosphat 27% N 1,02 kg/l			Harnstoff 46% N 0,76 kg/l		
[cm]	70 cm	75 cm	80 cm	70 cm	75 cm	80 cm	70 cm	75 cm	80 cm
5	29	27	25	30	28	26	25	23	22
10	66	62	58	81	76	71	56	52	49
15	100	93	87	118	110	103	84	78	73
20	135	126	118	160	149	140	111	104	98
25	174	162	152	196	183	172	140	131	123
30	204	190	178	234	218	204	167	156	146
35	236	220	206	270	252	236	195	182	171
40	268	250	234	304	284	266	219	204	191
45	297	277	260	340	317	297	244	228	214
50	333	311	292	381	356	334	274	256	240
55	363	339	318	409	382	358	299	279	262
60	404	377	353	471	440	413	328	306	287
65	429	400	375	490	457	428	358	334	313
70	465	434	407	529	494	463	389	363	340
75	497	464	435	586	547	513	401	374	351
80	512	478	448	593	553	518	418	390	366

[kg/l]	NPK 13+13+21 BASF 1,18 kg/l			Triple-Superphosphat 0,98 kg/l			MAP 12-52 1,02 kg/l		
[cm]	70 cm	75 cm	80 cm	70 cm	75 cm	80 cm	70 cm	75 cm	80 cm
5	42	39	37	26	24	23	14	13	12
10	85	79	74	79	74	69	57	53	50
15	120	112	105	120	112	105	94	88	83
20	162	151	142	158	147	138	139	130	122
25	198	185	173	197	184	173	178	166	156
30	231	216	203	233	217	203	219	204	191
35	271	253	237	267	249	233	246	230	216
40	305	285	267	308	287	269	287	268	251
45	346	323	303	345	322	302	328	306	287
50	388	362	339	383	357	335	343	320	300
55	422	394	369	418	390	366	374	349	327
60	464	433	406	451	421	395	410	383	359
65	507	473	443	493	460	431	447	417	391
70	551	514	482	528	493	462	491	458	429
75	591	552	518	573	535	502	511	477	447
80	599	559	524	585	546	512	521	486	456

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Fig. 176

Berechnung der Getriebe-Einstell-Nummer
für Einzelkorn-Sämaschinen mit anderen Reihenabständen

$$\text{Umrechnungsfaktor} = \frac{\text{Reihenabstand x Ausbringmenge (Tabellenwerte)}}{\text{Reihenabstand x Ausbringmenge}}$$

$$\text{Getriebe-Einstellnummer} = \frac{\text{Getriebe-Einstellnummer (Tabellenwert)}}{\text{Umrechnungsfaktor}}$$

Beispiel:

Gewünschte Düngersorte: Diammonphosphat

gewünschte Ausbringmenge:	300 kg/ha
Reihenabstand:	60 cm
Getriebe-Einstellnummer:	berechnen

Tabellenwerte (Fig. 176):	
Ausbringmenge:	333 kg/ha
Reihenabstand:	70 cm
Getriebe-Einstellnummer:	50

$$\text{Umrechnungsfaktor} = \frac{70\text{ cm} \times 333\text{ kg/ha}}{60\text{ cm} \times 300\text{ kg/ha}} = 1{,}295$$

$$\text{Getriebe-Einstellnummer} = \frac{50}{1{,}295} = 38{,}5$$

Den Getriebehebel (Fig. 175/3) auf den Skalenwert 38,5 stellen, zum Ausbringen von 300 kg/ha Diammonphosphat.

8.18.3 Dünger-Vorratsbehälter entleeren

Zum Entleeren des Dünger-Vorratsbehälters den mit einem Klappstecker (Fig. 177/1) gesicherten Schlauch (Fig. 177/2) der Halterung entnehmen.

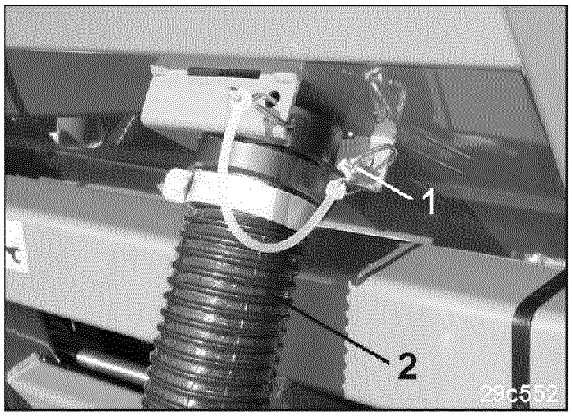


Fig. 177

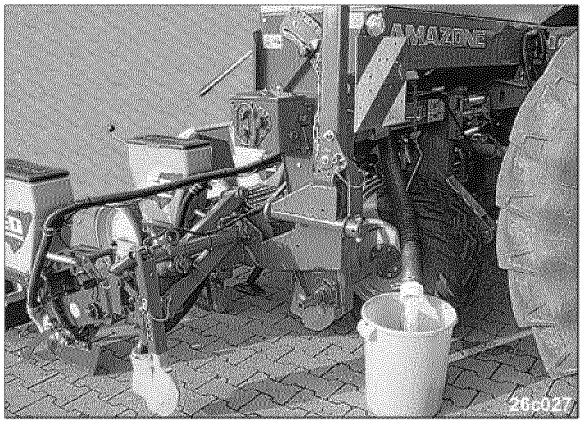


Fig. 178

8.19 Abdrehprobe (2x220l-Behälter und 900l/1100l-Behälter)

Wichtig!

Mit der Abdrehprobe prüfen, ob die gewünschte Düngermenge ausgebracht wird.

Abdrehprobe:

1. Dünger-Vorratsbehälter mindestens 1/4 mit Dünger befüllen.
2. **2x220l-Behälter:**
   Geeignete Auffangbehälter (Fig. 179/1) unter alle Düngerschare (Fig. 179/2) stellen.
3. **900/1100l-Behälter:**
   Geeignete(n) Auffangbehälter (Fig. 179/1) unter ein Düngerschar (Fig. 179/2), wahlweise unter alle Düngerschare stellen.

   Absperrschieber (Fig. 174) schließen zu den Düngerscharen ohne Auffangbehälter.
4. Die Abdrehkurbel (Fig. 180/1) in die Aufnahme des rechten Rades stecken.
5. Wenn Auffangbehälter (Fig. 179/1) unter Düngerscharen platziert sind, die mit Druckluft beschickt werden, das Druckluft-Gebläse einschalten (siehe Kapitel „Gebläse-Drehzahl“, Seite 100).
6. Das Rad mit der Abdrehkurbel rechts herum drehen (Uhrzeigersinn), bis Dünger in alle Auffangbehälter fällt.

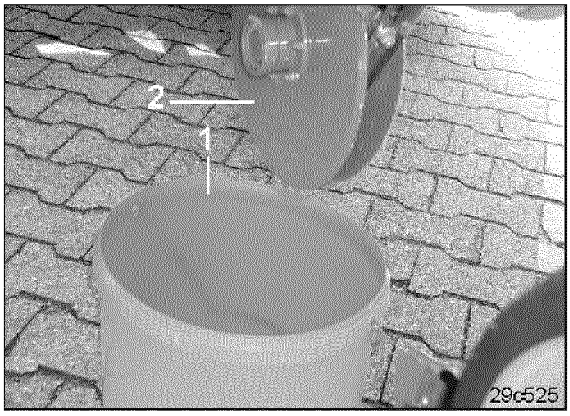


Fig. 179

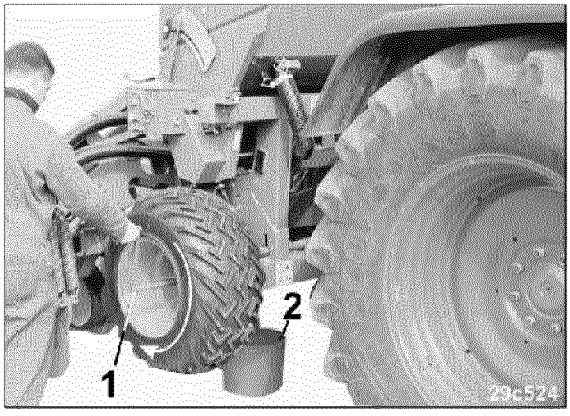


Fig. 180

7. Auffangbehälter entleeren (nicht in den Dünger-Vorratsbehälter bei laufendem Gebläse).
8. Auffangbehälter zurück unter die Düngerschare stellen.
9. Die Anzahl der Kurbelumdrehungen der Tabelle (Fig. 181) entnehmen.
   Die Anzahl der Kurbelumdrehungen richtet sich nach der Arbeitsbreite und Bereifung der Maschine.

	ED302					ED452 [-K]			ED602-K	
Anzahl Säaggregate	6	5	4	4	4	6	6	6	8	8
Reihenabstand [cm]	50	60	70	75	80	70	75	80	—	—
Kurbelumdrehungen auf 1/40 [ha] mit Bereifung 10.0/75-15	36,8	36,8	39,5	36,8	34,5	26,3	24,5	23,0	—	—
Kurbelumdrehungen auf 1/40 [ha] mit Bereifung 31x15.50-15	34,0	34,0	36,4	34,0	31,9	24,3	22,7	21,3	16,1	15,1

Fig. 181

Berechnung der Kurbelumdrehungen für Einzelkorn-Sämaschinen mit anderen Reihenabständen

$$\text{Kurbelumdrehung} = \frac{\text{Kurbelumdrehung x Anzahl Säaggregate x Reihenabstand (Tabellenwerte)}}{\text{Anzahl Säaggregate x Reihenabstand}}$$

Fig. 182

Beispiel:

Daten zur Berechnung der Kurbelumdrehungen am Rad	
Anzahl Säaggregate:	4
Reihenabstand	70 cm
Bereifung:	10.0/75-15
Kurbelumdrehungen:	berechnen

Daten aus Tabelle (Fig. 181)	
Anzahl Säaggregate:	6
Reihenabstand	50 cm
Bereifung:	10.0/75-15
Kurbelumdrehungen:	36,8

$$\text{Kurbelumdrehung} = \frac{36{,}8 \text{ x } 6 \text{ x } 50 \text{ cm}}{4 \text{ x } 70 \text{ cm}} = 39{,}5$$

10. Mit der in Tabelle (Fig. 181) angegebenen Kurbelumdrehung im Uhrzeigersinn drehen.
11. Die aufgefangene Düngermenge unter Berücksichtigung des Behältergewichtes wiegen (Fig. 183) und mit dem Faktor „40" multiplizieren.

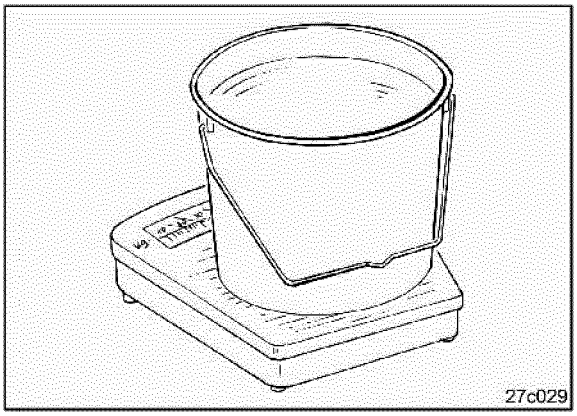


Fig. 183

Beispiel:

aufgefangene Düngermenge: 5 kg (abgedreht auf 1/40 ha)

Dünger-Ausbringmenge = 5 x 40 = 200 [kg/ha]

2x220l-Behälter:
Wird die gewünschte Dünger-Ausbringmenge [kg/ha] bei der Abdrehprobe nicht erreicht, verstellen Sie die Dosier-Stellringe (siehe Kapitel „Dosierstellringe einstellen", Seite 124).

Wiederholen Sie die Abdrehprobe, bis die gewünschte Dünger-Ausbringmenge erreicht ist.

900/1100l-Behälter:
Berechnung, wenn die Düngermenge nur eines Düngerschares aufgefangen wird und bei der späteren Arbeit 6 Düngerschare eingesetzt werden:

Dünger-Ausbringmenge = 20 [kg/ha] x 6 = 120 [kg/ha]

900/1100l-Behälter:
Wird die gewünschte Dünger-Ausbringmenge [kg/ha] bei der Abdrehprobe nicht erreicht, berechnen Sie die Abweichung (%) zwischen gewünschter und ermittelter Düngermenge und verstellen Sie das Getriebe um diese Prozentzahl.

Wiederholen Sie die Abdrehprobe, bis die gewünschte Dünger-Ausbringmenge erreicht ist.

12. Nach der Abdrehprobe
    - o Abdrehkurbel in die Transporthalterung stecken.
    - o Absperrschieber öffnen, die zur Abdrehprobe geschlossen wurden.

Wichtig!

Absperrschieber öffnen, die zur Abdrehprobe geschlossen wurden.

8.20 Fronttank

Gefahr!

Fronttank am Traktor ankuppeln vor dem Befüllen.

Fronttank entleeren vor dem Abkuppeln vom Traktor.

Den Fronttank befüllen anhand der Fronttank-Betriebsanleitung.

8.20.1 Düngermenge einstellen

Zum Ausbringen der gewünschten Düngermenge sind Einstellungen vorzunehmen

- an den Dosierern
- am Variogetriebe.

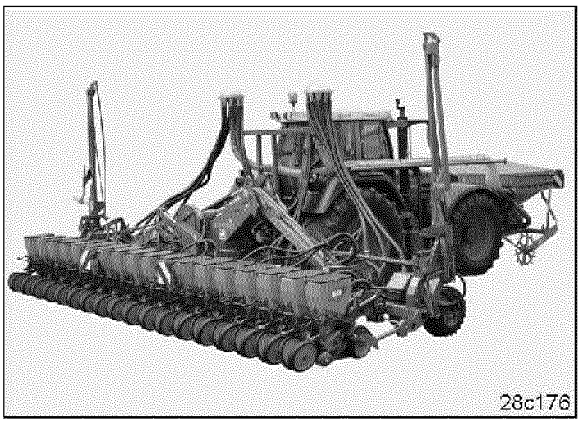


Fig. 184

Wichtig!

Jede Einstellung mit einer Abdrehprobe prüfen (siehe Kapitel „Abdrehprobe“, Seite 139).

Düngermenge einstellen:

1. Das Handrad (Fig. 185/1) soweit verdrehen, bis die Rändelschrauben (Fig. 185/2) sichtbar sind.

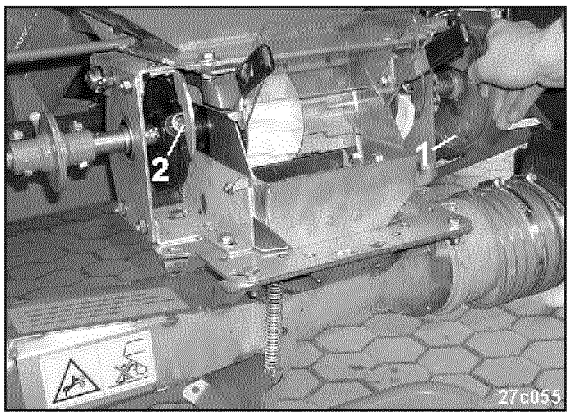


Fig. 185

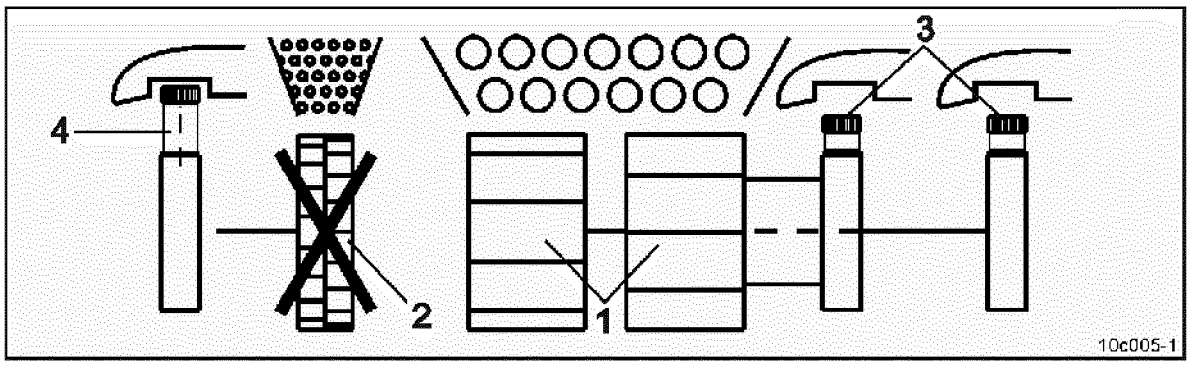


Fig. 186

2. Die Haupt-Dosierräder (Fig. 186/1) einschalten
   Dazu die Rändelschrauben (Fig. 186/3) einschrauben.
3. Das Fein-Dosierrad (Fig. 186/2) ausschalten
   Dazu die Rändelschraube (Fig. 186/4) herausdrehen.

Wichtig!

Rändelschrauben niemals zu fest einschrauben oder gegen den Anschlag drehen.

4. Die Getriebe-Einstellnummer für die gewünschte Dünger-Ausbringmenge den Tabellen (Fig. 188 bis Fig. 191) entnehmen.
5. Den Drehknopf (Fig. 187/1) lösen.
6. Den Zeiger (Fig. 187/2) von unten auf die Getriebe-Einstellnummer der Skala (Fig. 187/3) stellen.
7. Den Drehknopf festziehen.
8. Abdrehprobe durchführen (siehe Kapitel „Abdrehprobe“, Seite 139).

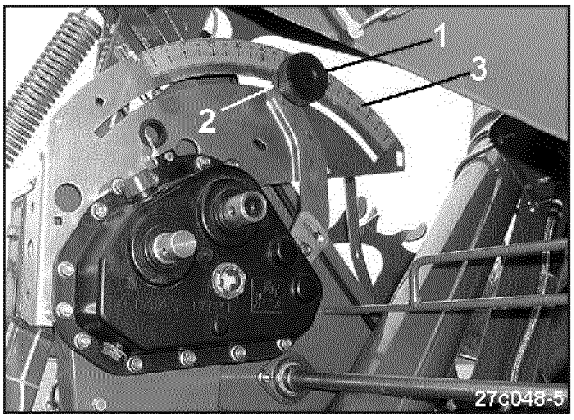


Fig. 187

Düngersorte	Diamonphosphat 18 – 46 – 0 0,97 kg/l							
Typ	FS2				FS1			
Arbeitsbreite	9,0 m	8,1 m	6,0 m	5,4 m	6,0 m	5,4 m	4,5m	3,0 m
5	2,67	2,96	4	4,44	2	2,22	2,67	4
10	20	22,2	30	33,3	15	16,7	20	30
15	38,7	43	58	64,4	29	32,2	38,7	58
20	53,3	59,3	80	88,9	40	44,4	53,3	80
25	74,7	83	112	124	56	62,2	74,7	112
30	92	102	138	153	69	76,7	92	138
35	111	123	166	184	83	92,2	111	166
40	129	144	194	216	97	108	129	194
45	148	164	222	247	111	123	148	222
50	167	185	250	278	125	139	167	250
55	185	206	278	309	139	154	185	278
60	205	228	308	342	154	171	205	308
65	227	252	340	378	170	189	227	340
70	245	273	368	409	184	204	245	368
75	267	296	400	444	200	222	267	400
80	288	320	432	480	216	240	288	432
85	311	345	466	518	233	259	311	466
90	323	359	484	538	242	269	323	484
95	351	390	526	584	263	292	351	526
100	372	413	558	620	279	310	372	558

Getriebe-Einstellnummer

Dünger-Ausbringmenge [kg/ha]

Fig. 188

Hinweis!

Max. Menge bei 10 km/h

Max. Menge bei 8 km/h

Düngersorte	Kalkammonsalpeter 1,06 kg/l							
Typ	FS2				FS1			
Arbeitsbreite	9,0 m	8,1 m	6,0 m	5,4 m	6,0 m	5,4 m	4,5m	3,0 m
Getriebe-Einstellnummer 5	2	2,22	3	3,33	1,5	1,67	2	3
10	16	17,8	24	26,7	12	13,3	16	24
15	37,3	41,5	56	62,2	28	31,1	37,3	56
20	56	62,2	84	93,3	42	46,7	56	84
25	74,7	83	112	124	56	62,2	74,7	112
30	96	107	144	160	72	80	96	144
35	117	130	176	196	88	97,8	117	176
40	136	151	204	227	102	113	136	204
45	157	175	236	262	118	131	157	236
50	179	199	268	298	134	149	179	268
55	197	219	296	329	148	164	197	296
60	216	240	324	360	162	180	216	324
65	237	264	356	396	178	198	237	356
70	256	284	384	427	192	213	256	384
75	280	311	420	467	210	233	280	420
80	301	335	452	502	226	251	301	452
85	323	359	484	538	242	269	323	484
90	341	379	512	569	256	284	341	512
95	363	403	544	604	272	302	363	544
100	389	433	584	649	292	324	389	584
	Dünger-Ausbringmenge [kg/ha]							

Fig. 189

Hinweis!

Max. Menge bei 10 km/h

Max. Menge bei 8 km/h

Düngersorte		NPK 1,15 kg/l							
Typ		FS2				FS1			
Arbeitsbreite		9,0 m	8,1 m	6,0 m	5,4 m	6,0 m	5,4 m	4,5m	3,0 m
Getriebe-Einstellnummer	5	3,33	3,7	5	5,56	2,5	2,78	3,33	5
	10	24	26,7	36	40	18	20	24	36
	15	45,3	50,4	68	75,6	34	37,8	45,3	68
	20	72	80	108	120	54	60	72	108
	25	88	97,8	132	147	66	73,3	88	132
	30	109	121	164	182	82	91,1	109	164
	35	131	145	196	218	98	109	131	196
	40	152	169	228	253	114	127	152	228
	45	171	190	256	284	128	142	171	256
	50	192	213	288	320	144	160	192	288
	55	213	237	320	356	160	178	213	320
	60	235	261	352	391	176	196	235	352
	65	259	287	388	431	194	216	259	388
	70	280	311	420	467	210	233	280	420
	75	304	338	456	507	228	253	304	456
	80	328	364	492	547	246	273	328	492
	85	349	388	524	582	262	291	349	524
	90	368	409	552	613	276	307	368	552
	95	392	436	588	653	294	327	392	588
	100	416	462	624	693	312	347	416	624
		Dünger-Ausbringmenge [kg/ha]							

Fig. 190

Düngersorte		Harnstoff 0,75 kg/l							
Typ		FS2				FS1			
Arbeitsbreite		9,0 m	8,1 m	6,0 m	5,4 m	6,0 m	5,4 m	4,5m	3,0 m
Getriebe-Einstellnummer	5	2,67	2,96	4	4,44	2	2,22	2,67	4
	10	21,3	23,7	32	35,6	16	17,8	21,3	32
	15	37,3	41,5	56	62,2	28	31,1	37,3	56
	20	50,7	56,3	76	84,4	38	42,2	50,7	76
	25	64	71,1	96	107	48	53,3	64	96
	30	77,3	85,9	116	129	58	64,4	77,3	116
	35	93,3	104	140	156	70	77,8	93,3	140
	40	107	119	160	178	80	88,9	107	160
	45	120	133	180	200	90	100	120	180
	50	133	148	200	222	100	111	133	200
	55	144	160	216	240	108	120	144	216
	60	163	181	244	271	122	136	163	244
	65	176	196	264	293	132	147	176	264
	70	189	210	284	316	142	158	189	284
	75	203	225	304	338	152	169	203	304
	80	219	243	328	364	164	182	219	328
	85	235	261	352	391	176	196	235	352
	90	248	276	372	413	186	207	248	372
	95	264	293	396	440	198	220	264	396
	100	277	308	416	462	208	231	277	416
		Dünger-Ausbringmenge [kg/ha]							

Fig. 191

8.20.1.1 Abdrehprobe

Wichtig!

Mit der Abdrehprobe prüfen, ob die gewünschte Düngermenge ausgebracht wird.

Abdrehprobe:

1. Dünger-Vorratsbehälter mindestens 1/4 mit Dünger befüllen.
2. Auffangbehälter der Transporthalterung an der Behälterwand entnehmen.

   Die Auffangbehälter sind zum Transport ineinander gesteckt und mit einem Klappstecker (Fig. 192/1) gesichert.

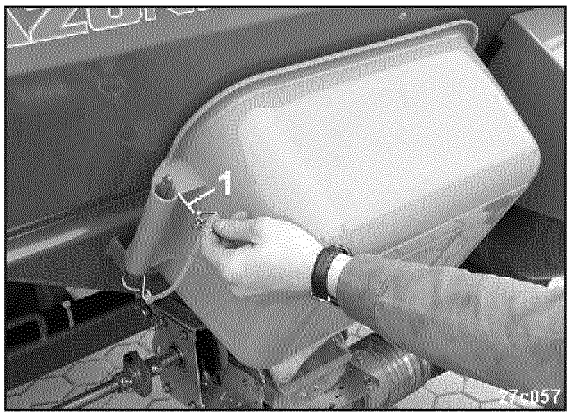


Fig. 192

3. Je einen Auffangbehälter unter jeden Dosierer stellen.
4. Alle Injektor-Schleusenklappen (Fig. 193/1) öffnen.

Warnung!

Quetschgefahr beim Öffnen und Schließen der Injektor-Schleusenklappe (Fig. 193/1)!

Injektor-Schleusenklappe nur an der Lasche (Fig. 193/2) anfassen, sonst besteht Verletzungsgefahr beim Zuschlagen der federbelasteten Injektor-Schleusenklappe.

Niemals mit der Hand zwischen Injektor-Schleusenklappe und Injektorschleuse fassen!

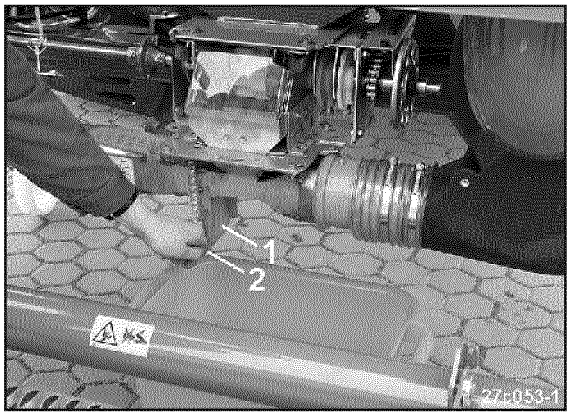


Fig. 193

5. Die Abdrehkurbel in das Vierkantloch des Spornrades stecken.
6. Das Spornrad mit der Abdrehkurbel so lange im Uhrzeigersinn drehen (Fig. 194), bis alle Kammern der Dosierräder mit Dünger gefüllt sind und ein gleichmäßiger Düngerstrom in den/die Auffangbehälter fließt.
7. Auffangbehälter in den Fronttank entleeren und wieder unter den/die Dosierer stellen.

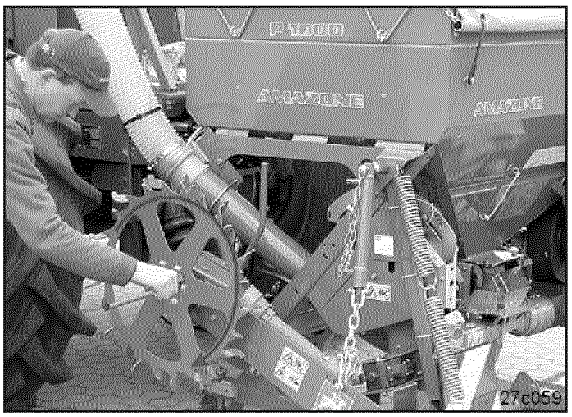
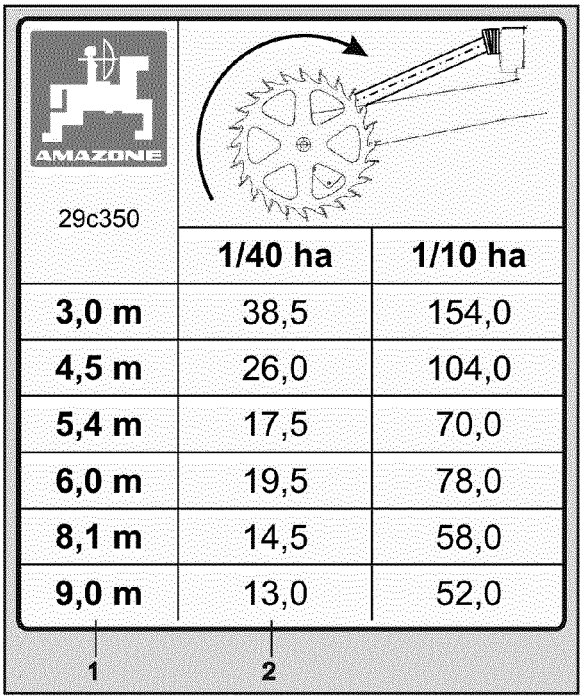


Fig. 194

Die erforderliche Anzahl der Kurbelumdrehungen ermitteln aus:

- der Arbeitsbreite (Fig. 195/1)
- den Kurbelumdrehungen am Spornrad auf 1/40 ha (Fig. 195/2).

Kurbelumdrehungen für nicht aufgeführte Arbeitsbreiten, wie unten aufgeführt berechnen.



	1/40 ha	1/10 ha
3,0 m	38,5	154,0
4,5 m	26,0	104,0
5,4 m	17,5	70,0
6,0 m	19,5	78,0
8,1 m	14,5	58,0
9,0 m	13,0	52,0

1 2

Fig. 195

$$\text{Kurbelumdrehungen} = \text{Tabellen-Kurbelumdrehung} \times \frac{\text{Tabellen-Arbeitsbreite [m]}}{\text{Arbeitsbreite [m]}}$$

Beispiel:

Daten zur Berechnung der Kurbelumdrehungen am Spornrad	
Arbeitsbreite:	8,40 m
Abdrehen:	auf 1/40 ha
Kurbelumdrehungen am Spornrad:	berechnen

Daten aus Tabelle (Fig. 195)	
Arbeitsbreite:	8,10 m
Abdrehen:	auf 1/40 ha
Kurbelumdrehungen am Spornrad:	14,5

$$\text{Kurbelumdrehungen} = 14{,}5 \times \frac{8{,}1\ [\text{m}]}{8{,}4\ [\text{m}]} = 14{,}0$$

8. Mit der in Tabelle (Fig. 195) angegebenen Kurbelumdrehung im Uhrzeigersinn drehen.
9. Die aufgefangene Düngermenge unter Berücksichtigung des Behältergewichtes wiegen (Fig. 196) und mit dem Faktor ”40” multiplizieren.

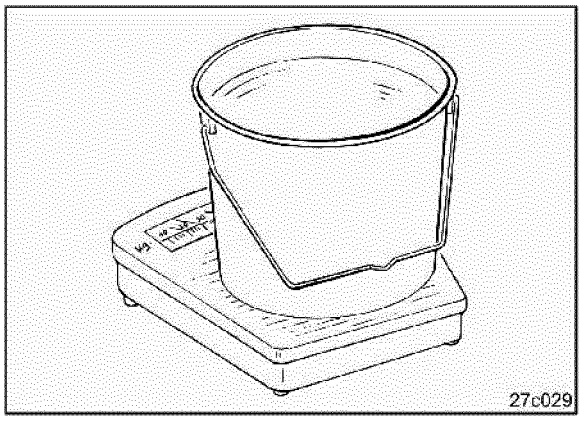


Fig. 196

Beispiel:

aufgefangene Düngermenge: 3,2 kg (abgedreht auf 1/40 ha)

Dünger-Ausbringmenge = 3,2 x 40 = 128 [kg/ha]

10. Wird die gewünschte Dünger-Ausbringmenge [kg/ha] bei der Abdrehprobe nicht erreicht, berechnen Sie die Abweichung (%) zwischen gewünschter und ermittelter Düngermenge und verstellen Sie das Getriebe um diese Prozentzahl.

    Wiederholen Sie die Abdrehprobe, bis die gewünschte Dünger-Ausbringmenge erreicht ist.

11. Nach der Abdrehprobe

    - Abdrehkurbel in die Transporthalterung stecken.
    - Injektor-Schleusenklappe mit besonderer Vorsicht schließen (siehe Gefahren-Hinweis [Fig. 193]).
    - Auffangbehälter (Fig. 192) an der Transporthalterung befestigen und mit einem Klappstecker sichern.

8.21 Dünger-Befüllschnecke (Option)

Dünger-Vorratsbehälter mit der Befüllschnecke befüllen:

1. Maschine auf einer ebenen Fläche abstellen.
2. Handbremse anziehen, Traktormotor abstellen und Zündschlüssel abziehen.
3. Abdeckplane (Fig. 197/1) entfernen.

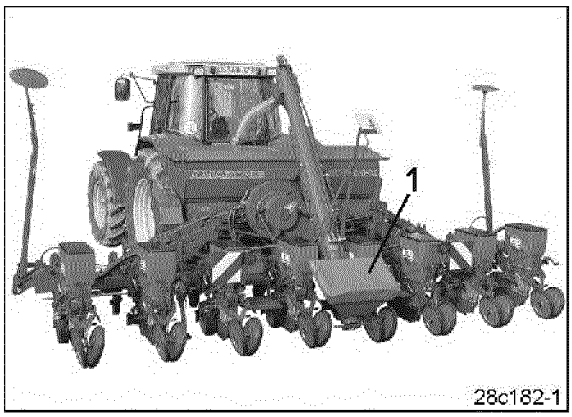


Fig. 197

4. Den hydr. Antrieb der Befüllschnecke ausschalten.

Befüllschnecke ausschalten

- Kugelhahn-Hebelstellung A (Fig. 198)

Befüllschnecke einschalten

- Kugelhahn-Hebelstellung B (Fig. 198).

5. Handbremse anziehen und Traktor-Motor anstellen.
6. Traktor-Steuergerät 4 (siehe Kapitel „Hydraulikanschlüsse“, Seite 80) einschalten.
7. Den hydr. Antrieb der Befüllschnecke am Kugelhahn (Fig. 199/1) langsam einschalten.

   Die Fördergeschwindigkeit am Kugelhahn regeln.

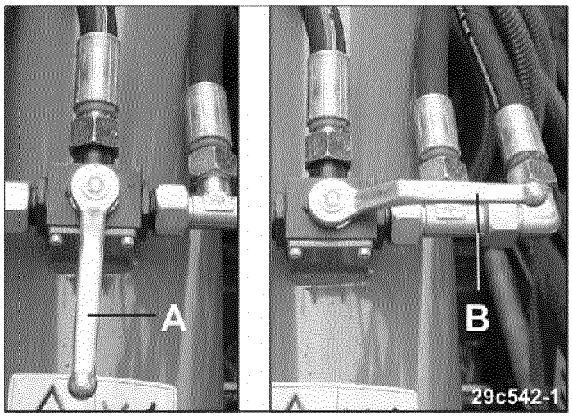


Fig. 198

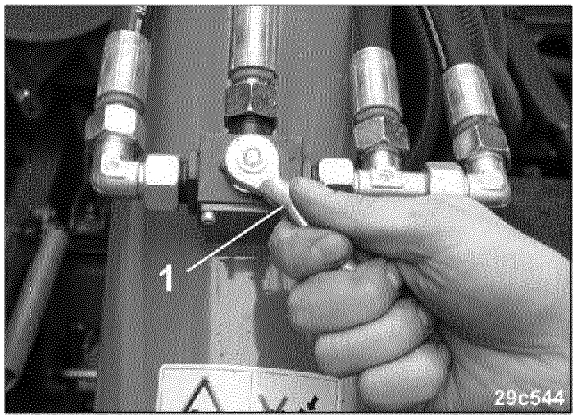


Fig. 199

8. Den Einfülltrichter der Befüllschnecke beschicken, z.B. von einem Versorgungsfahrzeug (Fig. 200).
9. Den hydr. Antrieb der Befüllschnecke ausschalten, sobald der Dünger-Vorratsbehälter gefüllt ist.
   Der Dünger-Vorratsbehälter mit geschlossener Plane ist gefüllt, sobald die Schnecke blockiert.
10. Traktor-Steuergerät 4 ausschalten.
11. Einfülltrichter mit der Abdeckplane (Fig. 197/1) verschließen.



Fig. 200

Gefahr!

Der Aufenthalt zwischen Versorgungsfahrzeug und Einfülltrichter ist beim Rangieren verboten.

Hinweis!

Der Rückspiegel (Option, Fig. 200) erleichtert das Manövrieren mit der Einzelkorn-Sämaschine.

Wichtig!

Den hydr. Antrieb der Befüllschnecke und das Traktor-Steuerventil nach Gebrauch ausschalten.

9 Transportfahrten

Gefahr!

- **Beachten Sie bei Transportfahrten das Kapitel "Sicherheitshinweise für den Bediener", Seite 25.**

Beim Befahren öffentlicher Straßen und Wege müssen Traktor und Maschine den nationalen Straßenverkehrsvorschriften (in Deutschland die StVZO und die StVO) und den Unfallverhütungsvorschriften (in Deutschland denen der Berufsgenossenschaft) entsprechen.

Fahrzeughalter und Fahrzeugführer sind für die Einhaltung der gesetzlichen Bestimmungen verantwortlich.

Darüber hinaus sind die Weisungen in diesem Kapitel vor Antritt und während der Fahrt einzuhalten.

1. Transportbreite der Maschine ermitteln. Dazu die Transportbreite der Maschine der Tabelle (Seite 55) entnehmen oder an der Maschine abmessen.

Wichtig!

Bei bestimmten Ausstattungen ist die Transportbreite größer, als in der Tabelle (Seite 55) angegeben.

Beantragen Sie eine Sondergenehmigung bei Ihrer örtlichen Behörde zum Transportieren Ihrer Maschine auf öffentlichen Straßen, wenn die Transportbreite von 3,0 m überschritten wird.

Hinweis!

Die Einzelkorn-Sämaschine ED 452 nur auf einem Transportfahrzeug befördern.

2. Spuranreißer-Auslegerrohre der ED 452, ED 452-K und ED 602-K einschieben und verriegeln (siehe Kapitel 8.9.5, Seite 107 und Kapitel 8.9.6, Seite 108).
3. Beide Spuranreißer senkrecht stellen (siehe Kapitel „Spuranreißer-Betätigung“, Seite 149).
4. Spuranreißer sichern [siehe Kapitel „Transportsicherung der Spuranreißer (ED 302 und ED 452 [-K])“, Seite 147].
5. Maschinen-Ausleger einklappen und sichern (siehe Kapitel „Maschinen-Ausleger klappen“, Seite 147).
6. Das Bedienterminal des Rechners ausschalten.

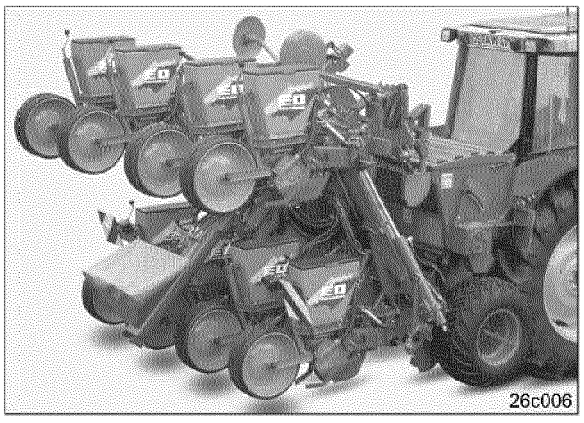


Fig. 201

Die verkehrstechnische Ausrüstung [siehe Kapitel „Verkehrstechnische Ausrüstung (Option)“, Seite 40] ist vorgeschrieben.

7. Die Beleuchtungsanlage auf Funktion prüfen.
8. Die Warntafeln müssen sauber und dürfen nicht beschädigt sein.
9. Maschine zum Straßentransport anheben. Einzuhalten ist der Abstand
   - o Rückleuchten-Oberkante zur Fahrbahn, max. 1550 mm
   - o Rückstrahler-Oberkante zur Fahrbahn, max. 900 mm.
10. Die Traktor-Steuergeräte sperren.



Fig. 202

Wichtig!

Wird die Einzelkorn-Sämaschine in Kombination mit einem Fronttank auf öffentlichen Straßen transportiert, muss auch der Fronttank den nationalen Straßenverkehrsvorschriften (in Deutschland die StVZO und die StVO) entsprechen. Nähere Angaben der Betriebsanleitung zum Fronttank entnehmen.

10 Einsatz der Maschine

Gefahr!

- **Beachten Sie beim Einsatz der Maschine das Kapitel "Sicherheitshinweise für den Bediener", Seite 25.**
- **Beachten Sie die Warnbildzeichen an der Maschine. Die Warnbildzeichen geben Ihnen wichtige Hinweise für den gefahrlosen Betrieb der Maschine. Die Beachtung dieser Hinweise dient Ihrer Sicherheit!**

10.1 Arbeitsbeginn

1. Maschinen-Ausleger ausklappen (siehe Kapitel „Maschinen-Ausleger klappen“, Seite 147).
2. Einzelkorn-Sämaschine am Feldanfang absetzen.
3. Handbremse anziehen, Traktormotor abstellen und Zündschlüssel abziehen.

Wichtig!

Den Saatgut-Behälterdeckel (Fig. 203/1) waagerecht stellen durch Verlängern oder Verkürzen des Oberlenkers (Fig. 203/2).

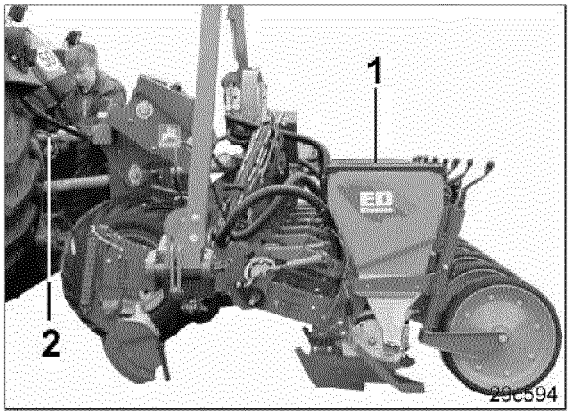


Fig. 203

4. Spuranreißer entsichern (nur ED 302 und ED 452 [-K]), [siehe Kapitel „Transportsicherung der Spuranreißer (ED 302 und ED 452 [-K])“, Seite 147].
5. Spuranreißer in Arbeitsstellung bringen (siehe Kapitel „Spuranreißer-Betätigung“, Seite 149).
6. Das Gebläse auf die richtige Drehzahl bringen (siehe Kapitel „Gebläse-Drehzahl“, Seite 100).
7. Steuergerät für die Traktor-Unterlenker in Schwimmstellung bringen und während der Arbeit in Schwimmstellung betreiben.
8. Traktorzapfwelle einschalten.
   Zur Vermeidung von Beschädigungen Zapfwelle nur im Leerlauf oder bei niedriger Traktormotordrehzahl langsam einkuppeln.
9. Mit dem Traktor anfahren.

Nach den ersten 30 m kontrollieren, ggf. korrigieren:

10. Saatgutablagetiefe und Kornabstand (siehe Kapitel „Saatgutablagetiefe und Kornabstand kontrollieren“, Seite 118).

10.2 Transportsicherung der Spuranreißer (ED 302 und ED 452 [-K])

Gefahr!

- **Die Spuranreißer sichern vor Verlassen des Feldes bzw. bei Fahrten auf Straßen und Wegen.**

Spuranreißer gegen die Halterung drücken und mit einem Klappstecker (Fig. 204/1) abstecken.

Bei Nichtgebrauch den Klappstecker in die Bohrung (Fig. 204/2) stecken (Parkposition).

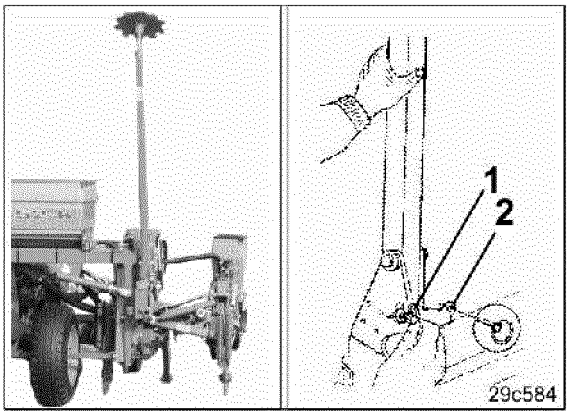


Fig. 204

10.3 Maschinen-Ausleger klappen

Gefahr!

- **Die Maschinen-Ausleger sichern vor Verlassen des Feldes bzw. bei Fahrten auf Straßen und Wegen.**
- **Der Aufenthalt im Schwenkbereich der Maschinen-Ausleger bei Betätigung des Traktor-Steuergerätes ist verboten.**
- **Zwischen Maschinen-Ausleger und Maschine befinden sich Quetsch- und Scherstellen. Niemals in den Quetschbereich greifen.**
- **Die Ausleger der ED 902-K nicht unter Freilandleitungen klappen.**
  - **Während der Arbeit beträgt der Abstand vom Boden zur Spuranreißerspitze bei der ED 902-K ca. 3,65 m.**
  - **Beim Ein- und Ausklappen mit angehobener Maschine beträgt der Abstand vom Boden zur Spuranreißerspitze deutlich über 4 m.**

Wichtig!

- **Den Traktor auf einer ebenen Fläche abstellen und die Einzelkorn-Sämaschine anheben, vor dem Ein- und Ausklappen der Maschinen-Ausleger.**
- **Das Traktor-Steuergerät ohne Unterbrechung betätigen, bis die Maschinen-Ausleger vollständig ein- oder ausgeklappt sind.**
- **Ölfördermengen unter 15 l/min. führen beim Klappen der ED 902-K-Ausleger zur Kollision der Säaggregate.**

10.3.1 Maschinen-Ausleger und Spuranreißer klappen (ED 452-K und ED 602-K)

Zwei Sicherungsbügel (Fig. 205) bilden die mechanische Sicherung der eingeklappten Maschinen-Ausleger.

Maschinen-Ausleger

- vor dem Ausklappen entriegeln (Fig. 205/B).
- nach dem Einklappen verriegeln (Fig. 205/A).

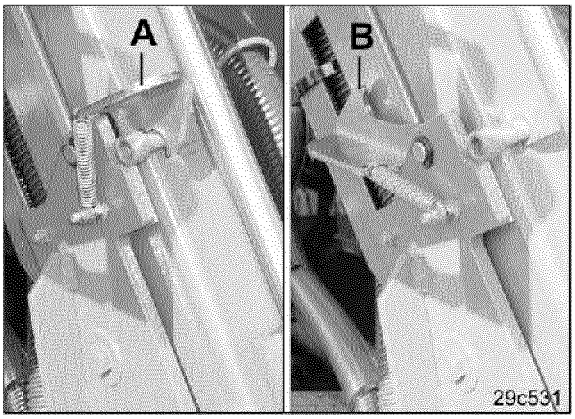


Fig. 205

Maschinen-Ausleger ausklappen:

1. Maschinen-Ausleger entriegeln.
2. Einzelkorn-Sämaschine anheben.
3. Traktor-Steuergerät 2 und 3 (siehe Kapitel „Hydraulikanschlüsse“, Seite 80) solange betätigen, bis die Maschinen-Ausleger ausgeklappt sind.
   Der Kraftschluss der Säaggregate erfolgt automatisch.

   Zusammen mit den Maschinen-Auslegern klappen auch die Spuranreißer der ED 602-K aus.
4. Traktor-Steuergeräte 2 und 3 in „0“-Stellung bringen.

Maschinen-Ausleger einklappen:

Nur ED 452-K:

1. Beide Spuranreißer sichern (siehe Kapitel „Transportsicherung der Spuranreißer (ED 302 und ED 452 [-K])“, Seite 147).

Nur ED 602-K:

1. Beide Spuranreißer anheben (siehe Kapitel „Spuranreißer-Betätigung“, Seite 149).

Alle Typen:

2. Einzelkorn-Sämaschine anheben.
3. Traktor-Steuergerät 2 und 3 solange betätigen, bis die Maschinen-Ausleger eingeklappt sind.

   Zusammen mit den Maschinen-Auslegern klappen auch die Spuranreißer der ED 602-K ein.
4. Die eingeklappten Maschinen-Ausleger verriegeln.

10.3.2 Maschinen-Ausleger und Spuranreißer klappen (ED 902-K)

Maschinen-Ausleger ausklappen:

1. Einzelkorn-Sämaschine anheben.
2. Traktor-Steuergerät 2 (siehe Kapitel „Hydraulikanschlüsse“, Seite 80) solange betätigen, bis die Maschinen-Ausleger und Spuranreißer ausgeklappt sind.
   Der Kraftschluss der Säaggregate erfolgt automatisch.
3. Traktor-Steuergerät 2 in „0“-Stellung bringen.

Maschinen-Ausleger einklappen:

1. Beide Spuranreißer anheben (siehe Kapitel „Spuranreißer-Betätigung“, unten).
2. Einzelkorn-Sämaschine anheben.
3. Traktor-Steuergerät 2 solange betätigen, bis die Maschinen-Ausleger und die Spuranreißer eingeklappt sind.

10.4 Spuranreißer-Betätigung



Gefahr!

- **Der Aufenthalt im Schwenkbereich der Spuranreißer ist verboten.**
- **Beim Betätigen des Traktor-Steuergerätes klappt, je nach Schaltstellung einer der beiden Spuranreißer aus.**
- **Zwischen Spuranreißer und Maschine befinden sich Quetsch- und Scherstellen. Beim Ein- und Ausklappen der Spuranreißer niemals in den Quetschbereich greifen.**

Arbeitsbeginn bzw. nach dem Wenden am Feldende:

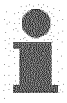
Traktor-Steuergerät 1 in Schwimmstellung stellen

→ der Spuranreißer senkt sich ab.

Vor dem Wenden am Feldende bzw. vor einem Hindernis:

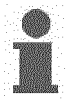
Traktor-Steuergerät 1 mit Druck beaufschlagen

→ beide Spuranreißer sind angehoben.



Hinweis!

Senkt sich beim Betätigen des Traktor-Steuergerätes 1 in Schwimmstellung der falsche Spuranreißer ab, das Steuergerät mehrmals durchschalten.



Hinweis!

Die Wechselautomatik bei Maschinen mit ED-Control ist nur dann aktiv, wenn die Maschine in Arbeitsposition Geschwindigkeit aufgenommen hat.

10.5 Wenden am Feldende

Vor dem Wenden am Feldende die Gebläsedrehzahl soweit absenken, bis das Manometer (Fig. 206/1) einen Wert zwischen 35 und 40 mbar anzeigt.

Bei dieser Drehzahl fallen die Körner nicht von den Vereinzelungsscheiben ab.

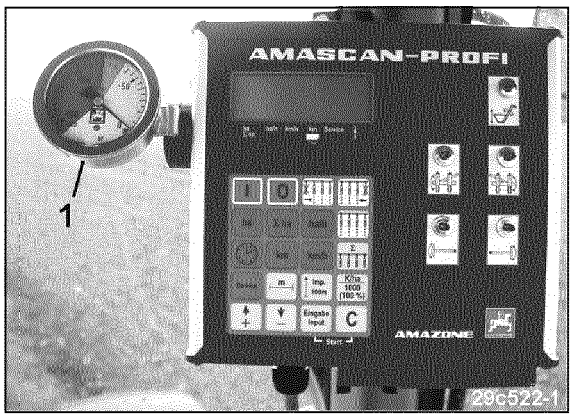


Fig. 206

11 Störungen

11.1 Stillstand einer Vereinzelungsscheibe

Störung:

Ein Scherstift (Fig. 207/1) ist zerstört. Dadurch dreht sich eine Vereinzelungsscheibe nicht.

Anzeige:

Das Bedienterminal (Option) zeigt den Fehler an.

Fehlerbehebung:

Ursache der Störung ermitteln und beheben.

Einen Ersatz-Scherstift (Fig. 207/1) in die Kupplung stecken.
Ersatz-Scherstifte (Fig. 207/2) befinden sich an allen Sägehäusen.

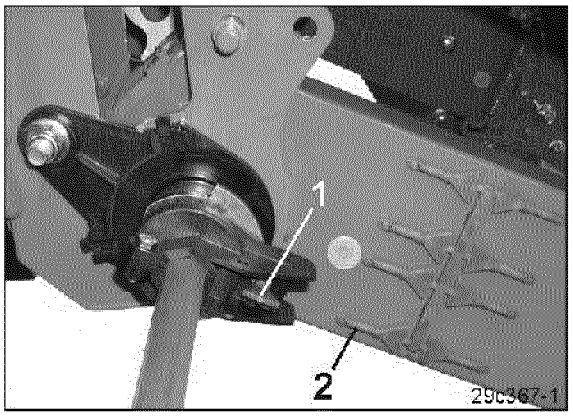


Fig. 207

11.2 Abscheren eines Spuranreißerauslegers

Trifft der Spuranreißer auf ein festes Hindernis, schert eine Schraube (Fig. 208/1) ab und der Spuranreißer klappt nach hinten.

Als Ersatz nur Schrauben der Festigkeit 8.8 verwenden (siehe Online-Ersatzteilliste).

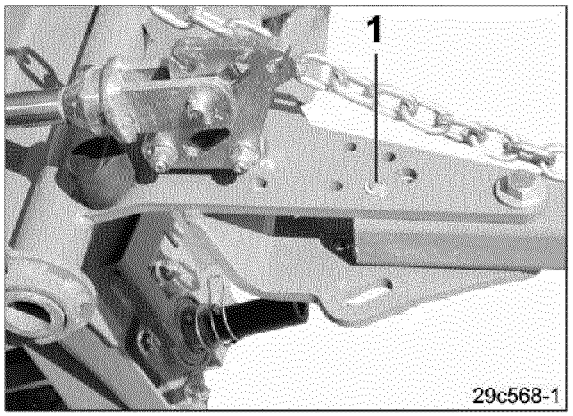


Fig. 208

12 Wartung, Instandsetzung und Pflege



Wichtig!

Kapitel „Wartung, Instandsetzung und Pflege“, Seite 29 lesen und beachten, vor Instandsetzungs-, Wartungs- und Reinigungsarbeiten.

Die Wartungsinterwalle gelten für normale Beanspruchung. Erschwerte Bedingungen verkürzen die Interwalle.

Die Maschine vor längeren Betriebspausen gründlich reinigen.



Gefahr!

Die mit „Fachwerkstatt“ gekennzeichnet Arbeiten dürfen nur in einer Fachwerkstatt ausgeführt werden.



Gefahr!

Sicherheits- und Schutzeinrichtungen nach Wartungs-, Instandsetzungsarbeiten und Reinigungsarbeiten montieren.

12.1 Reinigung



Wichtig!

- **Überwachen Sie Brems-, Luft- und Hydraulikschlauch-Leitungen besonders sorgfältig!**
- **Behandeln Sie Brems-, Luft- und Hydraulikschlauch-Leitungen niemals mit Benzin, Benzol, Petroleum oder Mineralölen.**
- **Schmieren Sie die Maschine nach der Reinigung ab, insbesondere nach der Reinigung mit einem Hochdruckreiniger / Dampfstrahler oder fettlöslichen Mitteln.**
- **Beachten Sie die gesetzlichen Vorschriften für die Handhabung und Beseitigung von Reinigungsmitteln.**



Gefahr!

Schutzmaske tragen. Giftige Stäube von Beizmitteln und/oder Düngermitteln nicht einatmen beim Reinigen mit Pressluft.

Reinigung mit Hochdruckreiniger / Dampfstrahler



Wichtig!

- **Beachten Sie unbedingt die folgenden Punkte, wenn Sie zur Reinigung einen Hochdruckreiniger / Dampfstrahler einsetzen:**
  - **Reinigen Sie keine elektrischen Bauteile.**
  - **Reinigen Sie keine verchromten Bauteile.**
  - **Richten Sie den Reinigungsstrahl der Reinigungsdüse vom Hochdruckreiniger / Dampfstrahler niemals direkt auf Schmier- und Lagerstellen.**
  - **Halten Sie immer einen Mindest-Düsen-Abstand von 300 mm zwischen der Hochdruckreiniger- bzw. Dampfstrahler-Reinigungsdüse und Maschine ein.**
  - **Beachten Sie die Sicherheits-Bestimmungen beim Umgang mit Hochdruckreinigern.**

12.1.1 Maschine reinigen

1. Maschine entleeren
   - Saatgut-Behälter und Sägehäuse (siehe Kapitel „Saatgut-Behälter und Sägehäuse entleeren“, Seite 98)
   - 900 Liter und 1000 Liter-Dünger-Vorratsbehälter (siehe Kapitel „Dünger-Vorratsbehälter entleeren“, Seite 130)
   - Fronttank- Dünger-Vorratsbehälter (siehe Fronttank-Betriebsanleitung).
2. Maschine mit einem Wasserstrahl, einem Hochdruckreiniger oder mit Pressluft reinigen.



Wichtig!

Düngerrückstände vollständig beseitigen. Düngerrückstände härten aus und können rotierende Bauteile beim nächsten Einsatz beschädigen.

12.1.2 Saugluftgebläseläufer reinigen

Beizmittelstaub kann sich, angesaugt vom Saugluftgebläse, auf dem Saugluftgebläseläufer ablagern und zur Unwucht des Gebläses führen. Dadurch kann das Gebläse zerstört werden. Den Saugluftgebläseläufer regelmäßig reinigen.

Saugluftgebläseläufer reinigen:

1. Kappe eines freien Sauganschlusses entfernen.
2. Traktorhandbremse anziehen.
3. Das Saugluftgebläse einschalten (siehe Kapitel „Gebläse-Drehzahl“, Seite 100).
4. Schutzbrille aufsetzen.
5. Einen Wasserstrahl in den freien Sauganschluss leiten und die Ablagerungen bei laufendem Gebläse entfernen.



Gefahr!

Wasser wird beim Reinigen aus dem Gebläseaustritt herausgeschleudert.

Schutzbrille tragen.



Gefahr!

Nicht in den geöffneten Sauganschluss greifen.

Die Lanze des Hochdruckreinigers nicht in die Öffnung des Sauganschlusses halten.

12.1.3 Befüllschnecke reinigen

Gefahr!

Reinigung und Wartung der Befüllschnecke nur bei abgeschaltetem Traktor-Motor und abgezogenem Zündschlüssel.

Befüllschnecke reinigen:

1. Sterngriffe (Fig. 209/1) lösen.
2. Einen geeigneten Auffangbehälter unter das Förderrohr stellen.
3. Deckel (Fig. 209/2) entfernen.

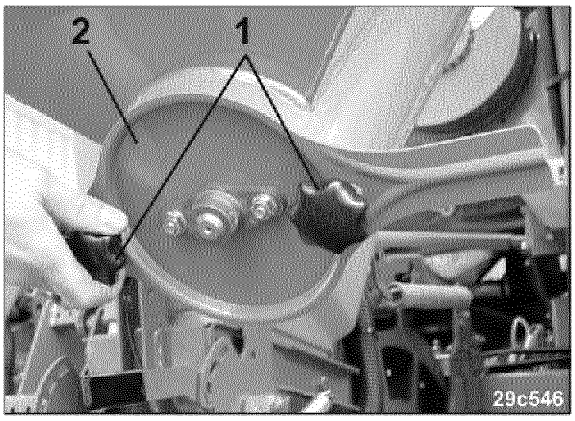


Fig. 209

4. Düngerreste aus dem Förderrohr herausklopfen.

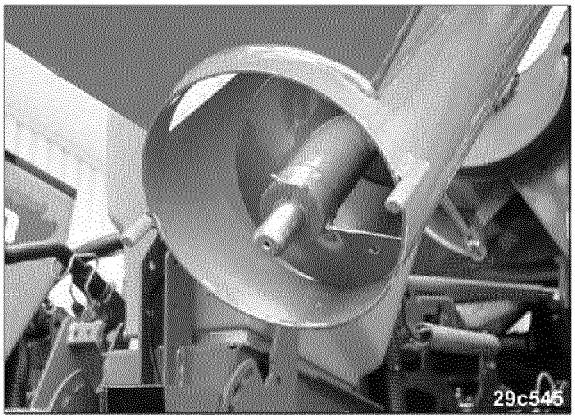


Fig. 210

5. Zur intensiven Reinigung Montageklappe (Fig. 211/1) abschrauben.
6. Befüllschnecke gründlich mit einem Wasserstrahl reinigen.

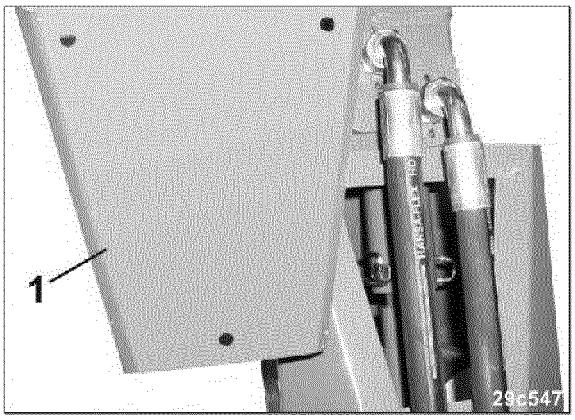


Fig. 211

12.2 Schmiervorschrift

Wichtig!

- **Die Maschine nach Angaben des Herstellers abschmieren.**
- **Verwenden Sie als Schmierstoff ein Lithium-Verseiftes-Mehrzweck-Fett mit EP-Zusätzen.**
- **Schmiernippel und Fettpresse vor dem Abschmieren sorgfältig reinigen, damit kein Schmutz in die Lager hineingepresst wird. Das verschmutzte Fett in den Lagern vollständig herauspressen und gegen neues ersetzen.**

Firma	Schmierstoff-Bezeichnung
ARAL	Aralub HL2
FINA	Marson L2
ESSO	Beacon 2
SHELL	Ratinax A

Die Schmierstellen der Maschine sind mit dem Folienaufkleber (Fig. 212) gekennzeichnet.

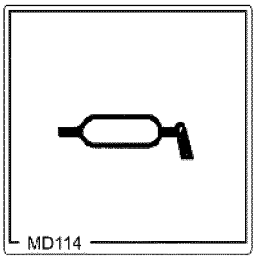


Fig. 212

12.2.1 Schmierstellen – Übersicht

Figur	Typ	Bauteil	Anzahl der Schmiernippel	Schmierintervall
Fig. 213/1	ED 302 ED 452 ED 452-K	Flanschlager	4	50 h
Fig. 214/1	ED 452-K	Ausleger	8	50 h
Fig. 215/1	ED 602-K	Ausleger	8	50 h
Fig. 216/1	ED 602-K	Hydraulikzylinder	2	50 h
Fig. 217/1	ED 602-K	Betätigungsschere	1	50 h
Fig. 217/2	ED 602-K	Betätigungsschere	1	50 h
Fig. 217/3	ED 602-K	Betätigungsschere	1	50 h
Fig. 217/4	ED 602-K	Hydraulikzylinder	1	50 h
Fig. 217/5	ED 602-K	Hydraulikzylinder	1	50 h
Fig. 218/1	ED 902-K	Hydraulikzylinder	1	50 h
Fig. 218/2	ED 902-K	Hydraulikzylinder	1	50 h
Fig. 218/3	ED 902-K	Betätigungsschere	1	50 h
Fig. 218/4	ED 902-K	Betätigungsschere	1	50 h
Fig. 219/1	ED 902-K	Spuranreißer	4	50 h
Fig. 219/1	ED 902-K	Ausleger	2	50 h
Fig. 220/1	ED 902-K	Flanschlager	4	50 h

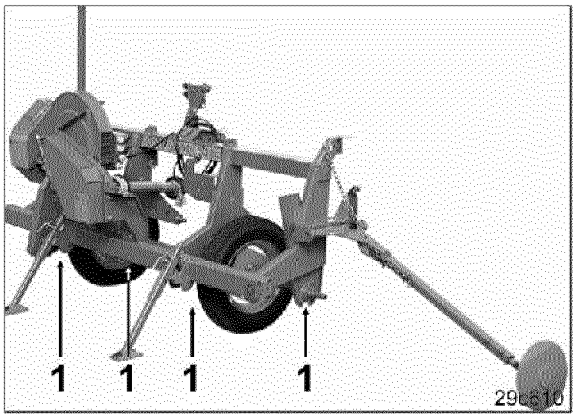


Fig. 213

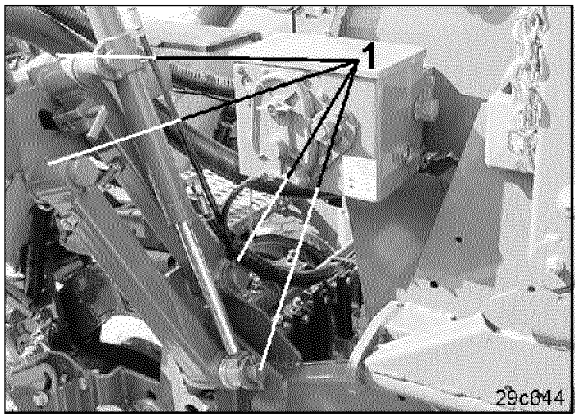


Fig. 214



Fig. 215

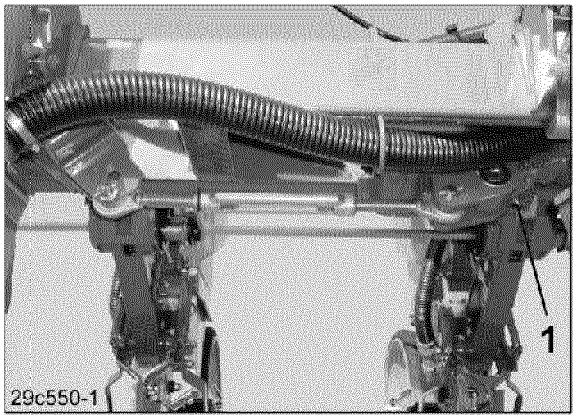


Fig. 216

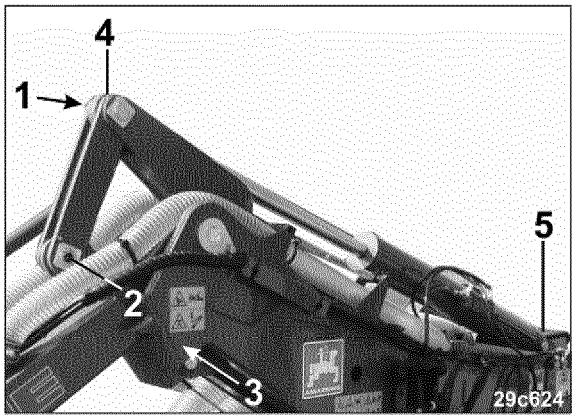


Fig. 217

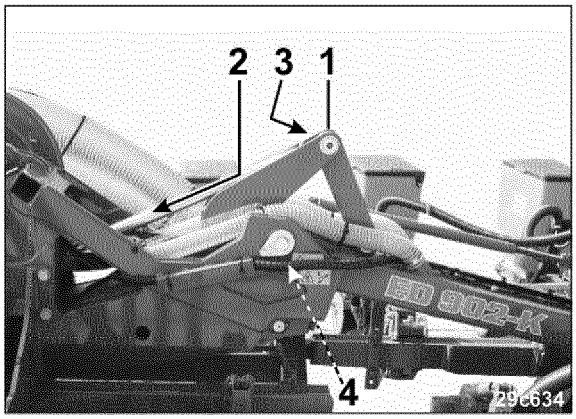


Fig. 218

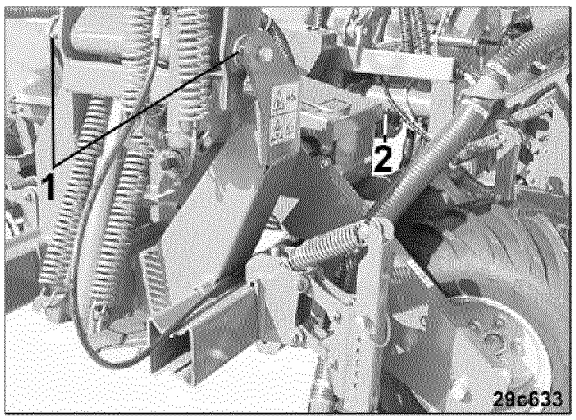


Fig. 219

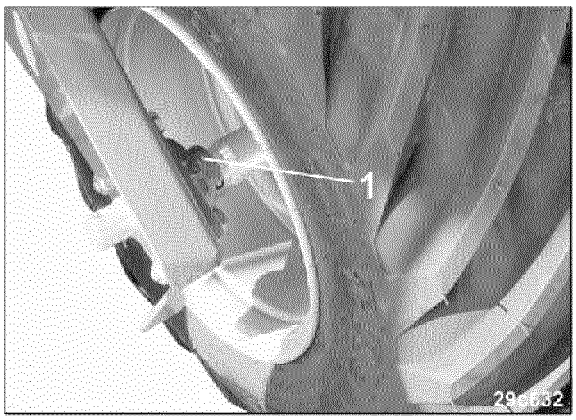


Fig. 220

Schmierstellen Gelenkwellen:

Anhand des Wartungsplans (Fig. 221)

- alle Gelenkwelle abschmieren
- die Schutzrohre und die Profilrohre einfetten.

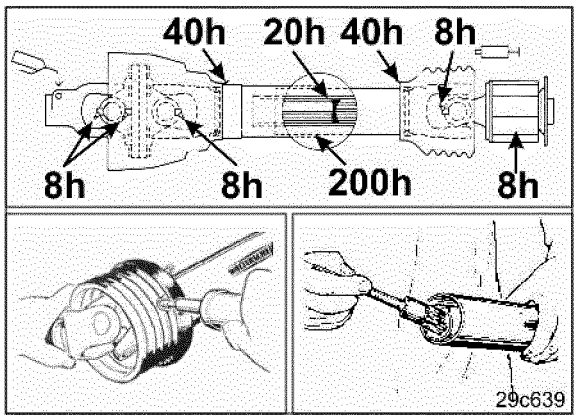


Fig. 221

12.3 Wartungs- und Pflegeplan – Übersicht



Wichtig!

- **Führen Sie die Wartungs-Intervalle nach der zuerst erreichten Frist durch.**
- **Vorrang haben die Zeitabstände, Laufleistungen oder Wartungs-Intervalle der eventuell mitgelieferten Fremd-Dokumentation.**
- **Fronttank-Wartungs-Intervalle, siehe Fronttank-Betriebsanleitung.**

Wartung vor Inbetriebnahme	Fachwerkstatt	Hydraulikschlauch-Leitungen kontrollieren und warten. Inspektion vom Betreiber protokollieren.	Kap. 12.7
		Reifenfülldruck prüfen.	Kap. 12.5
		Ölstand prüfen im Einstellgetriebe (900/1000 l Dünger-Vorratsbehälter).	Kap. 12.6
Wartung nach den ersten 10 Betriebsstunden	Fachwerkstatt	Radschrauben-Anzugsmoment prüfen	Kap. 12.4
	Fachwerkstatt	Hydraulikschlauch-Leitungen kontrollieren und warten. Inspektion vom Betreiber protokollieren.	Kap. 12.7
	Fachwerkstatt	Keilrippenriemen prüfen im Gebläse-Riementrieb	Kap. 12.8
	Fachwerkstatt	Rollenketten-Wartung	Kap. 12.9
10 Betriebsstunden nach einem Radwechsel	Fachwerkstatt	Radschrauben-Anzugsmoment prüfen	Kap. 12.4
Täglich nach Arbeitsende		Reinigung	Kap. 12.1
Jede Woche, spätestens alle 50 Betriebsstunden	Fachwerkstatt	Hydraulikschlauch-Leitungen kontrollieren und warten. Inspektion vom Betreiber protokollieren.	Kap. 12.7
Alle 2 Wochen, spätestens alle 100 Betriebsstunden		Reifenfülldruck prüfen.	Kap. 12.5
		Ölstand prüfen im Einstellgetriebe (900/1000 l Dünger-Vorratsbehälter).	Kap. 12.6
		Säscharspitzen prüfen/austauschen	Kap. 12.11
		Schleppdünger-Scharspitzen prüfen/austauschen	Kap. 12.12
Alle 6 Monate vor der Saison	Fachwerkstatt	Hydraulikschlauch-Leitungen kontrollieren und warten. Inspektion vom Betreiber protokollieren.	Kap. 12.7

Alle 6 Monate nach der Saison	Fachwerkstatt	Keilrippenriemen prüfen im Gebläse-Riementrieb	Kap. 12.8
	Fachwerkstatt	Rollenketten-Wartung	Kap. 12.9
		Säaggregate prüfen	Kap. 12.10

12.4 Radschrauben-Anzugsmomente

Bereifung	**Radschrauben-Anzugsmoment**
Bereifung 10.0/75-15	350 Nm
Bereifung 26 x 12.00/12	350 Nm
Bereifung 31 x 15,5/15 (Terra)	350 Nm

Fig. 222

12.5 Reifenfülldruck

Bereifung	**Reifenfülldruck**
Bereifung 10.0/75-15	1,2 bar
Bereifung 26 x 12.00/12	1,2 bar
Bereifung 31 x 15,5/15 (Terra)	1,2 bar

Fig. 223

12.6 Ölstand im Einstellgetriebe prüfen (900/1000 l Dünger-Vorratsbehälter)

Ölwechsel ist nicht erforderlich.

Ölstand im Einstellgetriebe prüfen:

1. Maschine auf einer waagerechten Fläche abstellen.
2. Der Ölspiegel muss im Ölauge (Fig. 224/1) sichtbar sein.
3. Zum Nachfüllen von Getriebeöl (siehe Tabelle unten), Schraube (Fig. 224/2) lösen und den Getriebedeckel (Fig. 224/3) entfernen.

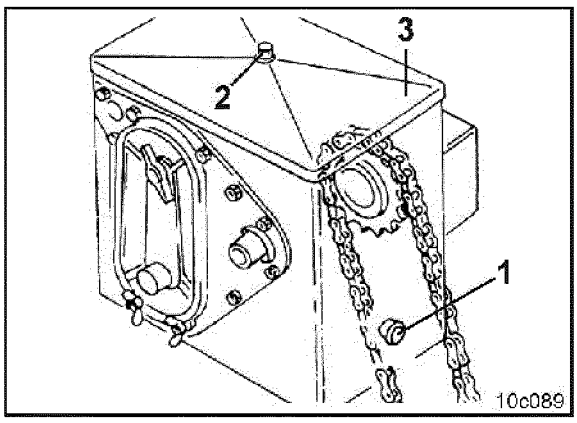


Fig. 224

Gesamtfüllmenge:	1,8 Liter
Getriebeöl (wahlweise):	Wintershall Wintal UG22 WTL-HM (werkseitig)
	Fuchs Renolin MR5 VG22

12.7 Hydraulik Anlage



Gefahr!

- **Nur eine Fachwerkstatt darf Instandsetzungsarbeiten an der Hydraulik-Anlage durchführen!**
- **Die Hydraulik-Anlage steht unter hohem Druck!**
- **Verwenden Sie unbedingt geeignete Hilfsmittel bei der Suche nach Leckstellen!**
- **Machen Sie die Hydraulik-Anlage drucklos, bevor Sie mit den Arbeiten an der Hydraulik-Anlage beginnen!**
- **Unter hohem Druck austretende Flüssigkeiten (Hydrauliköl) können die Haut durchdringen und schwere Verletzungen verursachen! Bei Verletzungen sofort einen Arzt aufsuchen! Infektionsgefahr!**
- **Achten Sie beim Anschluss der Hydraulikschlauch-Leitungen an die Zugmaschinen-Hydraulik darauf, dass die Hydraulik sowohl zugmaschinen- als auch anhängerseitig drucklos ist!**
- **Entsorgen Sie Altöl vorschriftsmäßig. Sprechen Sie bei Entsorgungs-Problemen mit Ihrem Öl-Lieferanten!**
- **Bewahren Sie Hydrauliköl sicher vor Kindern auf!**
- **Hydrauliköl darf nicht ins Erdreich oder Wasser gelangen!**
- **Beachten Sie bei Wartung- und Instandhaltung der Reifen und Räder das Kapitel "Sicherheitshinweise für den Bediener", Seite 25.**



Wichtig!

- **Achten Sie auf korrekten Anschluss der Hydraulikschlauch-Leitungen.**
- **Überprüfen Sie regelmäßig alle Hydraulikschlauch-Leitungen und Kupplungen auf Beschädigungen und Verunreinigungen.**
- **Lassen Sie Hydraulikschlauch-Leitungen mindestens einmal jährlich durch einen Sachkundigen auf ihren arbeitssicheren Zustand prüfen!**
- **Tauschen Sie Hydraulikschlauch-Leitungen bei Beschädigungen und Alterung aus! Verwenden Sie nur Original-AMAZONE Hydraulikschlauch-Leitungen!**
- **Die Verwendungsdauer der Hydraulikschlauch-Leitungen sollte sechs Jahre nicht überschreiten, einschließlich einer eventuellen Lagerzeit von höchstens zwei Jahren. Auch bei sachgemäßer Lagerung und zulässiger Beanspruchung unterliegen Schläuche und Schlauchverbindungen einer natürlichen Alterung, dadurch ist ihre Lagerzeit und Verwendungsdauer begrenzt. Abweichend hiervon kann die Verwendungsdauer entsprechend den Erfahrungswerten, insbesondere unter Berücksichtigung des Gefährdungspotentials, festgelegt werden. Für Schläuche und Schlauchleitungen aus Thermoplasten können andere Richtwerte maßgebend sein.**

Kennzeichnung von Hydraulikschlauch-Leitungen

Die Armatur-Kennzeichnung liefert folgende Informationen:

Fig. 225/...

(1) Kennzeichen des Herstellers der Hydraulikschlauch-Leitung.

(2) Herstelldatum der Hydraulikschlauch-Leitung (04/12 = Dezember 2004)

(3) Maximal zulässiger Betriebsdruck (bar).

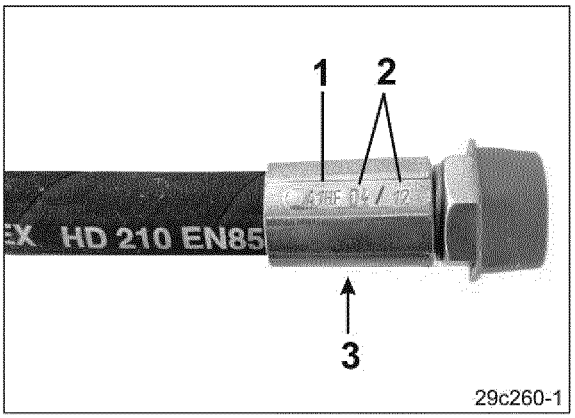


Fig. 225

Wartungs-Intervalle

Nach den ersten 10 Betriebsstunden und in Folge alle 50 Betriebsstunden

1. Prüfen Sie alle Bauteile der Hydraulik-Anlage auf Dichtigkeit.
2. Ziehen Sie gegebenenfalls Verschraubungen nach.

Vor jeder Inbetriebnahme

1. Kontrollieren Sie Hydraulikschlauch-Leitungen auf augenfällige Mängel.
2. Beheben Sie Scheuerstellen an Hydraulikschlauch-Leitungen und Rohren.
3. Tauschen Sie verschlissene oder beschädigte Hydraulikschlauch-Leitungen sofort aus.

Inspektions-Kriterien für Hydraulikschlauch-Leitungen

Wichtig!

Beachten Sie die folgenden Inspektionskriterien zu Ihrer eigenen Sicherheit!

Ersetzen Sie Hydraulikschlauch-Leitungen, wenn Sie bei der Inspektion folgende Inspektions-Kriterien feststellen:

- Beschädigungen der Außenschicht bis zur Einlage (z.B. Scheuerstellen, Schnitte, Risse).
- Versprödung der Außenschicht (Rissbildung des Schlauchmaterials).
- Verformungen, die der natürlichen Form des Schlauchs oder der Schlauch-Leitung nicht entsprechen. Sowohl im drucklosen als auch im druckbeaufschlagten Zustand oder bei Biegung (z.B. Schichtentrennung, Blasenbildung, Quetschstellen, Knickstellen).
- Undichte Stellen.
- Beschädigung oder Deformation der Schlaucharmatur (Dichtfunktion beeinträchtigt); geringe Oberflächenschäden sind kein Grund zum Austausch.

- Herauswandern des Schlauchs aus der Armatur.
- Korrosion der Armatur, die die Funktion und Festigkeit mindern.
- Anforderungen an den Einbau nicht beachtet.
- Die Verwendungsdauer von 6 Jahren ist überschritten.

  Entscheidend ist das Herstelldatum der Hydraulikschlauch-Leitung auf der Armatur plus 6 Jahre. Beträgt das auf der Armatur angegebene Herstelldatum "2004", endet die Verwendungsdauer im Februar 2010. Hierzu siehe "Kennzeichnung von Hydraulikschlauch-Leitungen".

12.7.1 Ein- und Ausbau von Hydraulikschlauch-Leitungen



Hinweis!

Beachten Sie beim Ein- und Ausbau von Hydraulikschlauch-Leitungen unbedingt die folgenden Hinweise:

- **Verwenden Sie nur Original-AMAZONE Hydraulikschlauch-Leitungen!**
- **Achten Sie grundsätzlich auf Sauberkeit.**
- **Sie müssen Hydraulikschlauch-Leitungen grundsätzlich so einbauen, dass in allen Betriebszuständen**
  - **eine Zugbeanspruchung entfällt, ausgenommen durch Eigengewicht.**
  - **bei kurzen Längen eine Stauchbelastung entfällt.**
  - **äußere mechanische Einwirkungen auf die Hydraulik-Schlauchleitungen vermieden werden.**

    Verhindern Sie das Scheuern der Schläuche an Bauteilen oder untereinander, durch zweckmäßige Anordnung und Befestigung. Sichern Sie Hydraulik-Schlauchleitungen gegebenenfalls durch Schutzüberzüge. Decken Sie scharfkantige Bauteile ab.
  - **die zulässigen Biegeradien nicht unterschritten werden.**
- **Bei Anschluss einer Hydraulikschlauch-Leitung an sich bewegende Teile muss die Schlauchlänge so bemessen sein, dass in dem gesamten Bewegungsbereich der kleinste zulässige Biegeradius nicht unterschritten und/oder die Hydraulikschlauch-Leitung zusätzlich nicht auf Zug beansprucht wird.**
- **Befestigen Sie die Hydraulikschlauch-Leitungen an den vorgegebenen Befestigungspunkten. Vermeiden Sie dort Schlauchhalterungen, wo sie die natürliche Bewegung und Längenänderung des Schlauche behindern.**
- **Verboten ist das Überlackieren von die Hydraulikschlauch-Leitungen!**

12.8 Keilrippenriemen prüfen im Gebläse-Riementrieb (Fachwerkstatt)

Keilrippenriemen prüfen im Gebläse-Riementrieb (Fachwerkstatt):

1. Den Keilrippenriemen (Fig. 226/1) austauschen bei
   - o Beschädigung
   - o Ausfransung
   - o Querrissen
   - o Rippenbruch.

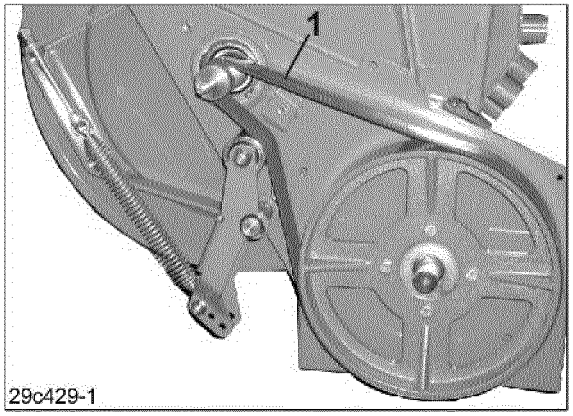


Fig. 226

12.9 Rollenketten und Kettenräder

Alle Rollenketten nach der Saison

1. reinigen (einschließlich der Kettenräder und Kettenspanner).
2. Zustand prüfen.
3. mit dünnflüssigem Mineralöl (SAE10 oder SAE15) schmieren.

12.10 Säaggregate prüfen

Folgende Funktionsteile auf Beschädigungen prüfen und ggf. austauschen:

1. Vereinzelungsscheibe (Fig. 227/1)
2. PE-Schaumprofil-Dichtung (Fig. 227/2)
3. Saugdeckel mit Saugniere (Fig. 227/3)

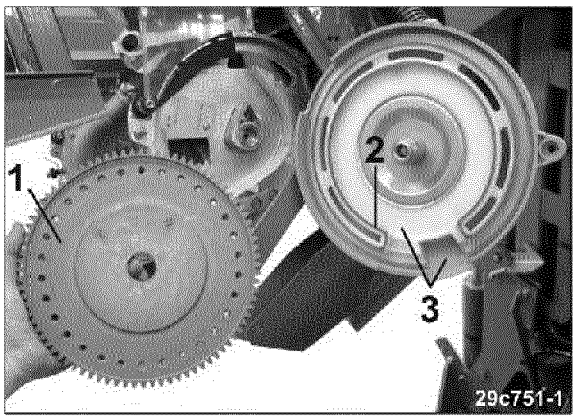


Fig. 227

4. Sägehäusedichtung (Fig. 228/1)
5. Auswerferspitze (Fig. 228/2).

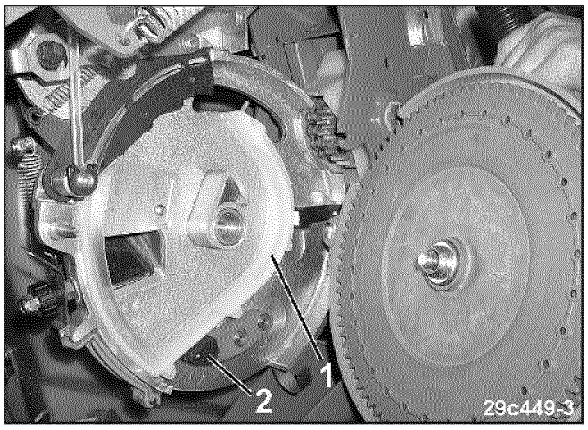


Fig. 228

12.11 Säscharspitzen prüfen/austauschen

Die Säscharspitzen formen die Furche und unterliegen einem natürlichen Verschleiß.

Säscharspitzen austauschen:

1. Maschine anheben und durch geeignete Abstützung sichern.
2. Handbremse anziehen, Motor abstellen und Zündschlüssel abziehen.
3. Muttern (Fig. 229/2) lösen und Säschar (Fig. 229/1) nach unten schwenken.

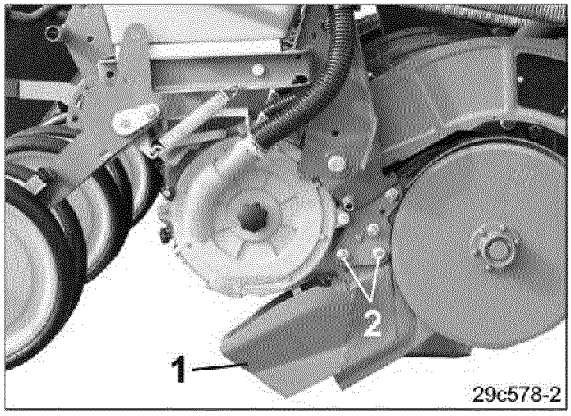


Fig. 229

Classic-Säscharspitze:

4. Mutter (Fig. 230/2) lösen und die Classic-Säscharspitze (Fig. 230/1) austauschen.

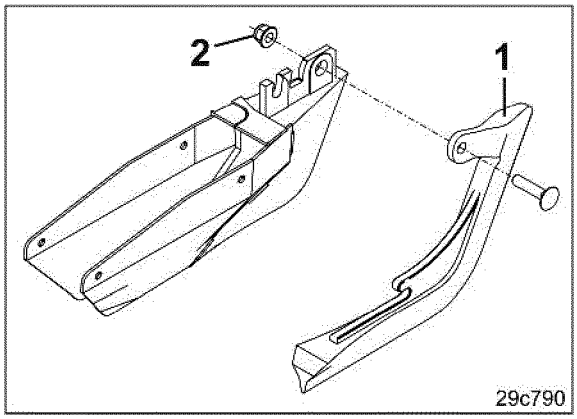


Fig. 230

Contour-Säscharspitze (Mais oder Rübe):

4. Mutter (Fig. 231/2) lösen und die Contour-Säscharspitze (Fig. 231/1) austauschen.

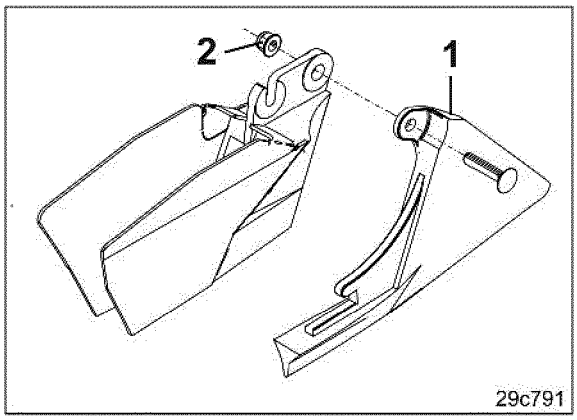


Fig. 231

12.12 Schleppdünger-Scharspitzen prüfen/austauschen

Die Schleppdünger-Scharspitzen formen die Furche und unterliegen einem natürlichen Verschleiß.

Schleppdünger-Scharspitzen austauschen:

1. Maschine anheben und durch geeignete Abstützung sichern.
2. Handbremse anziehen, Traktormotor abstellen und Zündschlüssel abziehen.
3. Mutter (Fig. 232/2) lösen und die Schleppdünger-Scharspitze (Fig. 232/1) austauschen.

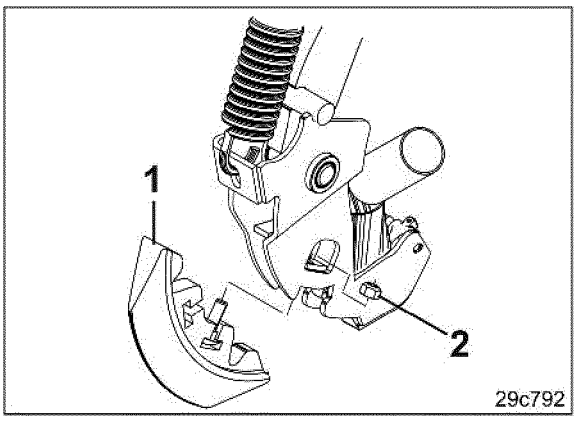


Fig. 232

12.13 Schrauben-Anzugsmomente

Gewinde	Schlüsselweite [mm]	Anzugs-Momente [Nm] in Abhängigkeit der Schrauben-/Muttern-Güteklasse		
		8.8	10.9	12.9
M 8	13	25	35	41
M 8x1		27	38	41
M 10	16 (17)	49	69	83
M 10x1		52	73	88
M 12	18 (19)	86	120	145
M 12x1,5		90	125	150
M 14	22	135	190	230
M 14x1,5		150	210	250
M 16	24	210	300	355
M 16x1,5		225	315	380
M 18	27	290	405	485
M 18x1,5		325	460	550
M 20	30	410	580	690
M 20x1,5		460	640	770
M 22	32	550	780	930
M 22x1,5		610	860	1050
M 24	36	710	1000	1200
M 24x2		780	1100	1300
M 27	41	1050	1500	1800
M 27x2		1150	1600	1950
M 30	46	1450	2000	2400
M 30x2		1600	2250	2700

Wichtig!

Anzugsmomente der Radschrauben (siehe Kapitel „Radschrauben-Anzugsmomente“, Seite 160).

Page 1248 of 1596 Precision Exhibit 1005

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Mehrzweck-Lagerhallen und Kommunalgeräte

Europäisches Patentamt
European Patent Office
Office européen des brevets

Notice of opposition to a European patent

I. Patent opposed

Patent No.	EP2637492
Application No.	EP11779702.7
Date of mention of the grant in the European Patent Bulletin (Art. 97(3), Art. 99(1) EPC)	03 December 2014
Title of the invention	SEED DISTRIBUTION ELEMENT FOR PRECISION SEED DRILLS, SEED DRILL INCLUDING SAID ELEMENT

II. Proprietor of the patent

first named in the patent specification	Maschio Gaspardo S.p.A.
Opponent's or representative's reference	E 98381

III. Opponent

Name	Precision Planting LLC
Address:	23207 Townline Road Tremont IL Illinois 61568 United States of America
State of residence or of principal place of business	United States of America
Multiple opponents (see additional sheet)	☐

IV. Authorisation

1. Representative

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Multiple representatives (see additional sheet) ☐

Authorisation(s)

is/are enclosed ☐

has/have been registered under No. ☐

V. Opposition is filed against

the patent as a whole ☒

claim(s) No(s).

VI. Grounds for opposition:

Opposition is based on the following grounds:

(a) the subject-matter of the European patent opposed is not patentable (Art. 100(a) EPC) because:

• it is not new (Art. 52(1); Art. 54 EPC) ☒

• it does not involve an inventive step (Art. 52(1); Art. 56 EPC) ☒

• patentability is excluded on other grounds, namely articles ☐

(b) the patent opposed does not disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art (Art. 100(b) EPC; see Art. 83 EPC). ☐

(c) the subject-matter of the patent opposed extends beyond the content of the application/of the earlier application as filed (Art. 100(c) EPC, see Art. 123(2) EPC). ☒

VII. Facts (Rule 76(2)(c) EPC)

presented in support of the opposition are submitted herewith on an attached document ☒

VIII. Other requests:

• Oral proceedings are hereby requested auxiliarily.

IX. Evidence presented

A01	Patent document	WO 2012/062876 (A1) , 18.05.2012 original file name: WO_12062876_A1.pdf attached as: Published-Evidence-9.pdf
B01	Patent document	EP2 637 492 (B1) , 03.12.2014 original file name: EP2637492B1.pdf attached as: Published-Evidence-8.pdf
D01	Patent document	US7,228,807 (B1) , 12.06.2007 original file name: D1_US_07228807_B1.pdf attached as: Published-Evidence-1.pdf
D02	Patent document	EP0 536 543 (A1) , 14.04.1993 original file name: D2_EP_00536543_A1.pdf attached as: Published-Evidence-2.pdf
D03	Patent document	EP2 848 109 (A1) , 18.03.2015 original file name: D3_EP2848109A1.pdf attached as: Published-Evidence-3.pdf
D04	Patent document	US4,664,290 (A) , 12.05.1987 original file name: D4_US4664290.pdf attached as: Published-Evidence-4.pdf
D05	Patent document	EP0 140 699 (A2) , 08.05.1985 original file name: D5_EP0140699A2.pdf attached as: Published-Evidence-5.pdf
D06	Other evidence	Manual ("Betriebsanleitung") for the "Einzelkorn-Sämaschine ED 302, ED 452, ED 452-K, ED 602-K ED 902-K" Amazonen-Werke original file name: D6-Amazone.pdf attached as: Other-evidence-1.pdf
D07	Patent document	DE689 16 976 (T2) , 16.03.1995 original file name: D7_DE_68916976_T2.pdf attached as: Published-Evidence-6.pdf
D08	Patent document	WO 96/02123 (A1) , 01.02.1996 original file name: D8_WO_9602123_A1.pdf attached as: Published-Evidence-7.pdf
IT01	Patent document	ITPD20100338 (A1) , 13.05.2012 original file name: IT PD2010A000338.pdf attached as: Published-Evidence-10.pdf
IT01	Other evidence	original file name: IT1 EN PD2010A000338_TRA.pdf attached as: Evidence-Tran-1.pdf

X. Payment

Mode of payment	Debit from deposit account

The European Patent Office is hereby authorised, to debit from the deposit account with the EPO any fees and costs indicated in the fees section below.

Currency:	EUR
Deposit account number:	28000327
Account holder:	Uexküll & Stolberg

Refunds

Any refunds should be made to EPO deposit account:	28000327
Account holder:	Uexküll & Stolberg

Fees

	Factor applied	Fee schedule	Amount to be paid
010 Opposition fee	1	775.00	775.00
Total:		EUR	775.00

A Forms

	Details:	System file name:
A-1	Form for notice of opposition	ep-oppo.pdf

B Attached document files

	Original file name:	System file name:
B-1 1. Facts and arguments	98381 EPO Notice of Opposition.pdf	OPPO.pdf

C Attached evidence files

	Original file name:	System file name:
C-1 1. Patent document	D1_US_07228807_B1.pdf	Published-Evidence-1.pdf
C-2 2. Patent document	D2_EP_00536543_A1.pdf	Published-Evidence-2.pdf
C-3 3. Patent document	D3_EP2848109A1.pdf	Published-Evidence-3.pdf
C-4 4. Patent document	D4_US4664290.pdf	Published-Evidence-4.pdf
C-5 5. Patent document	D5_EP0140699A2.pdf	Published-Evidence-5.pdf
C-6 6. Patent document	D7_DE_68916976_T2.pdf	Published-Evidence-6.pdf
C-7 7. Patent document	D8_WO_9602123_A1.pdf	Published-Evidence-7.pdf

C-8	8. Patent document	EP2637492B1.pdf	Published-Evidence-8.pdf
C-9	9. Patent document	WO_12062876_A1.pdf	Published-Evidence-9.pdf
C-10	10. Patent document	IT PD2010A000338.pdf	Published-Evidence-10.pdf
C-11	1. Other evidence	D6-Amazone.pdf	Other-evidence-1.pdf
C-12	1. Translation of a citation	IT1 EN PD2010A000338_TRA.pdf	Evidence-Tran-1.pdf

Signature of opponent or representative

Place	**Hamburg**
Date:	**02 September 2015**
Signed by:	**Malte Frese 41443**
Association:	**Uexküll & Stolberg**
Representative name:	**Malte Frese**
Capacity:	**(Representative)**

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Patent No.: 2 637 492

Application No.: 11779702.7

Proprietor: Maschio Gaspardo S.p.A.

Opponent: Monsanto International SARL

2. 9. 2015
E 98381 Me/MF

In the name and on behalf of Precision Planting LLC, 23207 Townline Road, Tremont, Illinois 61568, United States of America a

Notice of Opposition

is filed herewith in accordance with Art. 99 EPC to European Patent No. 2 637 492 (date of mentioning of the grant: December 3, 2014) entitled "Seed distribution element for precision seed drills, seed drill including said element" of Maschio Gaspardo S.p.A., Via Marcello 73, IT-35011 Campodarsego (PD), Italy.

It is requested that EP 2 637 492 (subsequently the opposed patent) be revoked in its entirety for all designated contracting states.

Oral proceedings are requested in accordance with Art. 116 EPC in case the Opposition Division should be inclined to maintain the opposed patent.

The opposition fee amounting to EURO 775 shall be debited from debit account number 28000327. A corresponding voucher is enclosed.

Grounds:

The opposition is based on the grounds for opposition of Art. 100(a) and 100(c) EPC. The subject-matter claimed in the opposed patent is not patentable, because it lacks novelty (contrary to Art. 52 (1), 54 (2), (3) EPC) and inventive step (contrary to Art. 52 (1), 56 EPC). The subject-matter claimed in the opposed patent further extends beyond the content of the application as filed (contrary to Art. 123 (2) EPC).

Documents relied upon:

In the present submission, reference is made to the following documents, copies of which are submitted as enclosure:

D1: U.S. 7,228,807 B1
D2: EP 0 536 543 A1

which were also cited in the examination procedure up to grant, and

D3: EP 2 848 109 A1
D4: U.S. 4,664,290 A
D5: EP 0 140 699 A2
D6: Betriebsanleitung Einzelkorn-Sämaschine ED 302, ED 453, ED 452-K, ED 602-K, ED 902-K, Amazonen-Werke

D7: DE 689 16 976 T2
D8: WO 96/02123 A1

Further, reference is made to the specification of the opposed patent,

B1: EP 2 637 492 B1

and the attached analysis of granted claims 1 and 10. It is also referred to the publication of the PCT application No. PCT/EP2011/069875 forming the application as filed,

A1: WO 2012/062876 A1

and to an Italian patent application the priority of which is claimed by the opposed patent and a machine translation of the latter into English

IT1: IT PD20100338 A1
IT1-EN: machine translation of IT1 into English

Arguments

I. Effective date of the opposed patent

The opposed patent was filed on November 10, 2011 claiming priority of Italian patent application IT1. IT1 was filed on November 12, 2010. According to Art. 87 EPC, priority of an earlier application can only be claimed for the same invention. Thus, for the priority of a claim to be valid, the subject-matter of the claim has to be unambiguously and directly derivable from the disclosure of the priority document (Decision of the Enlarged Board of Appeal G 2/98). To this end the

same tests are applied as for determining if an amendment meets the requirements of Art. 123 (2) EPC (Decision of the Enlarged Board of Appeal G 10/02 and the Guidelines for Examination at the EPO, Section F-IV, 2.2).

According to the machine translation into English of claim 1 of IT1, the seed distribution element disclosed in IT1 necessarily comprises a

> "means for generating a pressure differential between said opposing surfaces in correspondence of a segment of said circumferential crown of holes"

In other words, the seed distribution element comprises a means which generates a pressure differential between the opposing sides of the sowing disc. A similar element can be found in claim 10 of IT1 which is directed to a kit for retrofitting a seed distribution element resulting in a seed distribution element having essentially the same features as the seed distribution element as claim 1.

Claim 1 of the opposed patent does not comprise a similar feature. Also none of the dependent or other independent claims comprises a similar feature. Hence, compared to seed distribution element disclosed in the priority application, the opposed patent lacks a feature and, therefore, represents a generalization of the subject-matter originally disclosed in IT1.

Whether or not a claim generalized in this manner is directed to the same invention within the meaning of Art. 87 (1) EPC has to be determined using the essentiality test defined in Section H-V, 3.1 of the Guidelines. According to Section H-V, 3.1 of the Guidelines a feature may be removed from the claims if the skilled person would unambiguously and directly recognise that

(i) the feature was not explained as essential in the disclosure;

(ii) the feature is not, as such, indispensable for the function of the invention in light of the technical problem the invention serves to solve; and

(iii) the replacement or removal requires no real modification of other features to compensate for the change.

Only if all three of the above criteria are met by the missing feature, a seed distribution element without a means for generating a pressure differential can be considered to be the same invention as the invention disclosed in IT1.

As will be shown in the following paragraphs, at least the criteria listed under items (i) and (ii) are not met by the missing feature in view of IT1. The opposed patent, therefore, cannot validly claim the priority of IT1.

First of all, the feature not comprised by the subject-matter claimed in the opposed patent is explained as essential in the priority application. For example, it is explained in the priority document that "the principle of operation is based on the fact that due to the pressure differential between the opposing faces of the disc, a seed adheres to each hole ..." (IT1-EN, page 1, lines 14 to 16, emphasis added). The operation of the seed distribution element disclosed in IT-1 essentially relies on some means to create a pressure differential between opposing faces of the disc. Thus, the deleted feature is described as essential in IT-1 and may not be omitted from the claimed subject-matter.

Further, the omitted feature is also indispensable in IT-1 for the function of the invention in light of the technical problem the invention serves to solve. Without a pressure differ-

ential created by some means adapted to create a pressure differential, the seed distribution element is not operable. In addition, the pressure differential creates "substantial compression of the disk against [a] seal" (IT1-EN, page 1, lines 24 to 25) which "leads to a strong abrasion of the seal" (IT1-EN, page 1, line 26). This is one of the problems the opposed patent tries to solve (IT1-EN, page 2, lines 21 to 24). Thus, without a means for creating a pressure differential, the problem allegedly solved by the opposed patent does not even exist. The feature is, therefore, not indispensable for the function of the invention in light of the technical problem the invention serves to solve and item (ii) of the criteria laid down in Section H-V, 3.1 of the Guidelines is not met.

In summary, at least two of the three criteria of the test determining whether a feature is a necessary part of an invention are met by the missing feature. Claim 1 of the opposed patent therefore extends beyond the disclosure of the priority application and is therefore not entitled to the priority date. The same applies to all other claims.

The effective date of the opposed patent is, therefore, the filing date of the opposed patent, i.e., November 10, 2011.

II. Extended subject-matter

Claim 1 of the application underlying the opposed patent (the application as filed or "A1") is amongst others characterized by the feature "wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes" (A1, page 8, lines 20 to 22). This feature has been deleted from claim 1 during prosecution of the opposed patent. As a consequence, the claimed subject-matter has been extended to subject-matter not unambi-

guously and directly disclosed in the originally filed application. The opposed patent, therefore, violates Art. 123 (2), 101 (c) EPC and has to be revoked already for this reason.

Whether a feature can be removed from a claim without violating Art. 123 (2) EPC is determined using the essentiality test (Guidelines, Section H-V, 3.1) already discussed in the preceding section. Removing the above feature from claim 1 at least does not meet the criteria laid down under item (i) and item (ii), above.

The deleted feature is identified as an essential feature in the application as filed. A1 explains, for example, that "[t]he operating principle [of the seed distribution element] is based on the fact that, as a result of the pressure differential between the opposed faces of the disc, a seed adheres to each hole ..." (A1, page 1, lines 13 to 15). In other words, without a pressure differential provided between the opposing sides of the disc, the seed distribution element is not functional. The deleted feature is, therefore, an essential in the application as filed.

Furthermore, according to A1 the deleted feature is also indispensable for solving the technical problem underlying the alleged invention. According to A1 the suction effect created by the pressure differential "effects a substantial compression of the disc against [a] seal" (A1, page 2, lines 1 and 2). This causes "severe abrasion of the seal" which is disadvantageous as it limits the lifetime of the seal and makes it necessary to replace the seal frequently (A1, page 2, lines 4 to 8). This is one of the problems of prior art seed distribution elements that the opposed patent alleges to solve (A1, page 3, lines 9 to 12). Thus, without applying a pressure differential to the claimed seed distribution element, the problem allegedly solved by the subject-matter claimed in the op-

posed patent would not even exist. The deleted feature is, therefore, indispensable for the function of the invention in the light of the technical problem the invention serves to solve.

Hence, at least two of the three criteria of the essentiality test are not met by the deleted feature. Deleting the feature, therefore, violates Art. 123 (2) EPC as claim 1 extends to subject-matter not originally disclosed in the application as filed.

The same arguments apply vice-versa to claim 10 and all claims referring directly or indirectly back to any of claims 1 or 10. These claims, therefore also violate Art. 123 (2) EPC as their subject-matter extends to subject-matter not originally disclosed in the application as filed.

III. Subject-matter of the independent claims

1. Independent claim 1

The subject-matter of independent claim 1 defines a seed distribution element for precision pneumatic seed drills comprising the following features:

[1.1] a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
[1.2] a housing (10) with
[1.2.1.] a fixed portion (11) in which the shaft (20) is supported and
[1.2.2.] a portion (12) which is movable relative to the fixed portion (1 1) and can be closed against it,
[1.3] a seed collection chamber (15) being defined in the fixed portion (11),

[1.4] a pneumatic suction chamber (17) being defined in the movable portion (12),

[1.5] the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

[1.6] the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

[1.7] a seal (24) which

[1.7.1.] is arranged on the movable portion (12) and

[1.7.2.] is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

characterized in that

[1.8] the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16),

[1.9] which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

In other words, claim 1 is directed to a seed distribution element comprising a housing 10 and a sowing disc 16 arranged between a fixed and a movable portion 11, 12 of the housing 10 (features [1.1], [1.2]). The sowing disc 16 is further defined by a functional feature explicitly describing that the disc is rotated by a motor-driven transmission shaft 20 at controlled speed.

The movable portion is defined as being "movable" with respect to the fixed portion and can be closed against it (feature [1.2.2]). Both the fixed and the movable portion 11, 12 of the housing are further defined by several additional features. The fixed portion 11 supports the motor-driven transmission shaft 20 for rotating the sowing disc 16 and defines a seed collection chamber 15 (features [1.2.1], [1.3]). Please note

that claim 1 does not require that the motor-driven shaft is supported by or extends through the fixed portion. It only has to be supported somehow in the fixed portion 11.

The movable portion 12 defines a pneumatic suction chamber 17 (feature [1.4]). The chambers 15, 17 defined by the respective portions 11, 12 of the housing 10 are delimited by opposing surfaces of the sowing disc (feature [1.5]). Further, a seal 24 is arranged in the movable portion 12 of the housing 10 (features [1.7], [1.7.1]). The seal 24 is in sliding contact with one of the opposing surfaces of the sowing disc 16, when the movable portion 12 is closed against the fixed portion 11 (feature [1.7.2]).

Finally, a thrust-bearing element 26 is provided which is rotatably supported in the movable portion 12 for withstanding at least some of the axial load produced by the sowing disc 16 on the seal 24 (features [1.8], [1.9]). Thus, claim 1 only requires that the thrust-bearing element 26 is in some way supported in the movable portion 12. It does not have to be supported by the movable portion 12. It could, for example, also be supported – in the movable portion 12 - by the transmission shaft 20.

2. Independent claims 8 and 9

Independent claims 8 and 9 are directed to a sowing element for precision seed drills with a frame and a seed drill comprising a plurality of sowing elements according to claim 8 on a support structure. Both claims incorporate all features of independent claim 1. Therefore, the above considerations fully apply to independent claims 8 and 9.

3. Independent claim 10

Claim 10 is directed to a kit for retrofitting a seed distribution element of precision pneumatic seed drills. The distribution element is defined by the following features:

[10.1] a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

[10.2] a housing (10) with

[10.2.1] a fixed portion (11) in which the shaft (20) is supported and

[10.2.2] a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

[10.3] a seed collection chamber (15) being defined in the fixed portion (11),

[10.4] a pneumatic suction chamber (17) being defined in the movable portion (12),

[10.5] the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

[10.6] the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

[10.7] - a seal (24) which

[10.7.1] is arranged on the movable portion (12) and

[10.7.2] is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another.

The kit itself comprises the following features:

[10.8] the movable portion (12) pre-assembled with:

[10.8.1] a thrust-bearing element(26) of the sowing disc (16),

[10.8.2] which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

Thus, the kit is provided for retrofitting a seed distribution element having essentially the same features as the seed distribution element according to the preamble of claim 1, i.e., features [1.1] to [1.7.2]. Thus, the above discussion presented with regard to features [1.1] to [1.7.2] of claim 1 also applies to claim 10. However, it should be noted that the kit itself is defined by these features only insofar that it has to be adapted to be useable with such a seed distribution element.

The kit itself comprises a movable portion 12 of a seed distribution element pre-assembled with a thrust-bearing element 26 (features [10.8] and [10.8.1]). The thrust-bearing element 26 is rotatably supported in the movable portion like the thrust-bearing element 26 according to claim 1 (feature [10.8.2]). Thus, the thrust-bearing element 26 only has be support by some means or another in the movable portion 12. It does not have to be supported by the movable portion 12.

IV. Lack of novelty of claim 1

1. Lack of novelty in view of D1

D1 is a U.S. patent filed on March 29, 2006. The patent was published on June 12, 2007. Therefore, it represents prior art both with regard to novelty and inventive step. D1 is cited in paragraph [0003] of the opposed patent allegedly forming the closest prior art. However, as we will show in the following paragraphs, D1 is in fact novelty defeating for claim 1 of the opposed patent.

D1 discloses a metering unit 36, i.e., a seed distribution element, comprising a first housing member 50 (column 5, lines 59 to 62) and a second housing member 90 (column 7, lines 19

to 21). A retaining hub 56 connected to a drive shaft 55 is supported in the first housing member (Figure 6). Thus, the first housing member 50 is a fixed portion within the meaning of claim 1 (feature [1.2.1]). The second housing member 90 is attached to the first housing member 50 by a pivot pin 92 (column 7, lines 19 to 21) and can be assembled, i.e., closed, against the first housing member 50 (column 7, lines 28 to 30). Thus, the second housing member 90 discloses a movable portion according to claim 1 (feature [1.2.2]) and the first and the second housing members 50, 90 together disclose a housing of the metering unit 36 (feature [1.2]).

A seed or sowing disk 60 is arranged on the retaining hub 56 connected to the drive shaft 55, which can be engaged to a drive member by a pair of flanges 57 (column 6, lines 1 to 5, Figures 6 to 8, feature [1.1]). The seed disk 60 divides the interior of the housing 50, 90 of the metering unit 36 into a first and a second chamber, i.e., it is interposed between the first and the second housing members 50, 90 (column 7, lines 48 to 52, Figure 7). A first surface 61 of the seed disk 60 defines or delimits the first chamber formed in the interior of the metering disk 36 and a second surface 62 delimits the second chamber formed in the interior of the metering unit 36 (column 7, lines 52 to 56, Figure 7, feature [1.5]). The seed disk 60 also comprises a plurality of transverse holes 67 extending around a circle spaced a short distance within the outer circumference of the sowing disc 60 (column 6, lines 28 to 31). The transverse holes 67 correspond to the ring of selector holes of claim 1 of the opposed patent (D1, column 8, lines 5 to 19) and, therefore, disclose feature [1.6].

The first chamber defined in the first housing member 50 collects seeds from a hopper 32 (column 7, lines 62 to 64) and, thus, discloses feature [1.3]. A vacuum is provided in the second chamber (column, 7, lines 64 to 67) which, therefore, de-

fines a pneumatic suction chamber within the meaning of claim 1 of the opposed patent (feature [1.4]).

Further, the metering unit 36 comprises a sealing member or seal 99 arranged in the second housing member 90 and sealing against a second surface 62 of the seed disk 60 when the housing members 50, 90 are assembled or closed against one another (column 7, lines 26 to 30, Figures 6 to 8, features [1.7], [1.7.1], [1.7.2]).

Finally, D1 also discloses a thrust-bearing element supported rotatably in the movable portion and withstanding at least some of the axial load produced by the disc on the seal. In D1 a thrust-bearing element is formed by a hub handle 58 attached to the distal edge of the retaining hub 56 (column 6, lines 22 to 27). The hub handle 58 is arranged in the second housing member 90, i.e., the movable portion (Figure 6), and supported on the retaining hub 56, i.e., it is supported by the retaining hub 56 in the movable portion 90. The hub handle 58 is attached to the retaining hub 56 and will, therefore, rotate with the retaining hub 56 when the latter is rotated to rotate the sowing disc. Furthermore, the hub handle 58 "retains" the seed disk 60 on the retaining hub 56 (column 5, lines 62 to 67). For retaining the seed disk 60 in position it has to take up at least some of the load produced by the seed disk 60 on the seal 99. Therefore, features [1.8] and [1.9] are also disclosed in D1.

As all features of claim 1 are disclosed in D1, claim 1 of the opposed patent lacks novelty over D1.

2. Lack of novelty in view of D3

D3 is a divisional application of the opposed patent. D3 has a filing date of November 10, 2011 and was published on March

18, 2015. D3 also claims priority of IT-1 which was filed on November 12, 2010. The priority claim of D3 is valid as the seed distribution element according to claim 1 of D3 comprises "a suction device producing a pressure differential between the opposed surfaces in the region of a circumferential segment of ring holes" which is an embodiment of a means for creating a pressure differential as required according to IT-1. Such a means is missing in the claims of the opposed patent. Contrary to the opposed patent D3 can, therefore, validly claim the filing date of IT-1, i.e., November 12, 2010, as effective date with regard to novelty.

As the opposed patent does not validly claim the priority of IT-1, its effective date is November 10, 2011 which is nearly a year after the effective date of D3. Therefore, the disclosure of D3 is relevant for the novelty of the opposed patent (Art. 89, 54 (3) EPC).

D3 discloses a seed distribution element 1 (column 2, lines 40 to 42) comprising a sowing disc 16 rotated by a motor-driven shaft 20 at predetermined, i.e. controlled speed (column 3, lines 13 to 16, feature [1.1]). The distribution element comprises a housing 10 with a fixed portion 11 and a movable portion 12 which is hinged in the region of a hinge 12a on the fixed portion 11 and is, therefore, movable with respect to the fixed portion 11 (column 2, lines 53 to 57, feature [1.2]). The movable portion 12 can be closed against the fixed portion (column 3, lines 27 to 30, feature [1.2.2]). The motor-driven shaft 20 is supported in the fixed portion (column 3, lines 13 to 15, feature [1.2.1]). A seed collection chamber 14 is defined in the fixed portion 11 (column 3, lines 3 to 5, Figure 1, feature [1.3]) and a suction chamber is provided, i.e., defined, in the movable portion 12 (column 2, lines 6 to 8, feature [1.5]).

The sowing disc 16 separates the seed collection chamber 15 from the section chamber 17 (column 3, lines 6 to 8) and has opposed surfaces delimiting the chamber 15, 17 (column 3, lines 22 to 26, Figure 1, feature [1.5]). It is provided with a ring of holes 23 passing, i.e., extending, between the opposed surfaces of the sowing disc 16 (column 3, lines 23 to 26, feature [1.6]).

Furthermore, a seal 24 is fitted in the suction chamber 17 in sliding contact with the facing surface of the disc 16 when the movable portion 12 is closed on the fixed portion 11 (column 3, lines 27 to 30, features [1.7], [1.7.2]). As the suction chamber 17 is defined in the movable portion 12 (column 2, lines 6 to 8), the seal is arranged on the movable portion 12 (feature [1.7.1]).

The seed distribution element 1 also comprises a thrust-bearing element 26 which can be driven in rotation with the sowing disc 16 (column 3, lines 57 to 58) and, therefore, has to be supported rotatably. It comprises a shaft 27 which is rotatably mounted by means of bearings 28 in a seat 29 of the movable portion 12 (column 3, lines 46 to 48). Thus, the thrust-bearing element 26 is supported rotatably in the movable portion and can withstand at least some of the axial load produced by the disc 16 on the seal 24 (column 3, lines 52 and 53, feature [1.9]). The thrust-bearing element 26 can, therefore, be considered a thrust-bearing element 26 of the sowing disc (feature [1.8]).

Hence, all features of claim 1 of the opposed patent are disclosed in D3. Claim 1 is, therefore, not novel within in the meaning of Art. 54 (3) EPC over D3.

3. Lack of novelty over D4

D4 is a U.S. patent published on May 12, 1987, i.e., before the effective date of the opposed patent. D4 is, therefore, relevant both with regard to novelty and inventive step of the opposed patent.

D4 is directed to a seed meter 10, i.e., a seed distribution element, comprising a housing 12 with a first half shell 14 and a second half shell 16 (column 4, lines 67 to column 5, line 1, feature [1.2]). The second half shell 16 is coupled to the first half shell 14 by a hinge 18 and can be closed over the first half shell 14 (column 5, lines 1 to 4). The second half shell 16 is, therefore, a movable portion within the meaning of claim 1 of the opposed patent (feature [1.2.2]). As the second half shell 16 is closed on the first half shell 14, the latter is a fixed portion 14 within the meaning of claim 1. A hub 22 is mounted in the first half shell 14 of the housing 12 (column 5, lines 8 to 10). Lugs 24, 26 are provided outside of the housing 12 for driving the hub 22 into rotation using a driving arrangement (column 5, lines 10 to 14, Figure 3). Thus, the hub 22 is a motor-driven shaft 22 supported in the fixed portion 12 of the housing 10 (feature [1.2.1]).

The seed meter 10 comprises a seed disk 28, i.e., a sowing disc 28, mounted on the hub 22 for rotation (column 5, lines 16 to 20). Thus, the sowing disc 28 is mounted on a motor-driven shaft 22 such that it can be rotated at controlled speed (feature [1.1]).

The seed disk 28 divides the housing 12 into a seed chamber 44 and a vacuum chamber 46. The seed chamber 44, i.e., a seed collection chamber 44, is formed between the seed disk 28 and the first half shell 14 of the housing 12 (column 5, lines 37 to 41). It is, in other words, defined in the fixed portion 14 (feature [1.3]). The vacuum chamber 46, i.e., a pneumatic suction chamber 46, is formed between the seed disk 28 and the

second half shell 16 and, thus, defined in the movable portion 16 of the housing 12 (column 5, lines 37 to 41, feature [1.4]).

For dividing the housing 12 into the seed and the vacuum chamber 44, 46 the seed disk 28 necessarily has to be interposed between the two chambers 44, 46 and half shells 14, 16 (Figure 3). The seed disk 28 has a first side 38 (column 6, line 5) and an opposing second side 42 (column 6, lines 19 and 20, Figure 3). Thus, feature [1.5] is also disclosed in D4. The seed disk 28 comprises a plurality of apertures 34 extending between the first side 38 and the second side 42 of the seed disk 28. As the apertures 34 are arranged circumferentially inside a circular outer edge 36 of the seed disk 28 (column 5, lines 27 to 34), they form a ring of selector holes within the meaning of claim 1 of the opposed patent (column 5, lines 57 to 60, feature [1.6]).

A vacuum seal 56 is mounted on the inside of the second half shell 16 or movable portion 16 (features [1.7], [1.7.1]) and extends into contact with the first side 38 of the seed disk 28 (column 6, lines 2 to 5). As the seed disk 28 rotates relative to the vacuum seal 56, the contact of the first side 38 and the vacuum seal 58 is a sliding contact when the portions 14, 16 of the housing are closed against each other (feature [1.7.2]).

Finally, D4 also discloses a thrust-bearing element in form of a handle 32 which locks the seed disk 28 on the hub 22 (column 5, lines 20 to 21). The handle 32 is attached to the hub 22, but it is clearly arranged in the second half shell or movable portion 16 of the housing 12 (Figure 3). Thus, the handle 32 is supported on the hub 22 in the movable portion 16. The handle 32 is also supported rotatably in the movable portion 16 as it rotates with the hub 22 and the seed disk 28. Finally,

the handle 32 is also adapted to withstand at least some of the axial load produced by the seed disk 27 on the seal 56, as it enables precise positioning of the seed disk 27 relative to the first half shell or fixed portion 14 (column 8, lines 26 to 37, feature [1.9]).

Claim 1 of the opposed patent is, therefore, not novel in view of D4.

4. Lack of novelty over D5

D5 is European patent application filed on October 29, 1984 which was published on May 8, 1985. D5 is, thus, prior art relevant for novelty and inventive step of the opposed patent.

D5 essentially discloses the same seed distribution element as D4. We will, therefore, only briefly discuss where the features of claim 1 of the opposed patent are disclosed in Figure 3 of D5:

[1.1] sowing disc 28 supported on a shaft in form of a rotatable hub 22,
[1.2] housing 10 comprising
[1.2.1] a fixed portion 14 supporting the hub 22,
[1.2.2] a movable portion 20 movable relative to the fixed portion 14 and closable against the fixed portion 14,
[1.3] a first half shell 14 forming a seed collection chamber (page 5, second paragraph),
[1.4] a second half shell 20 forming vacuum chamber (page 5, second paragraph),
[1.5] the sowing disc 28 is interposed between the chambers 14, 20,
[1.6] selector holes in from of apertures 38 extend through the sowing disc 28 (page 5, second paragraph) and form a ring (Figure 2),

[1.7] a seal 42 is
[1.7.1] is arranged in the movable portion 20 of the housing and
[1.7.2] capable of sliding contact with the sowing disc 28 (page 5, last paragraph),
[1.8] a thrust-bearing element in from of an elongated handle 24 and
[1.9] the handle 24 is supported rotatably on the hub 22 in movable portion 20 and takes up at least some of the axial load produced by the disc 28 (page 8, penultimate paragraph, last sentence).

Hence, all features of claim 1 of the opposed patent are known from D5. Claim 1 is, therefore, not novel within the meaning of Art. 54 (2) EPC over D5.

5. Lack of novelty over D6

D6 is a manual ("Betriebsanleitung") for the "Einzelkorn-Sämaschine ED 302, ED 452, ED 452-K, ED 602-K ED 902-K" (single seed sowing machine) produced by Amazonen-Werke, H. Dreyer GmbH & Co. KG in Germany. The manual was created and published in October 2005 and has a copyright of 2005 (see page 3, section titled "Formales zur Betriebsanleitung").

D6 discloses a seed distribution element for pneumatic seed drills ("Einzelkorn-Sähmaschine") comprising a housing ("Sägehäuse", feature [1.2]) having a fixed portion comprising a seed collection chamber ("Saatgut-Vorrats-Bereich", page 53, Figure 39, no. 2, features [1.2.1], [1.3]) and a movable portion comprising a pneumatic suction chamber ("Saugdeckel", page 95, Figure 97, no. 4, feature [1.4]). The movable portion can clearly be moved relative to the fixed portion (see, for example, page 95, Figure 98) and can be closed against it (page 95, Figure 97, feature [1.2.2]).

A sowing disc ("Vereinzelungsscheibe", page 95, Figure 98, no. 1) is interposed between the two portions of the housing. Opposed surfaces of the sowing disc delimit the chambers (feature [1.5]). An outer edge of the sowing disc forms a gear rim which engages with a drive gear provided at the fixed portion of the housing (page 95, Figure 98, gear in the center of the upper half of the Figure). The drive gear drives the sowing disc into rotation. It, thus, forms a drive shaft supported in the fixed portion within the meaning of claim 1 of the opposed patent (features [1.1], [1.2.1]). The sowing disc has a plurality of selector holes ("Bohrungen", page 53, Figure 39, no. 4) which extend through the sowing disc and which are arranged in form of a ring along an outer edge of the sowing disc (page 53, Figure 40, [feature [1.6]).

A seal ("PE-Schaumprofil-Dichtung") arranged in the movable portion of housing is disclosed, for example, in Figure 227 on page 166 as no. 2 (features [1.7], [1.7.1]). The seal is capable of sliding contact with the sowing disc (feature [1.7.2]).

Finally, at least in Figures 40 (page 53), 98 (page 95) and 227 (page 166) a central shaft for mounting the sowing disc is shown in the center of the movable portion. The central shaft serves several purposes: it provides an axis of rotation for the sowing disc, it keeps the sowing disc in position along the axis of rotation and it secures the movable portion to the fixed portion of the housing. The central shaft comprises a male thread (page 95, Figure 98) for engagement with a female thread in the fixed portion of the housing. For securing the movable portion to the fixed portion, the male thread of the central shaft is rotated with the central shaft relative to the movable portion using a handle (page 95, Figure 97, no. 3). Thus, for securing the movable portion to the fixed por-

tion, the central shaft has to be rotatably supported in the movable portion.

Finally, it can be taken from a comparison of Figures 227 and 228 (page 166) that the central shaft has sections of different diameter along its extension direction. One of the transitions between two sections of different diameter takes up at least some of the load produced by the disc on the seal. Thus, the central shaft forms a thrust-bearing element within the meaning of claim 1 and features [1.8] and [1.9] of claim 1 are disclosed in D6.

As all features of claim 1 are disclosed in D6, the subject-matter of claim 1 of the opposed patent lacks novelty over D6.

V. Lack of inventive step of claim 1

1. Lack of inventive step over D7 in combination with common general knowledge

D7 is the publication of the German translation of European patent filed on April 4 1989 and granted on July 20, 1994. D7 is, therefore, relevant with regard to novelty and inventive step of the opposed patent.

D7 also relates to a seed distribution element and can be considered to represent the closest prior art.

D7 discloses a distributor ("Verteiler"), i.e., a seed distribution element, comprising a cylindrical case constituted by a housing 1 and a cover 4 (page 3, third paragraph). The cylindrical case is a housing with the meaning of claim 1 of the opposed patent (feature [1.2]). The housing 1 of D7 is connected to a suction element (page 3, third paragraph) and, therefore, forms a pneumatic suction chamber (feature [1.4]).

The cover 4 constitutes a seed container (page 3, third paragraph), i.e., a seed collection chamber (feature [1.3]).

Neither the housing 1 nor the cover 4 are explicitly defined as a movable or a fixed portion. However, as the two parts 1, 4 of the cylindrical case can be connected to each other using screws 22 which extend through lateral lugs 20, 21 and which are secured by nuts 23 (page 3, penultimate paragraph) they are both movable with respect to one another if disconnected. Thus, as the housing 4 comprises all other features of a movable portion according to claim 1, i.e., a vacuum chamber, we will refer to the housing 1 in the following as a movable portion 1 of the cylindrical case (feature [1.2.2]). The cover 4 on the other hand comprises a seed collection chamber. Further, a drive shaft 16 for rotationally driving a distributor disk 18 is supported by a bearing 19 in the cover 4 (page 3, penultimate paragraph). Hence, the cover 4 comprises all features of a fixed portion according to claim 1. Therefore, we will refer to the cover 4 as a fixed portion 4 of the cylindrical case (feature [1.2.1]).

The distributor of D7 also comprises a distributor or sowing disk 18, which is arranged between the vacuum chamber and the seed collection chamber and delimits the latter (Figures 1, 3, feature [1.5]). The distributor disk 18 is rigidly connected ("fest verbunden") to the shaft 16 (page 3, penultimate paragraph) which can be driven into rotation by a chain sprocket wheel 62 (page 5, last paragraph). Thus the distributor disk 18 is rotated by a motor-driven shaft 16 (feature [1.1]). It further comprises a plurality of selector holes 50 forming at least one ring on the distributor disk (page 4, ultimate paragraph, page 6, first paragraph, Figure 2, feature [1.6]).

The shaft 16 is supported rotatably in both portions 1, 4 of the distributor (page 3, third paragraph). Further, the shaft

16 is rigidly connected to the distributor disk 18 (page 3, lines 21 to 24). Thus, any axial load created by the distributor disk 18 is transmitted to the shaft 16. As the shaft 16 is provided for rotating the distributor disk 18 it has to withstand at least some of the axial load created by the distributor disk 18 towards the movable portion 1 of the distributor. Hence, the shaft 16 forms a thrust-bearing element within the meaning of claim 1 of the opposed patent (features [1.8] and [1.9]).

The subject-matter of D7, therefore, differs from the subject-matter of claim 1 of the opposed patent in that no seal is disclosed which is arranged in the movable portion and which is capable of sliding contact with the facing surface of the disc when the portions are closed against one another. The effect of the seal is to ensure an effective pneumatic seal between the face of the disc and the pneumatic suction chamber (B1, column 1, lines 28 to 31).

The objective technical problem underlying the alleged invention of the opposed patent in view of D7 can be considered to reside in providing an effective pneumatic seal between the face of the disc and the pneumatic suction chamber.

Motivation to solve this problem can be found in D7 itself. The document already states that the distributor disk 18 is in sealing contact with the wall of the housing 1 (page 3, line 22).

The solution as claimed is rendered obvious by D7 and the common general knowledge of the skilled person. This is due to the fact that anyone with some skills in this field would be aware that a seal between the face of the disc and the pneumatic suction chamber reduces the loss of the vacuum at the interface between the disc and the vacuum chamber. It is also

within the general knowledge of the skilled person to provide a seal which is capable of sliding contact with a surface of the disk 18 to provide an effective seal (features [1.8] and [1.9]).

Thus, the subject-matter of claim 1 of the opposed patent cannot be considered inventive within the meaning of Art. 56 EPC over a combination of D7 and the common knowledge of the skilled person.

2. Lack of inventive step over D7 in combination with D8

In view of the objective technical problem defined in the preceding section, the skilled person could alternatively turn towards D8 for solving the problem. D8 is a PCT application filed on July 11, 1995 and published February 1, 1996. D8 represents prior art relevant for novelty and inventive step with regard to the opposed patent.

D8 also relates to seed distribution elements and one of ordinary skill would therefore have been motivated to combine the disclosure of D7 and D8.

D8 discloses, for example, on page 1 in lines 7 to 18 that a seal, i.e., a body member or vacuum manifold, arranged in sliding contact with a seed selection disc has been known for a long time for the purpose of providing an effective seal. Figure 1 of D8 shows a non-rotatable seal 14 with a flexible lip 16 which is arranged in a housing 12 and in sliding contact with a seed selection disc 18 (page 12, lines 17 to 24). Thus, D8 discloses features [1.7], [1.7.1] and [1.7.2] of the opposed patent.

The combination of D7 and D8 discloses all features of claim 1 of the opposed patent. Claim 1 can, therefore, not be considered inventive in view of the combination of D7 and D8.

VI. Patentability of the dependent and the further independent claims

1. Patentability of claim 2

According to claim 2 the thrust-bearing element is rotated with the disc when the portions are closed against each other. The subject-matter of claim 2 is at least not novel in view of D1, D3, D4 and D5 and not inventive in view of a combination of D7 with the general common knowledge or D8.

1.1 Lack of novelty over D1

In D1 a thrust-bearing element in form of hub handle 58 is disclosed. The hub handle 58 is arranged on the distal end of the retaining hub 56 and can be rotated "between a first position for receiving or removing a seed disk 60 and a second position for removably retaining a seed disk 60" (column 5, lines 61 to 67). The retaining hub 56 is in turn attached to a drive shaft 55 (column 6, lines 1 to 5) which is used to rotate the seed disk (Figure 6). As the seed disk 60 and the hub handle or thrust-bearing element 58 are attached to the same rotatable shaft 55, the thrust-bearing element 58 rotates with the seed disk 60. Whether or not the portions of the housing are closed against each other does not affect the rotation of the thrust-bearing element.

D1, therefore, discloses the additional feature of claim 2. The subject-matter of claim 2 is, therefore, not novel in view of D1.

1.2 Lack of novelty over D3

D3 discloses a "thrust-bearing element 26 [which] is driven in rotation with the sowing disc 16 when the fixed and the movable portions 11, 12 are closed against one another ..." (column 3, line 57 to column 4, line 2).

Thus, D3 nearly literally discloses the additional feature of claim 2 which is, therefore, not novel in view of D3.

1.3 Lack of novelty over D4

In D4 a handle 32 discloses a thrust-bearing element within the meaning of claim 1. This thrust-bearing element is mounted on a hub 22 on which also the seed disk 28 is mounted (column 5, lines 15 to 20). As in D1, the handle 32 can be rotated between a first position in which it locks the seed disk 28 on the hub 22 and a second position in which the seed disk 28 can be arranged on the hub 22 (column 5, lines 20 to 21). As the seed disk 28 and the handle 32 are arranged on the same hub 22 and any relative rotational movement between the handle 32 and the seed disk 28 could result in an unlocking of the seed disk 28 from the hub 22, the handle 32 necessarily has to rotate with the hub 22. As this argument also applies when the parts 14, 16 of the housing 12 are closed against each other, all additional features of claim 2 are also known from D4.

The subject-matter of claim 2, therefore, also lacks novelty in view of D4.

1.4 Lack of novelty over D5

D5 essentially discloses the same seed meter as D4. Therefore, D5 also discloses that the thrust-bearing element 56 rotates

with the hub 22 and the seed disk 28 when the parts 14, 16 of the housing 12 are closed against each other. The subject-matter of claim 2 is, therefore, also not novel over D5.

1.5 Lack of inventive step over D7 in view of the general common knowledge or D8

In D7 the thrust-bearing element is formed by the shaft 16 driving the seed disk 18 into rotation. The thrust-bearing element, therefore, necessarily rotates with the seed disk 18. As the additional features of claim 2 are known from D7, the arguments present above regarding a lack of inventive step of claim 1 over D7 in view of the general common knowledge or D8 also apply with regard to claim 2.

The subject-matter of claim 2 is, therefore, not inventive over a combination of D7 with the general common knowledge or D8.

2. Patentability of claim 3

In claim 3 the thrust-bearing element is further defined as comprising a thrust-bearing plate which can bear on that surface of the sowing disc which faces the seal in a zone radially inward of the ring of holes. In the absence of a more precise definition of a thrust-bearing plate, any part of a thrust-bearing element having an extended planar surface will be considered a thrust-bearing plate that is in contact with a surface of the sowing disc facing the seal.

Claim 3 lacks novelty in view of D1, D3, D4 and D5 and is not inventive over a combination of D7 with D8.

2.1 Lack of novelty over D1

Figure 6 of D1 shows, for example, that the hub handle 58 is in contact over an extended area with a planar surface 62 of the sowing disc 60 facing towards the seal 99. The extended area of the hub handle 58, therefore, forms a thrust-bearing plate within the meaning of claim 3 which is arranged inside the ring of holes 67 (Figure 8).

Hence, all additional features of claim 3 are known from D1 and claim 3 lacks novelty over D1.

2.2 Lack of novelty over D3

D3 discloses in column 3, lines 46 to 53 a thrust-bearing element 26 comprising a shaft 27. The shaft 27 is fixed to "a thrust-bearing plate 31 which can bear on that surface of the disc which faces the seal 24 in a zone radially inside the ring of holes 23."

Thus, D3 literally discloses the additional features of claim 3 and claim 3 also lacks novelty over D3.

2.3 Lack of novelty over D4

In Figure 3 of D4 the thrust-bearing element in form of a hub 32 is shown in engagement with an extended surface on the first side 38 of the sowing disc 28 facing towards the seal 56. The entire hub 32 is arranged inside the ring of selector holes 34.

Thus, D4 also discloses the additional features of claim 3. Claim 3, therefore, lacks novelty of D4.

2.4 Lack of novelty over D5

D5 discloses essentially the same system as D4. In Figure 3 the handle 56 forming the thrust-bearing element is shown in planar contact with the sowing disc 28 inside the ring of holes 38. Thus, all additional features of claim 3 are also known from D5 which lacks, therefore, novelty over D5.

2.5 Lack of inventive step over D7 in view of D8

In D7 the thrust-bearing element is formed by a shaft 16 which does not comprise a thrust-bearing plate. Thus, D7 discloses all features of claim 3 but a seal and a thrust-bearing plate. As already discussed with regard to claim 1, the seal has the effect to improve the sealing between the sowing disc 18 and the wall of the housing 1 forming the vacuum chamber. The opposed patent does not define an additional benefit of the providing a thrust-bearing element comprising a thrust-bearing plate. The thrust-bearing plate is one way of connecting a thrust-bearing element to a sowing disc. The seal and the thrust-bearing plate do not have a combined effect, and their contribution to the claimed invention can, therefore, be considered separately (Guidelines, G-VII, 7).

It has already been shown that adding a seal between a sowing disc and a housing cannot constitute an inventive step.

The additional feature of a thrust-bearing plate is one way of connecting a sowing disc to a thrust-bearing device. D7 does not explain how the sowing disc 18 can be effectively connected to the thrust-bearing element in form of the shaft 16.

The skilled person could, for example, turn to D8 when looking for a way of mounting the sowing disc 18 on the thrust-bearing device 16. Figure 1 of D8 shows, for example, an extended surface connected to a shaft for mounting a sowing disc 18 to the shaft. AS can be seen in Figure 1, the extended surface is

mounted to the sowing disc using a bolt. Therefore, the extended surface has to rotate with the sowing disc.

The extended surface could and would be transferred without any problems to D7. The skilled person would also mount the extended surface on the side of the sowing disc facing towards the pneumatic suction chamber and, therefore, the seal as it is done in D8.

Hence, the additional feature of claim 3 missing in D7 is completely known from D8. The combination of D7 and D8, therefore, renders the claimed subject-matter obvious.

3. Patentability of claim 4

According to claim 4 the thrust-bearing element comprises a drive element which is fixed for rotation with the plate and can be coupled with the drive shaft of the disc when the portions are closed against each other. In other words, the thrust-bearing element of claim 4 is formed such that the thrust-bearing plate is directly or indirectly connected to the shaft such that the base plate rotates with the shaft. Claim 4, therefore, does not add anything to claim 3 as the thrust-bearing plate of claim 3 already rotated with the shaft and, therefore, some kind of physical connection, i.e. a drive element, between the shaft and the drive plate was necessary.

For the sake of completeness it should be pointed out that D3 explicitly discloses "a drive element 32" (column 4, line 2). Other distinct drive elements are disclosed in D2, Figure 2 (projection extending of axis from the support of the sowing disc 13 through the sowing disc 13) and in D8, Figure 1 (of axis bolt connecting the extended mounting surface and the sowing disc 18).

Hence, the subject-matter of claim 4 is not novel in view of D1, D3, D4 and D5 for the same reasons as the subject-matter of claim 3.

4. Patentability of claim 5

In claim 5 the thrust-bearing element of claim 4 is further defined as being self-centering relative to the drive shaft. A self-centering thrust-bearing element will be understood as a thrust-bearing element which is formed such that in use its axis of rotation is the same as the axis of rotation of the drive shaft.

The subject-matter of claim 5 also lacks novelty at least over over D1, D3, D4 and D5 and is not inventive over D7 in view of the common general knowledge or D8.

4.1 Lack of novelty over D1, D4 and D5

In D1, D4 and D5 the thrust-bearing element in form of a hub handle is directly attached to the hub rotating the sowing disc (see D1, Figure 6, D4, Figure 3 and D5, Figure 3). The handles are directly attached to the hub and rotate with the hub. The axis of rotation of the handles, therefore, coincides with the axis of rotation of the hub. The thrust-bearing elements of D1, D4 and D5 are, therefore, self-centering and the subject-matter of claim 5 lacks novelty over D1, D4 and D5.

4.2 Lack of novelty over D3

D3 discloses a thrust-bearing element 26 comprising a "drive element 32 which comprises a coupling device constrained for rotation with the thrust-bearing plate but with radial and/or circumferential clearance in such a way as to be self-centered in the rotational coupling with the drive shaft of the disc"

(column 4, lines 2 to 6). Thus, D3 also discloses a thrust-bearing element which is self-centering with respect to the drive shaft. All additional features of claim 5 are, therefore, also known from D3 and claim 5 lacks novelty over D3.

4.3 Lack of inventive step over D7 in view of the common general knowledge or D8

In D7 the thrust-bearing element is formed by the drive shaft 16. Thus, the axis of rotation of the thrust-bearing element 16 always coincides with the axis of rotation of drive-shaft 16. Hence, the thrust-bearing element disclosed in D7 is self-centering within the meaning of claim 5.

The subject matter of claim 5 is, therefore, not inventive over D7 in view of the common general knowledge or D8.

5. Patentability of claim 6

According to claim 6 the drive element comprises a coupling member which rotates jointly with the thrust-bearing plate but has radial and/or circumferential clearance so as to be self-centered during rotational coupling with the drive shaft of the disc. As there is no apparent difference between a "drive element" and a "coupling member" these terms may refer to the same element. When coupling the thrust-bearing element to the drive shaft, a coupling member of the thrust-bearing element shall have "radial and/or circumferential clearance so as to be self-centering." In other words, for coupling the thrust-bearing element with the drive shaft, the thrust-bearing element has to be moved parallel to the axis of the rotation of the drive shaft. To compensate for any misalignments of the axis of rotation of the drive shaft and the thrust-bearing element, the coupling member with or without the entire thrust-bearing element can additionally be moved in plane extending

perpendicular to the axis of rotation of the drive shaft as it has "radial or circumferential clearance".

First of all, it should be pointed out that providing lateral clearance between two elements which shall be connected to compensate for potential misalignments cannot be considered inventive. It's a simple routine task for the skilled person to compensate for potential misalignments between two components to be joined.

In addition, the subject-matter of claim 6 also lacks novelty over D1, D3, D4 and D5 and is not inventive over D7 in view of D8.

5.1 Lack of novelty over D1, D4 and D5

In D1, D4 and D5 the thrust-bearing element in form of a hub handle is directly attached to the hub rotating the sowing disc as already discussed with regard to claim 5. Before connecting the handle to the drive shaft, it can be moved freely in space and, therefore, also translated in a plane extending perpendicular to the axis of rotation of the drive shaft. The means connecting the hub handle to the hub which is a coupling member within the meaning of claim 6 moves with the hub handle and can, therefore, also be translated freely before connection with the hub. The hub handle, therefore, has radial and circumferential clearance to be self-centering.

The subject-matter of claim 6 is, therefore, known from D1, D4 and D5 and not novel within the meaning of Art 54 (2) EPC.

5.2 Lack of novelty over D3

The additional feature of claim 6 is literally disclosed on page 4, lines 2 to 6 of D3. Claim 6, therefore, also lacks novelty over D3.

5.3 Lack of an inventive step over D7 in view of D8

The thrust-bearing plate known from D8 as discussed with respect to claim 3 is arranged co-axially on the drive shaft 16. Before the thrust-bearing plate is attached to the drive shaft 16 by inserting the drive shaft into a central bore on the thrust-bearing plate, the thrust-bearing plate can be translated into any lateral direction with respect to the axis of rotation of the drive shaft 16. The thrust-bearing plate, therefore, has radial or circumferential clearance so as to be self-centered during rotational coupling with the drive shaft 16 within the meaning of claim 6.

As the additional feature of claim 6 is known from D8, claim 6 is not inventive over D7 in view of D8.

6. Patentability of claim 7

In claim 7 the seed distribution element of claim 1 is limited to a seed distribution element with a housing having a fixed and a movable portion, wherein the movable portion is hinged to the fixed portion. Coupling two parts of a housing using a hinge is a routine measure the skilled person would take to couple two elements of a housing which shall be movable between an opened and a closed position with respect to one another. It cannot constitute an inventive step.

The subject-matter of claim 7 is also known from D1, D3, D4 and D5 and, therefore, not novel in view of these references.

6.1 Lack of novelty over D1, D4 and D5

D1 discloses a coupling pin or hinge 92 coupling the fixed and the movable portion 50, 90 of the housing, for example, in Figures 7 and 8 (column 7, lines 19 to 21). In D4 and D5 a hinge 18 coupling the fixed and the movable portion 14, 16 of the housing 12 is shown in Figure 2 (D4, column 5, lines 1 to 4 and D5, page 4, penultimate paragraph).

The subject-matter of claim 7, therefore, lacks novelty over each of D1, D4 and D5.

6.2 Lack of novelty over D3

D3 states in column 2, lines 53 to 57 that the "movable portion 12 [is] hinged in the region of a hinge 12a on the fixed portion 11 by means of a removable hinge pin 13." Thus, the additional feature of claim 7 is literally disclosed in D3.

Claim 7, therefore, lacks novelty over D3.

7. Patentability of claim 8

Claim 8 is directed to a sowing element comprising a frame and a seed distribution element according to any of the preceding claims. Opponent cannot establish any difference between a sowing element and a seed distribution element. A frame appears to be nothing more than an element for mounting the seed distribution element of claim 1 to a seed drill. As each of the seed distribution elements disclosed in the prior art is provided for mounting to a seed drill, each of the seed distribution elements comprises a frame. Claim 8 is, therefore, not novel and not inventive for the same reasons as claim 1.

For the sake of completeness we will briefly point out that at least Figures 1 and 2 of D1, Figure 3 of D3 and the title page

of D6 show a seed distribution element having all features as the seed distribution element of claim 1 of the opposed patent attached to a larger structure by means of a frame.

8. Patentability of claim 9

Claim 9 is directed to a seed drill comprising a supporting structure on which a plurality of sowing elements of claim 8, i.e., comprising a seed distribution element according to any of the preceding claims, are mounted.

All seed distribution elements discussed with respect to the preceding claims are intended for use with a seed drill. A plurality of seed distribution elements mounted to a supporting structure of a seed drill is shown, for example, in Figures 1 and 2 of D1, Figure 3 of D3 and on the title page of D6. Thus, the subject-matter of claim 9 is not novel or not inventive, respectively, for the same reasons as claim 1.

9. Patentability of claims 10 and 11

As already discussed above, the kits of claims 10 and 11 do not comprise any additional features compared to the seed distribution element according to claim 1 or claims 2 to 7, respectively. Hence, the same arguments already presented with regard to these claims also apply to claims 10 and 11.

Claims 10 and 11 are, therefore, also not patentable.

VII. Summary

The subject-matter of the opposed patent extends beyond the originally filed subject-matter. Further, none of the claims of the opposed patent is novel or may constitute an inventive

step. Therefore, the request for revocation of the opposed patent in its entirety is justified.

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(54) Pneumatic precision seed drill.

(57) Precision-type single-seed planter with a distributor in the form of a disk (13) provided with perforations (34) and co-operating with a seed container (11, 15) and an air suction device.
The perforations (34) in the disk (13) have an elongated shape and a reduced cross-section. A selector element (14) is arranged to co-operate with the disk (13) by throttling the air suction area of the perforations.
An optimum seed separation and single-seed distribution effect is thereby achieved, regardless of the size and the shape of the seeds.

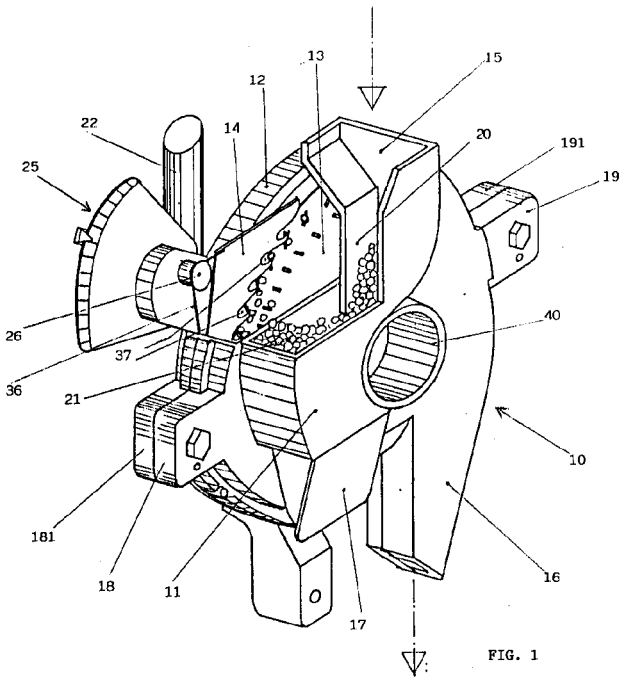


FIG. 1

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The present invention relates to precision-type, single-seed drilling planters, which are adapted to deposit seeds in the ground on a one-by-one basis, at regular intervals, ie. regularly spaced, along sowing rows.

It is well-known that these machines are used in particular for such cultivations as maize, sugar beet, soya, horticultural-type vegetables and all those horticultural and agricultural species in general that require regularly spaced sowing or deposition of either peeled or unpeeled, bare or coated seeds. Precision-type single-seed planters have a number of advantages as compared with universal-type ones. These advantages include a reduction in or even the elimination of downtimes required to subsequently carry out a thinning out of the plants, a simplification in the tilling and harvesting operations, a saving in the quantity of seeds used.

Precision-type single-seed planters can essentially be divided into two categories based on the distribution system that they are actually implementing, ie. mechanical or pneumatic.

This invention refers to precision-type single-seed planters falling into the pneumatic-type category, in which the withdrawal of the seeds from the loading container, their separation and their distribution according to a one-by-one pattern are performed by means of a rotating perforated disk having one or more sequences of concentric circular perforations, and co-operating on one side with a suction blower, which creates a negative pressure of the air through the perforations of the disk and thereby keeps the seeds adhering to the disk until the unloading zone is reached, and on the other side with a mechanical separator which enables the seeds to be selected one by one and causes excess seeds to fall back into the container.

In single-seed planters of the known type, in which the perforations of said disk are generally circular in their shape, it is rather difficult to succeed in having a single seed in correspondence of each perforation of the disk, particularly in those cases in which the seeds have no regular shape and/or have differing sizes. It is therefore general practice to try to use disks with quite large perforations so as to ensure that at least one seed is in all cases captured for distribution. However, by increasing the size of the individual perforations so as to enable even the largest seeds in the lot to be sucked in, a further problem is created in that smaller seeds have then the opportunity of passing through the perforations, or else in that many smaller seeds may get stuck in the perforations, thereby obstructing them. It is therefore quite difficult to succeed in separating the seeds so as to ensure that a single seed is actually sucked and kept adhering to each single perforation. It may further occur that the seeds that get stuck in the perforations are ultimately broken up by the separator when the latter interacts with the perforated disk.

It therefore ensues that precision-type single-seed planters have to be provided with several sets of perforated disks having perforations drilled to different diameter sizes, which must therefore be changed quite often according to the average size and shape of the seeds to be planted, so as to reduce the extent of the above described drawbacks.

Furthermore, the separators must be positioned and adjusted in such a way as to ensure that a single seed remains in each perforation. However, in the precision-type single-seed planters of the known type this is not possible when the seeds are irregular in their shape, since any adjustment enabling two smaller seeds that may possibly be inserted in a perforation to be effectively separated, would quite often prove inadequate in keeping a larger seed adhering to the disk, so that the same seed would fall back into the container and create a void in the sowing sequence. In the opposite case, any adjustment of the selector that enables large or ill-positioned seeds to be kept adhering to the disk for their correct deposition, may even enable several smaller seeds to pass through a perforation, thereby giving rise to an irregular seed deposition pattern.

The Italian patent specification no. 1.145.917 filed by F. Walter & H. Wintersteiger KG describes a precision-type single-seed drilling machine of the pneumatic type, in which the seed drilling disk is formed by two parts, ie. more precisely by a disk-type body member connected to the suction fan means and a thin disk-like plate adhering against said body member so as to cover it on its side facing the seeds. Said disk-type body member is fixed and is provided with a guide slot extending from the centre to the periphery of said body member so as to follow the ejection path of the seed. The disk-like plate is rotatable and is provided with a plurality of radial slots extending from the central portion to the periphery of the disk. This particular type of construction enables a slower speed to be implemented at which the seeds are extracted from the container, and therefore the disk to be facilitated in more effectively capturing the extracted seeds. This occurs owing to the fact that the conveying slots are arranged according to a radial pattern and start off from the central portion of the disk. However, in order to have said conveying slots adequately spaced so as to enable the seeds to adhere along a small central circumference of the disk, said slots have be provided only in a limited number. It therefore ensues that, with the distribution of a small number of seeds for each rotation of the disk, it is necessary to work at

a very slow forward-moving speed on the field, otherwise there would be no effective or even acceptable sowing action, since the seeds would necessarily be subjected to an excessively high centrifugal force.

The therein described system proves quite effective in operation with seeds having a roundish shape, while it is clearly less effective when it comes to individually distribute single seeds being irregular in their shape, eg. tapered or pointed, or in their size. Furthermore, this particular arrangement appears to be rather complicate in its construction, since it practically requires a double disk body, each one of said two parts of the disk having further to be provided with a number of special slots.

It should further be stressed how, from a functional point of view, the seeds are with that particular arrangement coming into contact with both said parts of the disk and are subjected to a rolling action which, if it on the one side promotes separation of the seeds, may on the other side cause the seeds to become damaged owing to the considerable friction against the surfaces of said two parts of the disk along a considerable length of their path.

The European patent application no. 0.338.883 filed by ATELIERS RIBOULEAU describes a precision-type single-seed drilling machine of the pneumatical type, in which the distribution disk is provided with circular, equally spaced perforations drilled along one or two circular patterns near the outer edge of the disk.

The main feature of said solution is the suction device which has an inner channel with a differing cross-section branching off into two arms, of which one is provided with a shut-off member capable of isolating said channel arm from the suction device. In a particular embodiment, the distribution disk is provided with circular perforations arranged a long two circular rings, as well as a set of fins arranged in an alternate sequence with said perforations, which set the seeds in motion in the container and convey them from the release point in the suction device through to the point at which they fall into the ground.

In this particular embodiment, in the passage of the seeds from one ring of perforations to the other one there occurs a separation of the individual seeds which, within certain limits, is independent of the actual size and shape of the seeds. It is however quite apparent that the space taken up by the fins arranged in an alternate sequence with the perforations has a limiting effect on the quantity of perforations that can actually be drilled along each circular ring and, as a consequence, the number of seeds that can be distributed for each rotation of the disk.

It therefore ensues that the forward moving speed of the drilling machine in the field shall necessarily be reduced so as to esclude any excessively high rotation speed of the disk, which would negatively affect the seeds owing to the centrifugal forces generated. It will be also appreciated that such an arrangement implies quite an expensive, complicated construction.

In a further embodiment of said arrangement, which is adapted to operate in a likewise manner as the usual precision-type single-seed drilling machines of the pneumatic type, the distribution disk is not provided with any of such fins, but is associated with a selector element provided with rectilinear slits and adjustable into position with respect to the perforations of the disk, so that the sucked-in seeds are caused to impinge against the protrusions of the plate and are in this way selected. However, even such a constructional solution appears to have its drawbacks. As a matter of fact, the circular perforations in the distribution disk cannot be sized to any large diameter, in order to prevent seeds from getting stuck in them or passing unhindered through them. On the other hand, they cannot even be given too small a diameter, since suction would in such a case turn out to be inadequate to effect seed extraction from the hopper. Furthermore, the separator cannot work in a much efficient way in the case of irregularly shaped or sized seeds.

It is the purpose of the present invention to provide an improved type of pneumatically operated, precision-type, single-seed planter which is simpler in construction as compared with the currently known machines of the same category, and which is such as to ensure individual selection of single seeds in a really effective way, whichever the size and the shape of the seeds may also be within certain reasonable limits.

In particular, the advantage is in this way achieved of being able to use the same disk and the same adjustment thereof to individually sow or plant single seeds having different grain sizes. Furthermore, by adjusting the selector element correspondingly, the possibility is achieved to individually, ie. on a one-by-one basis, sow or plant a variety of seed species which is much wider than the one that can normally be handled with pneumatically operated single-seed planters of the hitherto known type.

The main features of the present invention are as detailed in the appended claims. Anyway, the invention, along with its peculiar characteristics and advantages, will be further described below by way of non-limiting example, with reference to the accompanying drawings in which:

- Figure 1 is a perspective, partially cross-sectioned view of the single-seed distributor

means according to the invention;

- Figure 2 is a cross-section view along the II-II line of the single-seed distributor means of Figure 1; and
- Figure 3 is a perspective, exploded view of the distributor means of Figure 1.

The single-seed distributor means 10 according to the invention can be applied to any known type of planters (not shown) whatsoever.

The single-seed distributor means 10 is essentially formed by a seed container 11 and a box-like casing 12, with a perforated disk 13, associated with a selector element 14, arranged therebetween.

The seed container 11 is provided on its upper portion with a hopper 15 for loading the seeds, and on its lower portion with an unloading conduit 16 for depositing the seeds into the ground, as well as in a preferred way with a lid 17 that can be opened to clean the container 11, particularly when it is required to change the type of seeds to be distributed.

Said seed container 11 is further provided with projections 18, 19 that are adapted to co-operate with respective projections 181 and 191 of the casing 12 to effect the connection and the closure (by means of holes, pins and bolts) of the container 11 with the casing 12.

In a preferred way, the hopper 15 extends downwards into the interior of the container 11 with a wall 20, which acts an effective fending and conveying means for the seeds 21 in the same container, as shown in Figure 2.

The box-like casing 12 is connected with an air suction device (for instance, a motor-driven fan of known type, not shown in the Figure) through a suction conduit 22 which terminates in a hole 23 (Figure 3) in correspondence of a suction slit 24 that is provided along a circumferential arc in the body of the casing 12. Said slit 24 is open on the side facing the disk 13 which, when the distributor means is assembled, is enclosed between the container 11 and the casing 12.

The casing 12 further carries a hand-operated adjusting member with related indicator means 25, which is provided with an eccentric means 26, or a similar provision, so as to adjust the position of the selector element 14 as will be described hereinafter.

The casing 12 is also provided with a perforated hub 27 (Figure 2) through which passes, as supported by bearings 28, a shaft 29 that may for instance be driven through a cog-wheel 30 to rotatably drive the disk 13, to which it is connected by means of a driving disk 31, a centering dowel 32 and a driving pin 33 (Figures 2 and 3).

According to the main feature of the present invention, said disk 13 is provided with a ring of perforations 34, which are preferably arranged according to an equally spaced pattern along a circumferential circle near the outer periphery of the same disk. Said perforations 34 have an elongated shape and a reduced cross-section, so as to prevent seeds with a smaller size from passing therethrough, while at the same time ensuring the passage of a suction air flow which is sufficient to keep seeds with a larger size adhering to the perforations during the rotation of the disk 13. Said perforations 34 may in an advantageous manner be given an arrangement which is inclined with respect to the radial direction of the disk 13, as for instance shown in Figure 3.

The selector element 14, the profile of which is situated in front of the perforations 34, co-operates with that surface of the disk 13 which is facing the seed container 11. According to a particular embodiment, said profile of the selector element 14 is designed so as to divide the perforations into two portions, ie. a seed suction portion situated in an area which is closer to the centre of the disk 13, and a single-seed selection portion that is closer to the periphery of the same disk. This enables the effectiveness of the action of the selector element to be considerably enhanced as far as both the separation of small sized seeds, without them passing through the perforation, and the retention of larger sized seeds, which are exposed to a larger flow of suction air, are concerned.

If the point is to achieve a basically low-cost planter, such as only adapted to handle seeds of the same kind, said selector element 14 may be of a fixed type. Even in this case, with the disk 13 provided with perforations 34 according to the invention, a significant improvement is achieved in the operation and the performance capabilities of the planter, under a more reliable and accurate distribution of the single seeds. In a preferred way, however, said selector element 14 as described in this patent specification is mounted so as to pivot about a pin 35 fixed inside the casing 12, and is retained in a position adhering against the eccentric means 26 by means of a spring fork 36.

By actuating the regulator member 25, the eccentric means 26 is shifted and, as a consequence, the selector element 14 is moved into a suitable position with respect to the surface of the disk 13, as well as with respect to the perforations 34, according to the type of seeds that have to be distributed.

Said shifting and adjustment of the selector element may of course be performed also by means of different mechanical elements, such as screws, levers or sliders, while in all cases achieving a similar result and effect.

According to a further feature of the present invention, the selector element 14 is provided with a number of slots 37 that are cut along the region

of its profile which is situated in front of the ring of perforations 34 around the disk 13, said slots 37 being further co-operating with said perforations 34.

Said slots 37 are arranged with their open ends following an inclined pattern in the direction of rotation of the disk 13 and are very deep in their extension so as to ensure, in co-operation with said selector element 14, the suction and the selection of the seeds, with the distribution of single seeds and the falling of multiple or excess seeds back into the container 11.

Each one of said slots 37 further terminates with an end portion having a sharp profile, so as to create a ridge that promotes leapfrogging into the next slot by the seed which is kept sucked in the perforation in a privileged position, regardless within certain reasonable limits of the shape and the size of the seed, and that also causes multiple or excess seeds to be released and come off.

It may be useful, although not strictly necessary, to provide the inner surface of the disk 13 with a circle of radially arranged lugs 38 or the like, so as to promote an agitation of the seeds in the container 11 during the rotation of the disk 13.

In the operation of the planter, after the seeds are filled into the container 11, the disk 13 is set rotating (in the direction as indicated by the arrow F in Figure 3) and the air suction device is started.

The seeds 21, owing to the air suction through the conduit 22, the hole 23, the slit 24 and the perforations 34, are caused to adhere to the disk 13 and are lifted off the same disk, and get progressively separated, as they proceed in front of the slots 37 of the selector element 14.

Through an appropriate selection of the position of said selector element 14 it is possible to achieve that, in correspondence of the last slot 37 in the direction of rotation of the disk 13, there will be only one seed for each perforation 34 that keeps adhering to the disk 13 and that will then come off the same disk when it reaches the unloading area in correspondence of the unloading conduit 16, where the seed is no longer subjected to the air suction effect, since the suction slit 24 is in fact terminated.

It will of course be appreciated that the above described arrangement may be the subject of any modification or integration considered to be appropriate, without departing from the scopes of the present invention. For instance, the perforations may be given an elongated shape, which however deviates from the herein shown shape, eg. rhomboidal. Furthermore, a hollow sealing ring 39 or similar gasketing means of plastic material may be appropriately provided between the casing 12 and the disk 13 so as to ensure correct positioning of said two elements and an effective sealing effect between them (Figure 2).

Furthermore, the seed container 11 may be provided with a central opening 40 (Figures 1 and 2) to possibly introduce the support and driving elements for the disk 13 from the opposite side of the device, as opposed to the arrangement shown in the accompanying drawing.

Claims

1. Precision-type single-seed pneumatic planter, provided with distributor means for single seeds comprising a disk (13) that is provided with perforations (34) arranged circumferentially in the vicinity of its outer edge and is rotatably operable, said disk (13) being adapted to co-operate on one side with a seed container (11, 15) and on the other side with a casing (12) provided with an opening (24) connected with an air suction device to extract the seeds from said seed container (11, 15) through the action of a negative air pressure created through said perforations (34), and a selector element (14) provided in correspondence of said perforations (34) on the seed facing side of said disk (13) to separate single seeds, **characterized in that** said perforations (34) of the disk (13) have an elongated shape and a reduced cross-section so as to prevent seeds of a smaller size from passing therethrough and to enable at the same time such a suction air flow to pass therethrough as necessary to keep seeds with a larger size adhering on to the disk (13), said selector element (14) being arranged so as to have its profile co-operating with said perforations by throttling the suction area thereof so as to select the single seeds.

2. Precision-type single-seed pneumatic planter according to claim 1, characterized in that said selector element (14) is arranged so that its profile co-operates with said perforations (34) by dividing them up into two portions, of which one is a seed suction portion situatedin an area that is closer to the centre of the disk (13) and the other one is a single-seed selection portion situated in an area that is closer to the periphery of the same disk (13).

3. Precision-type single-seed pneumatic planter according to claim 1 or 2, in which the perforations (34) of the disk (13) are arranged at equally spaced intervals along a circle running circumferentially near the outer periphery of said disk (13), characterized in that said perforations (34) are arranged according to a pattern that is inclined with respect to the radial direction of the disk (13).

4. Precision-type single-seed pneumatic planter according to any preceding claims, characterized in that said selector element (14) is pivotally attached to said casing (12) and is connected through a spring fork (36) and a cam (26) with a hand-operated regulator means (25) adapted to adjust the position of said selector element (14) according to the type of seeds to be distributed.

5. Precision-type single-seed pneumatic planter according to any preceding claims, characterized in that said selector element (14) is provided with appropriately deep slots (37) having their edges protruding and terminating with a sharp contour so as to create an air suction effect that causes the seeds to adhere, as well as to cause single seeds to get over the ridge.

6. Precision-type single-seed pneumatic planter according to any preceding claims, characterized in that said casing (12) is provided with an annular slit (24) extending along an arc of circumference in front of the circumferential circle of perforations (34) of the disk (13), said slit (24) being in connection through a hole (23) with a conduit (22) connected to the air suction device.

7. Precision-type single-seed pneumatic planter according to any preceding claims, characterized in that said disk (13) is rotatably driven through a shaft (29), which is supported in the casing (12), a driving disk (31), which is attached to one end of said shaft (29), and an eccentric pin (33) fixed on said driving disk (31).

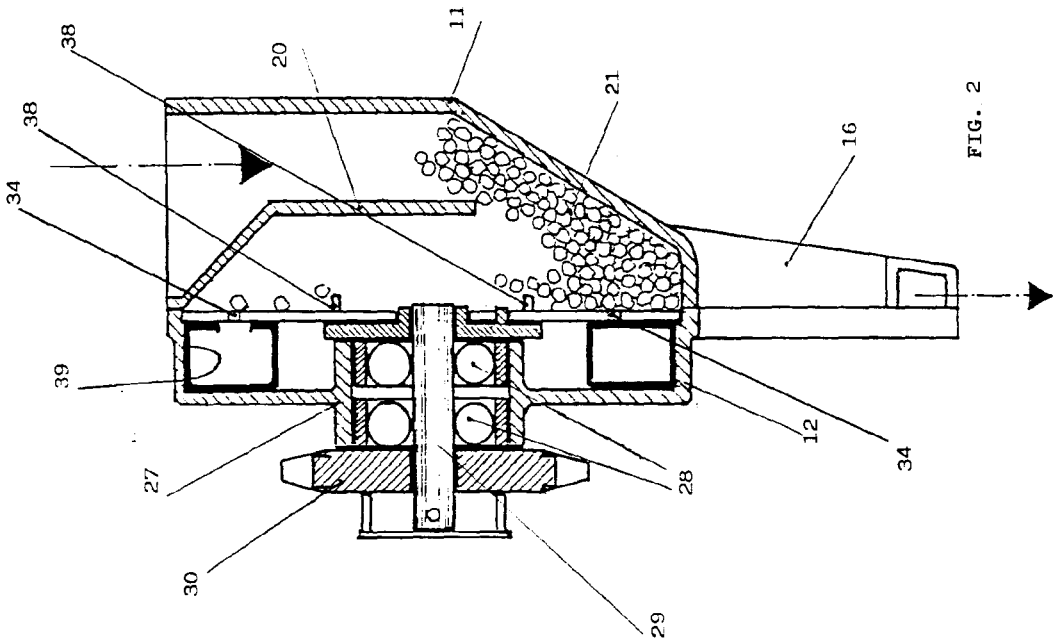

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FIG. 2

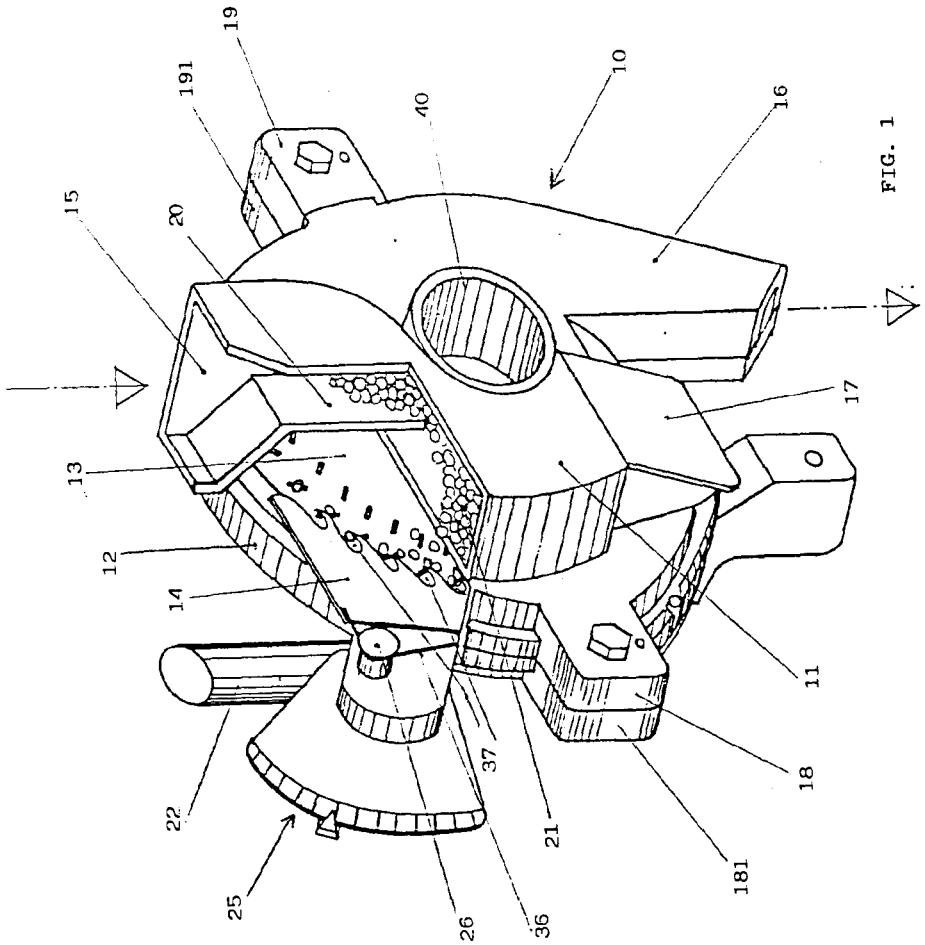

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FIG. 1

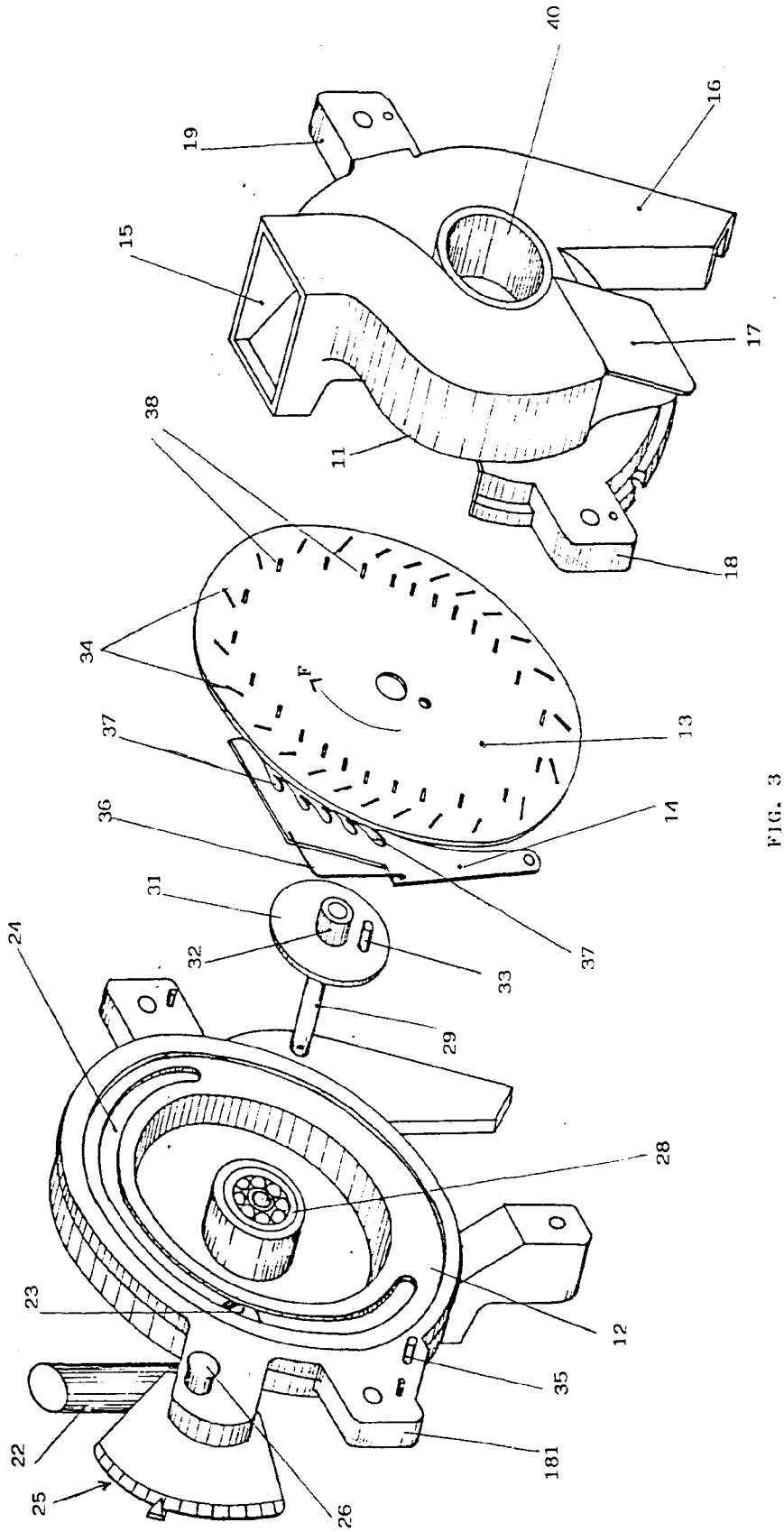

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FIG. 3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 11 5258

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	FR-A-2 643 212 (ATELIERS RIBOULEAU) * page 4, line 20 - page 10, line 21; figures 1-6 *	1	A01C7/04
A		2,5,6	

Y	GB-A-2 132 395 (FEDMECH HOLDINGS LTD.) * page 2, line 26 - line 72; figure 1 *	1	

A	US-A-3 990 606 (GUGENHAN H.) * column 4, line 35 - column 7, line 62; figures 1-8 *	1,2,4,5	

A	US-A-4 074 830 (ADAMS C.E.) * column 3, line 22 - line 59; figures 10-14 *	3	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

A01C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	02 DECEMBER 1992	ELSWORTH D.

CATEGORY OF CITED DOCUMENTS

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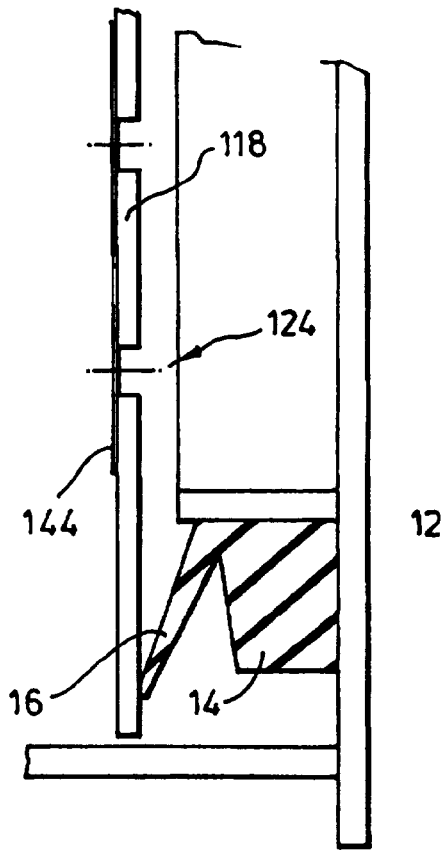
With international search report.

With amended claims and statement.

(54) Title: SEED DISPENSING MECHANISMS

(57) Abstract

A seed selection arrangement for a differential pressure seed selection mechanism comprises a seed selection plate assembly (144) and a flexible seal (14) for defining regions of differing pneumatic pressures. The seed selection plate assembly comprises an apertured flexible seed selection plate (144) mountable on a rotatable support plate (118). The support plate (118) is substantially thicker than the seed selection plate (144). In another aspect of the invention there is provided a seed dispensing mechanism having control means for controlling the application of the pressure differential for seed discharge purposes. The control means is in the form of a resiliently loaded control member mountable for sliding engagement with the seed selection plate assembly.



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SEED DISPENSING MECHANISMS

This invention relates to a method and apparatus for dispensing seed. More particularly, the invention relates to a method and apparatus in which a difference in pneumatic pressure is employed for seed selection purposes.

In the case of known pneumatic seed selection mechanisms as used in currently available farm machinery, and indeed in such mechanism as have been available commercially over the last 30 years or thereabouts, the arrangement is generally as follows. A stainless steel seed selection disc is arranged to co-operate with a body member or vacuum manifold, generally of a plastics material, the disc being rotatable and the body member being fixed. The disc and the body member are in sliding face-to-face contact over a substantial proportion of the side surface of the disc. Sub-atmospheric pressure is applied to the disc over a generally arcuate sub-area of the disc in which seed selection apertures are formed on a pitch circle centred on the rotation axis of the disc. Thus, a sub-atmospheric pressure or "vacuum" applied to the disc over the arcuate area effects seed selection from a seed supply housed in the body member and holds the selected seeds to the disc as the disc rotates. In accordance with well-established practices, the excess seeds are doffed from the seed selection apertures as the disc rotates, until only one seed remains. Then, the vacuum is blanked-off in order to dispense the seeds selectively from the apertures.

All the above technology is extremely well-known and has been widely used internationally over the last 30 years at least, and so far as commercial use is

concerned, has been used more or less exclusively in the form described.

Shortcomings of this prior system which have equally been well-known over this long period relate, inter alia, to the wearing characteristics of the mechanism and the consequential need for replacement parts.

As would be expected by those aware of the characteristics of the working environment of such mechanisms, and indeed of the stainless steel and plastics materials themselves, wear occurs both in relation to the body member and the stainless steel disc itself. One reason for this is the fact that the mechanism in use acts as a vacuum cleaner tending to attract significant amounts of dust in what is inevitably a very dusty situation when seeds are being planted in anything other than damp conditions.

Accordingly, we have identified a significant need for improvements in relation to methods and apparatus for pneumatically selecting seed wherein the wearing characteristics of the method and apparatus are improved.

Accordingly in certain embodiments of the invention there is provided a method and apparatus for dispensing seeds wherein seeds are selected employing a difference in pneumatic pressure applied to a seed selection disc or plate having seed selection apertures. In these embodiments of the invention, the arrangement is such that the seed selection disc or plate assembly is itself capable of supporting the load arising from the difference in pneumatic pressure applied to it and a flexible seal co-operates with the disc or plate to define regions of differing pneumatic pressure.

By arranging for the disc or plate to be self-supporting in combination with flexible sealing means,

the advantage is provided that the seal represents the only significant surface making rubbing contact with the disc or plate, and wear between these surfaces is accordingly correspondingly minimised. For example, when a lip-type seal is employed, the seal makes contact with the disc or plate only over the very narrow lip area, for example substantially line contact in an annular shape, and therefore it is only along this annular line where wear can occur. Because the disc or plate is self-supporting, it does not need to bear or rub against any other structure for reasons of support.

In an embodiment of the invention, the advantage is provided that substantially all or a major proportion of the frictional face-to-face rubbing contact between the rotating disc or plate and the non-rotatable body of prior art mechanisms is eliminated. In the embodiment, the seed selection disc is accordingly no longer a sacrificial component of the mechanism. The thickness of the seed selection disc or plate and its mode of mounting are such that it is self-supporting and thus it differs significantly in these respects from the discs or plates of prior art mechanisms which have not needed to perform this function since they have been supported by the associated non-rotatable body structure.

One more specific aspect of the invention relates to the means for selecting and dispensing relatively small seeds such as carrot or lettuce or tomato seeds - as opposed to maize or field beans or the like seeds.

Pneumatic seed selection mechanisms applicable to small seeds such as lettuce seeds have hitherto been subject to difficulties arising from the fact that the small seeds apertures need to be so very small, as

compared with the apertures applicable to, for example, field beans. As a practical matter, it is difficult and expensive to make seed selection apertures through the metallic structure of a seed selection disc and which are small enough to be suitable for small seeds such as lettuce. Typically, such an aperture might have a diameter in the range of 0.5 to 0.8 mm.

In addition to the mere production cost and difficulty of providing holes at such a size without any burrs or other irregularities, there is the attendant problem of dust and dirt and debris lodging in such holes during use. Conventionally, seed holes are provided in relatively thick discs and the provision of an aperture at such a diameter through a conventional disc means that the aperture is effectively (as compared with its diameter) a tube in which debris can be relatively easily lodged. Moreover, the pneumatic seed selection mechanism applies vacuum to the disc and foreign matter and debris is constantly drawn into these tubes and they tend to become blocked.

The conventional solution to this problem is to countersink the aperture from the non seed-selection side of the disc. However, this arrangement is not particularly satisfactory since it requires relatively complicated additional manufacturing procedures. Also, the arrangements for sealing such discs have hitherto suffered from the same disadvantages as are discussed elsewhere in the specification.

Accordingly, there is a need to provide a seed selection disc or plate arrangement, particularly for use in relation to a pneumatic seed selection mechanism of the kind disclosed above, but applicable more widely also, in which the hitherto conventional countersink arrangement is replaced by an alternative

arrangement which retains the advantages of the countersink arrangement in terms of the seed selection hole proportions, as they affect the resistance of the seed selection apertures to become plugged or otherwise to suffer from technical disadvantages in use, while offering improvements in relation to other aspects of this construction, including manufacturing.

There is disclosed in our own European patent EP 0 145 237 a pneumatic seed selection mechanism in which a thin and flexible or floppy disc is employed. We incorporate herein by reference the entire text and drawings of this prior publication by way of additional disclosure. This enables the convenient and relatively inexpensive production of seed selection apertures for small seeds. This can be done, for example, by a simple etching technique. More than one row of such apertures can be employed. The seed selection disc runs against a plastics manifold or gallery member to define the regions in which vacuum is applied to the disc. The disc can be likewise provided with larger seed selection apertures so as to enable the dispensing of larger seeds such as field beans. To the best of our knowledge, this prior-patented thin disc system represents the only way in which the entire range of seed sizes from large seeds to small seeds can be effectively dispensed by a single metering mechanism using interchangeable discs and a vacuum selection technique.

A shortcoming however of our above-identified and prior patented thin disc pneumatic seed selection mechanism arises in dusty conditions in which dust finds its way between the rotating thin disc and the non-rotating plastics manifold and eventually causes some wear of the thin disc. In non dusty conditions, such a disc lasts the lifetime of the planter. However, some improvement in this respect is desirable

and according to this aspect of the present invention there is provided a method and apparatus as defined in claim 1 of the accompanying claims.

In the embodiments of this aspect of the invention there is provided a seed selection mechanism and a seed selection plate or disc assembly comprising a relatively thin flexible seed selection disc or plate. The term "flexible" as used in this specification in relation to a disc or plate is intended to mean that the disc or plate is flexible to the extent that it is able to deform under the pneumatic pressure differential applied thereto so as to provide a self sealing effect with respect to its support. In an embodiment, a seed selection plate or disc has a thickness of betweeen 0.20 and 0.30 mm, and the reduced pressure applied to the seed selection plate or disc assembly is in the range of 30 to 100 millibars.

In the embodiments, the flexible disc is mounted in relation to a supporting disc or plate. The supporting disc or plate supports the flexible disc against the effect of the applied vacuum. A seal co-operates with the supporting disc or plate to define the region in which vacuum is applied to the disc assembly.

By providing an arrangement in which a flexible disc mounted on or in relation to a supporting disc or plate, is able as an assembly to co-operate with a seal, for example a lip-type seal, the advantage is provided that the seal produces negligible wear of the supporting disc or plate, even under dusty conditions, because it is loaded against the disc or plate only to the extent normal for a seal of that particular kind. Thus, in the case of a lip-type seal, the loading is that which is produced by the relevant degree of deflection of the lip of the seal itself.

Because in the embodiment the lip or other type of seal contacts the seed selection disc assembly only on the supporting disc or plate itself, there is no contact at all between the seal and the flexible disc, and therefore no wear at all of the latter at the region of sliding and sealing contact. In use, the vacuum applied to the assembly draws the flexible disc against its support and they function in this respect as one structure. The flexibility of the disc allows it to accommodate itself to any slight irregularities in the linearity of the support disc or plate under the action of vacuum applied to both.

In the embodiment, a circular and conventional proprietary lip-type seal may be employed. The diameter of this seal is arranged to fully encompass the seed selection region defined by the row or rows of seed selection apertures in the flexible disc so that vacuum is applied to the entire row within the seal, and the row of seed selection apertures does not cross the seal and cause wear, as in the case of the Deere prior proposal mentioned below.

Generally, the arrangement will be such that the disposition of the seal relative to the seed selection disc and its support plate or disc is such that vacuum is applied to the entire inner region of the double disc or plate assembly, apart from the region in which the vacuum is removed by means of the vacuum cut-off assembly in which a control member covers over a portion of the disc assembly and atmospheric pressure may be applied to the seed selection holes.

In accordance with this aspect of the present invention, a seed selection disc or plate assembly for use in a pneumatic seed selection mechanism comprises primary and secondary rotatable apertured plates or discs. For the purpose of dispensing small seeds, the primary dispensing plate is formed with at least one

row of appropriately sized apertures. One or more corresponding apertures or openings are formed in the secondary plate. The apertures in the secondary plate are substantially larger than those in the primary plate and are disposed so as to, at least partially, overlap with those in the primary plate.

The arrangement may be such that the apertures in the secondary plate are generally aligned with those in the primary plate and fully encompass at least some of these. The material of the primary plate is of substantially reduced thickness as compared with that of the secondary plate. As a result, the proportions of the small and large size apertures in the primary and secondary plates are such as to tend to inhibit blocking of the latter by foreign matter. The co-operating arrangement with the secondary disc provides support for the primary disc and allows the application of vacuum to the assembly. Indeed, both discs are held together by the vacuum applied to the assembly.

Accordingly, it can be seen that in the embodiment the advantages of the countersink arrangement are combined with those of the self-supporting disc while permitting the dispensing of small seeds with the required ability to resist the tendency for the apertures to become blocked.

The application of vacuum to the seed selection apertures in the primary flexible disc from the vacuum chamber through the secondary supporting disc or plate in the embodiments is by means of said apertures or openings formed in the supporting disc or plate. In one embodiment there is provided an aperture or opening in the supporting disc or plate for each of the seed selection apertures in the flexible disc. Thus in one embodiment, the supporting disc is itself in the form of a seed selection disc for large seeds

(with its projecting seed-stirring elements removed). Alternatively, the supporting plate or disc can be provided with elongated openings communicating with the small seed selection apertures in the flexible disc. In some cases it may be convenient to provide the supporting disc or plate merely with an annular opening at the appropriate location with occasional (three or more) transverse lands linking its outer portion to its inner portion. Generally, the same supporting disc or plate will be used for each one of a range of flexible discs having differing seed selection hole sizes, but it may be desirable for particular cases to provide a supporting disc or plate for particular ones of such a range.

A further aspect of this invention relates to the provision of a pneumatic seed selection mechanism in which an improved arrangement is provided for the controlled application of "vacuum" (meaning a pressure lower than atmospheric pressure) to the seed selection disc or assembly.

There is disclosed in, inter alia EP-A-0 141 637 (Deere) a pneumatic seed selection mechanism in which a seal having a non-circular shape serves to define and separate regions in which vacuum is applied to the seed selection disc and in which vacuum is not thus-applied.

Shortcomings of this prior proposal include the cost of the seal, which is a non-proprietary item, the fact that the seed selection holes consistently cross the seal during use and thus wear it, and the fact that the vacuum cut-off region is fixed and determined by the seal shape and cannot be changed as, for example, is required in order to change the characteristics of the mechanism for particular crops.

US-A-5 401 035 (Schoenmaekers) discloses a seed selection mechanism in which an O-ring is employed.

There is no disclosure of the system for controlling the application of vacuum in the region where seeds are to be removed from the disc. It must be expected that the mechanism employs a gallery system as indeed is common in planters in commercial use in which the control of the application of vacuum is achieved by the use of galleries moulded into a manifold or gallery member against which the seed selection disc runs. Such an arrangement is likewise subject to the shortcoming that the arrangement for control of the application of the vacuum to the disc cannot be readily varied for different crops since this would require replacement or interchange of the gallery member structure.

According to this aspect of the invention there is provided a seed dispensing mechanism as defined in claim 13 of the accompanying claims.

In the embodiment, since substantially the entire centre region of the seed selection disc has vacuum applied to it, effectively as many lines of seed can be selected by means of seed selection apertures arranged in concentric circles, as may be desired. Normally there will be from one to three lines of seed selected.

The sealing member is preferably of standard circular shape and vacuum is applied to the entire surface of the disc within this circular region defining an inner seed selection region. Control of the application of vacuum is achieved by means of a resiliently-loaded control member which slidingly engages the disc (where a self-supporting disc is used) or the disc assembly (where the combination of a self-supporting disc and a flexible or floppy disc are employed) so as to reduce or eliminate the effect of the vacuum applied to the rearface of the disc or the disc assembly.

The control member may be provided in the form of a spring-loaded plastic pad. This pad is able to accommodate the small degree of movement of the self-supporting disc under the action of the vacuum applied to it, and/or accommodate any irregularities in the linearity of the surface of the disc.

In an embodiment, the control member may be of a circumferential length (with respect to the disc) such as to cover a series of seed selection apertures in the disc or disc assembly, whereby, although the individual seeds are removed from the disc as soon as the vacuum is cut off from the seed selection holes, nevertheless the then open holes do not immediately have vacuum reapplied to them, with the attendant possibility of directly attracting foreign matter or debris before the vacant holes pass through the seed reservoir region and pick up further seeds.

A further feature of the control member in the embodiments is the provision of an opening or channel through to the atmosphere at a region in the control member, which region is aligned with the row of seed holes. In the case of a control member or control members covering more than one row of seed holes, it would be arranged that this opening provides access to atmosphere to both or each row of seed apertures. In this way, the removal of the vacuum applied to the seed selection disc by the presence of the control member is further enhanced by positively allowing the pressure within each seed selection aperture in turn to be brought back to atmospheric pressure. Such an arrangement is preferable to the previously proposed technique of providing a blower delivering a jet of air onto the disc in the relevant region so as to blow seed off. Such an arrangement tends to interfere with the controlled deposition of seed at well defined locations.

Embodiments of the invention will now be described by way of example and with reference to the accompanying drawings, in which :-

Fig 1 shows a cross section through a seed selection mechanism;

Figs 2 and 2A show a cross section through a seed selection mechanism similar to that of Fig 1 showing a modification for small seeds, Fig 2 being an exploded view;

Fig 3 shows an axial view of the seed selection mechanism of Fig 1 as seen in the direction of arrow III therein; and.

Fig 4 shows a partial inverted section on IV - IV of Fig 3 illustrating seed discharge details.

In Figs 1 and 3, the general construction and mode of operation is generally as described above.

The principal constructional items of the seed dispensing mechanism 10 comprise a non-rotatable body or housing 12 carrying an annular non-rotatable seal 14 having a flexible lip 16 which co-operates with a self-supporting seed selection disc 18 mounted on a bearing 20 for rotation about an axis 22 and provided with rows of seeds selection apertures on pitch circles indicated at 24, 26 and 28.

Disc 18 is sufficiently stiff to support itself against the vacuum applied to it by a vacuum pump connected to housing 12 and tending to bend the disc, especially in its outer regions, in the left-to-right direction in Fig 1. Flexible lip 16 accommodates this movement.

In Fig 3 item 30 indicates a seed supply zone fed by seeds from a hopper (not shown) and through which the seed selection apertures on the pitch circle 24 passes.

Item 32 indicates a seed singulating mechanism of generally known construction and adjustable in an arc

between positions indicated at 34 and 36 to vary the singulating effect.

Item 38, shown in more detail in Fig 4, shows the resiliently-loaded control member for controlling the removal of vacuum to an area of disc 18 for seed discharge purposes. The control member 38 comprises pad 44 which is spring-pressed against disc 18 by spring 46.

The spring-loaded pad 44 is able to accommodate any small degree of movement of the self support disc 18 under the action of the vacuum applied to it, as well as accommodating any minor imperfections in the surface of the disc.

The control member 38 is provided with a channel or drilling or bore 48 through to atmospheric pressure, the channel 48 being aligned with a seed selection aperture in disc 18. In this way, in use, the removal of vacuum applied to the seed selection disc 18 by the presence of control member 38 is enhanced by positively allowing the pressure within the seed selection aperture at 24 to be brought back to atmospheric pressure.

This embodiment has the advantage that the sealing lip does not cross the line of seed selection apertures and therefore has excellent wear characteristics.

As can be seen in Fig 3, pad 44 is so shaped as to cover a series of seed selection apertures in disc 18. Although the individual seeds are removed from the disc 18 as soon as the vacuum is cut off from the apertures, by being covered by pad 44, the open apertures do not immediately have vacuum re-applied to them, which would tend to attract foreign matter before the vacant aperture has passed through the seed reservoir to pick up a further seed.

In use, seeds are picked up by seed selection

apertures 40 from seed supply 30 and the seeds are singulated at 32 and finally discharged by the cut-off plate 38.

Figs 2 and 2A illustrate one aspect of the invention, relating to the selection and dispensing of relatively small seeds, such as carrot seeds, lettuce seeds, or tomato seeds. The apparatus of Figs 2 and 2A is similar to the apparatus of Fig 1, and like parts have been given the same reference numerals. This apparatus comprises a support disc 118, similar to the seeds selection disc 18 of Fig 1, but with its projecting seed-stirring elements removed. Typically, the disc 118 has a diameter of 288 millimetres and a thickness of 2 millimetres. The support disc 118 is provided with a row of aperture on the pitch circle indicated at 124. Typically the apertures have a dimension of 5.0 millimetres.

As with the arrangement of Fig 1, support disc 118 cooperates with an annular non-rotatable seal 14 having a lip 16 to define the region in which vacuum is applied to the support disc 118.

Mounted on the support disc 118 is a flexible seed selection disc 144. The seed selection disc 144 is apertured, with the apertures arranged to align or overlap with the apertures of the support disc 118. The seed selection disc 144 is of substantially reduced thickness as compared with the support disc 118 (typically the disc 144 has a thickness of 0.25 millimetres).

The size of the apertures in the seed selection disc 144 are selected according to the type of small seeds to be dispensed. Typically such apertures might have a diameter in the range of 0.5 to 2.0 millimetres.

In use, support disc 118 is sufficiently stiff to support itself, and the seed selection disc 114,

against the vacuum applied to it, with any bending being accommodated by the flexible lip 16 of seal 14. The applied vacuum also serves to draw to, and hold, the seed selection disc 144 against the support disc 118, through the apertures in the support disc 118 forming, in effect, a unitary seed selection assembly. The flexibility of the seed selection disc 144 accommodates itself to any slight irregularities in the linearity of the support disc 118.

Therefore, rotation of the seed selection assembly against the seal 14 produces negligible wear of the support disc 118, and because there is no contact between the seal 14 and the flexible seed selection disc 144, no wear occurs in the region of sliding and sealing contact.

Furthermore, the relative arrangements of the apertures in the disc assembly provide the advantage of prior art countersink arrangements of resisting the tendency for the apertures to become blocked by foreign matter, but without the attendant difficulties and cost of manufacture.

CLAIMS :-

1 A seed selection arrangement for a differential pressure seed selection mechanism comprising :-

a seed selection plate or disc assembly and flexible sealing means for defining regions of differing pneumatic pressures;

characterised in that

said seed selection plate or disc assembly comprises an apertured flexible seed selection disc or plate mountable on, or in relation to, a rotatable support disc or plate.

2 A seed selection arrangement for a differential pressure seed selection mechanism comprising :-

a seed selection plate or disc assembly and flexible sealing means for defining regions of differing pneumatic pressures;

characterised in that

said seed selection plate or disc assembly comprises a relatively thin primary plate and a relatively thick secondary plate;

said primary plate being formed with at least one row of relatively small apertures and said secondary plate being formed with substantially larger apertures disposed so as to be able to at least partially overlap the apertures of the primary plate.

3 A seed selection arrangement according to claim 2 wherein apertures in the secondary plate are arranged to be generally aligned with the apertures in the primary plate.

4 A seed selection arrangement according to any one of the preceding claims wherein said flexible sealing means comprises a lip type seal.

5 A seed selection arrangement according to any one

5 A seed selection arrangement according to any one of the preceding claims wherein the flexible sealing means is disposed relative to the seed selection plate or disc assembly to apply, in use, a reduced pressure to the entire inner region of the disc assembly.

6 A seed selection arrangement according to any one of the preceding claims wherein said seed selection plate or disc has a thickness measured between its opposite faces from 0.2 millimetres to 0.3 millimetres.

7 A seed selection arrangement according to any one of the preceding claims wherein said seed selection plate or disc is provided with circular apertures of diameter between 0.5 millimetres and 5.0 millimetres.

8 A seed selection arrangement according to any one of the preceding claims wherein said pressure differential is applied to the face of said support plate remote from said seed selection plate, and a resiliently-loaded control member is engageable with the support plate to reduce or eliminate the effect of the pressure differential, for seed discharge purposes.

9 A seed selection arrangement for a differential pressure seed selection mechanism comprising a rotatable seed selection plate or disc assembly and flexible sealing means for defining regions of differing pneumatic pressure characterised in that said flexible sealing means comprising a lip type seal.

10 A seed dispensing mechanism for an agricultural precision drill or planter, the seed dispensing mechanism comprising :-

a housing;

a seed supply in the housing;

a seed outlet formed in the housing at a location spaced from said seed supply;

a rotatable seed selection arrangement having a plurality of circumferentially spaced seed selection apertures formed therein and positioned to pass through said seed supply as the arrangement rotates and thereby to be exposed to the seeds in said supply on one side of the arrangement;

a source of pressure differential to be applied to the seed selection arrangement to cause seeds from said supply to be selected therefrom and held in said seed selection apertures as the arrangement rotates;

said pressure differential being a vacuum applied to said other side of said arrangement and being sufficient to permit effective seed selection and seed release by said arrangement; and

seed release means to release seeds from said seed selection arrangement into said seed outlet whereby, in use, seeds are selected from said supply in said seed apertures and are transported by rotation of said arrangement and released into said seed outlet;

characterised by a seed selection arrangement according to any one of the preceding claims.

11 A seed dispensing mechanism comprising a rotatable self-supporting seed selection plate or disc assembly;

a source of pressure differential to be applied to one side of the seed selection plate or disc assembly;

a non-rotatable flexible seal for defining regions of differing pneumatic pressure across the one side of the seed selection plate or disc assembly; and

control means for controlling the application of

the pressure differential for seed discharge purposes; characterised in that said control means comprises a resiliently loaded control member mounted for sliding engagement with said seed selection plate or disc assembly.

12 A seed dispensing mechanism according to claim 11 wherein said control member is adapted to cover simultaneously more than one seed selection aperture in the seed selection plate or disc assembly.

13 The seeds dispensing mechanism according to claim 11 or 12 wherein the control member is provided with an opening or channel through to atmospheric pressure which is adapted to be aligned with a row of seed selection apertures.

AMENDED CLAIMS

[received by the International Bureau on 3 January 1996 (03.01.96); original claims 1-13 replaced by amended claims 1-15 (5 pages)]

1 A seed selection arrangement for a differential pressure seed selection mechanism comprising :-

a) a seed selection plate or disc assembly and sealing means for defining regions of differing pneumatic pressures; and

b) said seed selection plate or disc assembly comprises an apertured flexible seed selection disc or plate mountable on, or in relation to, a rotatable support disc or plate;

characterised in that

c) said sealing means for defining regions of differing pneumatic pressures being flexible so as to be adapted to accommodate relative axial movement between the sealing means and said plate or disc assembly during use; and

d) said apertured flexible seed selection disc or plate being sufficiently flexible to be able to accommodate itself to irregularities in the linearity of said support disc or plate.

2 A seed selection arrangement for a differential pressure seed selection mechanism comprising :-

a) a seed selection plate or disc assembly and flexible sealing means for defining regions of differing pneumatic pressures;

b) said seed selection plate or disc assembly comprising a relatively thin primary plate and a relatively thick secondary plate; and

c) said primary plate being formed with at least one row of relatively small apertures;

characterised in that

d) said secondary plate is formed with substantially larger apertures disposed so as to be able to at least partially overlap the apertures of the primary plate.

3 A seed selection arrangement according to claim 2 wherein said apertures in the secondary plate are arranged to be generally aligned with the apertures in the primary plate.

4 A seed selection arrangement according to any one of the preceding claims wherein said flexible sealing means comprises a lip type seal.

5 A seed selection arrangement according to any one of the preceding claims characterised by said relatively thin or flexible seed selection disc or plate lying, in use, totally within the external profile of said relatively thick secondary support disc or plate.

6 A seed selection arrangement according to any one of the preceding claims wherein the flexible sealing means is disposed relative to the seed selection plate or disc assembly to apply, in use, a reduced pressure to the entire inner region of the disc assembly.

7 A seed selection arrangement according to any one of claims 1 to 6 characterised by said sealing means being positioned for sealing engagement with said secondary support disc or plate.

8 A seed selection arrangement according to

any one of the preceding claims wherein said seed selection plate or disc has a thickness measured between its opposite faces from 0.2 millimetres to 0.3 millimetres.

9 A seed selection arrangement according to any one of the preceding claims wherein said seed selection plate or disc is provided with circular apertures of diameter between 0.5 millimetres and 5.0 millimetres.

10 A seed selection arrangement according to any one of the preceding claims wherein said pressure differential is applied to the face of said support plate remote from said seed selection plate, and a resiliently-loaded control member is engageable with the support plate to reduce or eliminate the effect of the pressure differential, for seed discharge purposes.

11 A seed selection arrangement for a differential pressure seed selection mechanism comprising a rotatable seed selection plate or disc assembly and flexible sealing means for defining regions of differing pneumatic pressure characterised in that said flexible sealing means comprises a lip type seal.

12 A seed dispensing mechanism for an agricultural precision drill or planter, the seed dispensing mechanism comprising :-

a housing;

a seed supply in the housing;

a seed outlet formed in the housing at a location

spaced from said seed supply;

a rotatable seed selection arrangement having a plurality of circumferentially spaced seed selection apertures formed therein and positioned to pass through said seed supply as the arrangement rotates and thereby to be exposed to the seeds in said supply on one side of the arrangement;

a source of pressure differential to be applied to the seed selection arrangement to cause seeds from said supply to be selected therefrom and held in said seed selection apertures as the arrangement rotates;

said pressure differential being a vacuum applied to said other side of said arrangement and being sufficient to permit effective seed selection and seed release by said arrangement; and

seed release means to release seeds from said seed selection arrangement into said seed outlet whereby, in use, seeds are selected from said supply in said seed apertures and are transported by rotation of said arrangement and released into said seed outlet;

characterised by a seed selection arrangement according to any one of the preceding claims.

13 A seed dispensing mechanism comprising a rotatable self-supporting seed selection plate or disc assembly;

a source of pressure differential to be applied to one side of the seed selection plate or disc assembly;

a non-rotatable flexible seal for defining regions of differing pneumatic pressure across the one side of the seed selection plate or disc assembly; and

control means for controlling the application of

the pressure differential for seed discharge purposes; characterised in that

said control means comprises a resiliently loaded control pad mounted for sliding engagement with said seed selection plate or disc assembly, and adapted to remove said pressure differential from said plate or disc over the area of said plate or disc.

14 A seed dispensing mechanism according to claim 13 wherein said pad is adapted to cover simultaneously more than one seed selection aperture in the seed selection plate or disc assembly.

15 The seeds dispensing mechanism according to claim 13 or 14 wherein said pad is provided with an opening or channel through to atmospheric pressure which is adapted to be aligned with a row of seed selection apertures.

STATEMENT UNDER ARTICLE 19

1 New claims 1 to 15 are filed.

2 Claims 5 and 7 are new, based on matters clearly disclosed in the description and drawings. Claims 6 and 8 to 15 correspond to previous claims 5 and 6 to 13 accordingly.

3 Claims 1 and 13 have been amended to clarify the distinctions from the disclosure in US 4,718,574.

4 Claim 2 has been amended so as to correctly delimit it in two-part form with respect to the disclosure in the US '574 specification.

5 The remaining claims have been amended accordingly editorially.

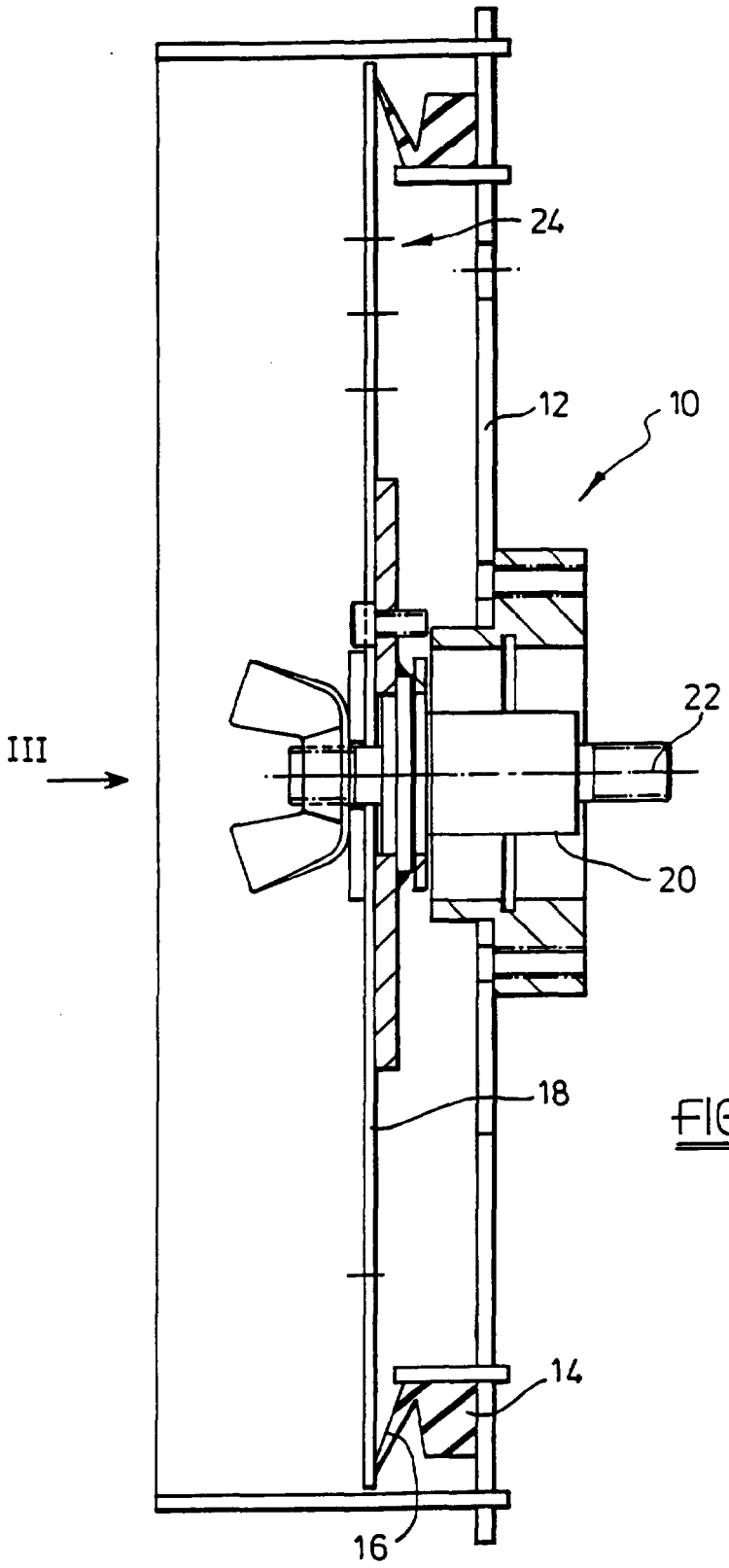


FIG.1

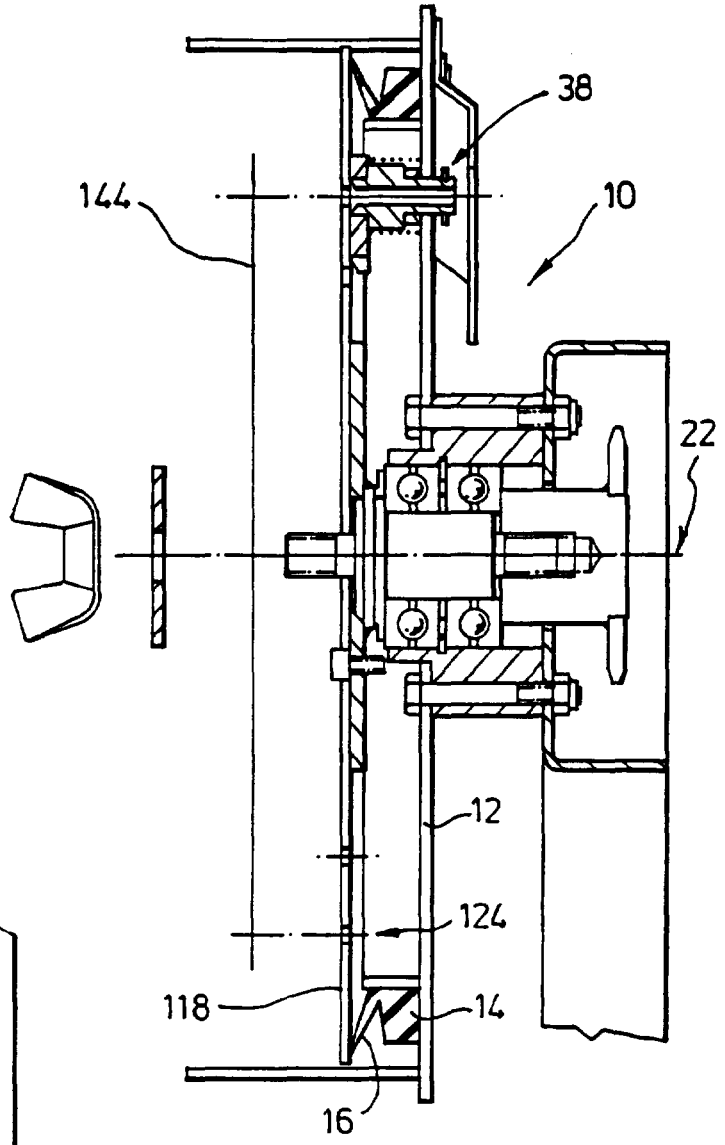


FIG.2

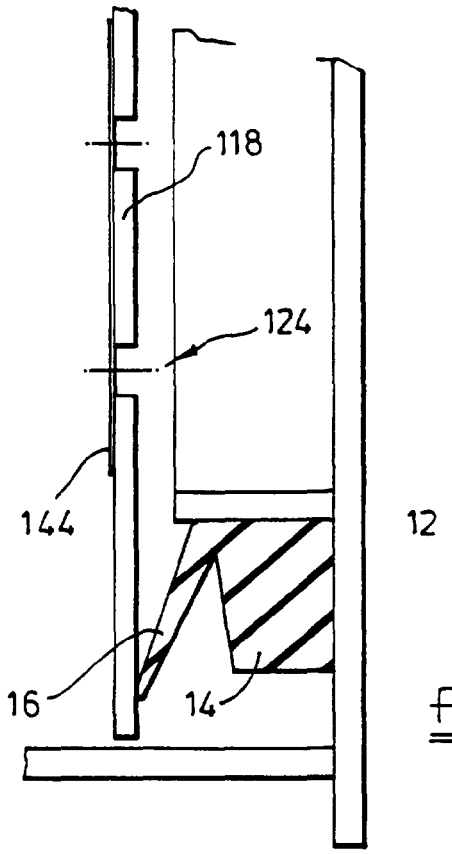


FIG.2A

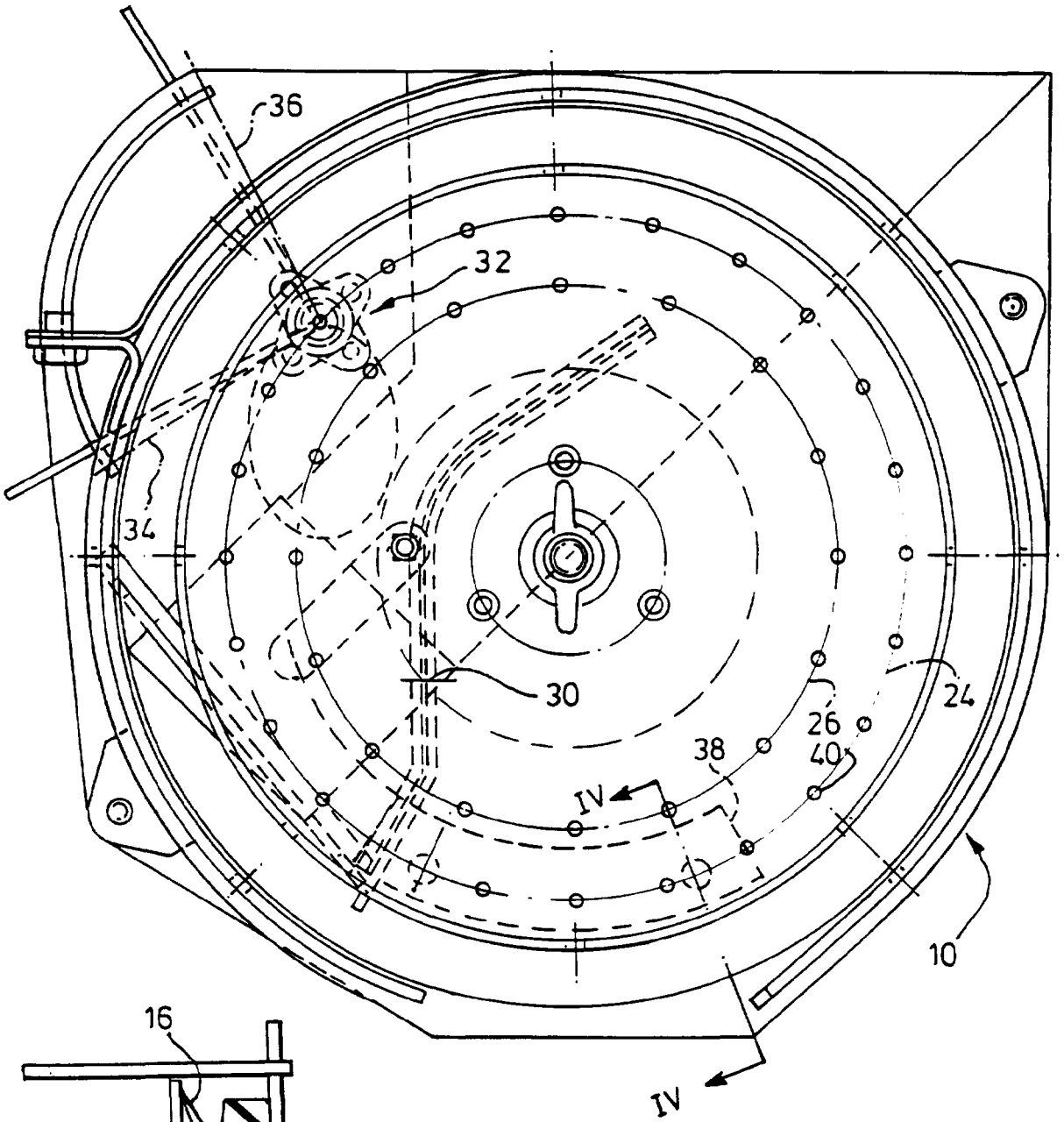


FIG.3

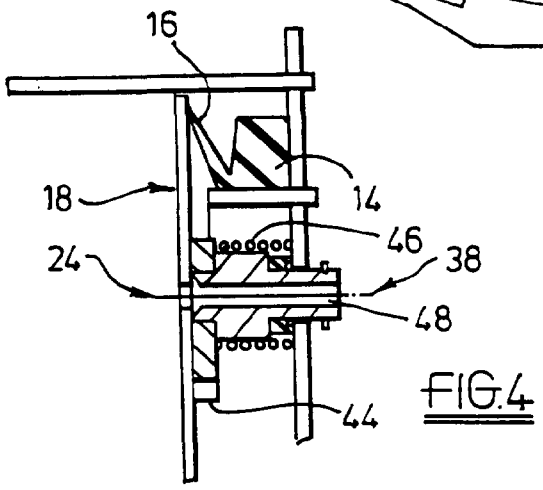


FIG.4

INTERNATIONAL SEARCH REPORT

Inter. ial Application No
PCT/GB 95/01647

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A01C7/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A01C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP,A,0 195 900 (FÄHSE) 1 October 1986 see the whole document	1,5,8, 10,11,13
P,A	EP,A,0 636 305 (FIORIDO) 1 February 1995 see column 4, line 36 - column 7, line 15; figures 1,2	1,4,5,10
A	DE,U,88 02 181 (GUGENHAN) 31 March 1988 see page 6, paragraph 5 - page 7; figures 1,2	8,10-12

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
3 October 1995	31. 10. 95

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax (+31-70) 340-3016	Vermander, R

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Inter. nal Application No
PCT/GB 95/01647

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A-195900	01-10-86	AU-B- 583347	27-04-89
		AU-B- 5364486	28-08-86
		CA-A- 1268081	24-04-90
		JP-B- 6071365	14-09-94
		JP-A- 61247306	04-11-86
		SU-A- 1556526	07-04-90
		US-A- 4718574	12-01-88
EP-A-636305	01-02-95	NONE	
DE-U-8802181	31-03-88	EP-A- 0329095	23-08-89

Form PCT/ISA/210 (patent family annex) (July 1992)

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(11) EP 2 637 492 B1

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(54) **SEED DISTRIBUTION ELEMENT FOR PRECISION SEED DRILLS, SEED DRILL INCLUDING SAID ELEMENT**

SAMENVERTEILUNGSELEMENT FÜR PRÄZIONSSÄMASCHINE UND SÄMASCHINE MIT DIESEM ELEMENT

ÉLÉMENT DE DISTRIBUTION DE SEMENCES POUR SEMIS MONOGRAINE DE PRÉCISION, SEMOIR COMPRENANT CET ÉLÉMENT

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(56) References cited:
EP-A1- 0 536 543 **US-B1- 7 228 807**

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EP 2 637 492 B1

Description

[0001] The subject of the present invention is a seed distribution element for precision pneumatic seed drills, a sowing element for such machines and a seed drill including a plurality of such sowing elements.

[0002] In precision pneumatic seed drills it is known to use sowing elements which are each equipped with a seed distribution element (hereinafter, in brief, distributor) for distributing one seed at a time in a controlled delivery while the sowing element moves along a sowing track.

[0003] It is equally known to use seed distributors which use an air pressure differential between opposed faces of a sowing disc (or selector) provided with one or more rings of through holes. The operating principle is based on the fact that, as a result of the pressure differential between the opposed faces of the disc, a seed adheres to each hole and is then transported by the rotation of the sowing disc from the seed selection zone to the point at which the pressure differential ceases and the seed is released to drop through a sowing pipe into the furrow or sowing track. In practice, on one of the faces of the disc a strong air suction is exerted which retains the seeds on the opposite face in the region of the respective holes. An example of such devices is disclosed in US 7 228 807.

[0004] For the correct functioning of such distributors it is necessary to ensure an effective pneumatic seal between the face of the disc that is subjected to suction and a seal which delimits the pneumatic suction chamber. The suction effect itself effects a substantial compression of the disc against the seal. If on the one hand this ensures adequate adherence of the seal to the disc surface which is subjected to negative pressure, on the other hand it involves severe abrasion of the seal which limits the effective service life thereof. It is therefore necessary periodically to replace the seal in order to prevent sowing errors arising from insufficient depressurization of the suction chamber.

[0005] On the other hand, even if replacing the seal is a simple operation, in each case it entails an unwanted machine stoppage, besides the cost of the spare part itself.

[0006] In order to remedy this drawback, seed drills have been developed which are equipped with a thrust-bearing element which relieves the heavy load on the seal. In all cases, however, the thrust-bearing element, which must be rotated with the disc, is mounted on the fixed portion of the housing, that is to say, that portion which is fixed to the framework of the sowing elements. This means that the disc must be attached to the thrust-bearing element; therefore an attachment system must be provided which in the stage of replacement of the disc must be removed, consequently lengthening the operation. This is inevitable in the known machines since it is obligatory to mount on the fixed portion the transmission which drives in rotation the motor-driven shaft which rotates the disc.

[0007] However, positioning the thrust-bearing element on the fixed portion entails the pneumatic suction chamber being provided on the fixed portion, or on the same side at which the thrust-bearing element is placed, while the seed collection chamber must be provided in the movable portion. This is the source of numerous drawbacks, including the fact that the opening of the housing necessarily involves the removal of the portion containing the seed collection chamber from the hopper type store located above, which must necessarily be fixed to the framework of the sowing element.

[0008] Furthermore, for the replacement of the sowing disc it is necessary to remove some parts of the distributor, such as the adjustable seed selector, and the seed ejector, where provided.

[0009] The problem underlying the present invention is that of providing a seed distribution element structurally and functionally designed to make it possible to remedy all the drawbacks mentioned with reference to the prior art cited.

[0010] This problem is solved by the invention by means of a seed distribution element produced in accordance with one or more of the attached claims. The features and advantages of the invention will become clearer from the following detailed description of a preferred exemplary embodiment thereof, illustrated by way of non-limiting example with reference to the appended drawings, in which:

- Fig. 1 is a perspective view of a seed distribution element produced according to the present invention;
- Fig. 2 is an exploded perspective view of a detail of the element of Fig. 1;
- Fig. 3 is a perspective view of a seed drill equipped with sowing elements with a seed distribution element according to the invention.

[0011] In the drawings the reference 1 indicates as a whole a seed distribution element intended for equipping a sowing element 2 of a precision pneumatic seed drill 3.

[0012] The distribution element 1 is the device intended to deposit one seed 4 at a time at a predetermined adjustable spacing in a sowing furrow opened by a coulter 5. The sowing element 2, besides the distribution element 1, comprises a frame 6 and a seed store or hopper 7, besides other devices which are known per se and not necessary for the understanding of the present invention. The seed drill 3 itself comprises a bearing structure 8 on which a plurality of sowing elements 2 are mounted, all connected to a pneumatic suction device 9.

[0013] The sowing element 1 itself comprises a housing 10 with a fixed portion 11 fixed in a stable manner on the frame 6 and a movable portion 12 hinged in the region of a hinge 12a on the fixed portion 11 by means of a removable hinge pin 13. The fixed portion includes a throat 14 by means of which it is connected below an

outflow mouth of the store or hopper 7 in such a way as to be fed directly by the latter.

[0014] From the throat 14 the seed flows through a gate 14a through which the seed flows into a seed collection chamber 15.

[0015] A sowing disc 16 separates the seed collection chamber 15 from a suction chamber 17 provided in the movable portion 12. A suction device 18 mounted on the bearing structure 8 is connected to the suction chamber 17 by means of pipes 19 for producing a pressure differential between the opposed surfaces 16a, 16b of the selector disc 16.

[0016] The sowing disc 16 is removably mounted on a motor-driven drive shaft 20, supported in the fixed portion 11 and driven in rotation at predetermined adjustable speeds by a transmission which is not shown. The presence of the transmission requires the shaft 20 to be mounted on the fixed portion 11 of the housing 10. The keying between the shaft 20 and the disc 16 is obtained by means of a polygonal profile 21 at the free end of the shaft 20 which protrudes beyond the disc 16 and preferably has chamfers 22 which serve to facilitate the functions explained hereinafter. At the periphery of the disc 16 is/are provided one (or several) ring(s) of holes 23 passing between the opposed faces of the sowing disc 16.

[0017] A seal 24 is fitted in the suction chamber 17 and is placed in sliding contact with the facing surface of the disc 16, when the movable portion 11 is closed on the fixed portion 12, to delimit a circumferential segment in which the holes 23 are subjected to the aforesaid pressure differential. The circumferential segment extends between the seed collection chamber 15 and a seed fall pipe 25 in which the seeds are released one at a time into the furrow formed by the coulter 5.

[0018] By reason of the pressure differential between the two opposed surfaces of the sowing disc, the seeds 4 are held, one to each hole 23, when the holes pass in the seed collection chamber 15, and are released in the region of the pipe 25 when the pneumatic effect of the pressure differential ceases or owing to the presence of a seed ejector (not shown). In order to limit the wear on the seal 24 resulting from sliding against the surface of the disc 16, a thrust-bearing element indicated as a whole by 26 is mounted on the movable portion.

[0019] The thrust-bearing element 26 comprises a shaft 27 rotatably mounted by means of bearings 28 in a seat 29 of the movable portion 12. The shaft 27 has flanging 30 by means of which it is fixed to a thrust-bearing plate 31 which can bear on that surface of the disc which faces the seal 24 in a zone radially inside the ring of holes 23 in order to withstand at least some of the axial load produced by the disc 16 on the seal 24.

[0020] The bearing between the thrust-bearing plate 31 and the disc 16 takes place in the region of a ring 31a in relief on the surface of the plate which faces the disc 16.

[0021] The thrust-bearing element 26 is driven in rotation with the sowing disc 16 when the fixed and movable portions 11, 12 are closed against one another by means of a drive element 32 which comprises a coupling device constrained for rotation with the thrust-bearing plate but with radial and/or circumferential clearance in such a way as to be self-centred in the rotational coupling with the drive shaft of the disc 16. For this purpose, in the present form of embodiment, the drive element 32 is coupled with limited radial and/or circumferential clearance to the element 26 by means of one (or more) appendage(s) 33 protruding radially towards the outside and fitted into corresponding seats 34 of the plate. The drive element 32 is coupled by means of an internal polygonal profile 35 (similar to that adopted for box-end wrenches) to the polygonal profile 21 of the free end of the shaft 20, the chamfers 22 of which serve to facilitate the centring of the two profiles and the respective engagement. The drive element 32 is thus self-centring relative to the drive shaft 20 by which it is driven. The positioning between seal 24 and plate 31 is such that the rotation of the latter will not be hindered by the presence of the seal 24 and, at the same time, both will be kept bearing against the disc 16.

[0022] Provision is also made for the thrust-bearing element 26 to be made idle and not driven in rotation by the shaft 20.

[0023] The whole of the movable portion 12 complete with thrust-bearing element 26 and seal 24 lends itself advantageously to the production of a kit for the retrofitting of existing seed drills. It is sufficient in this case to separate the old type of movable portion by removing the hinge pin 13 and replacing the old movable portion with the aforesaid kit. By reconnecting the pneumatic pipes previously disconnected, the seed drill becomes ready for use.

[0024] Among the principal advantages of the distribution element according to the invention is the fact that the wear on the seal resulting from the sliding contact with the seed selector disc is substantially reduced, if not eliminated; the thrust-bearing element is self-centring, thereby allowing easy opening and closing of the movable portion on the fixed portion of the housing; the system additionally lends itself to easy retrofitting, all without removing movable parts and/or operations of disconnecting the sowing disc.

Claims

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

   - a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
   - a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
   - a seed collection chamber (15) being defined

in the fixed portion (11),
- a pneumatic suction chamber (17) being defined in the movable portion (12),
- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),
- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and
- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another, **characterized in that** the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
- a seed collection chamber (15) being defined in the fixed portion (11),
- a pneumatic suction chamber (17) being defined in the movable portion (12),
- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),
- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and
- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another, **characterized in that** the kit comprises:
- the movable portion (12) pre-assembled with:
- a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

Patentansprüche

1. Samenverteilungselement (1) für pneumatische Präzisionssämaschinen (3), umfassend:

- eine Aussaatscheibe (16), die durch eine motorbetriebene Getriebewelle (20) mit kontrollierter Geschwindigkeit gedreht wird,
- ein Gehäuse (10) mit einem fixierten Bereich (11), in dem die Welle (20) abgestützt ist, und mit einem Bereich (12), der bezüglich des fixierten Bereichs (11) beweglich ist und gegen diesen geschlossen werden kann,

- ein Saatgut-Sammelbehälter (15), der im fixierten Bereich (11) ausgebildet ist,
- eine pneumatische Ansaugkammer (17), die im beweglichen Bereich (12) ausgebildet ist,
- wobei die Aussaatscheibe (16) zwischen den Bereichen (11, 12) angeordnet ist und gegenüberliegende Flächen aufweist, die die Kammern (15, 17) begrenzen,
- wobei die Aussaatscheibe (16) zumindest einen Ring von Auswahllöchern (23) aufweist, die sich zwischen den gegenüberliegenden Flächen erstrecken, und
- eine Dichtung (24), die auf dem beweglichen Bereich (12) angeordnet ist und einen Gleitkontakt mit der zugewandten Fläche der Scheibe (16) bilden kann, wenn die Bereiche (11, 12) gegeneinander geschlossen sind,

dadurch gekennzeichnet, dass das Samenverteilungselement (1) ferner ein Drucklagerelement (26) der Aussaatscheibe (16) aufweist, wobei das Drucklagerelement (26) drehbeweglich im beweglichen Bereich (12) abgestützt ist, um zumindest etwas der axialen Last standzuhalten, die durch die Scheibe (16) auf der Dichtung (24) erzeugt wird.

2. Samenverteilungselement (1) gemäß Anspruch 1, wobei das Drucklagerelement (26) mit der Scheibe (16) gedreht wird, wenn die Bereiche (11, 12) gegeneinander geschlossen sind.

3. Samenverteilungselement (1) gemäß Anspruch 1 oder Anspruch 2, wobei das Drucklagerelement (26) eine Drucklagerplatte (31), die sich auf der Fläche der Aussaatscheibe (16) abstützen kann, die der Dichtung (24) zugewandt ist, in einem Bereich aufweist, der radial innerhalb des Lochrings (23) liegt.

4. Samenverteilungselement (1) gemäß Anspruch 3, wobei das Drucklagerelement (26) ein Antriebselement (32) aufweist, das zur Drehung mit der Platte (31) fixiert ist und mit der Antriebswelle (20) der Scheibe (16) gekoppelt werden kann, wenn die Bereiche (11, 12) gegeneinander geschlossen sind.

5. Samenverteilungselement (1) gemäß Anspruch 4, wobei das Antriebselement (32) bezüglich der Antriebswelle (20) selbstzentrierend ist.

6. Samenverteilungselement (1) gemäß Anspruch 4 oder Anspruch 5, wobei das Antriebselement (32) ein Kopplungselement (33) aufweist, das sich mit der Drucklagerplatte (31) gemeinsam dreht, aber einen radialen und/oder umfangsmäßigen Abstand aufweist, um somit während einer drehbeweglichen Kopplung mit der Antriebswelle (20) der Scheibe (16) selbstzentrierend zu sein.

7. Samenverteilungselement (1) gemäß einem oder mehreren der vorhergehenden Ansprüche, wobei der bewegliche Bereich (12) gegen den fixierten Bereich (11) drehbar angeordnet ist.

8. Saatgutelement für Präzisionssämaschinen (3) mit einem Rahmen (6), auf dem ein Samenverteilungselement (1) gemäß einem oder mehreren der vorhergehenden Ansprüche befestigt ist.

9. Sämaschine (3) mit einer Abstützanordnung, auf der eine Mehrzahl von Saatgutelementen gemäß Anspruch 8 befestigt ist.

10. Bausatz zur Nachrüstung von Samenverteilungselementen (1) von pneumatischen Präzisionssämaschinen (3), wobei die Verteilungselemente (1) umfassen:

- eine Aussaatscheibe (16), die durch eine motorbetriebene Getriebewelle (20) mit kontrollierter Geschwindigkeit gedreht wird,
- eine Gehäuse (10) mit einem fixierten Bereich (11), in dem die Welle (20) abgestützt ist, und mit einem Bereich (12), der bezüglich des fixierten Bereichs (11) beweglich ist und gegen diesen geschlossen werden kann,
- ein Saatgut-Sammelbehälter (15), der im fixierten Bereich (11) ausgebildet ist,
- eine pneumatische Ansaugkammer (17), die im beweglichen Bereich (12) ausgebildet ist,
- wobei die Aussaatscheibe (16) zwischen den Bereichen (11, 12) angeordnet ist und gegenüberliegende Flächen aufweist, die die Kammern (15, 17) begrenzen,
- wobei die Aussaatscheibe (16) zumindest einen Ring von Auswahllöchern (23) aufweist, die sich zwischen den gegenüberliegenden Flächen erstrecken, und
- eine Dichtung (24), die auf dem beweglichen Bereich (12) angeordnet ist und einen Gleitkontakt mit der zugewandten Fläche der Scheibe (16) bilden kann, wenn die Bereiche (11, 12) gegeneinander geschlossen sind,

dadurch gekennzeichnet, dass der Bausatz aufweist:

- den beweglichen Bereich (12), der vormontiert ist mit:
- einem Drucklagerelement (26) der Aussaatscheibe (16), wobei das Drucklagerelement (26) drehbeweglich im beweglichen Bereich (12) abgestützt ist, um zumindest etwas der axialen Last standzuhalten, die durch die Scheibe (16) auf der Dichtung (24) erzeugt wird.

11. Bausatz gemäß Anspruch 10, wobei der bewegliche Bereich (12) und das Drucklagerelement (26) ein oder mehrere der Merkmale der Ansprüche 2 bis 7

aufweisen.

Revendications

1. Elément de distribution de semences (1) pour des semoirs pneumatiques de précision (3), du type comprenant :

   - un disque de semis (16) qui est entraîné en rotation par un arbre de transmission motorisé (20) à une vitesse contrôlée,
   - un boîtier (10) avec une partie fixe (11) dans laquelle l'arbre (20) est supporté et une partie (12) qui est mobile par rapport à la partie fixe (11) et peut être fermée contre cette dernière,
   - une chambre de collecte de semences (15) étant définie dans la partie fixe (11),
   - une chambre d'aspiration pneumatique (17) étant définie dans la partie mobile (12),
   - le disque de semis (16) étant intercalé entre les parties (11, 12) et ayant des surface opposées délimitant les chambres (15, 17),
   - le disque de semis (16) ayant au moins une bague de trous sélecteurs (23) s'étendant entre les surfaces opposées, et
   - un joint d'étanchéité (24) qui est agencé sur la partie mobile (12) et est capable d'entrer en contact coulissant avec la surface en vis-à-vis du disque (16) lorsque les parties (11, 12) sont fermées l'une contre l'autre,

   caractérisé en ce que l'élément de distribution de semences (1) comprend en outre un élément de palier de butée (26) du disque de semis (16), lequel élément de palier de butée (26) est supporté en rotation dans la partie mobile (12) afin de résister au moins à une certaine partie de la force axiale produite par le disque (16) sur le joint d'étanchéité (24).

2. Elément de distribution de semences (1) selon la revendication 1, dans lequel l'élément de palier de butée (26) est entraîné en rotation avec le disque (16) lorsque les parties (11, 12) sont fermées l'une contre l'autre.

3. Elément de distribution de semences (1) selon la revendication 1 ou la revendication 2, dans lequel l'élément de palier de butée (26) comprend une plaque de palier de butée (31) qui peut s'appuyer sur cette surface du disque de semis (16) qui fait face au joint d'étanchéité (24), dans une zone radialement à l'intérieur de la bague de trous (23).

4. Elément de distribution de semences (1) selon la revendication 3, dans lequel l'élément de palier de butée (26) comprend un élément d'entraînement (32) qui est fixé pour tourner avec la plaque (31) et peut être couplé avec l'arbre d'entraînement (20) du disque (16) lorsque les parties (11, 12) sont fermées l'une contre l'autre.

5. Elément de distribution de semences (1) selon la revendication 4, dans lequel l'élément d'entraînement (32) se centre automatiquement par rapport à l'arbre d'entraînement (20).

6. Elément de distribution de semences (1) selon la revendication 4 ou la revendication 5, dans lequel l'élément d'entraînement (32) comprend un élément de couplage (33) qui tourne conjointement avec la plaque de palier de butée (31), mais a un jeu radial et/ou circonférentiel afin d'être centrée automatiquement pendant le couplage rotatif avec l'arbre d'entraînement (20) du disque (16).

7. Elément de distribution de semences (1) selon une ou plusieurs des revendications précédentes, dans lequel la partie mobile (12) est articulée par rapport à la partie fixe (11).

8. Elément de semis pour des semoirs de précision (3) comprenant un bâti (6) sur lequel est monté un élément de distribution de semences (1) selon une ou plusieurs des revendications précédentes.

9. Semoir (3) comprenant une structure de support sur laquelle est montée une pluralité d'éléments de semis selon la revendication 8.

10. Kit pour la modernisation des éléments de distribution de semences (1) de semoirs pneumatiques de précision (3), dans lequel les éléments de distribution (1) sont du type comprenant :

    - un disque de semis (16) qui est entraîné en rotation par un arbre de transmission motorisé (20) à une vitesse contrôlée,
    - un boîtier (10) avec une partie fixe (11) dans laquelle l'arbre (20) est supporté et une partie (12) qui est mobile par rapport à la partie fixe (11) et peut être fermée contre cette dernière,
    - une chambre de collecte de semences (15) qui est définie dans la partie fixe (11),
    - une chambre d'aspiration pneumatique (17) qui est définie dans la partie mobile (12),
    - le disque de semis (16) étant intercalé entre les parties (11, 12) et ayant des surfaces opposées délimitant les chambres (15, 17),
    - le disque de semis (16) ayant au moins une bague de trous sélecteurs (23) s'étendant entre les surfaces opposées, et
    - un joint d'étanchéité (24) qui est agencé sur la partie mobile (12) et est capable d'entrer en contact coulissant avec la surface en vis-à-vis du disque (16) lorsque les parties (11, 12) sont fer-

mées l'une contre l'autre,
caractérisé en ce que le kit comprend :
- la partie mobile (12) pré-assemblée avec :
- un élément de palier de butée (26) du disque de semis (16), lequel élément de palier de butée (26) est supporté en rotation dans la partie mobile (12) afin de résister au moins à une certaine partie de la force axiale produite par le disque (16) sur le joint d'étanchéité (24).

11. Kit selon la revendication 10, dans lequel la partie mobile (12) et l'élément de palier de butée (26) comprennent une ou plusieurs des caractéristiques selon les revendications 2 à 7.

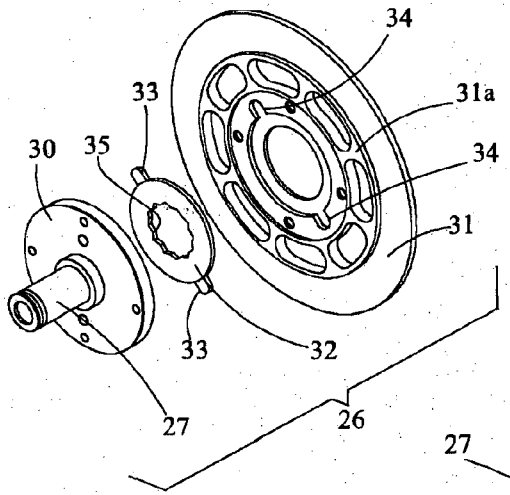

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fig. 2

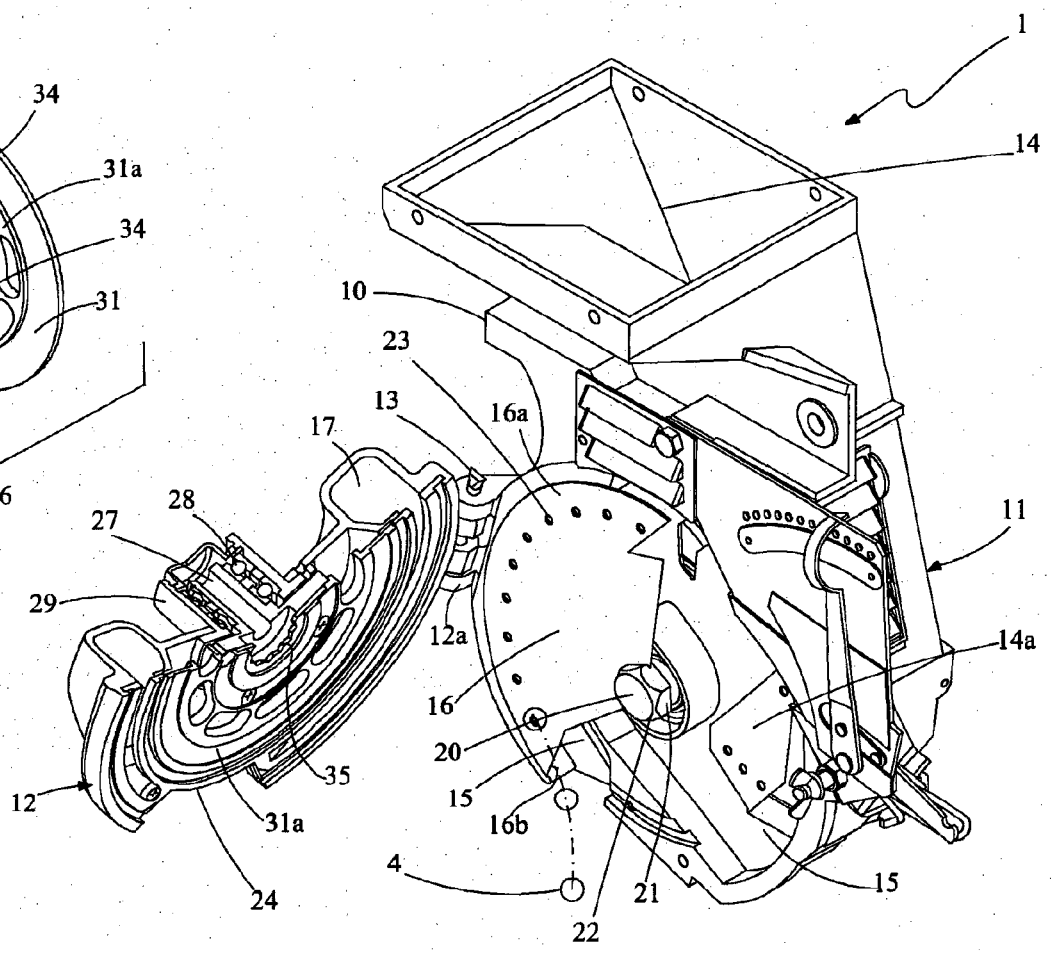

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fig. 1

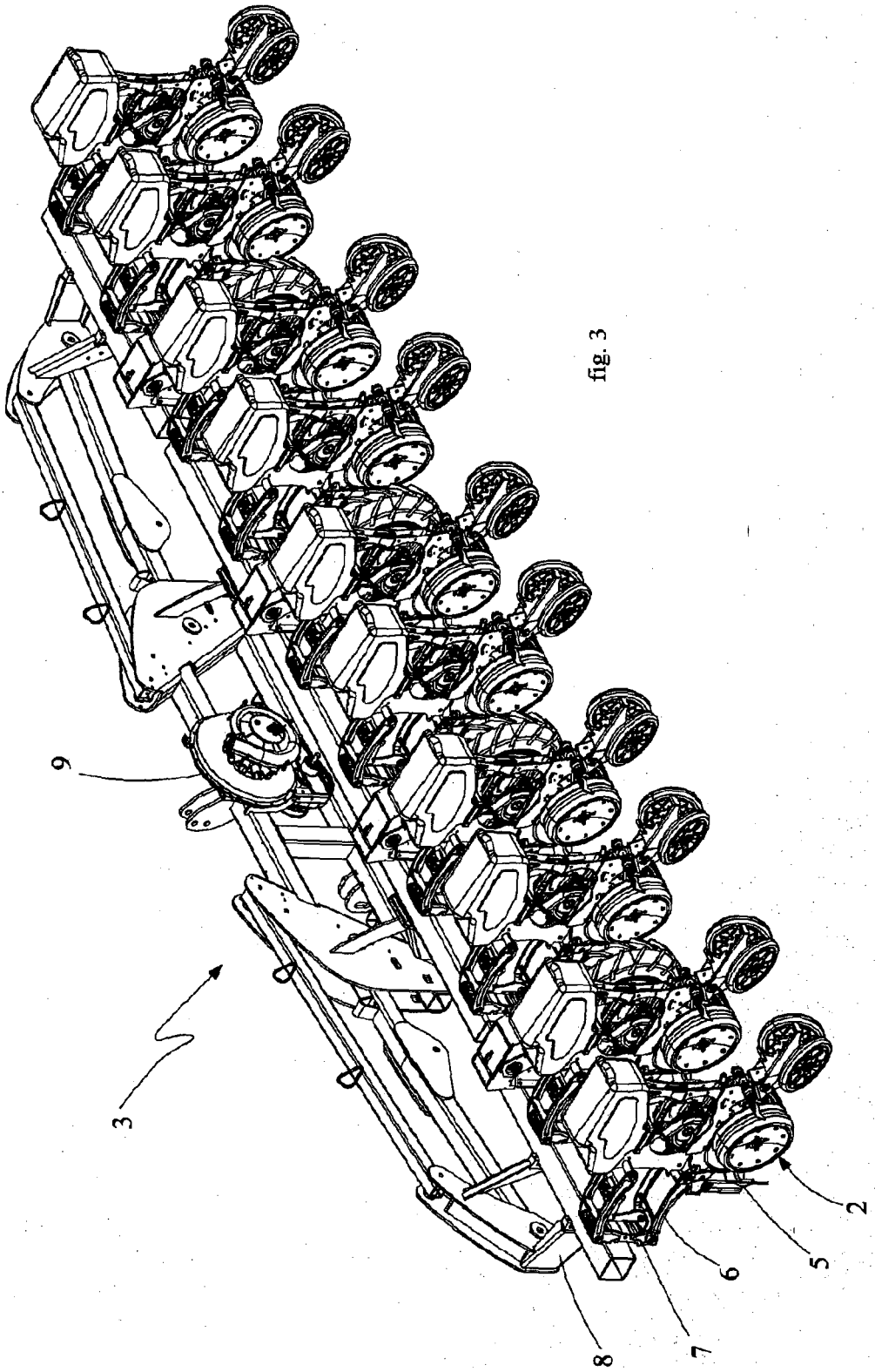


fig. 3

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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United States Patent [19]

Martin et al.

[11] **Patent Number: 4,664,290**

[45] **Date of Patent: May 12, 1987**

[54] **METHOD AND APPARATUS FOR PRECISE POSITIONING OF A SEED DISK IN A SEED METER**

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[51] **Int. Cl.**[4] **A01C 7/04**

[52] **U.S. Cl.** ..... **221/211**; 29/526 R; 111/78; 221/241; 301/113; 301/114; 403/17; 403/379

[58] **Field of Search** ..... 221/211, 241, 242; 111/34, 77, 78; 301/113, 114, 128; 403/17, 259, 379; 29/526 R

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Primary Examiner—L. J. Paperner

Assistant Examiner—P. McCoy Smith

[57] **ABSTRACT**

In a seed meter in which a seed disk is rotatably mounted within a housing, a method and apparatus are provided for positioning the seed disk within the housing so that the peripheral portion of the seed disk is located a desired, relatively uniform distance from an adjacent peripheral portion of the housing. A shaft having a threaded outer portion is rotatably mounted within the housing and a hub having a threaded aperture therein is positioned on and turned relative to the threaded outer portion of the shaft to begin advancing the threaded aperture onto the shaft. The seed disk is then mounted on the hub, following which rotation of the hub relative to the shaft is continued in a direction to advance the hub along the shaft toward the housing until a gap of desired size exists between the peripheral portion of the seed disk and the peripheral portion of the housing. The hub is then releasably secured on the shaft by inserting a pin through an aperture in the shaft and through an opposite pair of a plurality of slots spaced about the hub.

14 Claims, 12 Drawing Figures

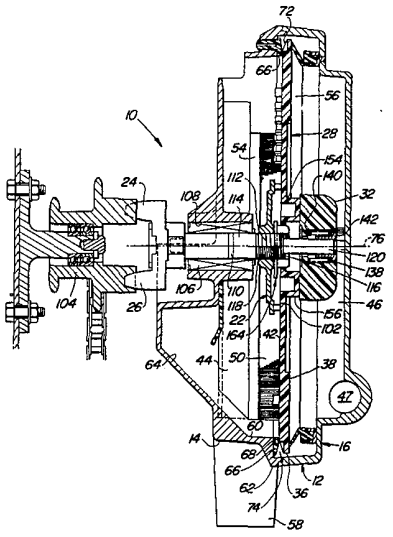
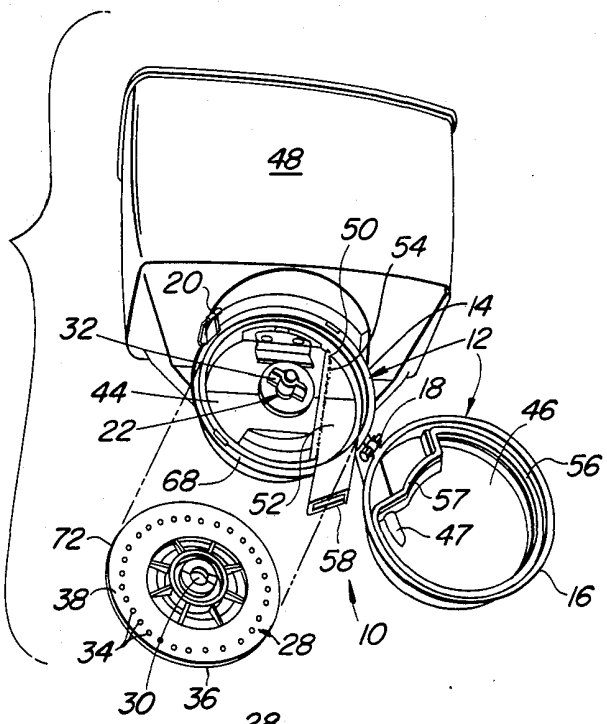


Fig. 1


48
50
54
20
14
32
12
44
18
46
22
56
68
52
57
72
47
58
38
16
10
34
28
30
36

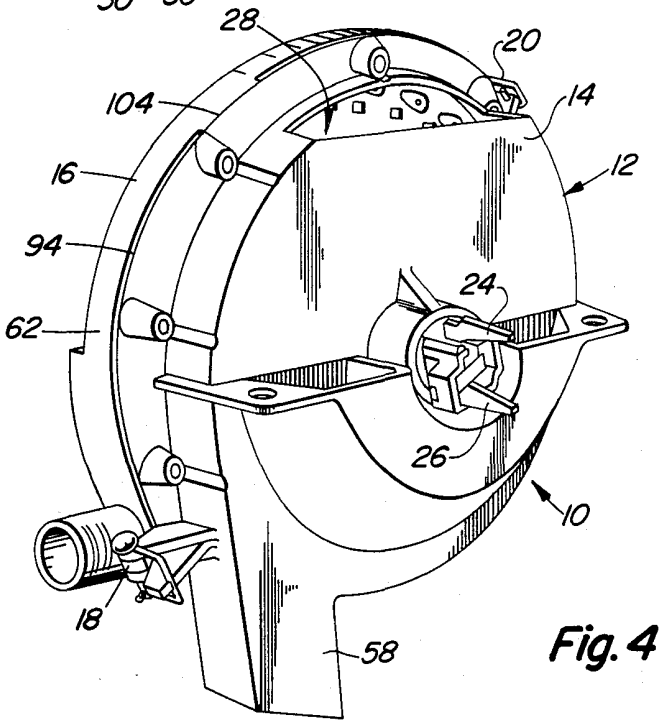

28
20
104
14
16
12
94
24
62
26
10
18
58

Fig. 4

Fig. 2

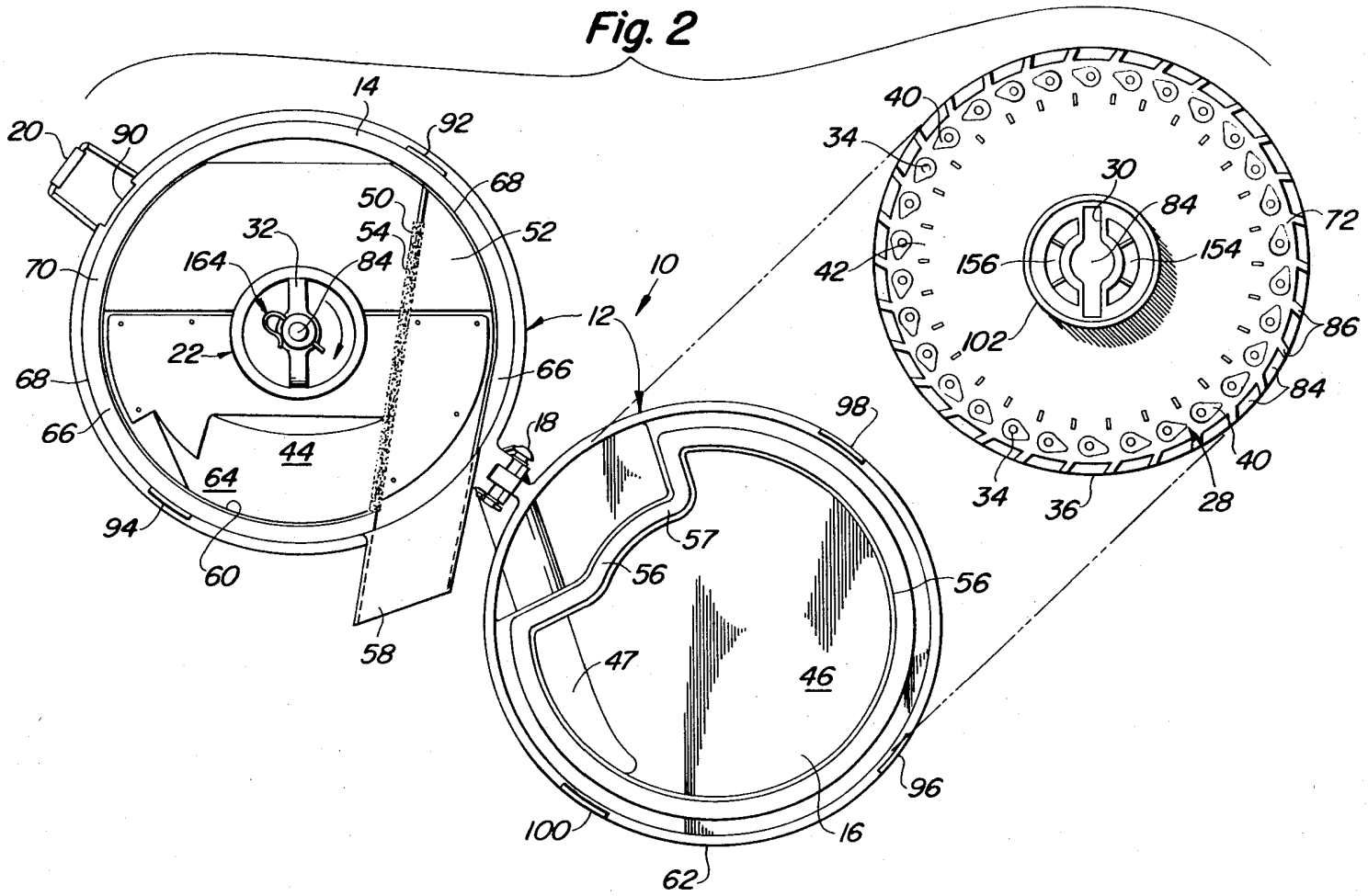

14
20
90
92
68
50
54
52
32
164
84
70
10
12
22
66
68
66
44
64
18
94
60
58
98
57
56
56
47
46
96
100
16
62
40
34
30
84
72
42
156
154
102
86
84
40
34
36
28

Fig. 3

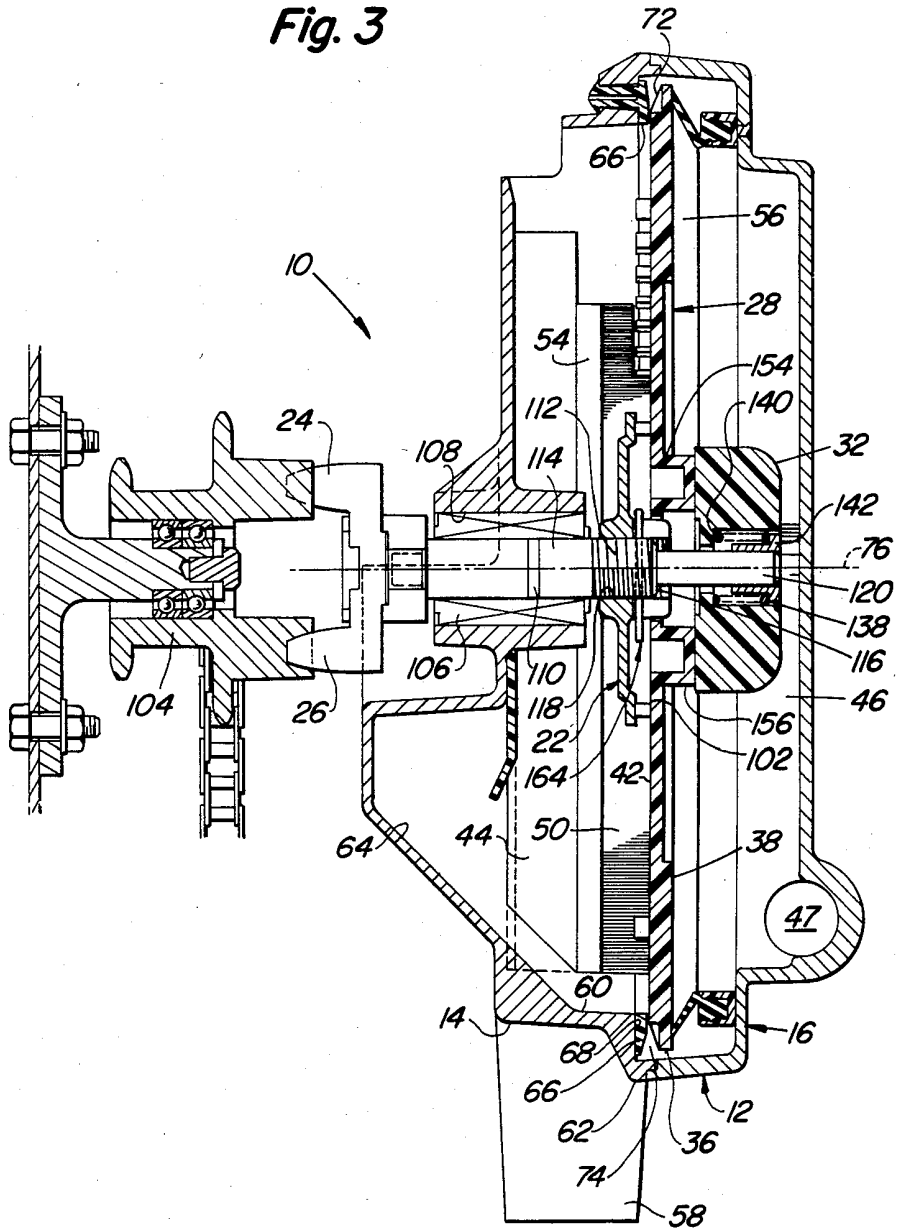

72
66
56
10
28
54
154
140
112
24
108
114
32
142
76
120
138
116
46
156
102
106
110
118
22
164
42
104
26
64
44
50
38
47
60
14
16
68
66
62
12
36
74
58

Fig. 5

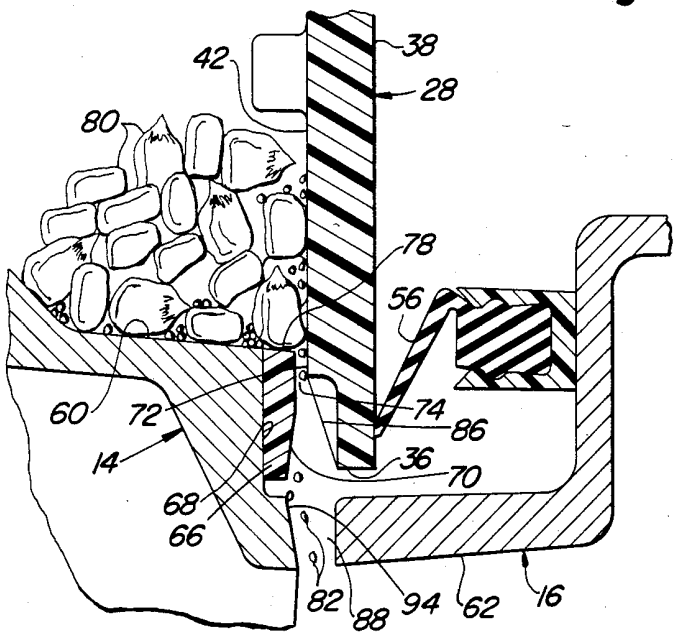
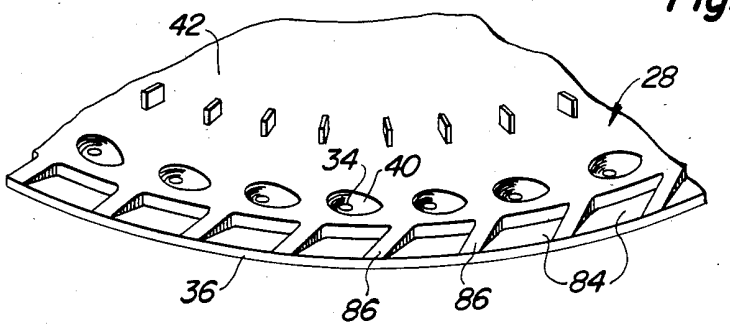

42
38
28
80
78
56
60
72
74
86
14
36
70
68
66
82
88
94
62
16

Fig. 6


42
28
34
40
36
86
86
84

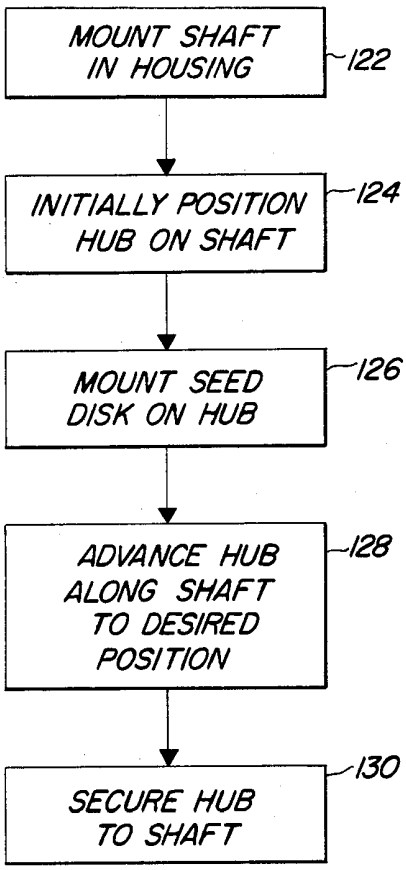

MOUNT SHAFT IN HOUSING
122
INITIALLY POSITION HUB ON SHAFT
124
MOUNT SEED DISK ON HUB
126
ADVANCE HUB ALONG SHAFT TO DESIRED POSITION
128
SECURE HUB TO SHAFT
130

Fig. 7

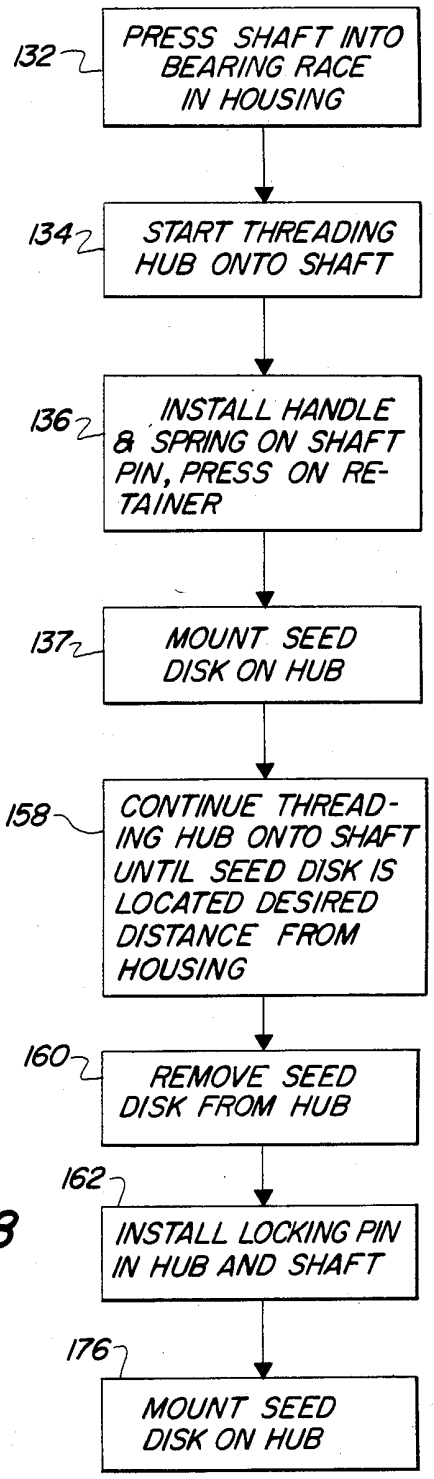

132
PRESS SHAFT INTO BEARING RACE IN HOUSING
134
START THREADING HUB ONTO SHAFT
136
INSTALL HANDLE & SPRING ON SHAFT PIN, PRESS ON RETAINER
137
MOUNT SEED DISK ON HUB
158
CONTINUE THREADING HUB ONTO SHAFT UNTIL SEED DISK IS LOCATED DESIRED DISTANCE FROM HOUSING
160
REMOVE SEED DISK FROM HUB
162
INSTALL LOCKING PIN IN HUB AND SHAFT
176
MOUNT SEED DISK ON HUB

Fig. 8

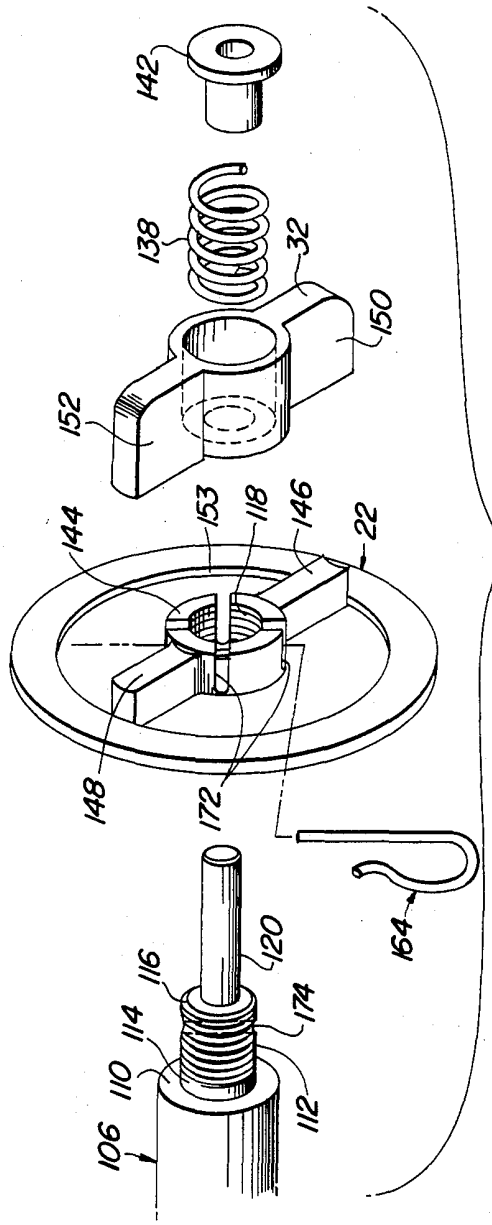


Fig. 9

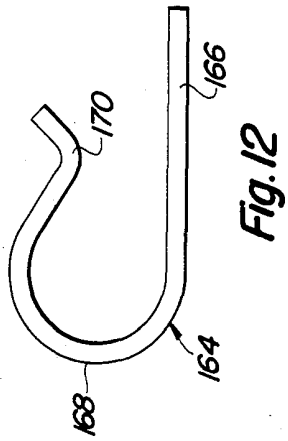


Fig. 12

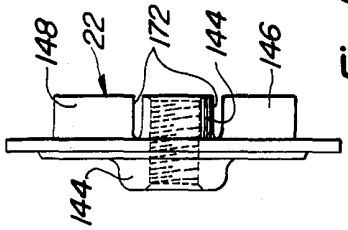


Fig. 11

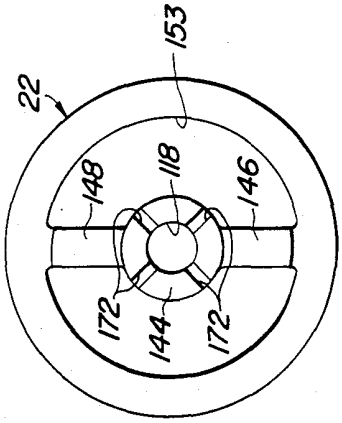


Fig. 10

Precision Exhibit 1005

METHOD AND APPARATUS FOR PRECISE POSITIONING OF A SEED DISK IN A SEED METER

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to seed meters in which a seed disk is rotatably mounted within the meter housing, and more particularly to methods and apparatus for rotatably positioning a rotatably mounted seed disk at a desired location within the housing of a seed meter.

2. History of the Prior Art

It is known in the field of agricultural equipment and machinery to provide seed meters which meter or dispense individual seeds into a furrow in the ground at a controlled rate in conjunction with associated apparatus for creating the furrow and then moving loose soil back into the furrow after the seeds have been deposited therein. There are various different types of seed meters including the mechanical type in which individual seeds are plucked from a seed mass and discharged from the meter for deposit within the furrow by mechanical devices. Still other types of seed meters are of the air type in which a pressure differential is employed, typically in conjunction with a rotating seed disk or similar device, to pick up seeds from the seed mass and then discharge them from the meter into the furrow. Air seed meters can be of the positive air flow type in which the seeds are picked up by the seed disk and held thereon by blowing air. Air seed meters can also be of the vacuum type in which a reduced pressure is communicated to the seed disk in a manner enabling the disk to pick up and carry individual seeds thereon with the assistance of the reduced pressure.

An example of a vacuum seed meter is provided by a co-pending application, Ser. No. 546,834, abandoned, Lundie et al, filed Oct. 31, 1983 and commonly assigned with the present application. The Lundie et al application describes a vacuum seed meter in which a rotating seed disk is mounted within the hollow interior of a housing so as to have a seed mass disposed on one side thereof and a source of reduced pressure coupled to a vacuum chamber at the opposite side of the disk. The reduced pressure communicates with a plurality of seed cells recessed in the side of the disk facing the seed mass via apertures extending through the thickness of the disk from the bottoms of the cells. The reduced pressure assists the cells in picking up individual seeds from the mass and transporting them to a seed discharge area sealed off from the reduced pressure to provide for release of the seeds carried in the seed cells. The released seeds fall through a discharge chute into a furrow in the ground formed by an opener unit mounted in conjunction with the seed meter.

In the vacuum seed meter described in the Lundie et al application the seed mass on one side of the rotating seed disk is formed by seeds falling from a hopper mounted above the seed meter into a seed chamber formed at the side of the seed disk by the shape of the hollow interior of the meter housing. The outer peripheral portion of the seed disk is disposed closely adjacent an outer peripheral portion of the hollow interior of the meter housing to prevent seeds in the seed chamber from escaping to the outside of the seed meter.

A co-pending application, Ser. No. 546,829, now U.S. Pat. No. 4,613,056, Olson, filed Oct. 31, 1983 and commonly assigned with the present application, describes an arrangement of the vacuum seed meter of the Lundie et al application in which a relatively small space is formed between the outer peripheral portion of the seed disk and the adjacent peripheral portion of the hollow interior of the housing on the side of the seed disk where the seed mass resides. The space defines a gap between the seed disk and the housing which is large enough to permit expulsion of debris from the interior of the meter housing while at the same time preventing the escape of the seeds themselves including in particular seeds of relatively small size. The debris which is eliminated by passing through such gap includes dust, dirt and unwanted particles of relatively small size such as broken seed particles or chips and the like. As described in the Olson application the outer peripheral portion of the seed disk may be provided with a succession of fins disposed on the opposite sides of recesses therebetween to agitate and encourage the expulsion of debris which may accumulate at the interface between the seed disk and adjacent portions of the housing interior.

In the arrangement described in the Olson application, it is desirable not only that the gap between the seed disk and the housing interior be of desired nominal size but also that such gap be of relatively uniform size about the entire outer peripheral portion of the seed disk. A gap which is too large may result in expulsion of the seeds themselves, particularly those seeds of smaller size, in addition to the debris. Conversely, a gap which is too small may not allow proper expulsion of the debris. A non-uniform gap tends to provide non-uniform expulsion of debris and the unwanted expulsion of seeds at locations where the gap becomes unduly large.

In the particular vacuum seed meters described in the Lundie et al and Olson applications, the seed disk is mounted for rotation within the hollow interior of the meter housing by a shaft rotatably mounted within the housing and having a seed disk mounting hub disposed on the outer end thereof so as to mount the seed disk for rotation with the shaft. An example of the seed disk mounting hub is provided by a co-pending application, Ser. No. 546,831, now abandoned, Webber, filed Oct. 31, 1983 and commonly assigned with the present application. During manufacture of such seed meters, the seed disk mounting hub is typically mounted on the outer end of the shaft such as by a cotter pin, following which the opposite end of the shaft is pressed into the outer race of a bearing within the housing to achieve an interference fit therebetween. The pressing of the shaft into the bearing race is carried out using equipment which has been programmed to provide a desired gap between the seed disk and the housing. Unfortunately, this process makes it difficult to form such gap within the close tolerances desired. Moreover, once the shaft is pressed into the bearing race, it can be very difficult to relocate the shaft to provide desired disk-housing spacing, particularly where the shaft installation equipment is not available. Such a problem may arise, for example, in the field where the farmer discovers that the gap between the seed disk and the housing is too large or too small. Another problem which commonly exists is lack of perpendicularlity. As a result of misalignment of the shaft upon pressing into the bearing race, or possibly due to other factors, the central axis of the shaft and thus of the seed disk itself may not be precisely perpendicular to the plane of the peripheral portion of the housing interior which interfaces with the outer peripheral portion of the seed disk. This may result in a non-

uniform gap with its attendant disadvantages as previously noted.

Accordingly, it would be advantageous to provide an improved method and apparatus for rotatably mounting a seed disk within the hollow interior of a housing of a seed meter.

It would furthermore be advantageous to provide an improved method and apparatus for rotatably mounting a seed disk within the hollow interior of a housing of a seed meter in a manner which provides both a gap of desired size therebetween and a gap which is relatively uniform in size about the entire outer peripheral portion of the seed disk.

BRIEF DESCRIPTION OF THE INVENTION

These and other objects are accomplished in accordance with the invention by disk mounting methods and apparatus in which a seed disk mounting hub can be secured to a shaft at any of a plurality of different locations along a portion of the length of the shaft following installation of the shaft in the meter housing. Moreover, the fit between the hub and the shaft is provided with enough tolerance or play to compensate for a lack of perpendicularity that may exist between the seed disk and the housing.

The shaft is first installed in the seed meter housing such as by pressing an end thereof into position in a bearing race within the housing. Thereafter, the hub is initially positioned on the opposite end of the shaft and the seed disk is then mounted on the hub. The hub and included seed disk are then advanced along the shaft toward the housing interior until a gap of desired size between the outer peripheral portion of the seed disk and the adjacent outer peripheral portion of the housing interior is achieved. The hub is then secured to the shaft so that the desired gap is thereafter maintained. The seed disk is removed from the hub if necessary to permit securing of the hub to the shaft following which the disk is again mounted on the hub. A predetermined amount of tolerance or play is provided in the fit of the hub on the shaft so that the axis of rotation of the hub and the seed disk can form relatively small angles with the central axis of the shaft. This small amount of play allows the axis of rotation of the seed disk to shift slightly as necessary so as to maintain the gap between the seed disk and the housing relatively uniform.

In a preferred embodiment of a method and apparatus according to the invention, an outer portion of the shaft opposite the housing interior is threaded as is an aperture within a central portion of the hub. Following installation of the shaft in the housing and with the seed disk removed from the hub, the central aperture in the hub is threaded onto the threaded outer portion of the shaft to initially position the hub on the shaft. The seed disk is then mounted on the hub, following which the hub and included seed disk are rotated relative to the shaft in a direction to advance the hub along the length of the shaft toward the housing interior. When a gap of desired size between the seed disk and the housing is achieved, the hub is secured on the shaft so that such gap is thereafter maintained. Securing of the hub to the shaft is accomplished by removing the seed disk from the hub, following which a pin is inserted through an aperture in the shaft and through an opposite pair of a plurality of slots in the hub which extend about the threaded aperture. The pin is releasably held in place by way of a curved portion thereof having an outer curved end which resiliently seats within a different one of the plurality of slots in the hub. With the hub thereby releasably secured in place on the shaft so as to provide a gap of desired size between the seed meter and the housing, the seed disk is again mounted on the hub.

The threaded aperture in the hub is slightly larger than the threaded outer portion of the shaft. This provides a small amount of tolerance or play between the threaded aperture of the hub and the shaft, enabling the axis of rotation of the hub and the seed disk to pivot slightly and form small angles with the central axis of the housing. This small amount of play causes the seed disk to rotate in a manner which provides a uniform gap between the outer peripheral portion of the seed disk and the adjacent peripheral portion of the housing.

BRIEF DESCRIPTION OF THE DRAWING

The foregoing and other objects, features and advantages of the invention will be apparent from the following more particular description of a preferred embodiment of the invention, as illustrated in the accompanying drawings, in which:

FIG. **1** is a perspective view of a seed meter having apparatus for the precise positioning of the seed disk therein in accordance with the invention, the seed meter being shown in an open position together with the seed disk;

FIG. **2** is a plan view of the seed meter of FIG. **1** with the meter in the open position and showing the reverse side of the seed disk;

FIG. **3** is a sectional view of the seed meter of FIG. **1** with the meter in a closed position;

FIG. **4** is a left rear perspective view of the seed meter of FIG. **1** with the meter in the closed position;

FIG. **5** is a sectional view of a portion of the seed meter of FIG. **1** illustrating the small gap between the outer peripheral portion of the seed disk and the adjacent outer peripheral portion of the seed meter housing;

FIG. **6** is a perspective view of a portion of the outer edge of the seed disk illustrating a series of spaced-apart cavities and intervening ribs formed therein;

FIG. **7** is a block diagram of the successive steps of a method for precise positioning of a seed disk in a seed meter in accordance with the invention;

FIG. **8** is a block diagram of the successive detailed steps of a detailed example of the method of FIG. **7** for precise positioning of the seed disk in the seed meter of FIGS. **1–6**;

FIG. **9** is an exploded perspective view of a portion of the seed meter of FIGS. **1–6** including a shaft, hub and pin which are included in the apparatus utilized in the method of FIG. **8**;

FIG. **10** is a front view of the hub of FIG. **9**;

FIG. **11** is a side view of the hub of FIG. **9**; and

FIG. **12** is an enlarged front view of the pin of FIG. **9**.

DETAILED DESCRIPTION

FIGS. **1–6** illustrate a vacuum seed meter **10** useful in describing the methods and apparatus according to the invention. The vacuum seed meter **10** is similar to that shown and described in the previously referred to co-pending application Ser. No. 546,834 of Lundie et al which is incorporated herein by reference. Accordingly, those portions of the vacuum seed meter **10** not directly relating to the present invention are described only briefly hereafter.

The vacuum seed meter **10** has a generally cylindrical housing **12** comprised of a first half shell **14** and an

opposite, mating second half shell **16**. The second half shell **16** is coupled to the first half shell **14** by a hinge **18** permitting the second half shell **16** to be closed over the first half shell **14** to close the housing **12**. A clasp **20** mounted on the first half shell **14** on a side thereof opposite the hinge **18** is secured to the second half shell **16** to hold the housing **12** in the closed position.

A hub **22** is rotatably mounted within the first half shell **14** of the housing **12** at the center of the first half shell **14**. As seen in FIGS. **3** and **4** a pair of lugs **24** and **26** are disposed on the outside of the first half shell **14** at the back of the housing **12**. The lugs **24** and **26** are engaged by a driving arrangement shown in FIG. **3** to rotatably drive the hub **22**.

The seed meter **10** includes a seed disk **28** which has an elongated aperture **30** at the center thereof. The seed disk **28** is mounted for rotation on the hub **22** by passing a handle **32** which is mounted on the hub **22** through the elongated aperture **30** to seat the seed disk **28** on the hub **22**. The handle **32** is then rotated into a position to lock the seed disk **28** on the hub **22**. This arrangement for mounting the seed disk **28** on the hub **22** which is also shown in FIG. **9** is similar to an arrangement described in detail in previously referred to co-pending application Ser. No. 546,831 of Webber, which application is incorporated herein by reference.

The seed disk **28** has a plurality of apertures **34** therein arranged in a circumferential array adjacent and inside of a circular outer edge **36** of the seed disk **28**. Each of the apertures **34** extends through the thickness of the seed disk **28** between a first side **38** of the seed disk **28** and the bottom of one of a pluraity of seed cells **40** formed in an opposite second side **42** of the seed disk **28**.

With the seed disk **28** mounted on the hub **22** and the second half shell **16** closed over the first half shell **14**, the seed disk **28** divides the hollow interior of the cylindrical housing **12** into a seed chamber **44** between the seed disk **28** and the first half shell **14** and a vacuum chamber **46** between the seed disk **28** and the second half shell **16**. A vacuum source is coupled by a vacuum port **47** in the second half shell **16** to create a reduced pressure within the vacuum chamber **46** adjacent the first side **38** of the seed disk **28**. The reduced pressure communicates with the seed cells **40** formed in the second side **42** of the seed disk **28** via the apertures **34**.

As shown in FIG. **1** the first half shell **14** of the cylindrical housing **12** is mounted at the base of a seed hopper **48** for containing seeds to be metered by the vacuum seed meter **10**. Seeds from the seed hopper **48** flow into the seed chamber **44** within the first half shell **14** where they form a seed mass against the second side **42** of the seed disk **28**. As the hub **22** is rotatably driven so as to rotate the seed disk **28**, the seed cells **40** agitate, accelerate and then capture individual seeds therein as they move through the seed mass within the seed chamber **44**. As each seed cell **40** rises out of the seed mass, the seed contained therein is held in place by the reduced pressure within the vacuum chamber **46** which communicates with the seed via the aperture **34**. The reduced pressure holds the seed in place in the seed cell **40** until the seed cell **40** passes across a divider brush **50**. The divider brush **50** extends across the interior of the first half shell **14** and defines a seed discharge area **52** which is separated from the seed chamber **44** and the seed mass contained therein by the divider brush **50** and a divider wall **54** from which the brush **50** is mounted. As the seed cell **40** enters the seed discharge area **52**, the effects of the reduced pressure from within the vacuum chamber **46** are cut off. This is due to the shape of a vacuum seal **56** which is mounted on the inside of the second half shell **16** and which extends into contact with the first side **38** of the seed disk **28**. A portion **57** of the vacuum seal **56** extends inwardly from the region adjacent the circumference of the second half shell **16** to isolate the seed discharge area **52** from the reduced pressure. As the reduced pressure is cut off from each seed cell **40**, the seed contained therein falls out of the seed cell **40** under the influence of gravity. The seed falls through a seed discharge chute **58** at the bottom of the first half shell **14** to the ground below.

Referring to FIG. **3** the seeds from the seed hopper **48** shown in FIG. **1** form the seed mass within the lower part of the seed chamber **44**. The seeds of the seed mass reside on an inner surface **60** of a generally circular outer edge **62** of the generally cylindrical housing **12**. The seeds also reside against the second side **42** of the seed disk **28** as well as an opposite inner wall **64** within the first half shell **14**. As the seed meter **10** is used, seed chips, broken seeds, dirt and other debris begin to form within the seed chamber **44**. Most of such debris is drawn through the apertures **34** in the seed disk **28** by the reduced pressure in the vacuum chamber **46**. Much of the remaining debris settles on the inner surface **60** at the second side **42** of the seed disk **28**.

The debris which settles within the seed chamber **44** is eliminated by an arrangement which is described in greater detail in previously referred to co-pending application Ser. No. 546,829 of Olson, which application is incorporated herein by reference. Such arrangement includes a cleanout and seed sealing member **66** mounted on a flat surface of circular configuration comprising an outer peripheral portion **68** of the first half shell **14** of the housing **12**. As seen in FIGS. **1** and **2** the cleanout and seed sealing members **66** is of elongated configuration so as to extend around a substantial portion of the circumference of the outer edge **62** of the housing **12**. The cleanout and seed sealing member **66** is interrupted only by the seed discharge chute **58** at the bottom of the seed discharge area **52**.

The cleanout and seed sealing member **66** has an outer surface **70** which extends along the length of the member **66** adjacent an outer peripheral portion **72** of the seed disk **28** in the region of the circular outer edge **36** so as to form a small gap **74** therewith. The cross-sectional shape of the cleanout and seed sealing member **66** is tapered such that the outer surface **70** thereof slopes gradually away from the outer peripheral portion **72** of the seed disk **28** with increasing distance from an axis of rotation **76** about which the seed disk **28** rotates.

The size of the gap **74** adjacent an inner edge **78** of the cleanout and seed sealing member **66** should be small enough to be below the limited range of sizes of a particular type of seed being used within the seed meter **10**. At the same time the size of the gap **74** should be large enough to freely pass most seed chips, broken seeds, dirt and other debris therethrough. Accordingly, the gap **74** facilitates cleanout of the interior of the seed chamber **44** while at the same time sealing the seeds therein. This is illustrated in FIG. **5** which shows both full seeds **80** and particles of debris **82** which can comprise seed chips, broken seeds or dirt.

As shown in FIG. **6** the outer edge **36** of the seed disk **28** is provided with a series of spaced-apart cavities **84** therein. Each adjacent pair of the cavities **84** defines a rib **86** therebetween. The ribs **86** which are located at

one side of the gap **74** and which have top surfaces that slope down from the side **42** of the seed disk **28** to a level equal to that of the cavaties **84** perform a scraping function by scraping any buildups of debris which may occur within the gap **74**. The ribs **86** also agitate debris which enters the gap **74** to speed up the passage of such debris through the gap **74**. This is aided by the intervening cavities **84** which receive some of the debris agitated by the ribs **86** and pass it freely and quickly out of the gap **74**.

The cylindrical housing **12** has a slot **88** therein which extends around substantially the entire circumference of the generally circular outer edge **62** thereof. The slot **88** is formed by opposite edges of the first and second half shells **14** and **16** which are held in slightly spaced-apart relation by an arrangement of flange as shown in FIGS. **1,2** and **4**. As best seen in FIG. **2**, the first half shell **14** has a flange **90** at the outer edge thereof opposite the hinge **18** and located just outside of the cleanout and seed sealing member **66**. An additional pair of flanges **92** and **94** are located on opposite sides of the first half shell **14** between the flange **90** and the hinge **18**. The second half shell **16** has a flange **96** at the outer edge thereof opposite the hinge **18** and an opposite pair of intermediate flanges **98** and **100**. The radial spacing of the flanges **96,98** and **100** from the center of the second half shell **16** is slightly greater than the radial spacing of the flanges **90,92** and **94** from the center of the first half shell **14**. When the second half shell **16** is closed over the first half shell **14**, the flange **96** extends just to the outside of and in engagement with the flange **90**. In like fashion the flanges **98** and **100** extend just to the outside of and in contact with the flanges **92** and **94** respectively. The various flanges **90,92,94,96,98** and **100** combine with the action of the hinge **18** to hold the edges of the first and second half shells **14** and **16** apart by a small and relatively uniform distance which forms the slot **88**.

It will therefore be seen that the slot **88** extends around substantially the entire circumference of the cylindrical housing **12** adjacent the cleanout and seed sealing member **66** and the outer edge **36** of the seed disk **28**. The slot **88** facilitates expulsion of debris from the interior of the cylindrical housing **12** at virtually any location around the generally circular outer edge **62** of the housing **12**, as illustrated in FIG. **5**.

As shown in FIG. **2**, the second side **42** of the seed disk **28** has an outwardly extending spacer ring **102** formed thereon. The spacer ring **102** is centered on the seed disk **28** so as to have the center thereof at the axis of rotation **76**. The spacer ring **102** which extends into contact with the hub **22** and the seed disk **28** is mounted thereon determines the spacing of the seed disk **28** from the hub **22**. Accordingly, once the hub **22** is actually fixed within the housing **12**, the spacer ring **102** determines the nominal size of the gap **74** between the cleanout and seed sealing member **66** at the outer peripheral portion **68** of the housing **12** and the outer peripheral portion **72** of the seed disk **28**. The seed disk **28** is normally usable only with a particular kind of seed having a predetermined limited size range. Thus the spacer ring **102** can be dimensioned to provide the desired size of the gap **74** to seal the seed which have sizes within the limited size range within the seed chamber **44** while at the same time providing escape of debris through the gap **74**. When a different type of seed is to be used in the seed meter **10**, the seed disk **28** is normally changed. The new disk is provided with a spacer ring **102** having a thickness corresponding to the size of the seeds which the new seed disk is designed to be used with. Seed disks **28** designed for use with larger seeds have spacer rings **102** with are relatively wide so as to position the second side **42** of the seed disk **28** a greater distance form the hub **22** to provide the gap **74** with a larger size. When smaller seeds are to be metered, the gap **74** must be reduced in size to seal the seeds within the seed chamber **44** and prevent the escape therefrom. This is accomplished by providing the seed disks **28** which are used with the smaller seeds with a narrower spacer ring **102** which positions the second side **42** of the seed disk **28** closer to the hub **22**.

As previously noted in connection with FIG. **3**, the seed disk **28** which is mounted on the hub **22** is rotatably driven by engagement of the lugs **24** and **26**. The lugs **24** and **26** which are engaged by a rotating driving arrangement **104** shown in FIG. **3** are coupled to a bearing **106** journaled within a bore **108** within the first half shell **14** of the housing **12** and having an outer race **110**. The hub **22** is coupled to the outer race **110** of the bearing **106** by a shaft **112** having a first end **114** pressed into the outer race **110** and an opposite threaded second end **116** for receiving a threaded central aperture **118** of the hub **22**. The second end **116** of the shaft **112** terminates in a pin **120** extending into and rotatably and resiliently mounting the handle **32** thereon. As described hereafter the shaft **112** combines with the threaded central aperture **118** of the hub **22** to provide for the precise positioning of the seed disk **28** relative to the first half shell **14** of the housing **12**. Such precise positioning enables the gap **74** between the outer peripheral portion **68** of the housing **12** and the outer peripheral **72** of the seed disk **28** to be of desired size and also to be relatively uniform in size around the entire outer edge **62** of the housing **12**. As previously noted the proper expulsion of debris such as the particles **82** to the exclusion of the full seeds **80** is dependent upon the gap **74** being of desired uniform size.

FIG. **7** depicts the successive steps in a method of precisely positioning a seed disk within the housing of a seed meter in accordance with the invention.

The method of FIG. **7** begins with a first step **122** in which a shaft is mounted for rotation within the housing of the seed meter. In a following second step **124** a hub for mounting a seed disk is initially positioned on the shaft. The initial positioning of the hub on the shaft is accomplished with the seed disk removed from the hub in order to facilitate such initial positioning of the hub. Following initial positioning of the hub on the shaft, the seed disk is mounted on the hub in a following third step **126**. With the seed disk mounted on the hub as provided for in the third step **126**, the hub and included seed disk are advanced along the shaft to a desired position in a fourth step **128**.

Movement of the hub and included seed disk along the shaft in accordance with the fourth step **128** of the method of FIG. **7** provides for variation in the position of the seed disk relative to the seed meter housing. Accordingly, the gap **74** between the outer peripheral portion **72** of the seed disk **28** and the outer peripheral portion **68** of the housing **12** can be provided with a selected size defined by the desired position of the hub on the shaft.

In a final fifth step **130** of the method of FIG. **7** the hub is secured to the shaft in the desired position. The securing of the hub to the shaft may be permanent but is preferably done in releasable fashion to enable the hub to be positioned at other desired locations on the shaft

such as where it is desired to change the size of the gap **74**.

FIG. **8** provides a detailed example of the method of FIG. **7** as applied to the particular vacuum seed meter **10** of FIGS. **1–6**.

In the method of FIG. **8** the mounting of the shaft in the housing in accordance with the first step **122** of FIG. **7** is accomplished by a step **132** in which the shaft **112** is pressed into the outer race **110** of the bearing **106** in the first half shell **14** of the seed meter housing **12**. This is an interference type of force fit which provides for the rotatable mounting of the shaft **112** within the housing **12**. As shown in FIG. **3** the first end **114** of the shaft **112** is pressed into the outer race **110**. This operation can be performed by hand but is preferably done by machine which provides for a more uniform and consistent mounting of the shaft **112**. The bearing **106** with its outer race **110** and the shaft **112** are shown in FIG. **9** as well as in FIG. **3**.

In a next step **134** of the method of FIG. **8** the second step **124** of the method of FIG. **7** is accomplished by starting to thread the hub **22** onto the shaft **112**. As previously noted the outer surface of the shaft **112** is threaded along a portion thereof at the second end **116**. The hub **22** has the threaded central aperture **118** therein. The step **134** is accomplished by engaging the hub **22** with the second end **116** of the shaft **112** and then turning the hub **22** in the appropriate direction to begin threading the hub **22** onto the shaft **112**.

In a next step **136** of the method of FIG. **8** the apparatus used in mounting the seed disk **28** is installed on the hub **22** in preparation for mounting the seed disk **28** on the hub **22**. In the disk mounting mechanism described in the previously referred to co-pending application Ser. No. 546,831 of Webber, the handle is rotatably and resiliently secured to the hub by a keeper mounted on the outer end of a pin extending from the hub and a coil spring encircling the pin and disposed between the keeper at one end thereof and an annular ridge within a central aperture in the handle at the other end thereof. A similar arrangement is as shown in FIGS. **3** and **9** where the handle **32** is rotatably and resiliently mounted on the pin **120** extending from the second end **116** of the shaft **112**. As shown in FIG. **3** a coil spring **138** which encircles the pin **120** extends between an annular surface **140** within the handle **32** and a keeper **142** pressed onto an outer end of the pin **120**.

Following the initial positioning of the hub **22** on the shaft **112** in the step **134**, the step **136** is begun by installing the handle **32** on the pin **120**. The pin **110** is inserted into the central aperture in the handle **32**, following which the spring **138** is placed on the pin **120** and the keeper **142** is pressed onto the outer end of the pin **120**. The handle **32** as so mounted is then ready to mount the seed disk **28** on the hub **22**.

In a next step **137** of the method of FIG. **8** which corresponds to the third step **126** in the method of FIG. **7** the seed disk **28** is mounted on the hub **22**. As shown in FIG. **9** the hub **22** which is generally disk shaped has a knob **144** at the center thereof which extends outwardly from the opposite sides of the disk-shaped portion of the hub **22** and has the threaded central aperture **118** therein. A pair of elongated elements **146** and **148** extend outwardly from the knob **144** on opposite sides thereof on the side of the hub **22** opposite the shaft **112** and receive opposite elongated elements **150** and **152** respectively of the handle **32** when the handle **32** is aligned with the elongated elements **146** and **148** of the hub **22**. With the handle **32** in this position, the seed disk **28** is mounted on the hub **22** by inserting the handle **32** through the elongated aperture **30** in the seed disk **28** so that the spacer ring **102** of the seed disk **28** is seated on the disk-shaped portion of the hub **22** on an outer rim **153** with the knob **144** and the opposite elongated elements **146** and **148** disposed within the elongated aperture **30**. With the seed disk **28** so positioned, the handle **32** is rotated relative to the hub **22** so that the opposite elongated elements **150** and **152** of the handle **32** ride up on opposite ramps **154** and **156** at the sides of the elongated aperture **30** against the resistance of the coil spring **138**. The ramps **154** and **156** are shown in FIGS. **2** and **3**. Eventually, the opposite elongated elements **150** and **152** of the handle **32** seat within recesses in the ramps **154** and **156**, and the mounting of the seed disk **28** on hub **22** is completed with the seed disk **28** so mounted, the axis of rotation **76** thereof coincides with the central axis of the hub **22**.

With the seed disk **28** mounted on the hub **22** as provided for in the step **137**, a following step **158** in the method of FIG. **8** which corresponds to the fourth step **128** in the method of FIG. **7** is performed. The step **158** is performed by continuing to thread the hub **22** onto the shaft **112** until the seed disk **28** is a desired distance from the housing **12**. More specifically, the hub **22** and the seed disk **28** which is mounted thereon are rotated about the shaft **112** in a direction to advance the hub **22** along the threaded portion of the shaft **112** until the gap **74** between the outer peripheral portion **72** of the seed disk **28** and the outer peripheral portion **68** of the first half shell **14** of the housing **12** has a desired size. Desired gap size can be determined by any appropriate technique including the use of a Spacer element. With such a spacer element placed against the outer surface **70** of the cleanout and seed sealing member **66**, the hub **22** and seed disk **28** are rotated about the shaft **112** until the seed disk **28** contacts the spacer element, whereupon the spacer element is removed from the gap **74**.

In a following step **160** of the method of FIG. **8** the seed disk **28** is removed from the hub **22**. This is accomplished by rotating the handle **32** so that the opposite elongated elements **150** and **152** thereof slide down and then off of the ramps **154** and **156** on the seed disk **28** and onto the elongated elements **146** and **148** of the hub **22**. With the handle **32** so aligned with the elongated elements **146** and **148** of the hub **22**, the seed disk **28** may simply be pulled off of the hub **22**. Removal of the seed disk **28** from the hub **22** in the step **160** is necessary in order to carry out a following step **162** in the method of FIG. **8**.

In the step **162** of the method of FIG. **8** which corresponds to the final step **130** in the method of FIG. **7**, the hub **22** is secured to the shaft **112** by installing a locking pin in the hub **22** and the shaft **112**. Installation of the locking pin **164** releasably secures the hub **22** in the desired position on the shaft **112**.

The locking pin **164** which is shown in FIGS. **3**, **9** and **12** includes a straight portion **166** thereof and an adjoining curved portion **168**. The curved portion **168** terminates in an outer curved end **170**. Installation of the locking pin **164** on the hub **22** is accomplished by inserting the straight portion **166** thereof through an opposite pair of slots **172** in the knob **144** of the hub **22** and through an aperture **174** in the shaft **112**. The aperture **174** is shown in dotted outline in FIG. **9**. The knob **144** is provided with four of the slots **172**. The slots **172** are located generally equidistantly or approximately 90

degrees apart about the threaded central aperture **118**. The aperture **174** extends through the shaft **112** at the threaded portion thereof adjacent the second end **116** and is generally perpendicular to the central axis of the shaft **112**.

Following the desired positioning of the seed disk **28** in the step **158** and the removal of the seed disk **28** from the hub **22** in the step **160**, the hub **22** is rotated on the shaft **112** by a slight amount as necessary to align an opposite pair of the slots **172** with the aperture **174** prior to installation of the locking pin **164**. Upon insertion of the straight portion **166** of the locking pin **164** through the aperture **174** and the opposite pair of the slots **172**, the outer curved end **170** of the locking pin **164** engages a third one of the slots **172** located midway between the opposite pair of the slots **172** through which the straight portion **166** of the locking pin **164** extends. This biasas the curved portion **168** of the locking pin **164** so as to resiliently seat the outer curved end **170** within the third one of the slots **172** to thereby releasably hold the locking pin **164** in the installed position. With the locking pin **164** so installed, the hub **22** cannot rotate on the shaft **112** and the seed disk **28** is held in the desired position.

As shown in FIG. **3** the spacer ring **102** of the seed disk **28** which seats on the rim **153** of the hub **22** provides a small amount of space between the hub **22** and the adjacent portion of the seed disk **28** in the region of the elongated aperture **30**. This space accommodates those portions of the locking pin **164** that protrude from the knob **144**.

In a final step **176** of the method of FIG. **8** the seed disk **28** is once again mounted on the hub **22**. This is accomplished in essentially the same manner as previously described in connection with the step **137**.

It will be appreciated from the method of FIG. **8** described in conjunction with the apparatus of FIGS. **1–6** and **9–12** that precise positioning of the seed disk **28** within the seed meter **10** is provided. The threaded outer surface of the shaft **112** in combination with the threaded central aperture **118** of the hub **22** and the locking pin **164** enables the hub **22** to be positioned at any of a plurality of selected positions along a portion of the length of the shaft **112**. The shaft **112** can therefor be mounted within the outer race **110** of the bearing **106** without regard to precise positioning of the shaft **112** therein. The locking pin **164** provides for the releasable securing of the hub **22** on the shaft **112** when a desired position has been reached. Should it become necessary or desirable to reposition the seed disk **28** within the housing **12**, it is only necessary to remove the locking pin **164** following removal of the seed disk **28** from the hub **22**, after which the hub **22** can be rotated on the shaft **112** to a new desired position, with the seed disk **28** remounted thereon. With the seed disk **28** again removed, the locking pin **164** is then inserted through the aperture **174** and through an opposite pair of the slots **172** to releasably secure the hub **22** on the shaft **112** in the new position.

As seen in FIG. **3** the axis of rotation **76** of the seed disk **28** coincides with the central axis of the hub **22** when the seed disk **28** is mounted on the hub **22**. The generally circular outer peripheral portion **68** of the housing **12** lies within a plane. The axis of rotation **76** is desirably perpendicular to this plane. Such perpendicularity provides for uniformity in the size of the gap **74**. It frequently happens that the shaft **112** is installed in the outer race **110** so that the central axis of the shaft **112** is not precisely perpendicular to the plane of the outer peripheral portion **68** of the housing **12**. This would normally result in non-uniformity of the gap **74**, which previously noted is undesirable in that it provides for non-uniform retention of full seeds **80** within the housing and non-uniform expulsion of debris such as particles **82** from the housing **12**.

In accordance with a feature of the invention, perpendicularity of the axis of rotation **76** of the seed disk **28** to the plane of the outer peripheral portion **68** of the housing **12** is maintained by providing a small amount of tolerance or play between the threaded portion of the shaft **112** and the threaded central aperture **118** of the hub **22**. More specifically the outer diameter of the threaded portion of the shaft **112** is made smaller than the inner diameter of the threaded central aperture **118** of the hub **22** by an amount which provides the desired tolerance or play. This allows the axis of rotation **76** of the seed disk **28** to form relatively small angles with the central axis of the shaft **112** as necessary to maintain perpendicularity. It has been found that such tolerance or play allows the desired perpendicularity to be achieved upon rotation of the seed disk **28** relative to the housing **12** during operation of the seed meter **10**. This is most likely due to aerodynamic effects in which the layer of air in the gap **74** causes the angle of the axis of rotation **76** to continually change relative to the plane of the outer peripheral portion **68** of the housing **12** as the seed disk **28** rotates so as to maintain uniformity of the gap **74**.

While the invention has been particularly shown and described with reference to preferred embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. In a seed meter an arrangement for rotatably mounting a seed disk within a housing of the seed meter comprising the combination of a shaft rotatably mounted within the housing and having a length thereof extending outwardly from the housing and an aperture therein, a hub disposed on and movable along a portion of the length of the shaft and adapted to mount a seed disk thereon, the hub having an aperture therein receiving the shaft and a plurality of openings therein spaced around the aperture, and means for releasably securing the hub at any of a plurality of different locations along the portion of the length of the shaft, said means comprising a pin extending through the aperture in the shaft and an opposite pair of the openings in the hub.

2. The invention set forth in claim **1**, wherein the pin has an outer end thereof engaged in one of the plurality of openings in the hub other than the opposite pair of openings in the hub through which the pin extends.

3. A seed meter comprising the combination of a housing having a peripheral portion thereof extending around a central axis, a shaft rotatably mounted within the housing and extending along the central axis, the shaft having a threaded outer surface thereof extending along a portion of the shaft from an outer end thereof opposite the housing, a hub having a threaded aperture therein receiving and threaded onto the threaded outer surface of the shaft, means for releasably locking the hub at one of a plurality of possible locations of the hub along the shaft, and a seed disk releasably mounted on the hub and having a peripheral portion thereof spaced apart from the peripheral portion of the housing by a

distance determined by the location along the shaft at which the hub is releasably locked.

4. The invention set forth in claim 3, wherein the shaft has an aperture extending therethrough generally perpendicular to the central axis, the hub has a plurality of slots therein spaced around the threaded aperture therein, and the means for releasably locking comprises a pin extending through the aperture in the shaft and an opposite pair of the slots in the hub.

5. The invention set forth in claim 4, wherein the plurality of slots in the hub comprises four slots substantially equally spaced around the hub.

6. A seed meter comprising the combination of a housing having a peripheral portion thereof extending around a central axis, a shaft mounted within the housing and extending along the central axis, the shaft having a threaded outer surface thereof extending along a portion of the shaft from an outer end thereof opposite the housing, a hub having a threaded aperture therein receiving and threaded onto the threaded outer surface of the shaft and means for releasably locking the hub at one of a plurality of possible locations of the hub along the shaft, the hub having an axis extending through the threaded aperture and nominally coincident with the central axis and the threaded aperture being larger than the threaded outer surface of the shaft by an amount sufficient to permit movement of the hub relative to the shaft so that the axis of the hub forms small angles with the central axis.

7. A seed meter comprising the combination of a housing having a peripheral portion thereof extending around a central axis, a shaft rotatably mounted within the housing and extending along the central axis, the shaft having a threaded outer surface thereof extending along a portion of the shaft from an outer end thereof opposite the housing, a hub having a threaded aperture therein receiving and threaded onto the threaded outer surface of the shaft and means for releasably locking the hub at one of a plurality of possible locations of the hub along the shaft, the shaft having an aperture extending therethrough generally perpendicular to the central axis, the hub having a plurality of slots therein spaced around the threaded aperture therein, the means for releasably locking comprising a pin extending through the aperture in the shaft and an opposite pair of the slots in the hub, the pin having a relatively straight portion extending through the aperture in the shaft and the opposite pair of the plurality of slots in the hub and a curved portion extending outwardly from the straight portion and terminating in an outer curved end resiliently residing in one of the plurality of slots in the hub disposed between the opposite pair of the plurality of slots.

8. In a seed meter having a housing, a method of mounting a seed disk at a desired location within the housing comprising the steps of:

rotatably mounting a shaft within the housing;

positioning a seed disk mounting hub on the shaft so that the seed disk when mounted thereon is at a desired location within the housing; and

securing the hub on the shaft as so positioned;

the step of positioning a seed disk mounting hub on the shaft comprising the steps of:

initially positioning the seed disk mounting hub on the shaft;

mounting the seed disk on the hub so that the seed disk is immovable relative to the hub; and thereafter

advancing the hub along the shaft until the seed disk is at the desired location within the housing.

9. The invention set forth in claim 8, wherein the shaft and the hub are threaded, the step of initially positioning comprises initially threading the hub onto the shaft and the step of advancing the hub comprises rotating the hub relative to the shaft until the seed disk is at the desired location within the housing.

10. The invention set forth in claim 9, wherein the shaft has an aperture therethrough, the hub has an opposite pair of slots therein and the step of securing the hub comprises inserting a pin through the aperture in the shaft and the opposite pair of slots in the hub.

11. In a seed meter comprising a shaft, a housing rotatably mounting the shaft and having a peripheral portion thereof extending around the shaft, a hub mounted on and movable along the shaft and a seed disk having a peripheral portion thereof, a method of locating the peripheral portion of the seed disk a desired distance from the peripheral portion of the housing comprising the steps of:

mounting the seed disk on the hub;

advancing the hub along the shaft in a direction toward the housing to a position in which the peripheral portion of the seed disk is the desired distance from the peripheral portion of the housing; and

securing the hub to the shaft;

and including the further steps of removing the seed disk from the hub following the step of advancing the hub along the shaft and before the step of securing the hub to the shaft, and mounting the seed disk on the hub following the step of securing the hub to the shaft.

12. The invention set forth in claim 11, wherein the shaft has a threaded outer portion, the hub has a threaded inner portion, and the step of advancing the hub along the shaft comprises rotating the threaded inner portion of the hub about the threaded outer portion of the shaft.

13. In a seed meter having a housing with a peripheral portion thereof extending around a central axis and a seed disk, a method of rotatably mounting the seed disk within the housing so that a peripheral portion thereof is a desired distance from the peripheral portion of the housing comprising the steps of:

providing a shaft having a threaded outer portion;

mounting the shaft within the housing for rotation about the central axis;

providing a hub having a threaded aperture therein;

rotating the threaded aperture of the hub onto the threaded outer portion of the shaft to initially mount the hub on the shaft;

mounting the seed disk on the hub;

rotating the hub relative to the shaft to advance the hub and the seed disk along the shaft until the peripheral portion of the seed disk is a desired distance from the peripheral portion of the housing; and

locking the hub on the shaft to prevent rotation of the hub relative to the shaft;

and including the further steps of removing the seed disk from the hub following the step of rotating the hub relative to the shaft to advance the hub and the seed disk and before the step of locking the hub on the shaft, and mounting the seed disk on the hub following locking the hub on the shaft.

14. The invention set forth in claim 13, wherein the shaft has an aperture therethrough, the hub has a plurality of slots therein spaced about the threaded aperture thereof, and the step of locking the hub on the shaft comprises inserting a pin through the aperture in the shaft and an opposite pair of the plurality of slots in the hub.

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— *of inventorship (Rule 4.17(iv))*

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(54) Title: SEED DISTRIBUTION ELEMENT FOR PRECISION SEED DRILLS, SEED DRILL INCLUDING SAID ELEMENT

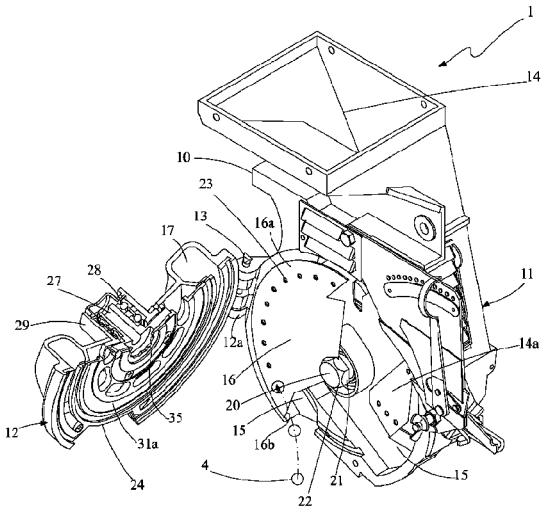


fig. 1

(57) Abstract: A seed distribution element (1) includes: -a sowing disc (16) rotated by a motor-driven transmission shaft (20) -a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) movable relative to the fixed portion and can be closed against it, with a seed collection chamber (15) in the fixed portion (11) and a pneumatic suction chamber (17) in the movable portion(12), -the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces (16a, 16b) delimiting the chambers, and provided with a ring of selector holes (23) extending between the opposed surfaces, -means for producing a pressure differential between the opposed surfaces in the region of a circumferential segment of the ring of holes, including the pneumatic suction chamber, and -a seal (24) on the movable portion (12) capable of sliding contact with the facing surface (16a) of the disc (16) when the portions are closed against one another, -a thrust -bearing element (26) of the sowing disc (16), supported rotatably in the movable portion (12), to withstand the axial load produced by the disc (16) on the seal (24).

WO 2012/062876 A1

"Seed distribution element for precision seed drills, seed drill including said element"

DESCRIPTION

The subject of the present invention is a seed distribution element for precision pneumatic seed drills, a sowing element for such machines and a seed drill including a plurality of such sowing elements.

In precision pneumatic seed drills it is known to use sowing elements which are each equipped with a seed distribution element (hereinafter, in brief, distributor) for distributing one seed at a time in a controlled delivery while the sowing element moves along a sowing track.

It is equally known to use seed distributors which use an air pressure differential between opposed faces of a sowing disc (or selector) provided with one or more rings of through holes. The operating principle is based on the fact that, as a result of the pressure differential between the opposed faces of the disc, a seed adheres to each hole and is then transported by the rotation of the sowing disc from the seed selection zone to the point at which the pressure differential ceases and the seed is released to drop through a sowing pipe into the furrow or sowing track. In practice, on one of the faces of the disc a strong air suction is exerted which retains the seeds on the opposite face in the region of the respective holes. An example of such devices is disclosed in US 7 228 807.

For the correct functioning of such distributors it is necessary to ensure an effective pneumatic seal between the face of the disc that is subjected to suction and a seal which delimits the pneumatic suction chamber. The

suction effect itself effects a substantial compression of the disc against the seal. If on the one hand this ensures adequate adherence of the seal to the disc surface which is subjected to negative pressure, on the other hand it involves severe abrasion of the seal which limits the effective service life thereof. It is therefore necessary periodically to replace the seal in order to prevent sowing errors arising from insufficient depressurization of the suction chamber.

On the other hand, even if replacing the seal is a simple operation, in each case it entails an unwanted machine stoppage, besides the cost of the spare part itself.

In order to remedy this drawback, seed drills have been developed which are equipped with a thrust-bearing element which relieves the heavy load on the seal. In all cases, however, the thrust-bearing element, which must be rotated with the disc, is mounted on the fixed portion of the housing, that is to say, that portion which is fixed to the framework of the sowing elements. This means that the disc must be attached to the thrust-bearing element; therefore an attachment system must be provided which in the stage of replacement of the disc must be removed, consequently lengthening the operation. This is inevitable in the known machines since it is obligatory to mount on the fixed portion the transmission which drives in rotation the motor-driven shaft which rotates the disc.

However, positioning the thrust-bearing element on the fixed portion entails the pneumatic suction chamber being provided on the fixed portion, or on the same side at which the thrust-bearing element is placed, while the seed collection chamber must be provided in the

movable portion. This is the source of numerous drawbacks, including the fact that the opening of the housing necessarily involves the removal of the portion containing the seed collection chamber from the hopper type store located above, which must necessarily be fixed to the framework of the sowing element.

Furthermore, for the replacement of the sowing disc it is necessary to remove some parts of the distributor, such as the adjustable seed selector, and the seed ejector, where provided.

The problem underlying the present invention is that of providing a seed distribution element structurally and functionally designed to make it possible to remedy all the drawbacks mentioned with reference to the prior art cited.

This problem is solved by the invention by means of a seed distribution element produced in accordance with one or more of the attached claims.

The features and advantages of the invention will become clearer from the following detailed description of a preferred exemplary embodiment thereof, illustrated by way of non-limiting example with reference to the appended drawings, in which:

- Fig. 1 is a perspective view of a seed distribution element produced according to the present invention;
- Fig. 2 is an exploded perspective view of a detail of the element of Fig. 1;
- Fig. 3 is a perspective view of a seed drill equipped with sowing elements with a seed distribution element according to the invention.

In the drawings the reference 1 indicates as a whole a seed distribution

element intended for equipping a sowing element 2 of a precision pneumatic seed drill 3.

The distribution element 1 is the device intended to deposit one seed 4 at a time at a predetermined adjustable spacing in a sowing furrow opened by a coulter 5. The sowing element 2, besides the distribution element 1, comprises a frame 6 and a seed store or hopper 7, besides other devices which are known per se and not necessary for the understanding of the present invention. The seed drill 3 itself comprises a bearing structure 8 on which a plurality of sowing elements 2 are mounted, all connected to a pneumatic suction device 9.

The sowing element 1 itself comprises a housing 10 with a fixed portion 11 fixed in a stable manner on the frame 6 and a movable portion 12 hinged in the region of a hinge 12a on the fixed portion 11 by means of a removable hinge pin 13. The fixed portion includes a throat 14 by means of which it is connected below an outflow mouth of the store or hopper 7 in such a way as to be fed directly by the latter.

From the throat 14 the seed flows through a gate 14a through which the seed flows into a seed collection chamber 15.

A sowing disc 16 separates the seed collection chamber 15 from a suction chamber 17 provided in the movable portion 12. A suction device 18 mounted on the bearing structure 8 is connected to the suction chamber 17 by means of pipes 19 for producing a pressure differential between the opposed surfaces 16a, 16b of the selector disc 16.

The sowing disc 16 is removably mounted on a motor-driven drive shaft 20, supported in the fixed portion 11 and driven in rotation at

predetermined adjustable speeds by a transmission which is not shown. The presence of the transmission requires the shaft 20 to be mounted on the fixed portion 11 of the housing 10. The keying between the shaft 20 and the disc 16 is obtained by means of a polygonal profile 21 at the free end of the shaft 20 which protrudes beyond the disc 16 and preferably has chamfers 22 which serve to facilitate the functions explained hereinafter.

At the periphery of the disc 16 is/are provided one (or several) ring(s) of holes 23 passing between the opposed faces of the sowing disc 16.

A seal 24 is fitted in the suction chamber 17 and is placed in sliding contact with the facing surface of the disc 16, when the movable portion 11 is closed on the fixed portion 12, to delimit a circumferential segment in which the holes 23 are subjected to the aforesaid pressure differential. The circumferential segment extends between the seed collection chamber 15 and a seed fall pipe 25 in which the seeds are released one at a time into the furrow formed by the coulter 5.

By reason of the pressure differential between the two opposed surfaces of the sowing disc, the seeds 4 are held, one to each hole 23, when the holes pass in the seed collection chamber 15, and are released in the region of the pipe 25 when the pneumatic effect of the pressure differential ceases or owing to the presence of a seed ejector (not shown).

In order to limit the wear on the seal 24 resulting from sliding against the surface of the disc 16, a thrust-bearing element indicated as a whole by 26 is mounted on the movable portion.

The thrust-bearing element 26 comprises a shaft 27 rotatably mounted by means of bearings 28 in a seat 29 of the movable portion 12. The shaft 27

has flanging 30 by means of which it is fixed to a thrust-bearing plate 31 which can bear on that surface of the disc which faces the seal 24 in a zone radially inside the ring of holes 23 in order to withstand at least some of the axial load produced by the disc 16 on the seal 24.

The bearing between the thrust-bearing plate 31 and the disc 16 takes place in the region of a ring 31a in relief on the surface of the plate which faces the disc 16.

The thrust-bearing element 26 is driven in rotation with the sowing disc 16 when the fixed and movable portions 11, 12 are closed against one another by means of a drive element 32 which comprises a coupling device constrained for rotation with the thrust-bearing plate but with radial and/or circumferential clearance in such a way as to be self-centred in the rotational coupling with the drive shaft of the disc 16. For this purpose, in the present form of embodiment, the drive element 32 is coupled with limited radial and/or circumferential clearance to the element 26 by means of one (or more) appendage(s) 33 protruding radially towards the outside and fitted into corresponding seats 34 of the plate. The drive element 32 is coupled by means of an internal polygonal profile 35 (similar to that adopted for box-end wrenches) to the polygonal profile 21 of the free end of the shaft 20, the chamfers 22 of which serve to facilitate the centring of the two profiles and the respective engagement.

The drive element 32 is thus self-centring relative to the drive shaft 20 by which it is driven. The positioning between seal 24 and plate 31 is such that the rotation of the latter will not be hindered by the presence of the seal 24 and, at the same time, both will be kept bearing against the disc

16.

Provision is also made for the thrust-bearing element 26 to be made idle and not driven in rotation by the shaft 20.

The whole of the movable portion 12 complete with thrust-bearing element 26 and seal 24 lends itself advantageously to the production of a kit for the retrofitting of existing seed drills. It is sufficient in this case to separate the old type of movable portion by removing the hinge pin 13 and replacing the old movable portion with the aforesaid kit. By re-connecting the pneumatic pipes previously disconnected, the seed drill becomes ready for use.

Among the principal advantages of the distribution element according to the invention is the fact that the wear on the seal resulting from the sliding contact with the seed selector disc is substantially reduced, if not eliminated; the thrust-bearing element is self-centring, thereby allowing easy opening and closing of the movable portion on the fixed portion of the housing; the system additionally lends itself to easy retrofitting, all without removing movable parts and/or operations of disconnecting the sowing disc.

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

- a seed collection chamber (15) being defined in the fixed portion (11),

- a pneumatic suction chamber (17) being defined in the movable portion (12),

- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the

movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
- a seed collection chamber (15) being defined in the fixed portion (11),
- a pneumatic suction chamber (17) being defined in the movable portion (12),
- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),
- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and
- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed

surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the kit comprises:

- the movable portion (12) pre-assembled with:

- a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

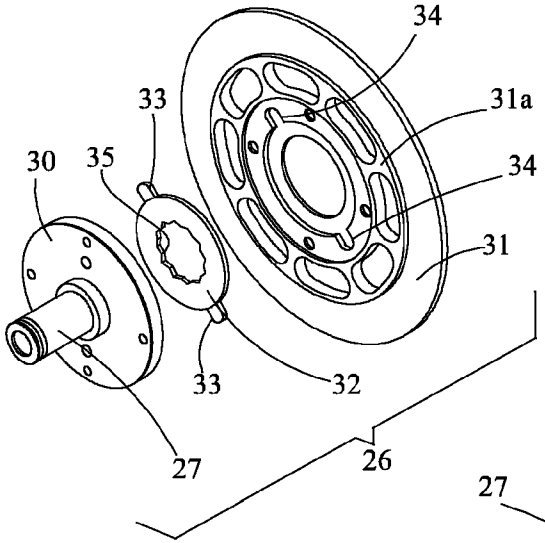

34
33
31a
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35
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31
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32
27
26

fig. 2

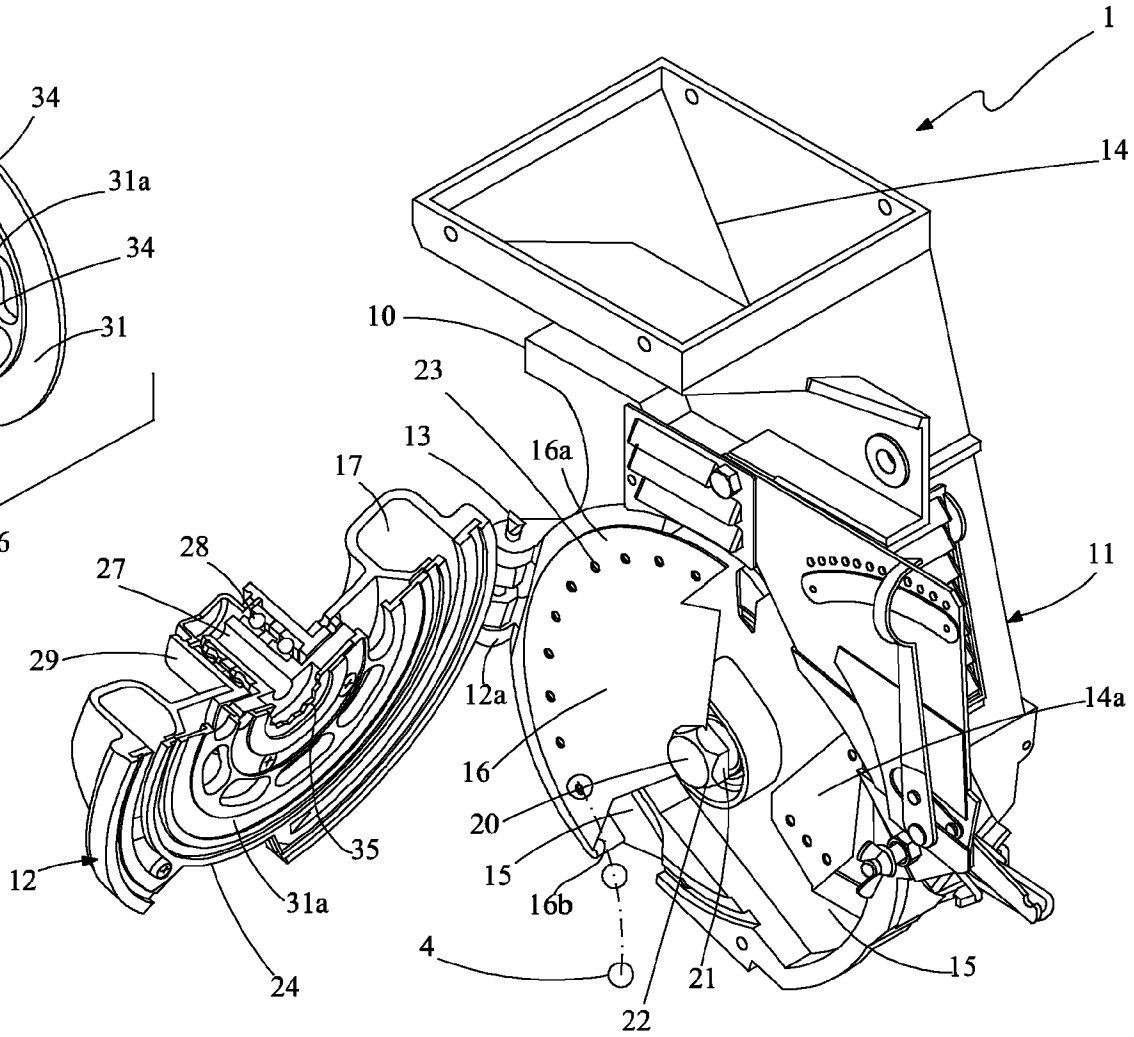

1
14
10
23
13
16a
17
11
27
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29
12a
14a
16
20
15
16b
35
12
31a
4
24
21
22
15

fig. 1

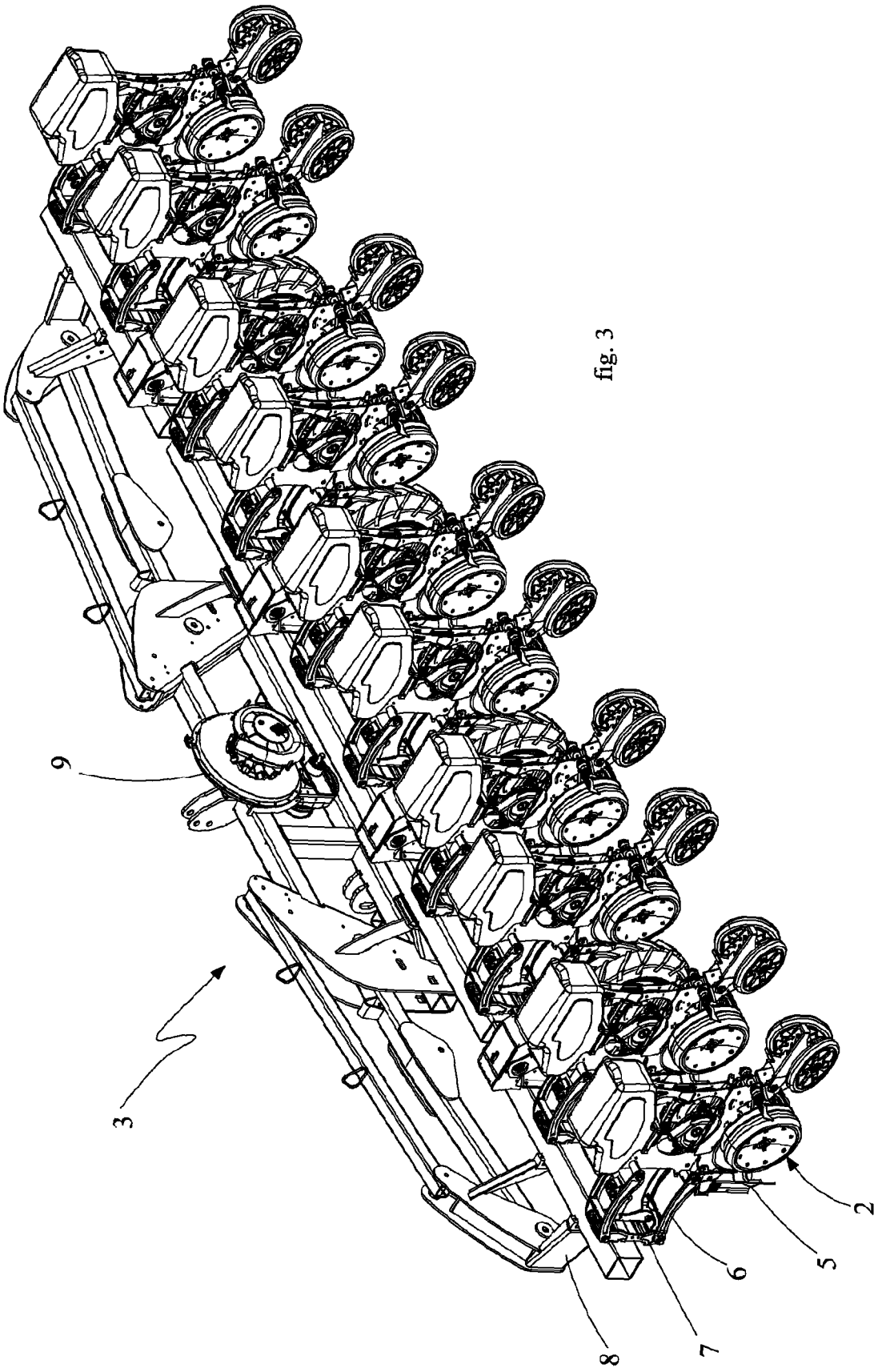


fig. 3

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2011/069875

A. CLASSIFICATION OF SUBJECT MATTER
INV. A01C7/04
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A01C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 7 228 807 B1 (VENHUIZEN DALE [US]) 12 June 2007 (2007-06-12) column 5, line 59 - column 7, line 37; figures 6-10	1
A	EP 0 536 543 A1 (MATERMACC SRL [IT]) 14 April 1993 (1993-04-14) column 5, line 7 - column 8, line 6; figures	1

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
9 February 2012	17/02/2012

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Bunn, David

1

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2011/069875

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 7228807 B1	12-06-2007	NONE	
EP 0536543 A1	14-04-1993	EP 0536543 A1	14-04-1993
		IT 1253373 B	08-08-1995
		US 5325801 A	05-07-1994

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(84) Benannte Vertragstaaten:
AT, BE, DE, ES, GB, GR, IT, NL, SE

(54) Verteiler für eine Einzelkörnersämaschine.

Anmerkung: Innerhalb von neun Monaten nach der Bekanntmachung des Hinweises auf die Erteilung des europäischen Patents kann jedermann beim Europäischen Patentamt gegen das erteilte europäische Patent Einspruch einlegen. Der Einspruch ist schriftlich einzureichen und zu begründen. Er gilt erst als eingelegt, wenn die Einspruchsgebühr entrichtet worden ist (Art. 99 (1) Europäisches Patentübereinkommen).

Die Übersetzung ist gemäß Artikel II § 3 Abs. 1 IntPatÜG 1991 vom Patentinhaber eingereicht worden. Sie wurde vom Deutschen Patentamt inhaltlich nicht geprüft.

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Precision Exhibit 1005

Beschreibung

Einzelkornsämaschinen werden von Landwirten wegen der Regelmäßigkeit und der Genauigkeit, die mit ihnen möglich ist, mehr und mehr geschätzt.

Diese Sämaschinen sind im allgemeinen mit einem Verteiler versehen, der ein im wesentlichen zylindrisches Gehäuse, in dem auf einer horizontalen Achse eine Verteilerscheibe drehbar angebracht ist, welche mit in Umfangsrichtung im Abstand liegenden Öffnungen versehen ist und einen Kornbehälter von einer Ansaugvorrichtung trennt, welche mit einem Element zur Ansaugregulierung versehen ist derart, daß die Öffnungen einem Unterdruck zum Festenhalten der aus dem Behälter entnommenen Körner während wenigstens eines Teils von deren Winkelversetzung unterworfen werden; Mittel zur Beseitigung von Doppelkörnern, die durch eine Ablenkeinrichtung gebildet sind, und, im unteren Teil des Gehäuses, eine Abgabeöffung für die Körner aufweist.

Verteiler dieser Art, wie die in FR-A-2 135 702 und 2 174 341 beschriebenen, weisen eine Scheibe auf, die mit Flügeln versehen ist, welche die Speisung der Öffnung mit Körnern sowie das Führen und das genaue Loslassen dieser Körner erleichtern, was eine sehr einfache automatische Auswahl der Körner bei gleichzeitigem Erfordernis eines nur schwachen Unterdrucks gestattet. Da jedoch die Scheiben nur eine begrenzte Anzahl von Flügeln, d.h. Zellen, die jeweils ein Korn enthalten, aufweisen können, kann nur eine Steigerung der Drehgeschwindigkeit der Scheibe die Sädichte steigern, was ein Säen mit hoher Dichte verbietet.

Weitere Verteiler (FR-A-1 585 445) weisen eine Scheibe ohne Flügel auf, die folglich von einer großen Anzahl von Öffnungen durchsetzt sein kann und die sich aus diesem Grund gut einer hohen Sädichte anpaßt. Leider erfordern diese Verteiler einen hohen Unterdruck, ohne den die Körner nicht mitgenommen werden, so daß sie schweren und großkalibrigen Körnern wenig angepaßt sind.

Der Landwirt, der im allgemeinen mehrere Arten von Aussaaten durchführen muß, sieht sich daher mit einer schwierigen Wahl konfrontiert oder in der Notwendigkeit, über mehrere Sämaschinen

verfügen zu müssen.

Aufgabe der Erfindung ist es, diesen Nachteil zu beseitigen und einen Verteiler für eine Einzelkornsämaschine zu schaffen, welcher auf verschiedene Arten von Körnern eingestellt werden kann.

Gegenstand der Erfindung ist also ein Verteiler der oben genannten Art, bei welchem die Ablenkeinrichtung beweglich ist und ein Bedienelement vorgesehen ist, welches sowohl das Element zur Ansaugregulierung als auch die Stellung der Ablenkeinrichtung steuert.

Gemäß einem weiteren Merkmal der Erfindung ist das Bedienelement schwenkbar.

Vorzugsweise ist die bewegliche Ablenkeinrichtung schwenkbar angebracht, wobei das eine ihrer Enden auf einer beweglichen Achse sitzt, die durch das Schwenken des Bedienelements zur Steuerung des Elements zur Ansaugregulierung verschoben wird.

Die abnehmbare Verschließeinrichtung, die ihre Wirkungen mit derjenigen des Bedienelements zur Regulierung der Außenluftabnahme und ggf. derjenigen des Selektors kombiniert, ermöglicht eine Veränderung des Unterdrucks und somit die Verwendung des Verteilers mit einer Flügelscheibe und einer einfachen Scheibe, je nach Art des vorzunehmenden Säens.

Die folgende Beschreibung von als nicht einschränkendes Beispiel gegebenen und in den beigefügten Zeichnungen dargestellten Ausführungsformen wird überdies die Vorteile und Merkmale der Erfindung deutlich werden lassen. Auf diesen Zeichnungen ist bzw. zeigt

Fig. 1 eine perspektivische Explosionsansicht eines Verteilers für eine Einzelkornsämaschine gemäß der Erfindung, versehen mit einer Flügelscheibe,

Fig. 2 den Verteiler der Fig. 1 einmal montiert im Schnitt gemäß Linie 2-2 der Fig. 3,

Fig. 3 eine Schnittansicht gemäß Linie 3-3 der Fig. 2,

Fig. 4 eine Schnittansicht gemäß Linie 4-4 der Fig. 2,

Fig. 5 eine Teilansicht entsprechend Fig. 2, die eine Abwandlung der Ausführung der Mittel zur Beseitigung von Doppelkörnern zeigt,

Fig. 6 eine Fig. 2 entsprechende Ansicht eines mit einer einfachen Scheibe versehenen Verteilers.

Ein Verteiler für eine Einzelkornsämaschine weist, wie dies im einzelnen Fig. 1 zeigt, einen Kasten allgemein zylinderischer Form auf, der durch ein Gehäuse 1, welches in seinem oberen Teil mit einem Kamin 2 zum Anschluß an eine Ansaugeinrichtung oder eine andere geeignete Unterdruckquelle versehen ist, und durch einen Deckel 4 gebildet ist, welcher einen Kornbehälter 6 bildet, der von einem Kragen 8 umgeben ist, welcher an seinem Umfang mit einem zum Gehäuse 1 gerichteten Rand 10 versehen ist. Der Kragen 8 ist in seinem oberen Teil bei 12 unterbrochen, damit die Verbindung seines Innenvolumens mit Außenatmosphäre gewährleistet ist, und in seinem unterem Teil bei 14, damit eine Abgabeöffnung für die Körner gebildet ist. Das Gehäuse 1 und der Deckel 4 sind auf der gleichen Welle 16 über zylindrische Auflageflächen 17 bzw. 19 gehaltert, die dieser Welle eine Drehung in Bezug auf sie gestatten (Fig. 3).

Die Welle 16 ist mit einer Verteilerscheibe 18 fest verbunden, die in dichtendem Kontakt mit der Wand des Gehäuses 1 ist und gegen die der Deckel 4 mit irgendwelchen geeigneten Mitteln gehalten wird. Beispielsweise weisen in der dargestellten Ausführungsform das Gehäuse 1 und der Deckel 4 jeweils zwei seitliche Lappen 20 bzw. 21 auf, die von zwei Schrauben 22 durchsetzt und mittels Muttern 23 gegeneinander gedrückt werden.

Im Inneren des Gehäuses 1 begrenzt eine Trennwand 24 zusammen mit der Wand dieses Gehäuses einen Unterdruckkanal 26, der mit dem Ansaugkamin 2 in Verbindung steht. Da die Trennwand 24 in ihrem oberen Teil im wesentlichen die Form eines umgedrehten V hat, weist der Unterdruckkanal 26 im Bereich des Ansaugkamins einen weiten oberen Teil 27, im wesentlichen halbmondförmig, auf. Jedes der Enden dieses Halbmonds setzt sich in einem

engen Umfangschenkel 28 bzw. 30 fort, wobei diese beide Schenkel sich gegeneinander richten, sich aber nicht verbinden. Die Enden dieser Schenkel 28 und 30 sind vielmehr im unteren Teil des Gehäuses 1 an der Abgabeöffnung der Körner aus dem Deckel 4 verschlossen. Ihre Enden 29, 31 sind in dieser Ausführungsform gegenüber dieser Öffnung 14 leicht verschoben, so daß das Ende 29 des Schenkels 28 höher liegt als das Ende 31 des Schenkels 30. Das Ende 31 des im Drehsinne der Verteilerscheibe 18, der durch den Pfeil F in Fig. 2 angegeben ist, absteigenden Schenkels ist normalerweise der tiefste Punkt des Verteilers.

Im oberen Teil des Schenkels 30, d.h. des absteigenden Schenkels, weist die Wand des Gehäuses 1 sowie die gegenüberliegende Seite der Trennwand 24 jeweils eine gekrümmte Ausnehmung 32 und 33 auf, die zusammen einen Hohlraum zur Aufnahme eines Verschließelements begrenzen, das in der dargestellten Ausführungsform durch einen zylindrischen Stopfen 34 gebildet ist, aber auch durch eine Klappe, einen Schiebedeckel oder irgendeine andere geeignete Einrichtung gebildet sein kann. Dieser Stopfen 34 hat eine axiale Länge, die gleich der Tiefe des Gehäuses 1 ist, so daß, wenn er in dem Hohlraum 32, 33 aufgenommen ist, er den Eingang des Schenkels 30 des Unterdruckkanals vollständig veschließt und diesen vom Ansaugkamin 2 isoliert. Der Stopfen 34 ist jedoch lösbar und kann leicht zurückgezogen werden, wenn der Schenkel 30 einem Unterdruck unterworfen werden muß. Der Boden 36 des Gehäuses 1 ist ferner im Bereich des Ansaugkamins 2 mit einem Lüftungsloch 38 versehen, welchem ein Bedienelement bzw. Bedienhebel 40 zugeordnet ist, der hinter dem Boden 36 auf einer Welle 42 schwenkbar ist, die einen äußeren Buckel 44 der Wand des Gehäuses 1 durchsetzt (Fig. 4).

Bei der in Fig. 1 bis 4 dargestellten Ausführungsform ist die Verteilerscheibe 18 mit einer Reihe von Flügeln 46 versehen, die ganz in Richtung des Deckels 4 vorspringen und regelmäßig über den Umfang verteilt sind, und weist zwei Umfangsreihen von zwei Löchern 48, 50 auf, wobei ein Loch jeder Reihe in einer

Zelle 47 enthalten ist, die durch zwei benachbarte Flügel 46 begrenzt wird. Der Durchmesser der Öffnungen 48, 50 sowie ihre Radiallage sind so, daß die Löcher 48 der radial äußeren Reihe sich vor den engen Schenkeln 28 oder 30 des Unterdruckkanals befinden, während sich die Löcher 50 der inneren Reihe vor dem zylindrischen Abschnitt 24a, 24b der Trennwand 24 anordnen, die diese engen Schenkel 28 und 30 begrenzt. Im oberen Teil des Gehäuses münden die beiden Reihen von Löchern 48, 50 im weitem Teil 28 des Unterdruckkanals, wie dies im einzelnen in Fig. 2 gezeigt ist. Auf der Seite der Scheibe, die dem Unterdruckkanal gegenüberliegt, sind die durch die benachbarten Flügel 46 begrenzten Zellen 47 radial außen durch den Rand 10 des Kragens 8 und innen durch eine zylindrische Fortsetzung 52 der Wand des Kornbehälters abgeschlossen, die sich vor dem absteigenden Teil des Unterdruckkanals über etwas mehr als die Hälfte eines Umfangs, d.h. bis zu einem Punkt jenseits der Öffnung 14 zur Abgabe der Körner erstreckt.

Auf der anderen Seite des Verteilers, d.h. im Bereich des ansteigenden Abschnitts des Unterdruckkanals stehen die Zellen mit dem Behälter 6 in Verbindung. Ferner trägt der Buckel 44 über zwei Achsen 56 und 57 ein Ablenkelement 58, an welchem die Seite der Verteilerscheibe 18 gleitet, die dem Unterdruckkanal abgewandt liegt. Das Element 58 ist vorzugsweise eine Platte, deren Unterrand geradlinig ist und die ein solches Profil hat, daß sie teilweise, dann vollständig, die Öffnungen 48 der äußeren Reihe nach Maßgabe der Zunahme der Breite des Unterdruckkanals 26 abdeckt.

Der so aufgebaute Verteiler gewährleistet mit Präzision unter Verwendung eines geringen Unterdrucks Aussaaten, deren Dichte nicht sehr hoch ist. Wenn nämlich nach Anordnung die Körner 60 im Behälter 6 die Welle 16, beispielsweise über ein Kettenrad 62 gedreht wird, dringen Körner in die Zellen 47 ein, die im unteren Teil des Gehäuses jenseits der Wand 52 liegen, und werden durch den in dem Kanal 26 und besonders im ansteigen-

den Schenkel 28 herrschenden Unterdruck mitgenommen. Danach werden die Körner, im allgemeinen in Gruppen von zweien oder dreien, gegen jedes der Löcher 48, die diesem ansteigenden Schenkel entsprechen, angelegt und in Richtung des breiten Abschnitts 27 des Kanals 26 mitgenommen. Bei ihren Eintritt in diesen erweiterten Abschnitt schlägt jede Gruppe von Körnern gegen den Ablenker 58 an, der sie in Richtung der Öffnungen 50 der Innenreihe drückt, so daß nur eines der Körner verbleibt und die anderen in den zentralen Behälter 6 zurückfallen. Ein Korn wird so durch den Unterdruck gegen jedes der Löcher 50 gelegt und durch die Verteilerscheibe 18 bis an den Stopfen 34 mitgenommen. An diesem Punkt wird die Unterdruckwirkung unterbrochen und ein Korn fällt durch einfache Schwerkraft in die Zelle 47, die es enthält, wo es durch den Flügel 46 und den Rand 10 des Deckels bis zu dem Zeitpunkt zurückgehalten wird, zu dem es die Abgabeöffung 14 erreicht, die ihm erlaubt, in die einzusäende Furche zu fallen.

Während dieses Vorgangs ist das Bedienelement 40 in seiner in Fig. 2 dargestellten Stellung gehalten worden, in der es das Luftloch 38 vollständig verschließt, derart, daß im Inneren des Unterdruckkanals 26 ein maximaler Unterdruck gewährleistet und die Verteilung von verhältnismäßig schweren Körner, wie Maiskörnern oder ähnlichen, möglich ist, oder versetzt worden, derart, daß ein mehr oder weniger großer Teil dieses Luftlochs freigegeben und so die Größe des Unterdrucks im Inneren des Kanals 26 vermindert ist, um die Verteilung von leichten Körnern, wie von Zuckerrüben, zu erleichtern.

Da die leichten Körner oft auch kleine Körner sind, kann es vorteilhaft sein, den Ablenker zu verschieben, um den geradlinigen Rand 64 des Ablenkers schneller an die Löcher 50 heranzurücken, wenn man das Luftloch 38 öffnet. Man verwendet also vorzugsweise in diesem Fall als Ablenker eine Platte 66, die einerseits auf einer festen Achse 57 und andererseits auf einer beweglichen Achse 67, die auf der Schwenkachse 42 des Bedienele-

ments 40 exzentriert ist, wie dies die Fig. 4 und 5 zeigen. Auf diese Weise bewirkt ein Schwenken des Endes des Bedienhebels 40, nach links bei Betrachtung der Fig. 5, gleichzeitig eine Zunahme der Öffnung des Luftloches 38 und ein Absenken des oberen Endes der Platte 66 derart, daß diese an die Löcher 50 heranrückt, die sie teilweise verschließen kann. Natürlich hebt ein Verschwenken des Bedienhebels 40 im entgegengesetzten Sinne zum Verschließen des Luftloches umgekehrt das obere Ende der Platte 60 an und ermäglicht, daß Körner größerer Abmessungen in wirksamer Weise durch einen höhren Unterdruck, der sich durch die Löcher 50 hindurch entfaltet, festgehalten werden.

Der Verteiler kann also durch einfaches Einstellen der Stellung des Bedienelements 40 verschiedenen Arten von Körnern angepaßt werden und ihre Einzelablegung in extrem zuverlässiger und regelmäßiger Weise gewährleisten.

Dieser Verteiler kann auch anstelle der Verteilerscheibe 18 eine von Flügeln freie Verteilerscheibe 68 aufweisen (Fig. 6), die nur eine einzige Umfangsreihe von Löchern 70 aufweist. In diesem Fall sind die Löcher 70 so ausgebildet, daß sie mit dem Unterdruckkanal 26 korrespondieren und insbesondere dem Innenvolumen der engen Schenkel 28 und 30. Ferner ist der Stopfen 34 zurückgezogen, so daß die Gesamtheit des Kanals 26 dem Unterdruck unterworfen ist, und daß lediglich die Löcher 70, die sich in dem zwischen den Enden 29 und 31 der engen Schenkel 28 und 30 freigelassenen Raum befinden, nicht eben diesem Unterdruck unterworfen sind.

Am Eintritt des aufgeweiteten Teils 27 des Unterdruckkanals 26 trägt der Buckel 44 als Ablenker eine Platte 72, deren unterer Rand gezahnt ist und infolgedessen eine Aufeinanderfolge von Rampen 73, 74, 75 bildet, die in Bezug auf den durch die Löcher 70 gebildeten Umfang geneigt sind. Die Platte 72 ist vorzugsweise auf der festen Achse 57 und der beweglichen Achse 67 angebracht derart, daß sie in Bezug auf die Reihe von Löchern 70 in Abhängigkeit von der Stellung des Bedienhebels 40, d.h. der

Öffnung des Luftlochs 38, versetzt werden kann. Auf diese Weise kann, wie bei der vorstehenden Ausführungsform, die Stellung der Platte 72 gleichzeitig mit der Größe des im Kanal 26 herrschenden Unterdrucks variiert werden.

Dieser Unterdruck muß jedoch stets groß und in der gesamten Ausdehnung des Kanals 26 vorhanden sein. Bei der Drehung der Scheibe 68 werden die Körner 60 durch den Ansaugefekt, der sich durch die Löcher 70, die sich vor dem engen Schenkel 28 befinden, hindurch entfaltet, aus dem Behälter 6 entnommen. Sie ballen sich im allgemeinen in Gruppen von zweien oder dreien gegen jedes dieser Löcher zusammen und werden durch letztere in Richtung der Platte 72 oder genauer der Rampen 73, 74 und 75 mitgenommen. Unter aufeinanderfolgendem Anschlagen gegen diese Rampen wird die Gruppe von Körnern versetzt und nur eines von letzteren bleibt gegen das Loch 70 angelegt, während die anderen in den zentralen Behälter zurückfallen. Das am Loch 70 verbliebene Korn 60 wird über die gesamt Länge des Unterdruckkanals 26 bis zum Ende 31 des engen Schenkels 30, d.h. praktisch bis zu dem Augenblick, wo es sich vor der Abgabeöffnung 14 befindet, versetzt. Es fällt dann auf den Boden.

Wie bei der vorstehenden Ausführungsform können die Größe des Unterdrucks sowie die Stellung der Ablenkeinrichtung bzw. Selektionsplatte in extrem einfacher Weise in Abhängigkeit von der Natur der Körner reguliert werden. Ferner kann der Verteiler leicht an verschiedenen Arten von Samen angepaßt werden, weil der Austausch der Scheibe 18 gegen die Scheibe 68 oder umgekehrt einfach das Öffnen des Deckels 4 erforderlich macht, damit die erste Scheibe von der Achse 16 abgezogen, der Stopfen 34 zurückgezogen oder wieder aufgesetzt, dann die neue Scheibe auf die Achse 16 gesteckt werden kann, bevor der Deckel 4 angebracht wird. Solche Vorgänge können leicht vom Landwirt durchgeführt werden, so daß der Besitz einer Sämaschine und mehrerer Verteilerscheiben für ihn ausreichend ist, um in wirksamer Weise jeder Art von Saat auszubringen, indem er über den Unterdruck

und den Sätakt, die am geeignesten sind, verfügen kann.

Es liegt auf der Hand, daß der Verteiler auch eine Scheibe aufweisen kann, die mit Flügeln versehen und von einer einzigen Lochreihe für eine Aussaat von schweren Körnern geringer Dichte durchsetzt ist. Eine solche Scheibe wird vorzugsweise mit angebrachter Verschließeinrichtung 34 zur Begrenzung des Unterdruckabrufs verwendet.

Ebenso könnte die Verteilerscheibe auch mehr als zwei Lochreihen aufweisen.

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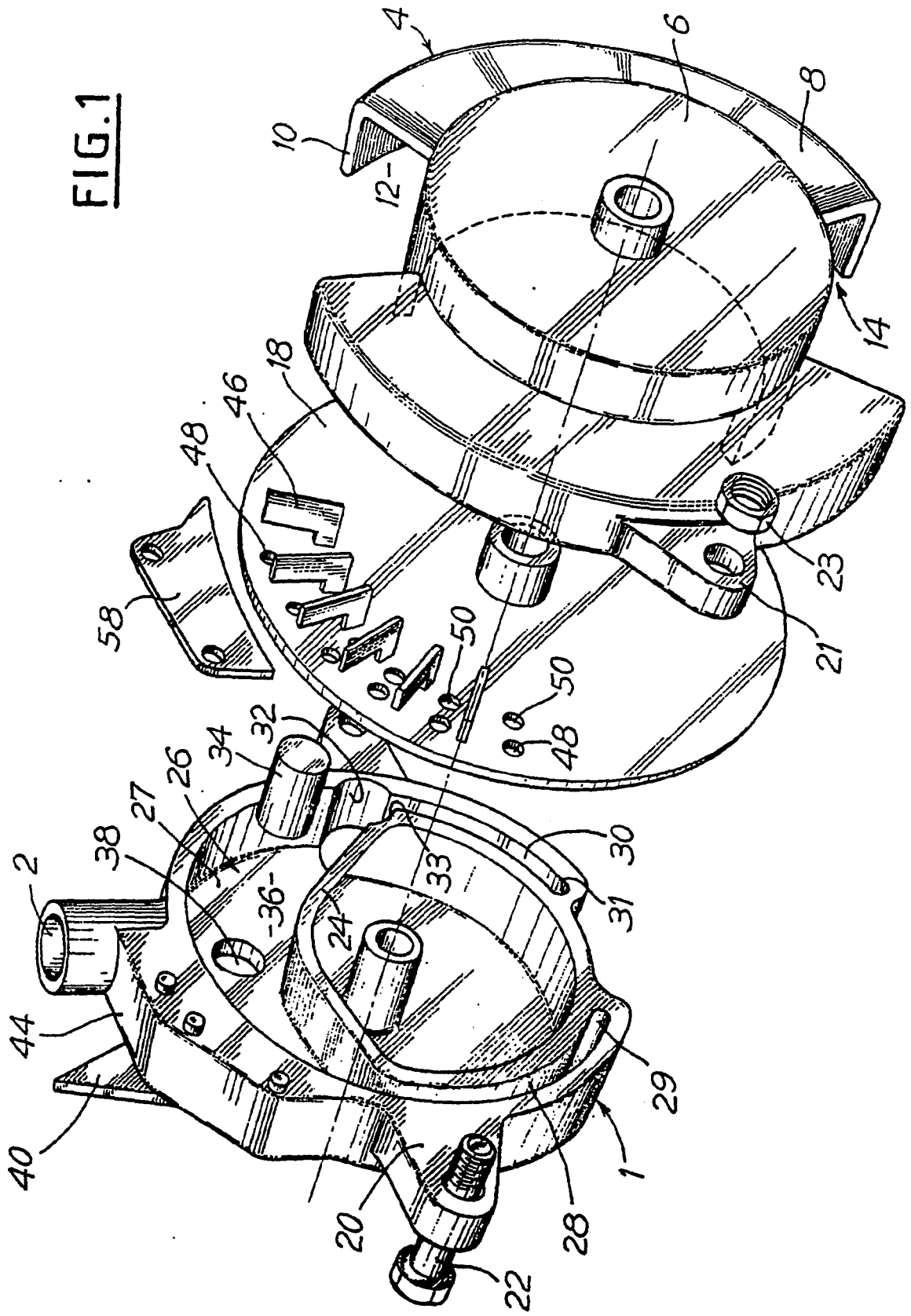
Patentansprüche

1. Verteiler für eine Einzelkornsämaschine, mit einem im wesentlichen zylinderförmigen Gehäuse, in dem auf einer horizontalen Achse eine Verteilerscheibe (18, 68) drehbar angebracht ist, welche mit in Umfangrichtung im Abstand liegenden Öffnungen versehen ist und einen Kornbehälter (6) von einer Ansaugvorrichtung trennt, welche mit einem Element (38) zur Ansaugregulierung versehen ist derart, daß die Öffnungen einem Unterdruck zum Festhalten der aus dem Behälter entnommenen Körner während wenigstens eines Teils von deren winkelmäßiger Versetzung unterworfen werden; Mitteln zur Beseitigung von Doppelkörnern, die durch eine Ablenkeinrichtung (66, 72) gebildet sind, und, im unteren Teil des Gehäuses, einer Abgabeöffnung für die Körner, dadurch gekennzeichent, daß die Ablenkeinrichtung (66, 72) beweglich ist, und daß ein Bedienelement (40) vorgesehen ist, welches sowohl das Element (38) zur Ansaugregulierung als auch die Stellung der Ablenkeinrichtung (66, 72) steuert.

2. Verteiler nach Anspruch 1, dadurch gekennzeichnet, daß das Bedienelement (40) schwenkbar ist.

3. Verteiler nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß die bewegliche Ablenkeinrichtung (66, 72) schwenkbar angebracht ist, wobei das eine ihrer Enden auf einer beweglichen Achse (67) sitzt, die durch das Schwenken des Bedienelements (40) zur Steuerung des Elements (38) zur Ansaugregulierung verschoben wird.

FIG.1


4
6
8
10
12
14
18
46
48
58
50
23
21
32
34
26
27
38
2
36
33
30
31
24
44
40
29
1
20
28
22

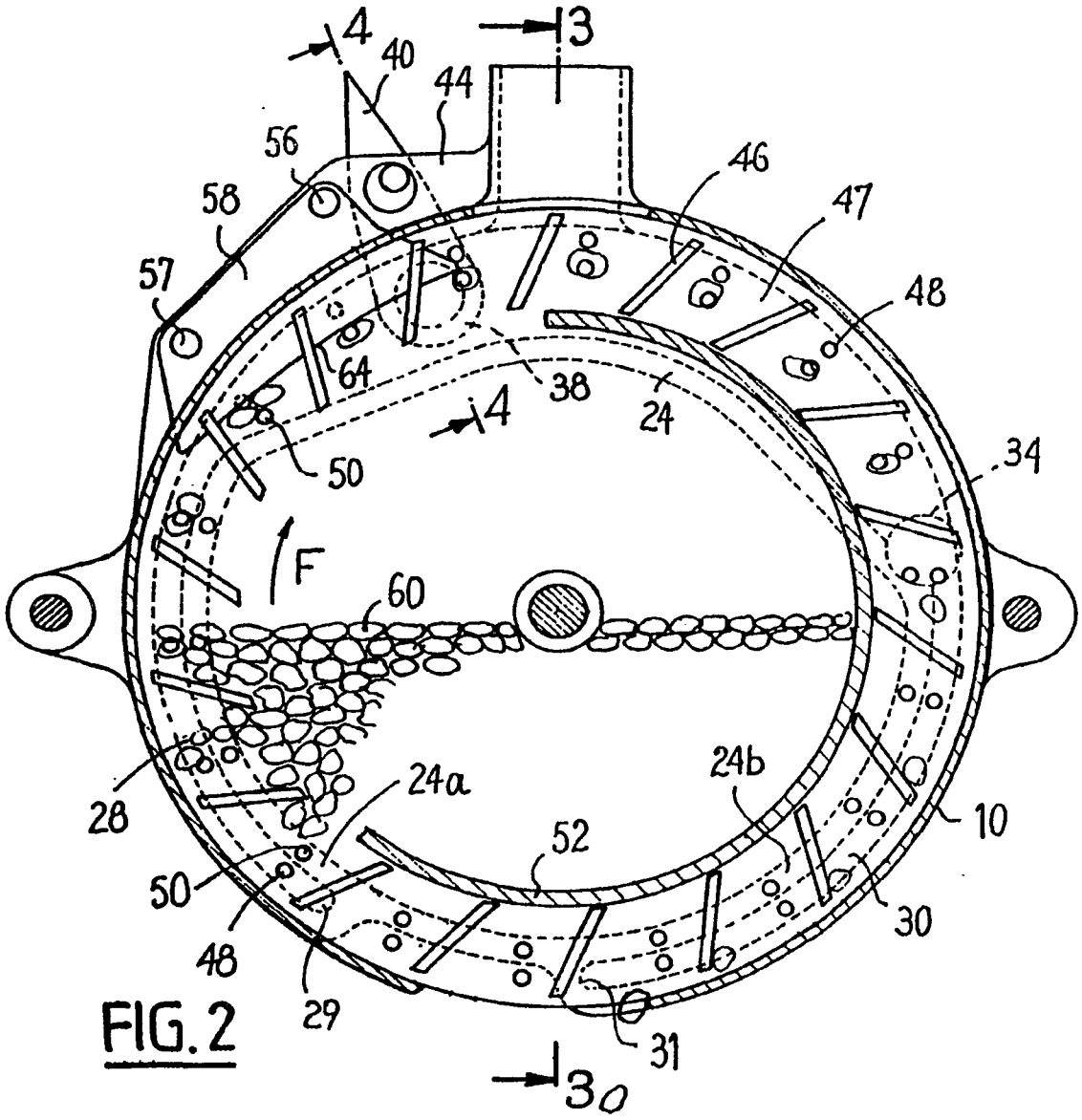

4
3
40
44
56
58
57
46
47
48
64
38
24
4
50
34
F
60
28
24a
24b
52
10
50
48
29
30
31
3
0

FIG. 2

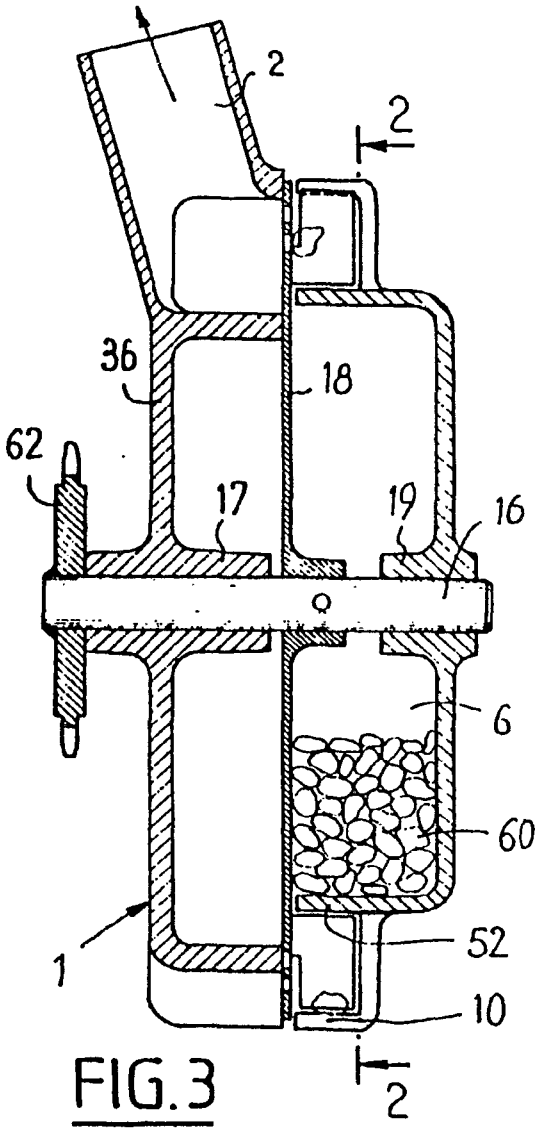

2
2
36
18
62
17
19
16
6
60
1
52
10
2

FIG. 3

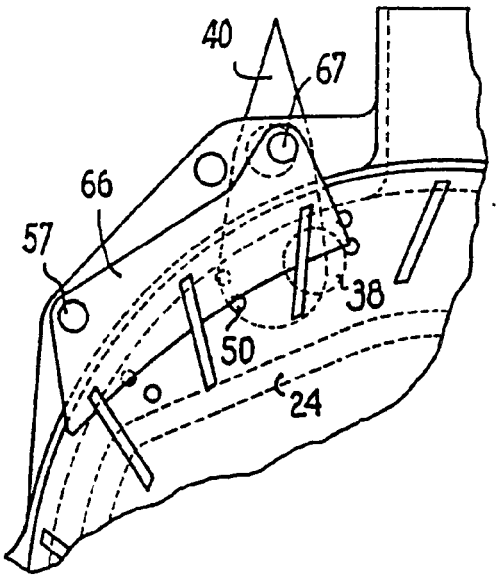


FIG.5

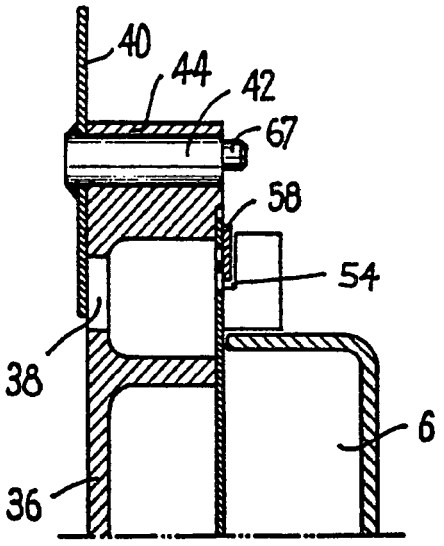


FIG.4

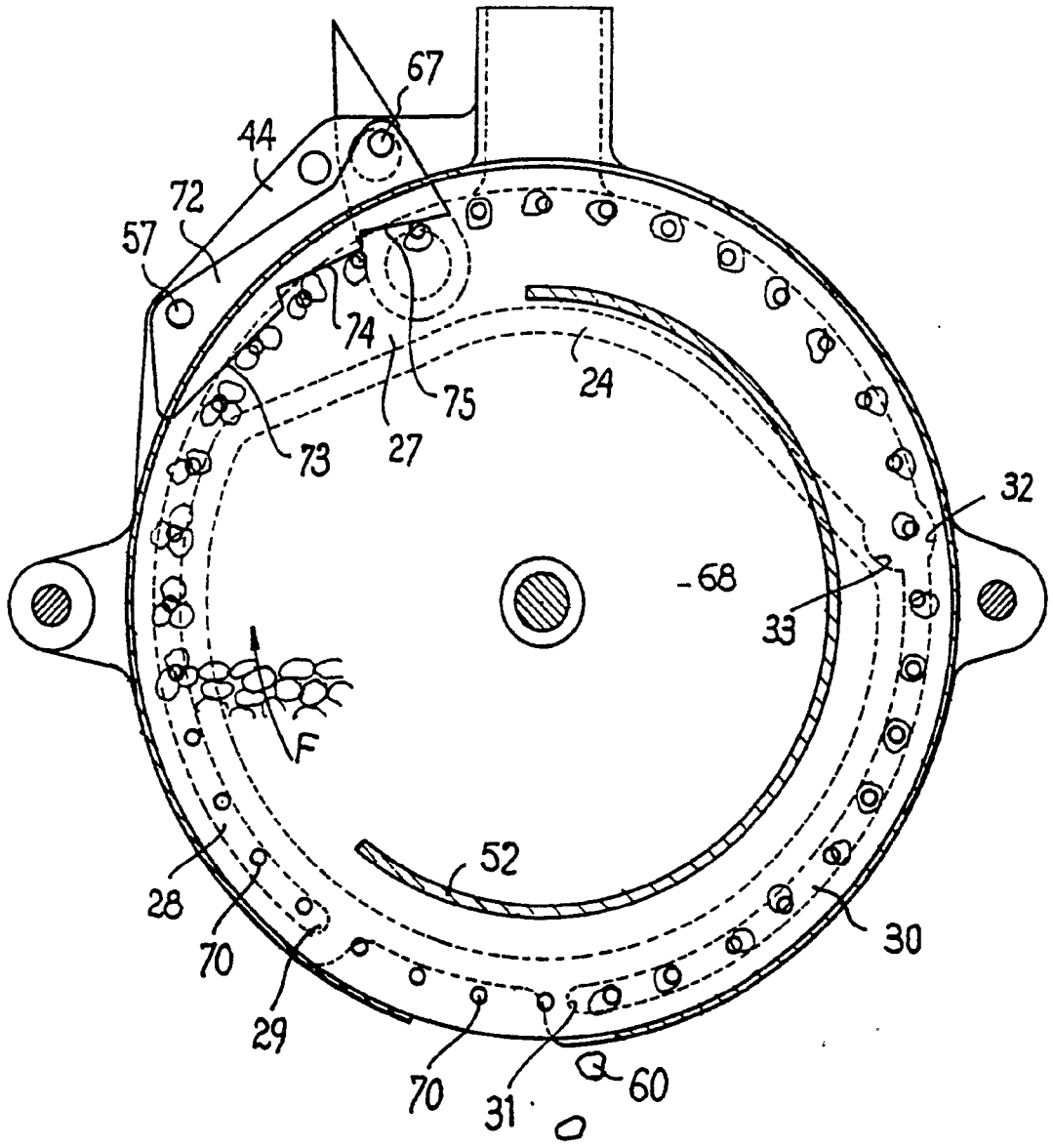


FIG. 6

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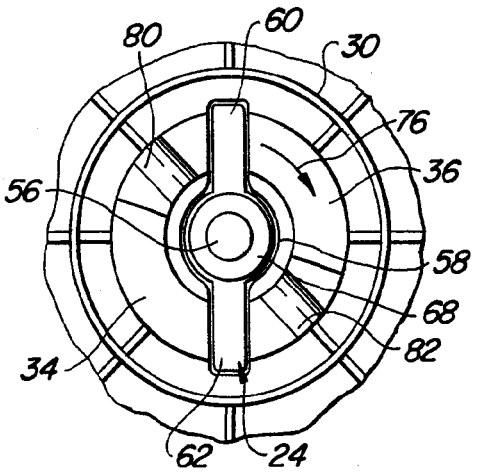
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(54) Disk mounting arrangement.

(57) A seed disk in a vacuum seed meter has a central mounting aperture in the form of a slot widening to a circular hole at its centre. When the disk is mounted on the hub of the seed meter a correspondingly shaped raised portion of the hub is received in the aperture to key the disk to the hub and a correspondingly shaped handle (24) passes through the aperture. The handle is retained rotatably on a shaft by a cap (56) and a coil spring under the cap urges the handle towards the hub. After the disk has been fitted, the handle is rotated as indicated by arrow (76) and the arms (60, 62) of the handle ride up ramps (34, 36) until the arms click into detent recesses (82. 80).



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DISK MOUNTING ARRANGEMENT

The present invention relates to an arrangement for releasably mounting a disk or other relatively flat member on a hub, comprising a relatively flat member having an elongated aperture therein, a hub, and an elongated handle rotatably mounted on the hub, the handle being adapted to fit through the elongated aperture and when rotated out of alignment with the aperture, to trap the said member on the hub.

It is sometimes necessary that a disk be releasably mounted on a rotatable hub, e.g. if the disks are interchangeable or are removed for cleaning or for other reasons.

One example of an arrangement in which a disk must be releasably mounted on a rotatable hub is a seed meter in which a relatively flat seed disk is releasably mounted on a rotatable hub within the generally cylindrical housing of the seed meter. The generally cylindrical housing is composed of mating half shells which are hinged and are coupled together with a clasp. In this manner, the housing may be opened to permit removal of or replacement of the seed disk. Removal of the seed disk may be necessary in order to clean the seed disk or to clean the interior of the seed meter housing or otherwise gain access thereto. Different seed disks are used to meter different types of seeds. Therefore, removal of the seed disk may be necessary in order to replace it with another seed disk designed for use with a different type of seed which is to be planted. The seed disk in a vacuum seed meter must be securely retained on the hub so as to be able to withstand the force of a seed mass and air pressure on the disk and must be driven by the hub through the seed mass and past various other restraining objects within the seed meter housing. In addition, the seed disk must form a relatively airtight seal with the hub so that the vacuum created at one side of the disk communicates with the opposite side of the disk only through apertures in a plurality of seed cells within the disk. At the same time the disk should be capable of relatively easy replacement and preferably without the need for special tools.

A number of different arrangements are known for releasably mounting a relatively flat member such as a seed disk on a rotating

hub within a seed meter or similar agricultural implement. One such arrangement is shown in US Patent 2,695,733 wherein the disk is retained by a cap fitted on to a T-bar by a bayonet fixing. The arrangement is relatively complicated and such arrangements have proved to be cumbersome if not impractical because of the difficulty involved in changing the seed disk. In many cases special tools are required. Even if special tools are not required, considerable physical effort may be necessary. These factors become even more of a problem in situations involving limited space such as where the planting units are spaced closely together for planting narrow rows.

At the same time certain other arrangements in the art have achieved some simplicity but have not addressed the particular problems peculiar to devices such as agricultural seed meters where a tight, sealing, load-bearing fit are necessary. Such arrangements include those shown in US Patent 3,214,996 where replaceable cams are releasably mounted on a rotatable bushing by a spring loaded retaining ring and those shown in US Patent 4,101,232 where legs are mounted on a disk-like member using a lugged post in conjunction with a head having ramped bearing surfaces.

The object of the present invention is to provide an improved arrangement which is useable in relatively quick and simple fashion and without the need for special tools or the expenditure of considerable physical effort. It is furthermore desirable to provide an arrangement in which the disk is capable of forming a seal with the hub as well as having a substantial load-bearing fit.

The arrangement in accordance with the invention is characterised by a ramp surface adjacent the aperture, whereby the handle rides up the ramp surface when it is rotated out of alignment with the aperture and jams the said member on to the hub.

In a preferred arrangement in accordance with the invention, a rotatable hub on which a disk is releasably mounted is provided with a central raised portion having a cross-sectional shape similar to that of a central mating elongated slot in the disk. The raised portion of the hub is slightly smaller in size than the slot in the disk so that the raised portion is received within the slot when the disk is mounted on the hub. The raised portion of the hub seats the disk on the hub in relatively secure, close-fitting fashion so that

the disk is capable of bearing a substantial load when driven in response to rotation of the hub.

An elongated handle having a cross-sectional shape similar to that of the raised portion of the hub is disposed on the raised portion by a shaft which is mounted on the raised portion and which has the handle slidably and rotatably mounted thereon. The handle is resiliently biased toward and into contact with the raised portion by a coil spring which encircles the shaft and resides between the elongated handle and a keeper at the end of the shaft opposite the raised portion. The spring seats a pair of rounded detent surfaces at the bottom of opposite portions of the handle in opposite detent recesses in the raised portion of the hub to maintain the handle in alignment with the raised portion of the hub when the disk is positioned on the hub.

The disk has a pair of camming ramps formed therein on opposite sides of the elongated slot. The camming ramps are of partially circular configuration and have heights which gradually increase in a common direction around the slot. Each of the camming ramps has a detent recess therein at a position of maximum height thereon.

The disk is releasably mounted on the hub by inserting the elongated handle through the slot in the disk so that the disk is seated on the hub and the raised portion of the hub resides within the slot. The elongated handle is then rotated, causing it to unseat from the opposite detent recesses in the raised portion at the hub and to ride up on the opposite camming ramps against the resistance of the coil spring disposed between the handle and the keeper at the end of the shaft. Eventually the opposite detent surfaces at the bottom of the elongated handle are pushed into the detent recesses in the ramps by the coil spring to complete the disk mounting operation.

Removal of the disk is accomplished by rotating the elongated handle in the opposite direction to unseat the detent surfaces of the opposite portions of the handle from the detent recesses in the ramps and then allow such opposite portions to ride down along the opposite camming ramps until the handle is aligned with the raised portion of the hub and the slot and the detent surfaces of the handle are seated in the detent recesses in the raised portion. The

disk may then be pulled away from the hub to complete the removal thereof.

A sealing, relatively airtight fit between the disk and the hub is accomplished by providing the side of the disk opposite the pair of camming ramps and adjacent the hub with an annular flange which seats against the face of the hub when the disk is seated in place on the hub.

The invention will be described in more detail, by way of example and with reference to the accompanying drawings, in which:

Fig 1 is a perspective view of a seed meter in an open position and showing a seed disk in conjunction with a disk mounting arrangement embodying the invention;

Fig 2 is a front view of the seed meter of Fig 1 and showing the reverse side of the seed disk;

Fig 3 is a sectional view of the seed meter of Fig 1 with the seed disk releasably mounted and the meter in the closed position;

Fig 4 is a perspective, exploded view of a portion of the disk mounting arrangement illustrating the manner in which the handle is mounted on the hub;

Fig 5 is a plan view of a central portion of the seed disk illustrating the details thereof;

Fig 6 is a plan view of the central portion of the seed disk with the disk placed over the handle and onto the hub;

Fig 7 is a plan view of the central portion of the seed disk illustrating the position that the handle assumes after it has been rotated up on opposite camming ramps and into detent recesses therein; and

Fig 8 is a perspective view of the central portion of the seed disk.

Fig 1 illustrates a seed meter 10 which has a generally cylindrical housing 12. The housing 12 is composed of a first half shell 14 which is mounted at the base of a seed hopper 16 and is coupled via a hinge 18 to an opposite, mating second half shell 20.

A hub 22 is rotatably mounted within the first half shell 14 at the centre thereof. An elongated handle 24 mounted on the hub 22 forms part of a disk mounting arrangement 26 in accordance with the invention for releasably mounting a seed disk 28 on the hub 22. As

described hereafter in detail, the seed disk 28 has a central portion 30 having an elongated slot 32 therein. A pair of curved camming ramps 34 and 36 are formed within the central portion 30 of the seed disk 28 on opposite sides of the elongated slot 32. When the seed disk 28 is placed on the hub 22, the elongated handle 24 extends through the elongated slot 32. Rotation of the handle 24 causes the opposite ends thereof to ride up on the camming ramps 34 and 36 of the seed disk 28 to a pair of opposite detent recesses in which the handle becomes seated.

With the seed disk 28 mounted on the hub 22 using the disk mounting arrangement 26, the second half shell 20 may be closed over the seed disk 28 and onto the first half shell 14 to close the seed meter 10. Seeds from the hopper 16 flow into the bottom of the first half shell 14 where they form a seed mass on one side of the seed disk 28. Seed cells 37 on that side of the seed disk 28 agitate, accelerate and then capture therein individual seeds from the seed mass. The individual seeds are held in the cells by the force of a vacuum created within the second half shell 20 on the opposite side of the seed disk 28 and which communicates with the seed cells 37 via apertures 38 located at the bottoms of the seed cells 37 and which extend through the thickness of the seed disk 28. The seeds are held by such vacuum until they reach a seed discharge area 39 within the first half shell 14 which is isolated from the effects of the vacuum within the second half shell 20. This causes the individual seeds to be released from the seed cells 37 in the seed disk 28 so that the seeds fall through a seed chute 40 at the bottom of the first half shell 14 to the ground below.

As the seed disk 28 rotates within the generally cylindrical housing 12 it encounters considerable resistance from a number of items including the seed mass at the bottom of the first half shell 14, a seal 42 at the inside of the second half shell 20 which bears against the opposite side of the seed disk 28 from the seed mass, and a divider brush 44 which is mounted within the first half shell 14 and which helps to separate the seed discharge area 39. This resistance requires that the seed disk 28 be mounted on the hub 22 in positive, non-slip fashion. At the same time the seed disk 28 must be positioned within the generally cylindrical housing 12 in

relatively accurate and precise fashion requiring a relatively accurate, precise fit of the seed disk 28 on the hub 22. This fit must be maintained in the face of forces exerted on the sides of the disk by the seed mass and the vacuum. In addition, the presence of the vacuum within the second half shell 20 requires a relatively air-tight mounting of the seed disk 28 onto the hub 22 so that the seed cells 37 located about the seed disk 28 are exposed to the full force of the vacuum within the second half shell 20 via the aperture 38.

Referring to Fig 4 it will be seen that the hub 22 which has a central axis 46 has a raised portion 48 at the centre thereof. The raised portion 48 is composed of a generally cylindrical portion 50 at the centre of the raised portion 48 and an opposite pair of elongated portions 52 and 54 having concave upper surfaces forming an opposite pair of detent recesses 55 thereon. An elongated shaft 56 is mounted on the cylindrical portion 50 of the raised portion 48 so as to extend upwardly along the central axis 46.

The elongated handle 24 is composed of a generally cylindrical portion 58 at the centre thereof and opposite elongated portions 60 and 62 having convex lower surfaces forming an opposite pair of detent surfaces 63. The detent surfaces 63 normally reside in the detent recesses 55 in the raised portion 48 of the hub 22 when the second seed disk 28 is not mounted in the hub 22. The cylindrical portion 58 has a central aperture 64 therein for receiving the shaft 56. The central aperture 64 also receives a coil spring 66 which encircles the shaft 56. A keeper 68 is mounted on the upper end of shaft 56 opposite the hub 22. The keeper 68 is disposed on the opposite side of the coil spring 66 from the elongated handle 24.

Referring now to Fig 5 it will be seen that the elongated slot 32 within the central portion 30 of the seed disk 28 is composed of a generally circular central portion 70 and opposite elongated portions 72 and 74. Accordingly, the elongated slot 32 has a shape similar to the cross-sectional shape of the raised portion 48 of the hub 22 and a size slightly larger than the raised portion 48. When the seed disk 28 is mounted on the hub 22, the raised portion 48 resides within the elongated slot 32 to provide a positive, driving fit therebetween.

Fig 6 illustrates the central portion 30 of the seed disk 28 with the elongated handle 24 inserted through the elongated slot 32 in the disk 28. The elongated handle 24 has a cross-sectional shape similar to that of the raised portion 48 and also the elongated slot 32. As in the case of the raised portion 48, the handle 24 is slightly smaller than and therefore fits freely through the elongated slot 32. The detent surfaces 63 at the bottom of the handle 24 reside in the detent recesses 55 in the raised portion 48 to provide positive alignment of the opposite portions 52 and 54 of the raised portion 48 with the opposite portions 60 and 62 respectively of the handle 24 to facilitate placement of the seed disk 28 over the handle 24 and the raised portion 48. Thereafter, rotation of the elongated handle 24 in a direction shown by arrows 76 causes the detent surfaces 63 of the opposite elongated portions 60 and 62 thereof to begin to ride up on the opposite camming ramps 34 and 36.

As illustrated in Figs 5-8 the opposite camming ramps 34 and 36 extend generally about major portions of a circle the centre of which lies on a central axis 78 of the central portion 30 of the seed disk 28. It will be seen that each of the camming ramps 34 and 36 is of partially circular shape so as to extend around a portion of the central portion 30 between the opposite elongated portions 72 and 74 of the elongated slot 32. Each of the camming ramps 34 and 36 has a height which gradually increases in a common direction around the central axis 78 to a maximum height at one end thereof. The camming ramp 34 has a concave detent recess 80 in the top surface thereof at a region of maximum height of the ramp 34. Likewise, the camming ramp 36 has a concave detent recess 82 in the top surface thereof at the region of maximum height. The detent recesses 80 and 82 lie along a common diameter which intersects the central axis 78.

Referring again to Fig 4 it will be observed that the elongated handle 24 is capable of movement up and down along the shaft 56 as well as rotation about the shaft 56. Movement of the handle 24 along the shaft 56 in a direction away from the hub 22 is restrained by the coil spring 66. As best seen in Fig 3 the coil spring 66 extends between the keeper 68 and an annular flange 84 formed in the

wall of the central aperture 64 within the handle 24. The coil spring 66 bears against the keeper 68 at the upper end of the shaft 56 to exert a downward force on the handle 24. This downward force tends to maintain the detent surfaces 63 of the handle 24 seated in the detent recesses 55 on the raised portion 48. Upward movement of the handle 24 in a direction away from the raised portion 48 is possible only against the resilient resistance of the spring 66.

It will be noted in connection with Fig 6 that rotation of the handle 24 in the direction of the arrows 76 causes the opposite elongated portions 60 and 62 of the handle 24 to begin to ride up on the opposite camming ramps 34 and 36. Such rotational movement causes the handle 24 to move upwardly and away from the raised portion 48 against the resistance of the coil spring 66. When the opposite elongated portions 60 and 62 of the handle 24 reach the portions of maximum height of the camming ramps 34 and 36, the detent surfaces 63 at the bottom thereof eventually encounter and then seat within the opposite detent recesses 80 and 82. The detent recesses 80 and 82, the concave surfaces of which conform to the rounded detent surfaces 63 of the handle 24, hold the handle 24 in a locked position so as to maintain the seed disk 28 mounted on the hub 22. This position of the handle 24 relative to the central portion 30 of the seed disk 28 is illustrated in Fig 7.

Fig 2 illustrates the side of the seed disk 28 opposite the camming ramps 34 and 36. As shown in Fig 2 such opposite side of the seed disk 28 is provided with an annular flange 86. When the seed disk 28 is mounted on the hub 22, the annular flange 86 resides against the face of the hub 22 to provide a sealing fit between the seed disk 28 and the hub 22. This prevents vacuum pressure within the second half shell 20 from being lost at the interface between the seed disk 28 and the hub 22. The manner in which the annular flange 86 seats against the hub 22 is illustrated in Fig 3. The coil spring 66 must be strong enough to maintain the annular flange 86 seated against the hub 22 in the face of forces exerted on the sides of the seed disk 28 by the seed mass and the vacuum.

Removal of the seed disk 28 from the hub 22 is initiated by rotating the handle 24 in a direction shown by arrows 90 in Fig 7. This unseats the opposite elongated portions 60 and 62 of the handle

24 from the detent recesses 80 and 82 and allows the portions 60 and 62 to ride down along the camming ramps 34 and 36 to the bottoms thereof where continued rotation of the handle 24 places it in the position shown in Fig 6. At this point the tension in the coil spring 66 is released and the detent surfaces 63 of the handle are seated in the detent recesses 55 in the raised portion 48 to align the handle 24 with the elongated slot 32. The seed disk 28 can then simply be lifted to pass the handle 24 through the elongated slot 32 and remove the disk 28 from the hub 22.

Alternatively, removal of the seed disk 28 from the hub 22 can be initiated by rotating the handle 24 in a direction opposite that of the arrows 90 shown in Fig 7. However, this causes the opposite elongated portions 60 and 62 of the handle 24 to drop abruptly off of the high ends of the camming ramps 34 and 36. Because rotation of the handle 24 in the direction shown by the arrows 90 provides a smoother and less abrupt action, this is generally preferred.

CLAIMS

1. An arrangement for releasably mounting a disk or other relatively flat member on a hub, comprising a relatively flat member (28) having an elongated aperture (32) therein, a hub (22), and an elongated handle (24) rotatably mounted on the hub, the handle being adapted to fit through the elongated aperture and, when rotated out of alignment with the aperture, to trap the said member on the hub, characterised by a ramp surface (34) adjacent the aperture (32), whereby the handle (24) rides up the ramp surface when it is rotated out of alignment with the aperture, and jams the said member on to the hub.

2. An arrangement according to claim 1, characterised in that there are two ramp surfaces (34, 36) on opposite sides respectively of the elongated aperture (32).

3. An arrangement according to claim 1 or 2, characterised in that the or each ramp surface (34, 36) leads to a detent recess (80, 82) for receiving the elongated handle (24).

4. An arrangement according to claim 3, characterised in that there are two diametrically opposite detent recesses (80, 82) for receiving opposite ends of the handle.

5. An arrangement according to any of claims 1 to 4, characterised in that the elongated handle (24) is also movable axially relative to the hub (22) and by a spring (66) biasing the handle axially towards the hub.

6. An arrangement according to claim 5, characterised by a shaft (56) mounted on the hub (22) receiving the elongated handle (24), and a keeper (68) mounted on the shaft to retain the elongated handle thereon, and in that the spring (66) is a coil spring encircling the shaft and disposed between the keeper and the elongated handle.

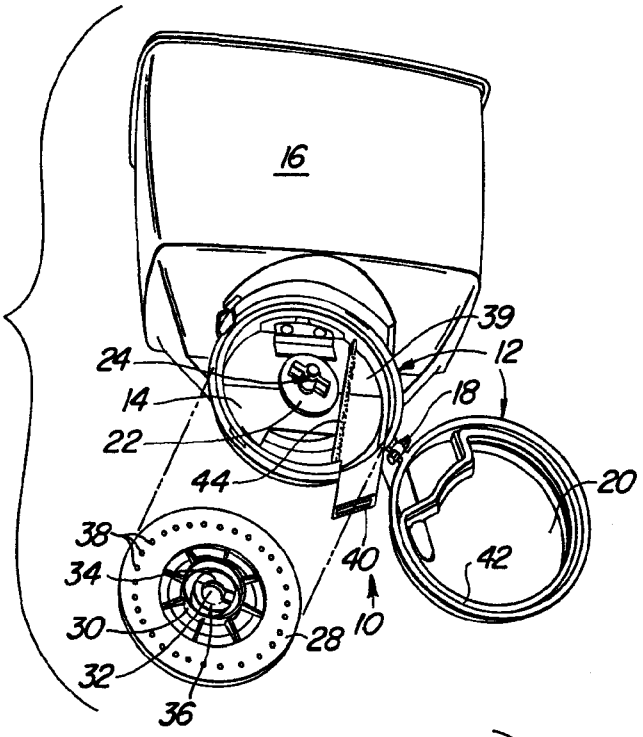
7. An arrangement according to any of claims 1 to 6, characterised

in that the hub (22) has a central raised portion (48) with a cross-sectional shape similar to but slightly smaller than the aperture in the relatively flat member and which resides within the aperture when the said member is mounted on the hub; and in that the elongated handle (24) has a cross-sectional shape similar to the cross-sectional shape of the raised portion of the hub.

8. An arrangement according to claim 7, characterised in that the aperture (32) has a generally circular central portion and a pair of elongated outer portions on opposite sides of the generally circular central portion.

9. An arrangement according to claim 7, wherein the relatively flat member (28) is a seed disk in a seed meter, characterised in that the disk (28) has an annular flange (86) on the side opposite the ramp surfaces (34, 36), the annular flange forming a seal with the hub (22) when the disk is mounted on the hub.

Fig. 1


16
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12
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22
44
20
38
34
40
42
10
30
28
32
36

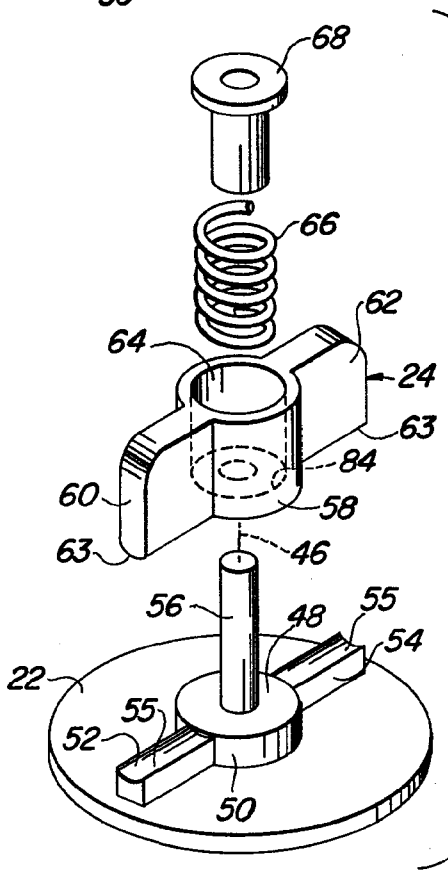

68
66
62
64
24
63
84
60
58
63
46
56
48
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54
22
55
52
50

Fig. 4

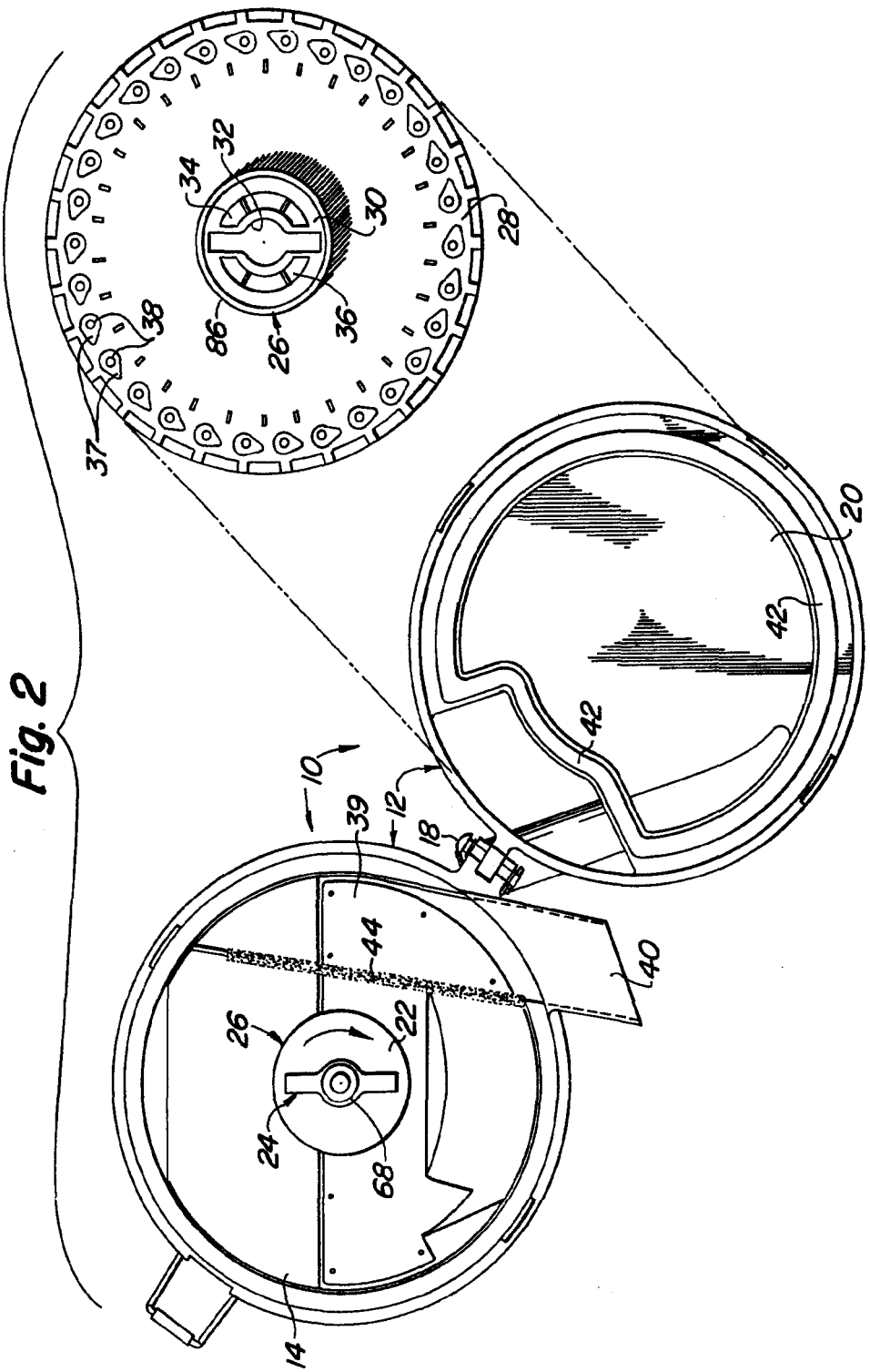


Fig. 2

Fig. 3

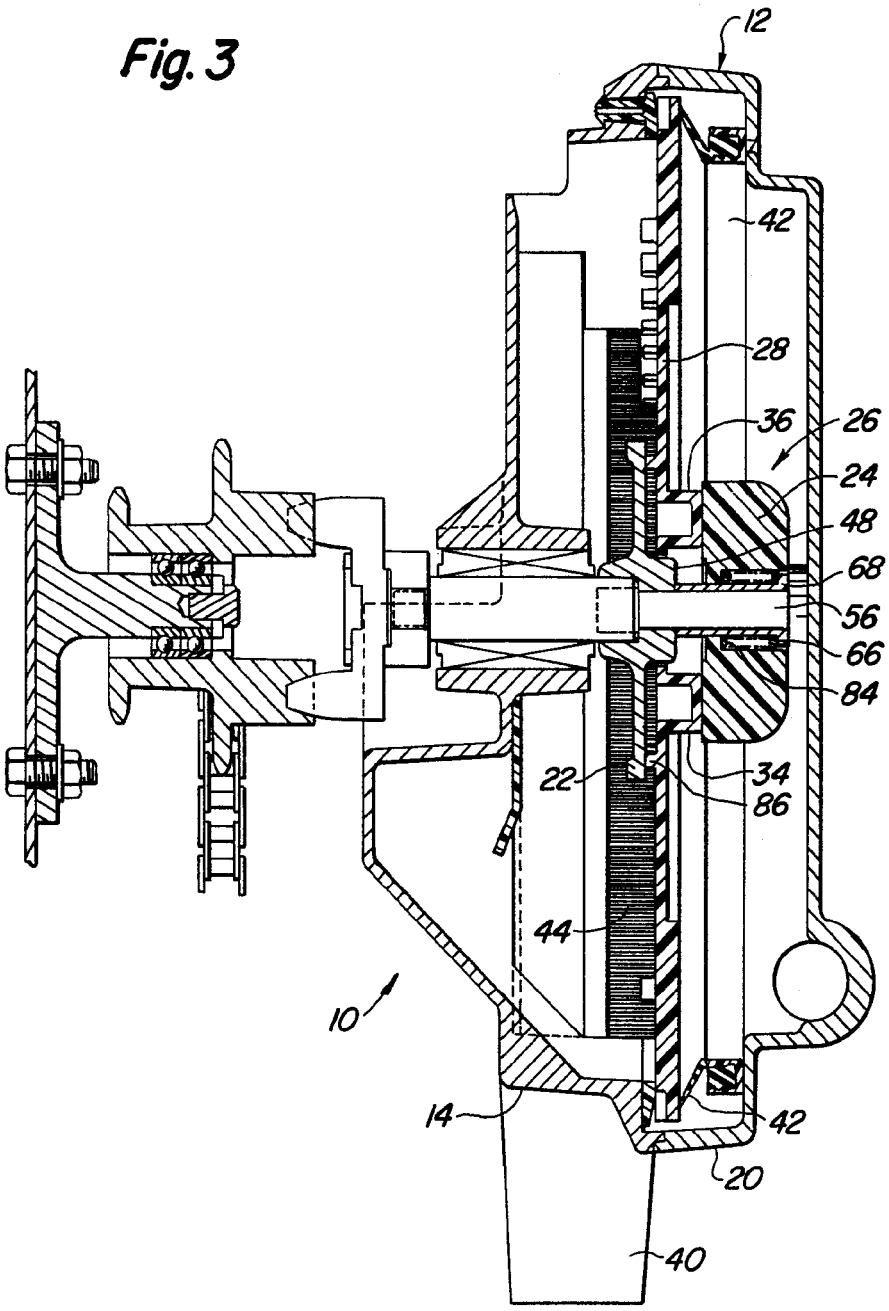


Fig. 5

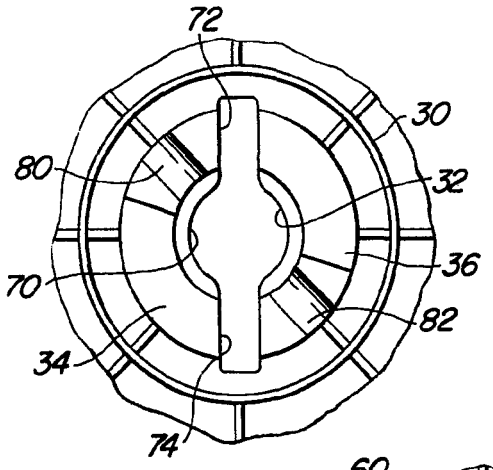
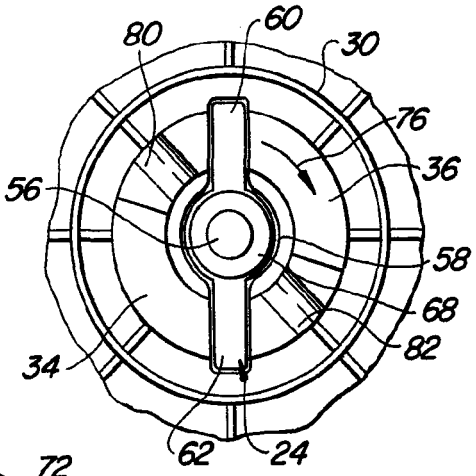


Fig. 6



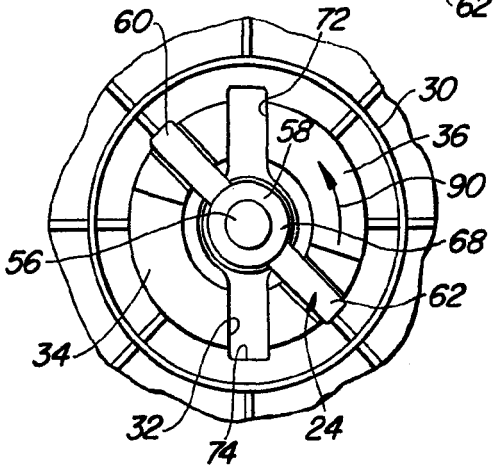


Fig. 7

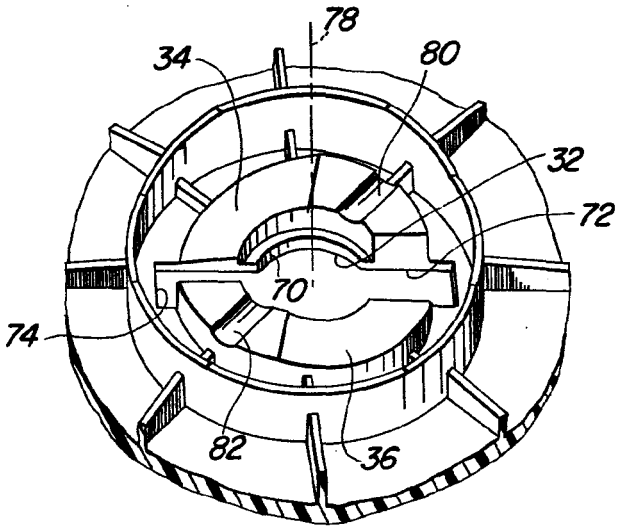


Fig. 8

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Remarks:
This application was filed on 30-09-2014 as a divisional application to the application mentioned under INID code 62.

(54) Seed distribution element for precision seed drills, seed drill including said element

(57) A seed distribution element (1) for precision pneumatic seed drills, includes:
- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20), at controlled speed, jointly with the shaft,
- a housing (10) with a fixed portion (11) in which the shaft is supported and a portion (12) which is movable relative to the fixed portion and can be closed against it, with a seed collection chamber (15) in the fixed portion and a pneumatic suction chamber (17) in the movable portion,
- the sowing disc (16) being interposed between the portions and having opposed surfaces (16a,16b) delimiting the chambers, and being provided with at least one ring of selector holes (23) extending between the opposed surfaces,
- means (9) for producing a pressure differential between the opposed surfaces in the region of a circumferential segment of the ring of holes, including the pneumatic suction chamber, and
- a seal (24) on the movable portion capable of sliding contact with the facing surface of the disc when the portions are closed against one another,
- a thrust-bearing element (26) of the sowing disc, supported rotatably in the movable portion, in order to withstand at least some of the axial load produced by the disc on the seal.

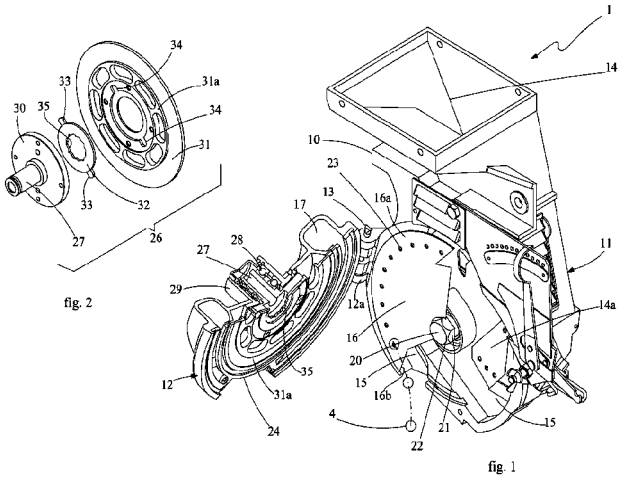


fig. 2

fig. 1

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Description

[0001] The subject of the present invention is a seed distribution element for precision pneumatic seed drills, a sowing element for such machines and a seed drill including a plurality of such sowing elements.

[0002] In precision pneumatic seed drills it is known to use sowing elements which are each equipped with a seed distribution element (hereinafter, in brief, distributor) for distributing one seed at a time in a controlled delivery while the sowing element moves along a sowing track.

[0003] It is equally known to use seed distributors which use an air pressure differential between opposed faces of a sowing disc (or selector) provided with one or more rings of through holes. The operating principle is based on the fact that, as a result of the pressure differential between the opposed faces of the disc, a seed adheres to each hole and is then transported by the rotation of the sowing disc from the seed selection zone to the point at which the pressure differential ceases and the seed is released to drop through a sowing pipe into the furrow or sowing track. In practice, on one of the faces of the disc a strong air suction is exerted which retains the seeds on the opposite face in the region of the respective holes. An example of such devices is disclosed in US 7 228 807.

[0004] For the correct functioning of such distributors it is necessary to ensure an effective pneumatic seal between the face of the disc that is subjected to suction and a seal which delimits the pneumatic suction chamber. The suction effect itself effects a substantial compression of the disc against the seal. If on the one hand this ensures adequate adherence of the seal to the disc surface which is subjected to negative pressure, on the other hand it involves severe abrasion of the seal which limits the effective service life thereof. It is therefore necessary periodically to replace the seal in order to prevent sowing errors arising from insufficient depressurization of the suction chamber.

[0005] On the other hand, even if replacing the seal is a simple operation, in each case it entails an unwanted machine stoppage, besides the cost of the spare part itself.

[0006] In order to remedy this drawback, seed drills have been developed which are equipped with a thrust-bearing element which relieves the heavy load on the seal. In all cases, however, the thrust-bearing element, which must be rotated with the disc, is mounted on the fixed portion of the housing, that is to say, that portion which is fixed to the framework of the sowing elements. This means that the disc must be attached to the thrust-bearing element; therefore an attachment system must be provided which in the stage of replacement of the disc must be removed, consequently lengthening the operation. This is inevitable in the known machines since it is obligatory to mount on the fixed portion the transmission which drives in rotation the motor-driven shaft which rotates the disc.

[0007] However, positioning the thrust-bearing element on the fixed portion entails the pneumatic suction chamber being provided on the fixed portion, or on the same side at which the thrust-bearing element is placed, while the seed collection chamber must be provided in the movable portion. This is the source of numerous drawbacks, including the fact that the opening of the housing necessarily involves the removal of the portion containing the seed collection chamber from the hopper type store located above, which must necessarily be fixed to the framework of the sowing element.

[0008] Furthermore, for the replacement of the sowing disc it is necessary to remove some parts of the distributor, such as the adjustable seed selector, and the seed ejector, where provided.

[0009] The problem underlying the present invention is that of providing a seed distribution element structurally and functionally designed to make it possible to remedy all the drawbacks mentioned with reference to the prior art cited.

[0010] This problem is solved by the invention by means of a seed distribution element produced in accordance with one or more of the attached claims. The features and advantages of the invention will become clearer from the following detailed description of a preferred exemplary embodiment thereof, illustrated by way of non-limiting example with reference to the appended drawings, in which:

- Fig. 1 is a perspective view of a seed distribution element produced according to the present invention;
- Fig. 2 is an exploded perspective view of a detail of the element of Fig. 1;
- Fig. 3 is a perspective view of a seed drill equipped with sowing elements with a seed distribution element according to the invention.

[0011] In the drawings the reference 1 indicates as a whole a seed distribution element intended for equipping a sowing element 2 of a precision pneumatic seed drill 3.

[0012] The distribution element 1 is the device intended to deposit one seed 4 at a time at a predetermined adjustable spacing in a sowing furrow opened by a coulter 5. The sowing element 2, besides the distribution element 1, comprises a frame 6 and a seed store or hopper 7, besides other devices which are known per se and not necessary for the understanding of the present invention. The seed drill 3 itself comprises a bearing structure 8 on which a plurality of sowing elements 2 are mounted, all connected to a pneumatic suction device 9.

[0013] The sowing element 1 itself comprises a housing 10 with a fixed portion 11 fixed in a stable manner on the frame 6 and a movable portion 12 hinged in the region of a hinge 12a on the fixed portion 11 by means of a removable hinge pin 13. The fixed portion includes a throat 14 by means of which it is connected below an

outflow mouth of the store or hopper 7 in such a way as to be fed directly by the latter.

[0014] From the throat 14 the seed flows through a gate 14a through which the seed flows into a seed collection chamber 15.

[0015] A sowing disc 16 separates the seed collection chamber 15 from a suction chamber 17 provided in the movable portion 12. A suction device 18 mounted on the bearing structure 8 is connected to the suction chamber 17 by means of pipes 19 for producing a pressure differential between the opposed surfaces 16a, 16b of the selector disc 16.

[0016] The sowing disc 16 is removably mounted on a motor-driven drive shaft 20, supported in the fixed portion 11 and driven in rotation at predetermined adjustable speeds by a transmission which is not shown. The presence of the transmission requires the shaft 20 to be mounted on the fixed portion 11 of the housing 10. The keying between the shaft 20 and the disc 16 is obtained by means of a polygonal profile 21 at the free end of the shaft 20 which protrudes beyond the disc 16 and preferably has chamfers 22 which serve to facilitate the functions explained hereinafter. At the periphery of the disc 16 is/are provided one (or several) ring(s) of holes 23 passing between the opposed faces of the sowing disc 16.

[0017] A seal 24 is fitted in the suction chamber 17 and is placed in sliding contact with the facing surface of the disc 16, when the movable portion 11 is closed on the fixed portion 12, to delimit a circumferential segment in which the holes 23 are subjected to the aforesaid pressure differential. The circumferential segment extends between the seed collection chamber 15 and a seed fall pipe 25 in which the seeds are released one at a time into the furrow formed by the coulter 5.

[0018] By reason of the pressure differential between the two opposed surfaces of the sowing disc, the seeds 4 are held, one to each hole 23, when the holes pass in the seed collection chamber 15, and are released in the region of the pipe 25 when the pneumatic effect of the pressure differential ceases or owing to the presence of a seed ejector (not shown). In order to limit the wear on the seal 24 resulting from sliding against the surface of the disc 16, a thrust-bearing element indicated as a whole by 26 is mounted on the movable portion.

[0019] The thrust-bearing element 26 comprises a shaft 27 rotatably mounted by means of bearings 28 in a seat 29 of the movable portion 12. The shaft 27 has flanging 30 by means of which it is fixed to a thrust-bearing plate 31 which can bear on that surface of the disc which faces the seal 24 in a zone radially inside the ring of holes 23 in order to withstand at least some of the axial load produced by the disc 16 on the seal 24.

[0020] The bearing between the thrust-bearing plate 31 and the disc 16 takes place in the region of a ring 31a in relief on the surface of the plate which faces the disc 16.

[0021] The thrust-bearing element 26 is driven in rotation with the sowing disc 16 when the fixed and movable portions 11, 12 are closed against one another by means of a drive element 32 which comprises a coupling device constrained for rotation with the thrust-bearing plate but with radial and/or circumferential clearance in such a way as to be self-centred in the rotational coupling with the drive shaft of the disc 16. For this purpose, in the present form of embodiment, the drive element 32 is coupled with limited radial and/or circumferential clearance to the element 26 by means of one (or more) appendage(s) 33 protruding radially towards the outside and fitted into corresponding seats 34 of the plate. The drive element 32 is coupled by means of an internal polygonal profile 35 (similar to that adopted for box-end wrenches) to the polygonal profile 21 of the free end of the shaft 20, the chamfers 22 of which serve to facilitate the centring of the two profiles and the respective engagement.

[0022] The drive element 32 is thus self-centring relative to the drive shaft 20 by which it is driven. The positioning between seal 24 and plate 31 is such that the rotation of the latter will not be hindered by the presence of the seal 24 and, at the same time, both will be kept bearing against the disc 16.

[0023] Provision is also made for the thrust-bearing element 26 to be made idle and not driven in rotation by the shaft 20.

[0024] The whole of the movable portion 12 complete with thrust-bearing element 26 and seal 24 lends itself advantageously to the production of a kit for the retrofitting of existing seed drills. It is sufficient in this case to separate the old type of movable portion by removing the hinge pin 13 and replacing the old movable portion with the aforesaid kit. By reconnecting the pneumatic pipes previously disconnected, the seed drill becomes ready for use.

[0025] Among the principal advantages of the distribution element according to the invention is the fact that the wear on the seal resulting from the sliding contact with the seed selector disc is substantially reduced, if not eliminated; the thrust-bearing element is self-centring, thereby allowing easy opening and closing of the movable portion on the fixed portion of the housing; the system additionally lends itself to easy retrofitting, all without removing movable parts and/or operations of disconnecting the sowing disc.

Claims

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

   - a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
   - a housing (10) with a fixed portion (11) and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
   - a seed collection chamber (15) being defined

in the fixed portion (11),
- a pneumatic suction chamber (17) being defined in the movable portion (12),
- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),
- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and
- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a suction device produces a pressure differential between the opposed surfaces in the region of a circumferential segment of the ring of holes (23), the seed distribution element (1) further comprising a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
- a seed collection chamber (15) being defined in the fixed portion (11),
- a pneumatic suction chamber (17) being defined in the movable portion (12),
- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),
- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and
- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),
characterized in that the kit comprises:

- the movable portion (12) pre-assembled with:
- a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

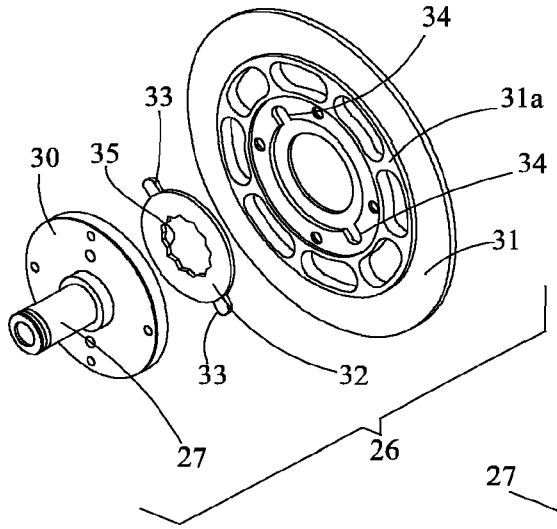

34
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31a
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26

fig. 2

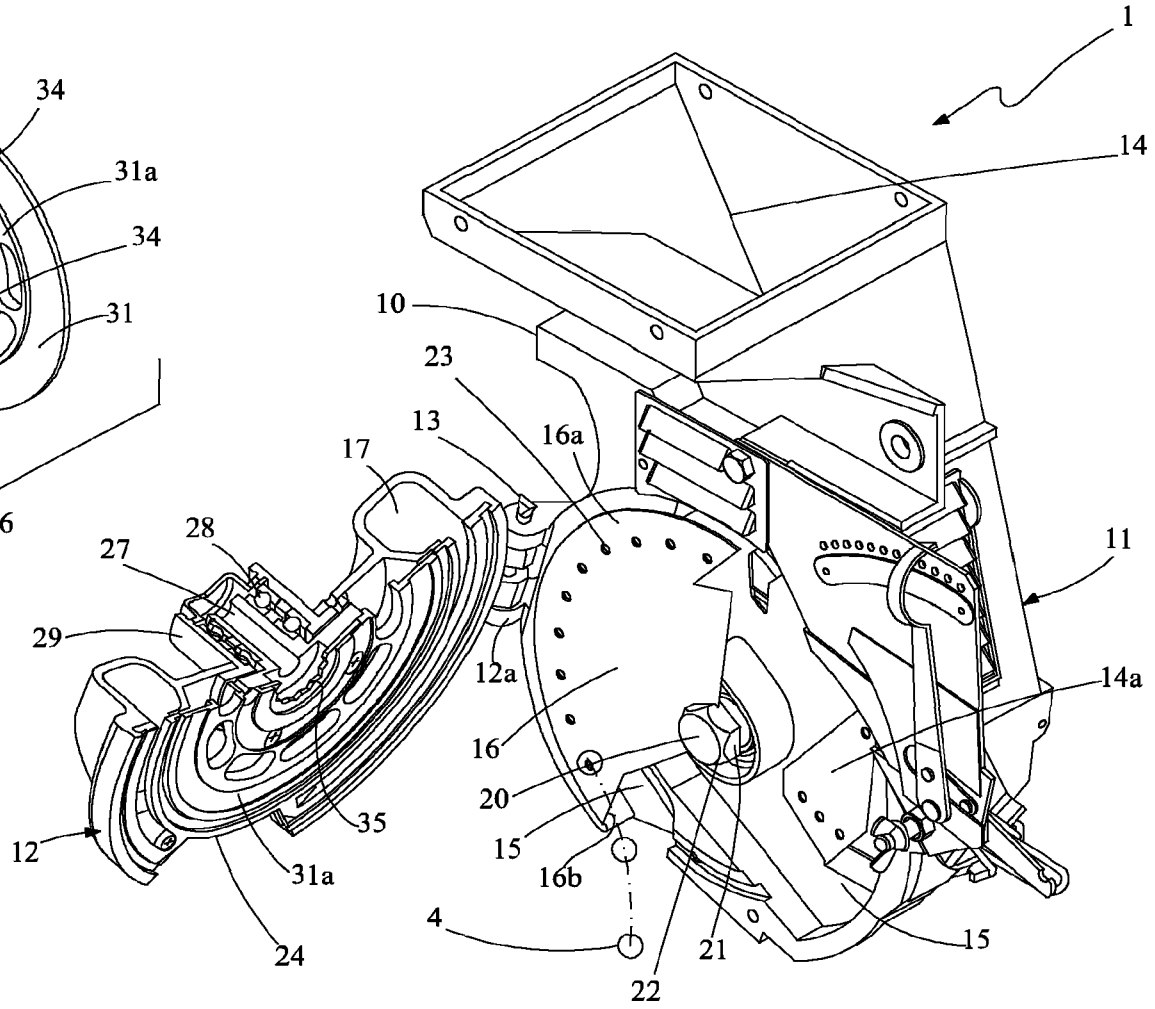

1
14
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23
13
16a
17
28
27
11
29
12a
14a
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15
16b
12
31a
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24
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fig. 1

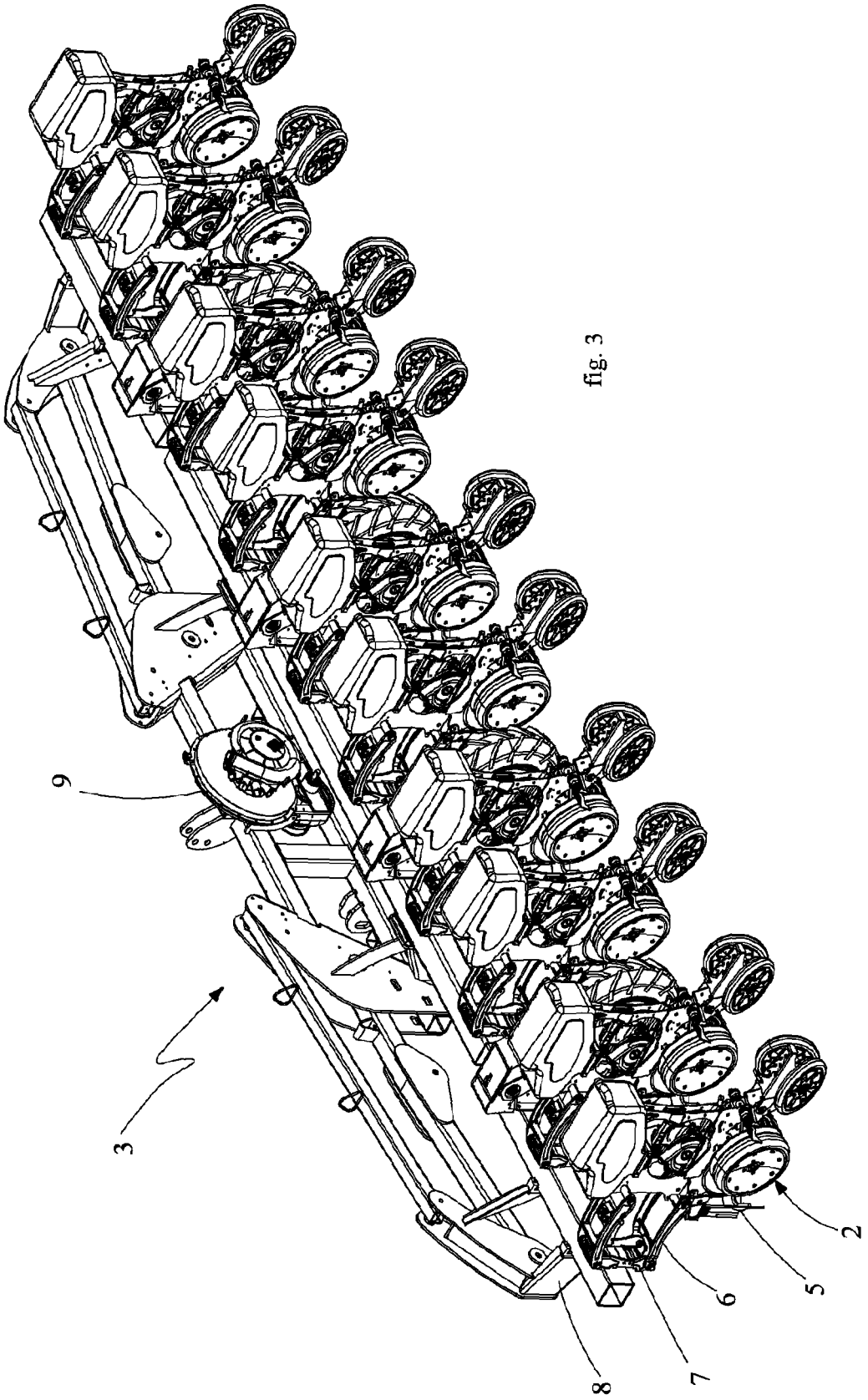


fig. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 14 18 7190

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 7 228 807 B1 (VENHUIZEN DALE [US]) 12 June 2007 (2007-06-12) * column 5, line 59 - column 7, line 37; figures 6-10 *	1	INV. A01C7/04
A	EP 0 536 543 A1 (MATERMACC SRL [IT]) 14 April 1993 (1993-04-14) * column 5, line 7 - column 8, line 6; figures *	1	

TECHNICAL FIELDS SEARCHED (IPC)
A01C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	5 February 2015	Bunn, David

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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T : theory or principle underlying the invention
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 14 18 7190

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 7228807 B1	12-06-2007	NONE	
EP 0536543 A1	14-04-1993	EP 0536543 A1	14-04-1993
		IT 1253373 B	08-08-1995
		US 5325801 A	05-07-1994

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 7228807 B **[0003]**

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International application number:		**PCT/EP2011/069875**
International filing date:		**10 November 2011 (10.11.2011)**
Document type:		**Certified copy of priority document**
Document details:	Country/Office:	**IT**
	Number:	**PD2010A000338**
	Filing date:	**12 November 2010 (12.11.2010)**
Date of receipt at the International Bureau:		**26 January 2012 (26.01.2012)**

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a),(b) or (b-*bis*)

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INVENZIONE INDUSTRIALE N. PD 2010 A 000338.

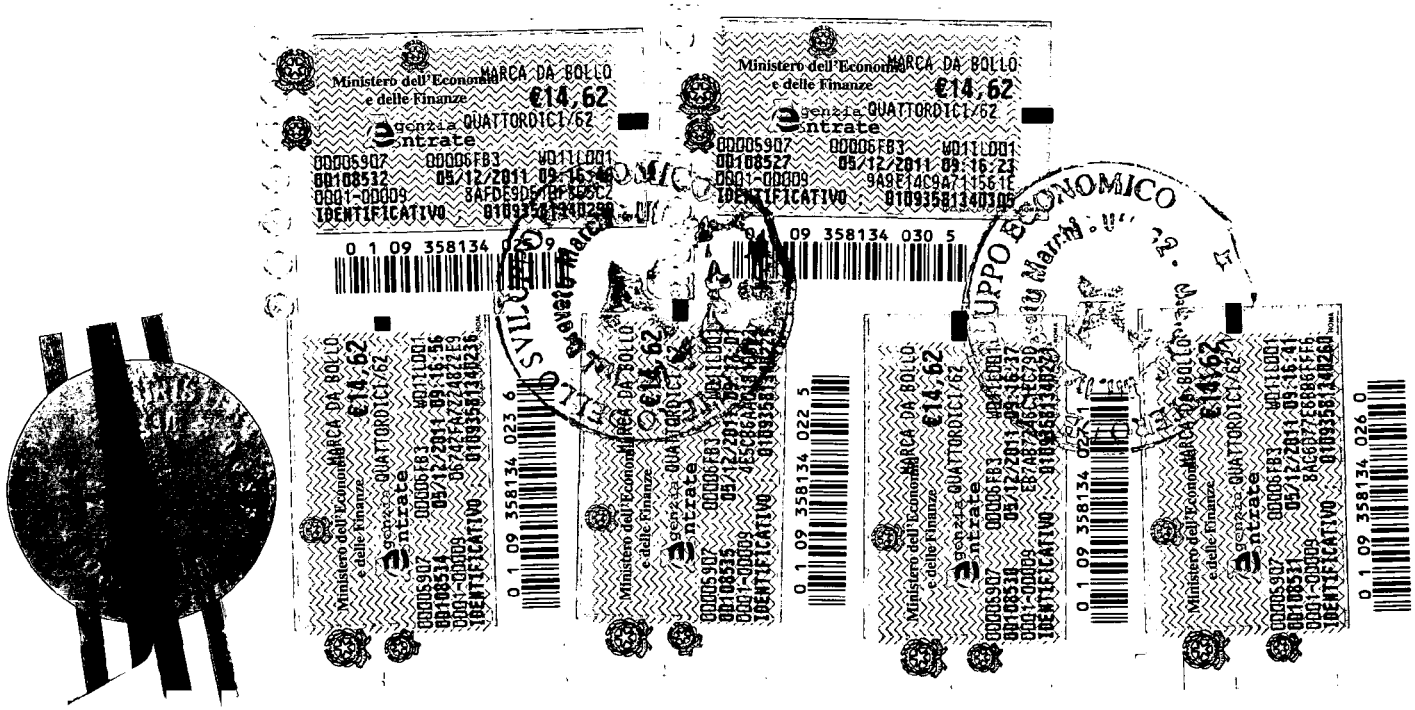
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IL FUNZIONARIO
Sig.ra E. MARINELLI



Domanda di Brevetto per Invenzione Industriale

Richiedente/i

Denominazione: **MASCHIO GASPARDO S.P.A.;**
Natura Giuridica: ***PG*** *(Persona Giuridica);*
Codice Fiscale: **03272800289;**
Indirizzo: **VIA MARCELLO 73;** *Localita' Residenza:* ; *Comune:* **CAMPODARSEGO;** *Cap:* **35011;** *Provincia Residenza:* **PADOVA (PD);** *Stato:* **ITALIA (IT);**

Recapito

Cognome/Denominazione: ; *Nome:* ;
Indirizzo recapito: ; *Localita' Recapito:* ; *Comune:* ; *Provincia:* **();** *Cap:* ;

Titolo

Descrizione: **ELEMENTO DISTRIBUTORE DEL SEME PER SEMINATRICI DI PRECISIONE, SEMINATRICE INCLUDENTE DETTO ELEMENTO**

Inventori Designati

Cognome: ; *Nome:* ; *Nazionalita':*

Classi Proposte

Sezione: **A;** *Classe:* **01;** *Sottoclasse:* **C;**

Centro Abilitato di Raccolta Colture di Microorganismi

Denominazione:

Mandatario abilitato presso UIBM

Numero Iscrizione Albo: **00436**
Cognome: **CANTALUPPI** *Nome:* **STEFANO**

Denominazione Studio: **CANTALUPPI & PARTNERS S.R.L.**
Indirizzo: **PIAZZETTA CAPPELLATO PEDROCCHI,18**
Comune: **PADOVA** *Cap:* **35122** *Provincia:* **PADOVA**
Numero Domicilio Professionale: **865**

Annotazioni Speciali

Descrizione:

Documentazione Allegata o con Riserva di Presentazione

Tipo Documento: **Tavole Disegno;** *N. Es. All. :* **1;** *N.Es.Ris.:* **1;** *N. Pag. per Esemplare:* **2;**

Tipo Documento: **Lettera di Incarico;** *N. Es. All. :* **0;** *N.Es.Ris.:* **1;** *N. Pag. per Esemplare:* **0;**

Tipo Documento: **Riassunto in Italiano;** *N. Es. All. :* **1;** *N.Es.Ris.:* **0;** *N. Pag. per Esemplare:* **1;**

Tipo Documento: **Rivendicazione in Italiano;** *N. Es. All. :* **1;** *N.Es.Ris.:* **0;** *N. Pag. per Esemplare:* **4;**

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Tipo Documento: **Attestato Versamento; SI;**

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Camera di Commercio Padova

Camera di Commercio Industria, Artigianato e Agricoltura di PADOVA

Verbale di Deposito Domanda di Brevetto per INVENZIONE INDUSTRIALE

Numero domanda: PD2010A000338
CCIAA di deposito: PADOVA
Data di deposito: 12/11/2010

In data 12/11/2010 il richiedente ha presentato a me sottoscritto la seguente domanda di brevetto per Invenzione Industriale.

PADOVA, 12/11/2010

L'Ufficiale Rogante

Diritti di Segreteria	**15,00 EURO**
Bollo Virtuale	**20,00 EURO**

A. RICHIEDENTE

Cognome Nome/ Denominazione **MASCHIO GASPARDO S.P.A.**
Codice fiscale: 03272800289
Indirizzo: CAMPODARSEGO (PD)
VIA MARCELLO 73 cap 35011
Natura Giuridica: Persona Giuridica

C. TITOLO

Titolo **ELEMENTO DISTRIBUTORE DEL SEME PER SEMINATRICI DI PRECISIONE, SEMINATRICE INCLUDENTE DETTO ELEMENTO**

E. CLASSE PROPOSTA

Classe A01C - PIANTAGIONE; SEMINAGIONE; FERTILIZZAZIONE

I. MANDATARIO ABILITATO PRESSO L'UIBM

Mandatario Numero iscrizione albo: 436
CANTALUPPI STEFANO

Denominazione Studio CANTALUPPI & PARTNERS S.R.L.
Indirizzo: PADOVA (PD)
PIAZZETTA CAPPELLATO PEDROCCHI,18 cap 35122

M. DOCUMENTAZIONE DICHIARATA

Lista documenti **Attestato Versamento**
Numero esemplari allegati : 1
Numero esemplari di cui si riserva la presentazione: 0
Numero pagine per esemplare : 0

Tavole Disegno
Numero esemplari allegati : 1
Numero esemplari di cui si riserva la presentazione: 1
Numero pagine per esemplare : 2

Rivendicazione in Italiano
Numero esemplari allegati : 1
Numero esemplari di cui si riserva la presentazione: 0
Numero pagine per esemplare : 4

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Numero esemplari allegati : 0
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Numero esemplari allegati : 1
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Numero pagine per esemplare : 7

Riassunto in Italiano
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Numero esemplari di cui si riserva la presentazione: 0
Numero pagine per esemplare : 1

Documento Generico
Numero esemplari allegati : 1
Numero esemplari di cui si riserva la presentazione: 0
Numero pagine per esemplare : 1

Designazione di Inventore
Numero esemplari allegati : 0
Numero esemplari di cui si riserva la presentazione: 1
Numero pagine per esemplare : 0

Lettera di Incarico/Autocertificazione
Numero esemplari allegati : 0
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Numero pagine per esemplare : 0

Versamento in euro Importo: 95,00

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Anticipata accessibilità al pubblico Non concessa

PROSPETTO MODULO A

DOMANDA DI BREVETTO PER INVENZIONE INDUSTRIALE

NUMERO DI DOMANDA:		DATA DI DEPOSITO:	

A. RICHIEDENTE/I COGNOME E NOME O DENOMINAZIONE, RESIDENZA O STATO

MASCHIO GASPARDO S.P.A.
VIA MARCELLO 73
35011 CAMPODARSEGO (PD)

C. TITOLO

Elemento distributore del seme per seminatrici di precisione, seminatrice includente detto elemento.

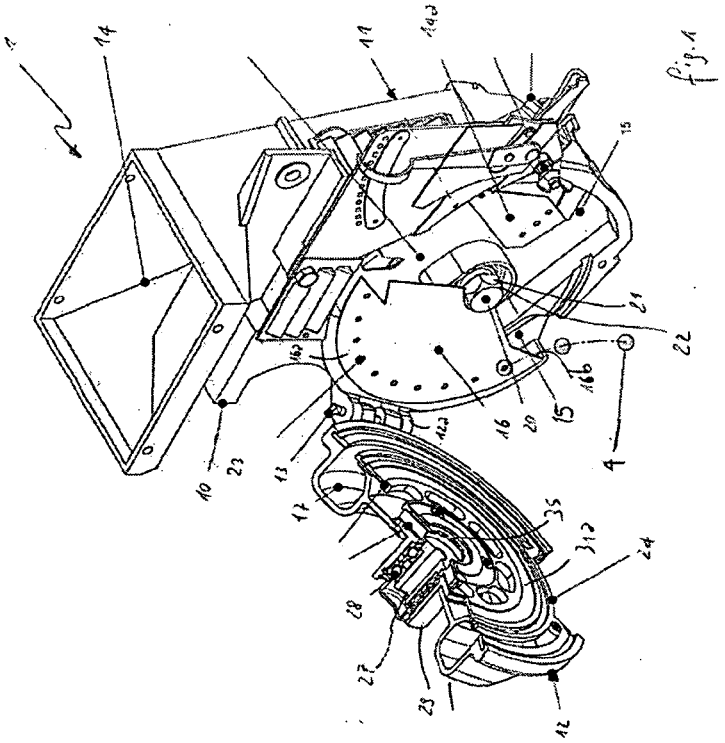
	SEZIONE	CLASSE	SOTTOCLASSE	GRUPPO	SOTTOGRUPPO
E. CLASSE PROPOSTA	A	01	C		

O. RIASSUNTO

Un elemento distributore del seme per macchine seminatrici pneumatiche di precisione, include:

- un disco di semina trascinato da un albero motorizzato di trasmissione in rotazione a velocità controllata in solido con detto albero,
- un involucro con una parte fissa nella quale è supportato detto albero ed una parte mobile rispetto a detta parte fissa e richiudibile su di essa, con una camera di raccolta del seme nella parte fissa e una camera di aspirazione pneumatica nella parte mobile,
- il disco di semina essendo interposto tra dette parti ed avente superfici contrapposte delimitanti dette camere, ed essendo provvisto di almeno una corona di fori selettori passanti tra dette superfici contrapposte,
- mezzi per generare un differenziale di pressione tra le dette superfici contrapposte in corrispondenza di un segmento circonferenziale di detta corona di fori, includenti la camera di aspirazione pneumatica ed
- una guarnizione sulla parte mobile suscettibile di contatto di strisciamento con la superficie affacciata del disco quando dette parti sono chiuse l'una sull'altra,
- un elemento reggispinta del disco di semina girevolmente supportato nella parte mobile, per sostenere almeno parte del carico assiale generato dal disco sulla guarnizione.

P. DISEGNO PRINCIPALE



FIRMA DEL/DEI RICHIEDENTE/I

DESCRIZIONE

La presente invenzione ha per oggetto un elemento distributore del seme per macchine seminatrici pneumatiche di precisione, un elemento di semina per tali macchine ed una macchina seminatrice includente una pluralità di tali elementi di semina.

Nelle macchine seminatrici pneumatiche di precisione vengono notoriamente utilizzati elementi di semina dotati ciascuno di un elemento distributore del seme (di seguito, in breve, distributore) per distribuire un seme alla volta in erogazione controllata mentre l'elemento di semina si muove lungo una traccia di semina.

E' parimenti noto l'impiego di distributori del seme che utilizzano un differenziale di pressione d'aria tra facce contrapposte di un disco di semina (o selettore) munito di una o più corone di fori passanti. Il principio di funzionamento si basa sul fatto che, per effetto del differenziale di pressione tra le facce contrapposte del disco, un seme aderisce a ciascun foro ed è quindi trasportato con la rotazione del disco di semina dalla zona di selezione del seme fino al punto in cui cessa il differenziale di pressione ed il seme è rilasciato per caduta attraverso un condotto di semina nel solco o traccia di semina. In pratica su di una delle facce del disco viene esercitata una forte aspirazione d'aria che trattiene i semi sulla faccia contrapposta in corrispondenza dei rispettivi fori.

Per il buon funzionamento di tali distributori è necessario garantire una tenuta pneumatica efficace tra la faccia del disco soggetta ad aspirazione ed una guarnizione che delimita la camera di aspirazione pneumatica. L'effetto stesso di aspirazione determina una sostanziale compressione del disco

contro la guarnizione. Se ciò da un lato garantisce una adeguata aderenza della guarnizione alla superficie del disco soggetta a depressione, dall'altro lato ciò comporta una forte abrasione della guarnizione che ne limita la durata efficace. E' quindi necessario sostituire periodicamente la guarnizione per prevenire errori di semina derivanti da una insufficiente depressurizzazione della camera di aspirazione.

D'altro canto, anche se sostituire tale guarnizione è una operazione semplice, in ogni caso essa comporta un indesiderato fermo macchina, oltre al costo in sé del ricambio.

Per ovviare a tale inconveniente sono state sviluppate macchine seminatrici dotate di un elemento reggispinta che allevia il carico gravante sulla guarnizione. In tutti i casi, tuttavia, l'elemento reggispinta, che deve essere condotto in rotazione con il disco, è montato sulla parte fissa dell'involucro, vale a dire quella che viene fissata all'intelaiatura degli elementi di semina. Questo comporta che il disco debba essere agganciato all'elemento reggispinta; quindi deve essere previsto un sistema di aggancio che in fase di sostituzione del disco deve essere disinserito allungando conseguentemente tale operazione. Ciò è inevitabile nelle macchine note poiché sulla parte fissa deve obbligatoriamente essere montata la trasmissione che conduce in rotazione l'albero motorizzato che conduce in rotazione il disco.

Posizionare l'elemento reggispinta sulla parte fissa comporta tuttavia che la camera di aspirazione pneumatica sia realizzata sulla parte fissa, ovvero dalla stessa parte in cui è posto l'elemento reggispinta, mentre la camera di raccolta del seme deve essere realizzata nella parte mobile. Ciò è fonte di

numerosi inconvenienti, tra i quali il fatto che l'apertura dell'involucro comporta necessariamente l'allontanamento della parte contenente la camera di raccolta del seme dal magazzino a tramoggia soprastante che deve necessariamente essere fissato alla intelaiatura dell'elemento di semina.

Inoltre per la sostituzione del disco di semina è necessario rimuovere alcune parti del distributore, quali il selettore registrabile del seme, e l'epulsore del seme, ove previsto.

Il problema alla base della presente invenzione è quello di mettere a disposizione un elemento distributore del seme strutturalmente e funzionalmente concepito così da consentire il superamento di tutti gli inconvenienti lamentati con riferimento alla tecnica nota citata.

Questo problema è risolto dall'invenzione mediante un elemento distributore del seme realizzato in accordo con una o più delle unite rivendicazioni.

Le caratteristiche ed i vantaggi del trovato meglio risulteranno dalla descrizione dettagliata che segue di un suo esempio preferito di realizzazione illustrato, a titolo indicativo e non limitativo, con riferimento agli uniti disegni in cui:

- la fig. 1 è una vista in prospettiva di un elemento distributore del seme realizzato in accordo con la presente invenzione;
- la fig. 2 è una vista prospettica a parti staccate di un particolare dell'elemento di fig. 1;
- la fig. 3 è una vista prospettica di una seminatrice dotata di elementi di semina con elemento distributore del seme secondo l'invenzione.

Nelle figure con 1 è complessivamente indicato un elemento distributore del

seme destinato ad equipaggiare un elemento di semina 2 di una seminatrice pneumatica di precisione 3.

L'elemento distributore 1 è l'organo destinato a depositare un seme 4 alla volta ad una prefissata distanza regolabile in un solco di semina aperto da un assolcatore 5. L'elemento di semina 2, oltre all'elemento distributore 1 comprende un telaio 6 ed un magazzino del seme o tramoggia 7, oltre ad altri organi in sé noti e non necessari per la comprensione della presente invenzione; La seminatrice 3 a sua volta comprende una struttura portante 8 sulla quale è montata una pluralità di elementi di semina 2, tutti collegati ad un aspiratore pneumatico 9.

L'elemento di semina 1 a sua volta comprende un involucro 10 con una parte fissa 11 fissata stabilmente sul telaio 6 ed una parte mobile 12 incernierata in corrispondenza di una cerniera 12a sulla parte fissa 11 tramite un perno di cerniera 13 rimovibile. La parte fissa include una imboccatura 14 tramite la quale essa è collegata al di sotto di una bocca di efflusso del magazzino o tramoggia 7 in modo tale da essere alimentata direttamente da questo.

Dall'imboccatura 14 il seme fluisce attraverso una porta 14a di afflusso del seme in una camera 15 di raccolta del seme.

Un disco di semina 16 separa la camera 15 di raccolta del seme da una camera di aspirazione 17 ricavata nella parte mobile 12. Un aspiratore 18 montato sulla struttura portante 8 è collegato alla camera di aspirazione 17 mediante tubazioni 19 per generare un differenziale di pressione tra le superfici contrapposte 16a,b del disco selettore 16.

Il disco di semina 16 è montato in modo rimovibile su di un albero di

trascinamento 20 motorizzato, supportato nella parte fissa 11 e condotto in rotazione a velocità prefissate e regolabili da una trasmissione non rappresentata. La presenza di tale trasmissione impone che l'albero 20 sia montato sulla parte fissa 11 dell'involucro 10. Il calettamento tra albero 20 e disco 16 è ottenuto mediante un profilo poligonale 21 alla estremità libera dell'albero 20 che sporge oltre il disco 16 ed ha preferibilmente smussi 22 i quali servono da invito per le funzioni chiarite di seguito.

Alla periferia del disco 16 è ricavata una (o più) corona di fori 23 passanti tra le facce contrapposte del disco di semina 16.

Una guarnizione 24 è applicata nella camera di aspirazione 17 ed è posta in contatto di strisciamento con la superficie affacciata del disco 16, quando la parte mobile 11 è chiusa sulla parte fissa 12, a delimitare un segmento circonferenziale in cui i fori 23 sono assoggettati al differenziale di pressione anzidetto. Tale segmento circonferenziale si estende tra la camera 15 di raccolta del seme ed un condotto di caduta del seme 25 in cui i semi sono rilasciati uno alla volta nel solco tracciato dall'assolcatore 5.

In ragione del differenziale di pressione tra le due superfici contrapposte del disco di semina , i semi 4 sono trattenuti, uno per ciascun foro 23, quando i fori transitano nella camera 15 di raccolta del seme e sono rilasciati in corrispondenza del condotto 25 quando cessa l'effetto pneumatico del differenziale di pressione ovvero per la presenza di un espulsore del seme (non rappresentato).

Per limitare l'usura della guarnizione 24 in conseguenza dello strisciamento contro la superficie del disco 16 sulla parte mobile è montato un elemento reggispinta complessivamente indicato con 26.

L'elemento reggispinta 26 comprende un albero 27 montato girevolmente mediante cuscinetti 28 in una sede 29 della parte mobile 12. L'albero 27 reca una flangiatura 30 tramite la quale esso è fissato ad un piattello reggispinta 31 suscettibile di appoggio alla superficie del disco affacciata alla guarnizione 24 in una zona radialmente interna alla corona di fori 23 per sostenere almeno parte del carico assiale generato dal disco 16 sulla guarnizione 24.

L'appoggio tra il piattello reggispinta 31 ed il disco 16 avviene in corrispondenza di una corona 31a in rilievo sulla superficie del piattello affacciata al disco 16.

L'elemento reggispinta 26 è condotto in rotazione con il disco di semina 16 quando le parti fissa e mobile 11,12 sono chiuse l'una sull'altra mediante un elemento di trascinamento 32 che comprende un organo accoppiatore vincolato al piattello reggispinta in rotazione ma con gioco radiale e/o circonferenziale in modo da auto-centrarsi nell'accoppiamento rotazionale con l'albero di trascinamento del disco 16. A tale scopo, nella presente forma di realizzazione, l'elemento di trascinamento 32 è accoppiato con limitato gioco radiale e/o circonferenziale all'elemento 26 tramite una (o più) appendice 33 sporgente radialmente verso l'esterno ed annidata in corrispondenti sedi 34 del piattello. L'elemento di trascinamento 32 si accoppia tramite un profilo poligonale interno 35 (simile a quello adottato per le chiavi a stella o box-end wrench) al profilo poligonale 21 della estremità libera dell'albero 20, i cui smussi 22 servono da invito per facilitare la centratura dei due profili ed il rispettivo innesto.

L'elemento di trascinamento 32 risulta così auto-centrante rispetto all'albero

di trascinamento 20 da cui esso è condotto. Il posizionamento tra guarnizione 24 e piattello 31 sarà tale per cui le rotazione di quest'ultimo non sarà ostacolata dalla presenza della guarnizione 24 e, al tempo stesso, verranno entrambi mantenuti in appoggio al disco 16.

È altresì previsto che l'elemento reggispinta 26 possa essere realizzato folle e non condotto in rotazione dall'albero 20.

L'assieme della parte mobile 12 completa di elemento reggispinta 26 e guarnizione 24 si presta vantaggiosamente alla realizzazione di un kit per il retrofitting di seminatrici già esistenti. È sufficiente in tal caso separare la parte mobile di vecchio tipo rimuovendo il perno di cerniera 13 e sostituirla con il kit anzidetto. Ricollegando le tubazioni pneumatiche preventivamente sganciate la seminatrice è pronta al lavoro.

Tra i principali vantaggi dell'elemento distributore secondo l'invenzione vi è il fatto che viene sensibilmente ridotta, se non eliminata, l'usura della guarnizione per effetto del contatto di strisciamento con il disco selettore del seme; l'elemento reggispinta è autocentrante il che consente una facilitata apertura e chiusura della parte mobile sulla parte fissa dell'involucro; il sistema si presta inoltre ad un agevole retrofitting, il tutto senza rimozioni di parti mobili e/o operazioni di sgancio del disco di semina.

RIVENDICAZIONI

1. Elemento distributore del seme per macchine seminatrici pneumatiche di precisione, del tipo includente:

- un disco di semina trascinato da un albero motorizzato di trasmissione in rotazione a velocità controllata in solido con detto albero,
- un involucro con una parte fissa nella quale è supportato detto albero ed una parte mobile rispetto a detta parte fissa e richiudibile su di essa,
- in detta parte fissa essendo definita una camera di raccolta del seme,
- in detta parte mobile essendo definita una camera di aspirazione pneumatica,
- detto disco di semina essendo interposto tra dette parti ed avente superfici contrapposte delimitanti dette camere,
- detto disco di semina avente almeno una corona di fori selettori passanti tra dette superfici contrapposte,
- mezzi per generare un differenziale di pressione tra le dette superfici contrapposte in corrispondenza di un segmento circonferenziale di detta corona di fori,
- detti mezzi includenti detta camera di aspirazione pneumatica ed
- una guarnizione sulla parte mobile suscettibile di contatto di strisciamento con la superficie affacciata del disco quando dette parti sono chiuse l'una sull'altra,
- caratterizzato dal fatto di comprendere
- un elemento reggispinta del disco di semina girevolmente supportato

in detta parte mobile, per sostenere almeno parte del carico assiale generato dal disco su detta guarnizione.

2. Elemento distributore del seme secondo la rivendicazione 1 in cui detto elemento reggispinta è condotto in rotazione con detto disco quando dette parti sono chiuse l'una sull'altra.
3. Elemento distributore del seme secondo la rivendicazione 1 o 2, in cui detto elemento reggispinta comprende un piattello reggispinta suscettibile di appoggio alla superficie del disco di semina affacciata a detta guarnizione in zona radialmente interna alla corona di fori.
4. Elemento distributore del seme secondo la rivendicazione 3 in cui l'elemento reggispinta comprende un elemento di trascinamento solidale in rotazione al piattello e suscettibile di accoppiamento con l'albero di trascinamento del disco quando dette parti sono chiuse l'una sull'altra.
5. Elemento distributore del seme secondo la rivendicazione 4 in cui l'elemento di trascinamento è auto-centrante rispetto all'albero di trascinamento.
6. Elemento distributore del seme secondo la rivendicazione 4 o 5 in cui l'elemento di trascinamento comprende un organo accoppiatore vincolato al piattello reggispinta in rotazione ma con gioco radiale e/o circonferenziale in modo da auto-centrarsi in accoppiamento rotazionale con l'albero di trascinamento del disco.
7. Elemento distributore del seme secondo una o più delle rivendicazioni precedenti in cui la parte mobile è incernierata alla parte fissa.
8. Elemento di semina per seminatrici di precisione includente un telaio

sul quale è montato un elemento distributore del seme secondo una o più delle rivendicazioni precedenti.

9. Seminatrice comprendente una struttura portante sulla quale è montata una pluralità di elementi di semina secondo la rivendicazione 8.

10. Kit per retrofitting degli elementi distributori del seme di seminatrici pneumatiche di precisione in cui gli elementi distributori sono del tipo includente:

- un disco di semina trascinato da un albero motorizzato di trasmissione in rotazione a velocità controllata in solido con detto albero,
- un involucro con una parte fissa nella quale è supportato detto albero ed una parte mobile rispetto a detta parte fissa e richiudibile su di essa,
- in detta parte fissa essendo definita una camera di raccolta del seme,
- in detta parte mobile essendo definita una camera di aspirazione pneumatica,
- detto disco di semina essendo interposto tra dette parti ed avente superfici contrapposte delimitanti dette camere,
- detto disco di semina avente almeno una corona di fori selettori passanti tra dette superfici contrapposte,
- mezzi per generare un differenziale di pressione tra le dette superfici contrapposte in corrispondenza di un segmento circonferenziale di detta corona di fori,
- detti mezzi includenti detta camera di aspirazione pneumatica ed

- una guarnizione sulla parte mobile suscettibile di contatto di strisciamento con la superficie affacciata del disco quando dette parti sono chiuse l'una sull'altra,

caratterizzato dal fatto di comprendere:

- detta parte mobile preassemblata con
- un elemento reggispinta del disco di semina girevolmente supportato in detta parte mobile, per sostenere almeno parte del carico assiale generato dal disco su detta guarnizione.

11. Kit secondo la rivendicazione 10 in cui detta parte mobile e detto elemento reggispinta comprendono una o più delle caratteristiche delle rivendicazioni da 2 a 7.

RIASSUNTO

Un elemento distributore del seme per macchine seminatrici pneumatiche di precisione, include:

- un disco di semina trascinato da un albero motorizzato di trasmissione in rotazione a velocità controllata in solido con detto albero,
- un involucro con una parte fissa nella quale è supportato detto albero ed una parte mobile rispetto a detta parte fissa e richiudibile su di essa, con una camera di raccolta del seme nella parte fissa e una camera di aspirazione pneumatica nella parte mobile,
- il disco di semina essendo interposto tra dette parti ed avente superfici contrapposte delimitanti dette camere, ed essendo provvisto di almeno una corona di fori selettori passanti tra dette superfici contrapposte,
- mezzi per generare un differenziale di pressione tra le dette superfici contrapposte in corrispondenza di un segmento circonferenziale di detta corona di fori, includenti la camera di aspirazione pneumatica ed
- una guarnizione sulla parte mobile suscettibile di contatto di strisciamento con la superficie affacciata del disco quando dette parti sono chiuse l'una sull'altra,
- un elemento reggispinta del disco di semina girevolmente supportato nella parte mobile, per sostenere almeno parte del carico assiale generato dal disco sulla guarnizione.

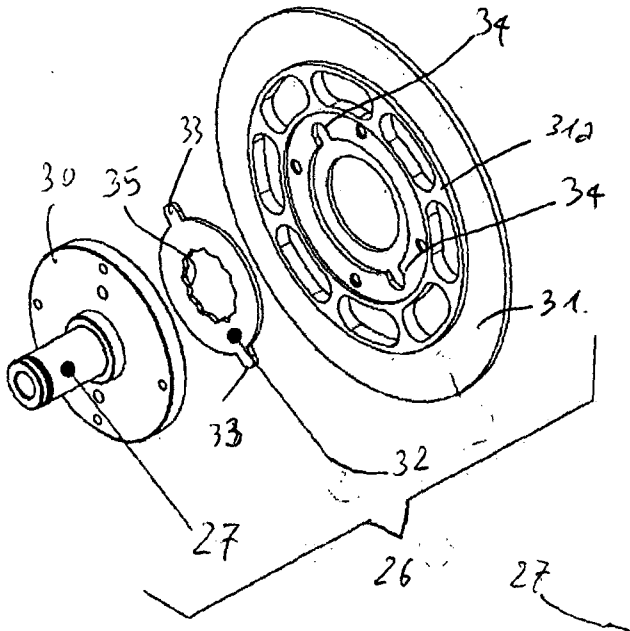

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fig.2

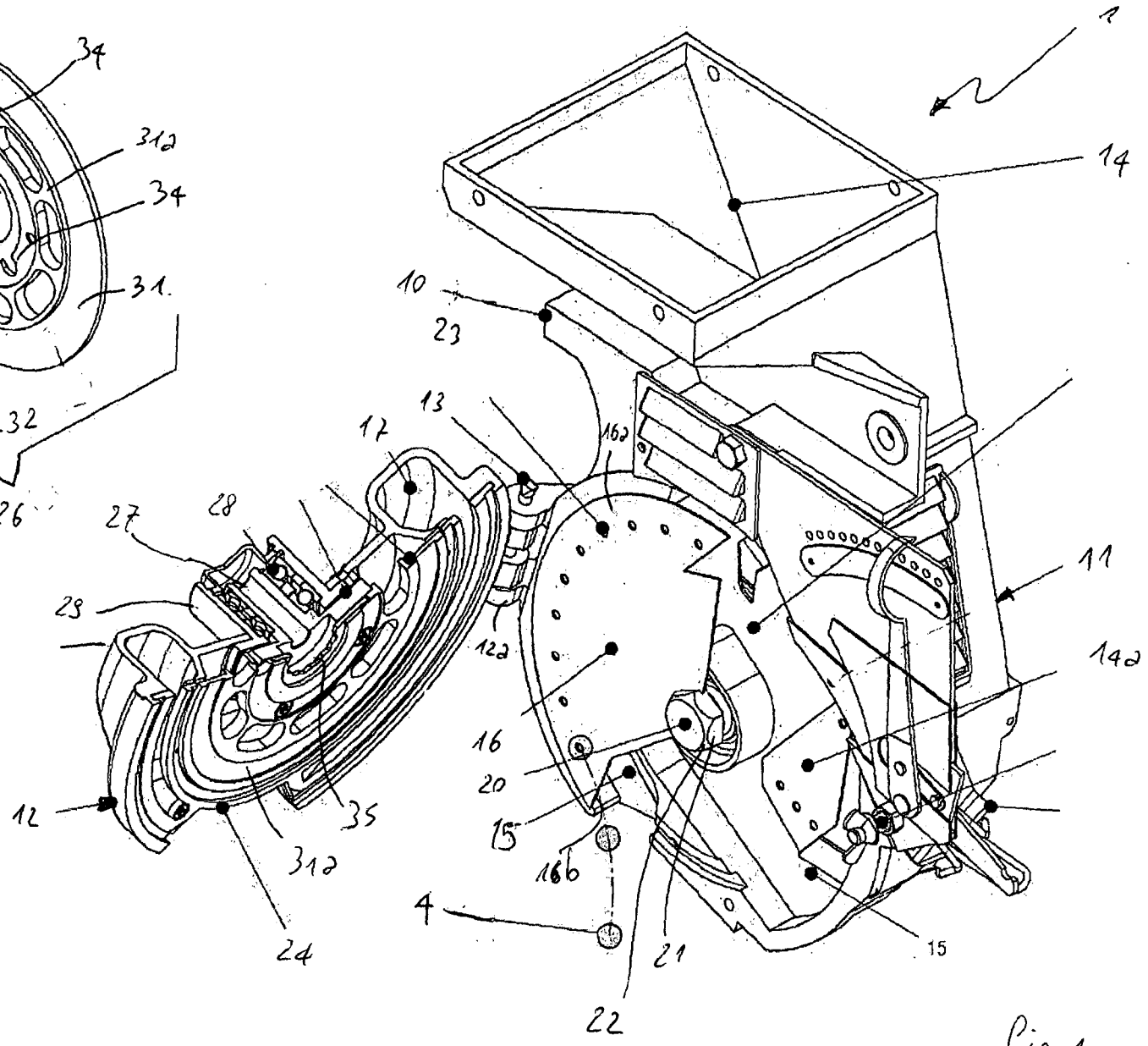

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fig.1

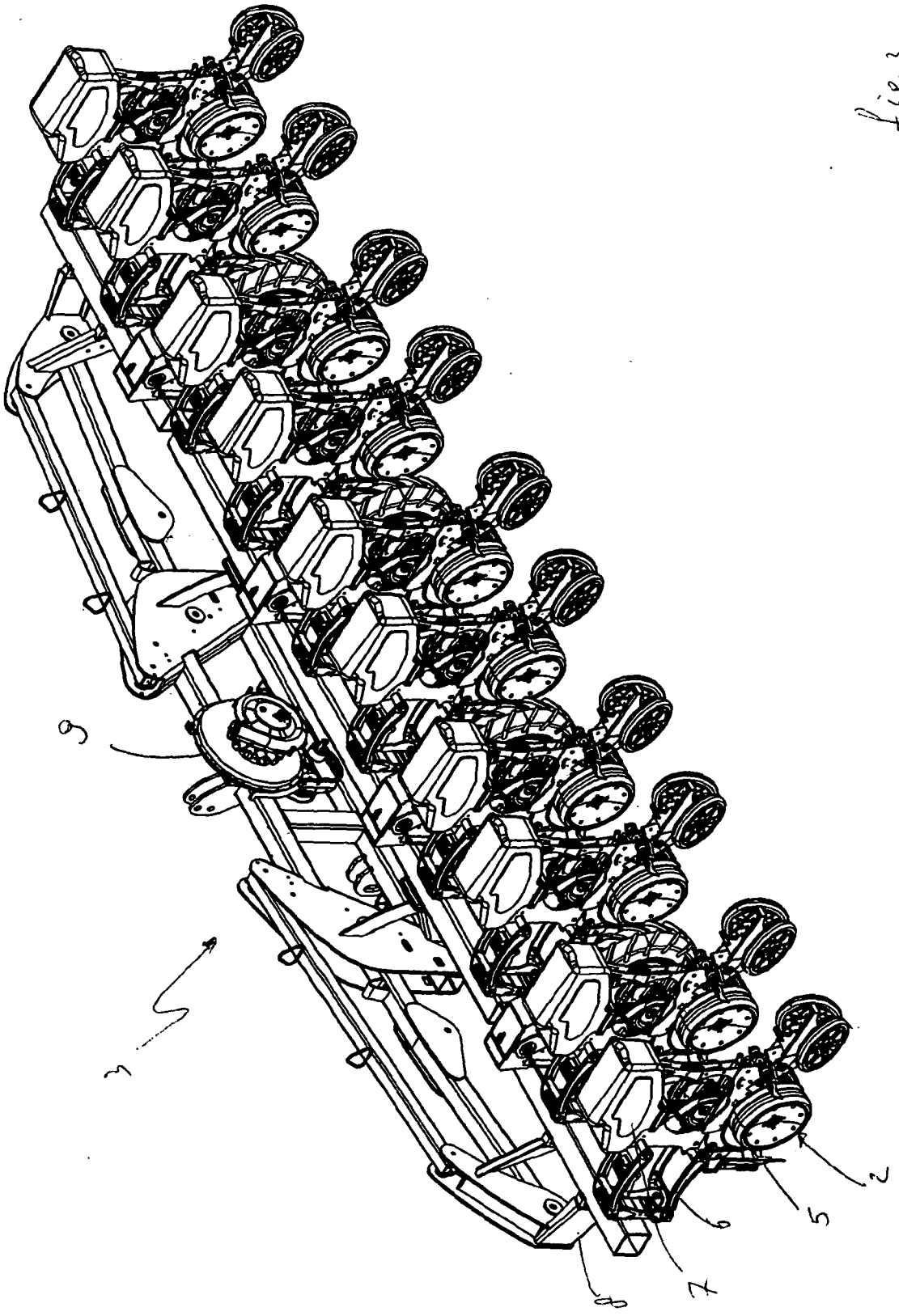


Fig. 3

US007228807B1

(12) **United States Patent**
VenHuizen

(10) **Patent No.: US 7,228,807 B1**
(45) **Date of Patent: Jun. 12, 2007**

(54) **DEVICE FOR IMPROVING THE SPACING BETWEEN SEEDS PLANTED BY A JOHN DEERE VACUUM PLANTER**

(76) Inventor: **Dale VenHuizen**, 1954 IL Route 78N, Stockton, IL (US) 61085

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **11/392,055**

(22) Filed: **Mar. 29, 2006**

(51) **Int. Cl.**
A01C 7/00 (2006.01)
A01C 9/00 (2006.01)

(52) **U.S. Cl.** **111/174**; 111/185

(58) **Field of Classification Search** 111/170–189
See application file for complete search history.

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Primary Examiner—Christopher J. Novosad
(74) *Attorney, Agent, or Firm*—Robert L. Marsh

(57) **ABSTRACT**

A seed planter of the type having a metering unit with a seed chute that drops seeds into a seed tube for planting as manufactured by John Deere is provided with a deflector in the metering unit. The deflector directs the path of the seeds as they fall away from the seed disk so as to free fall along a vertical centerline between the leading and trailing walls of the seed tube and between the opposing sides thereof.

13 Claims, 8 Drawing Sheets

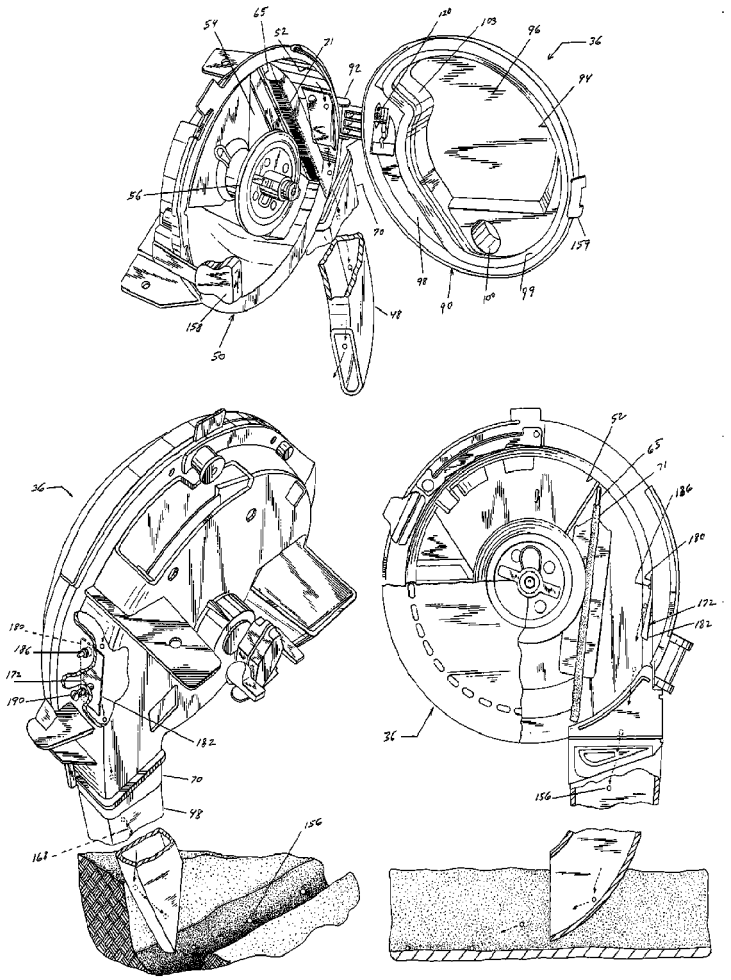


FIG. 1
PRIOR ART

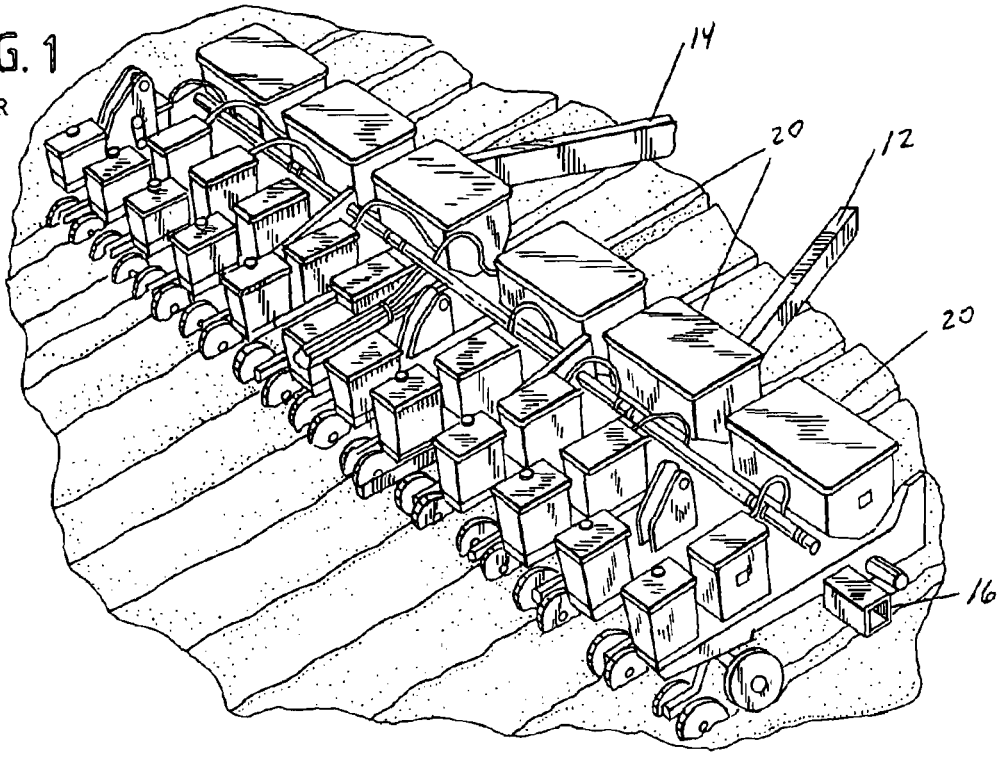


FIG. 2 PRIOR ART

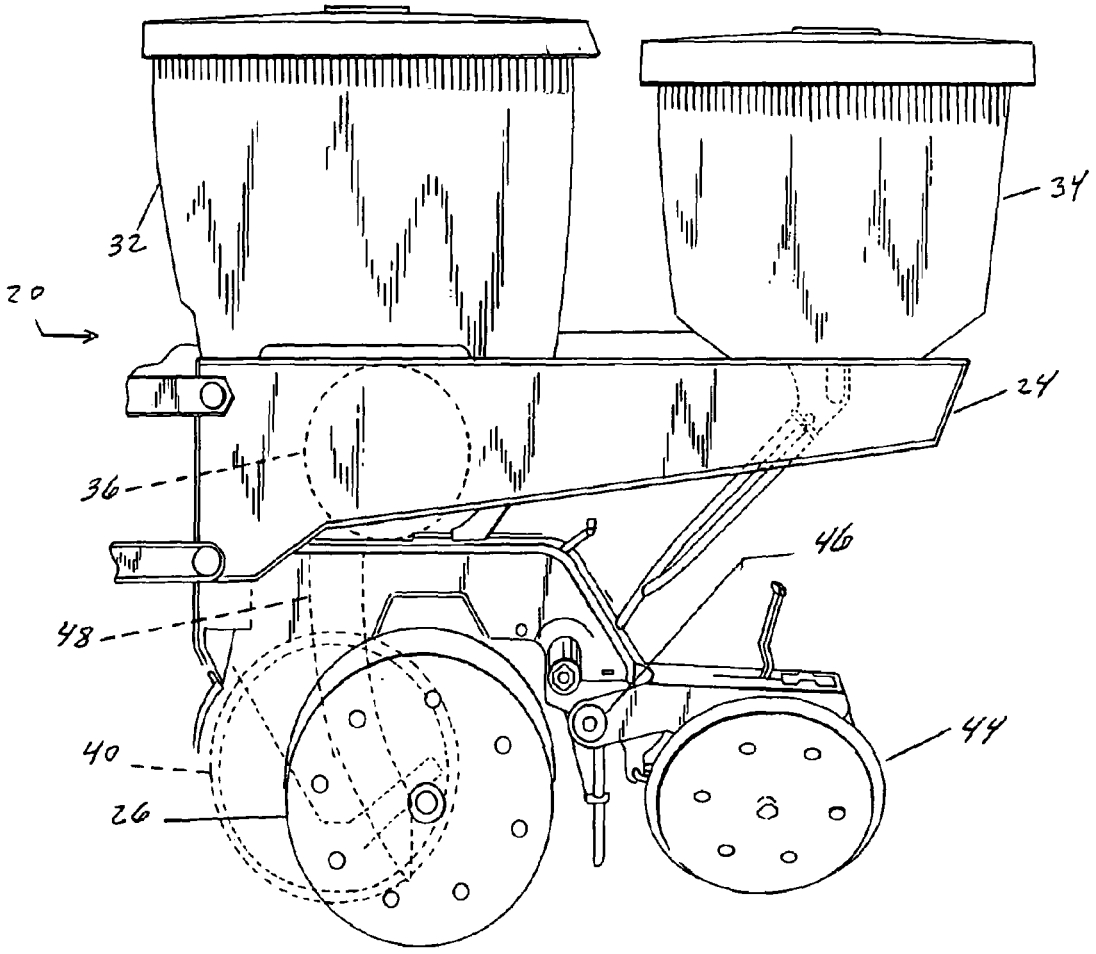


FIG. 3 PRIOR ART

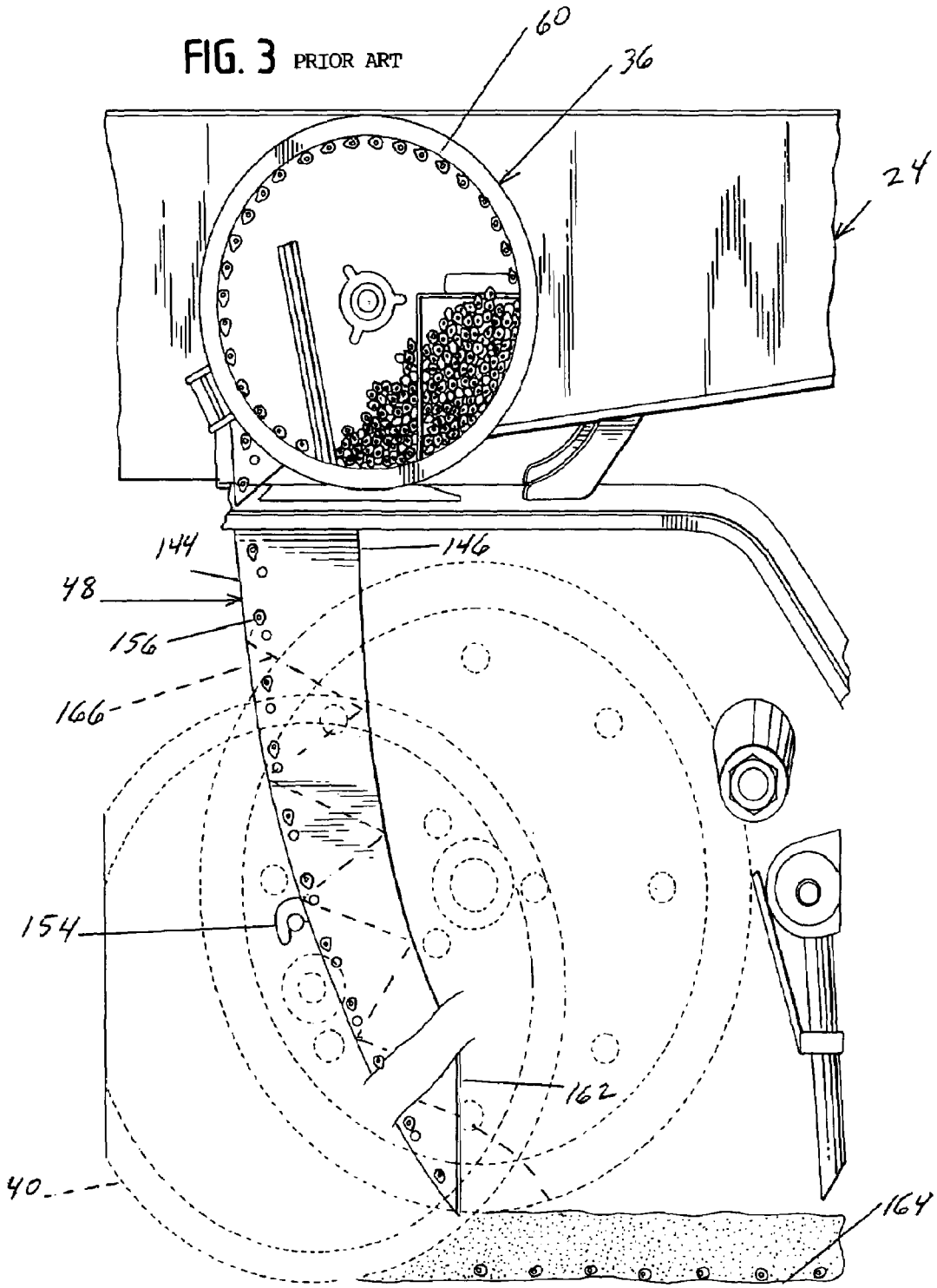


FIG. 4 PRIOR ART

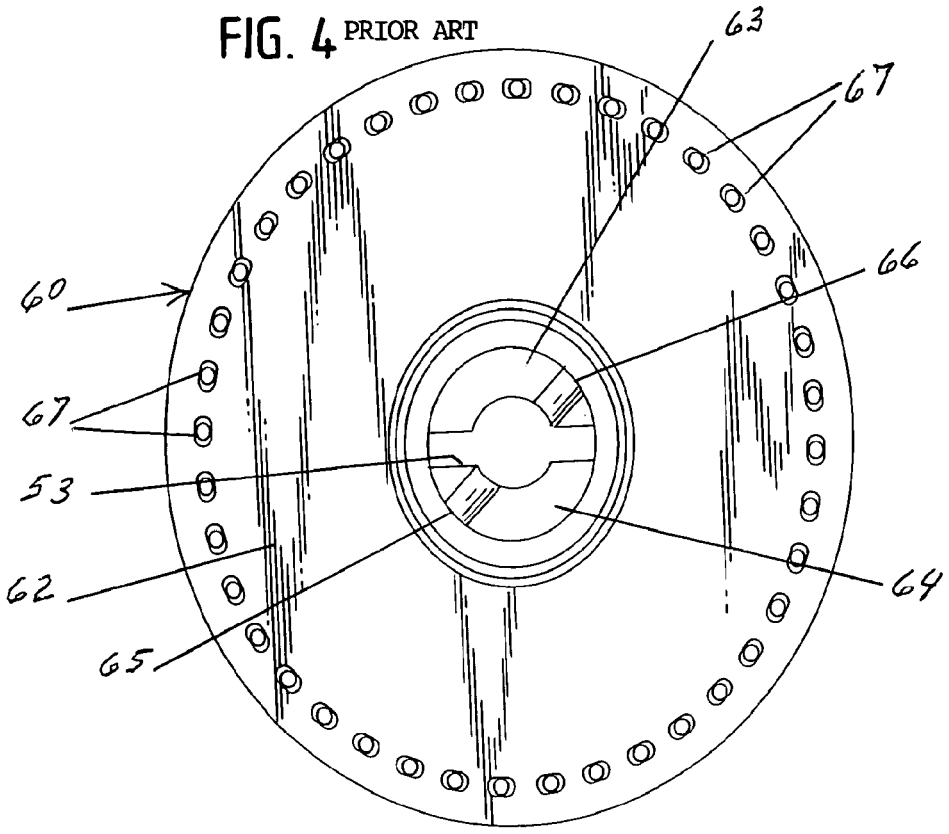


FIG. 5 PRIOR ART

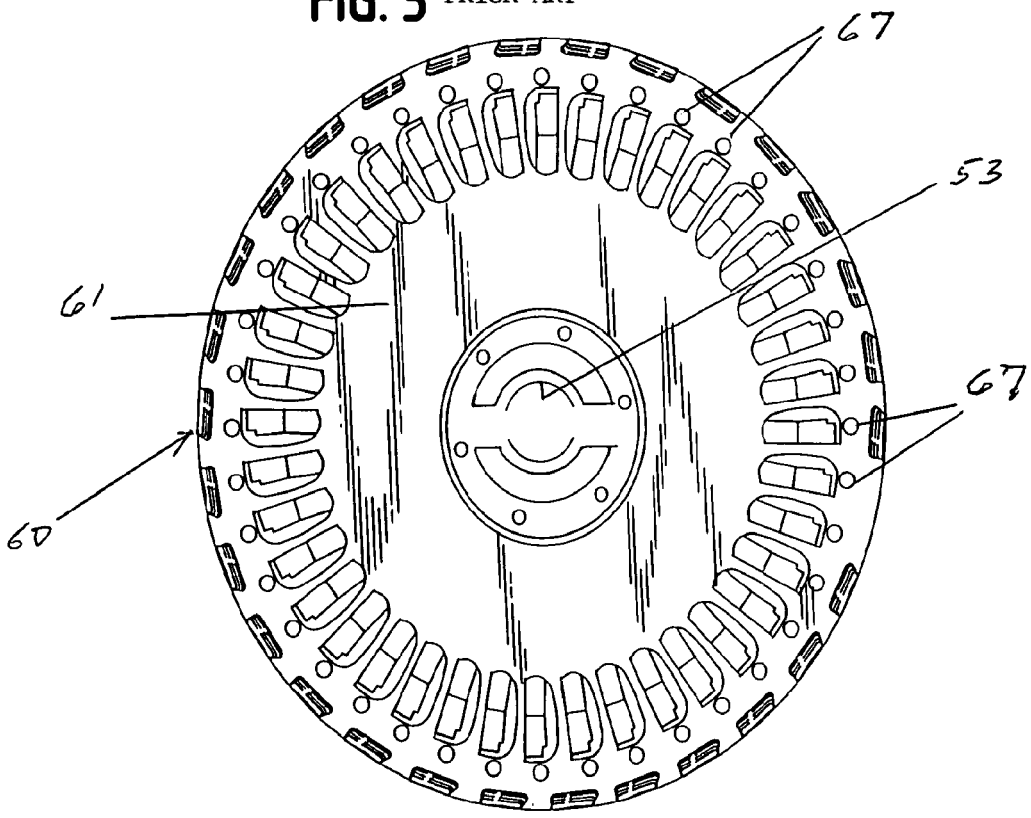
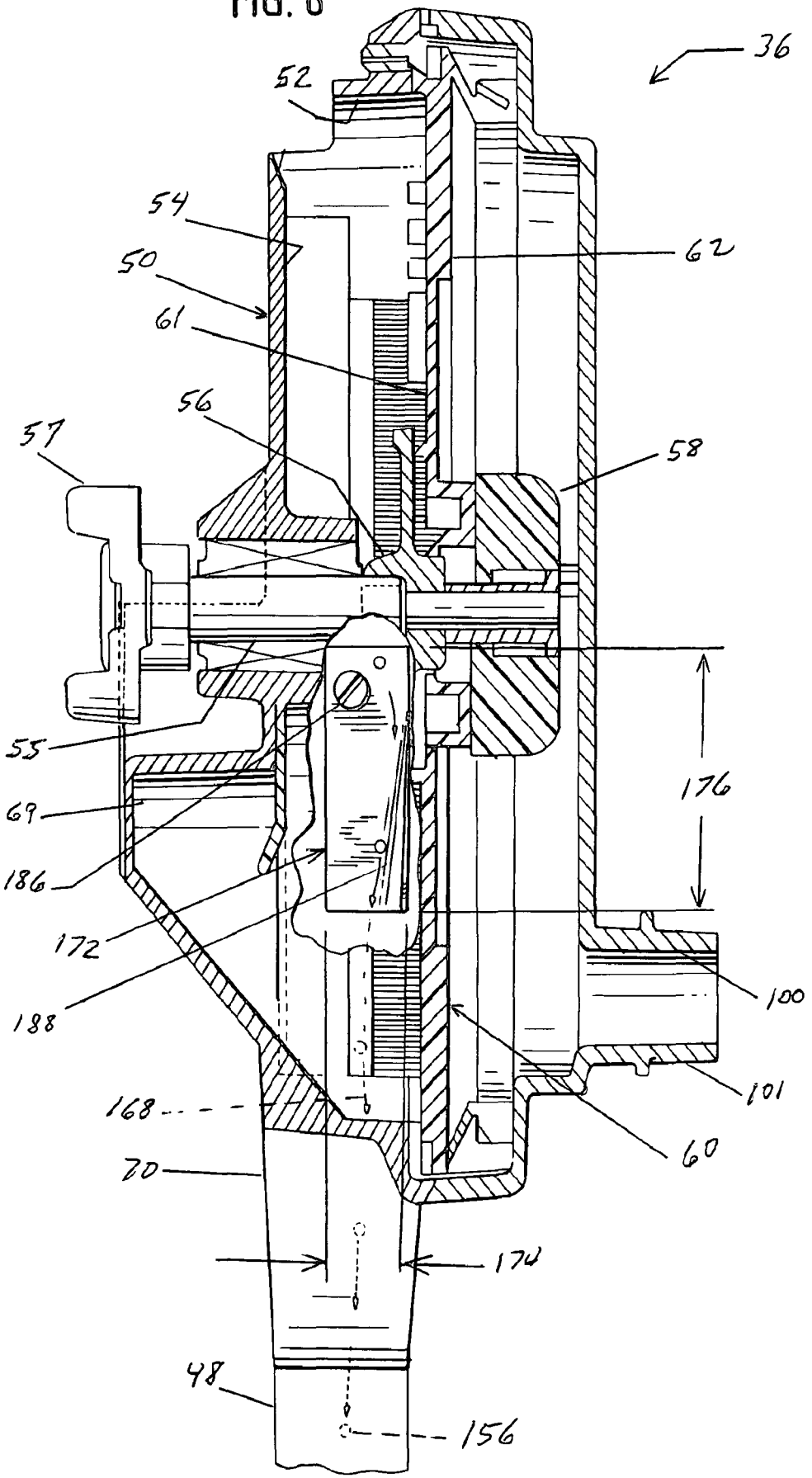


FIG. 6


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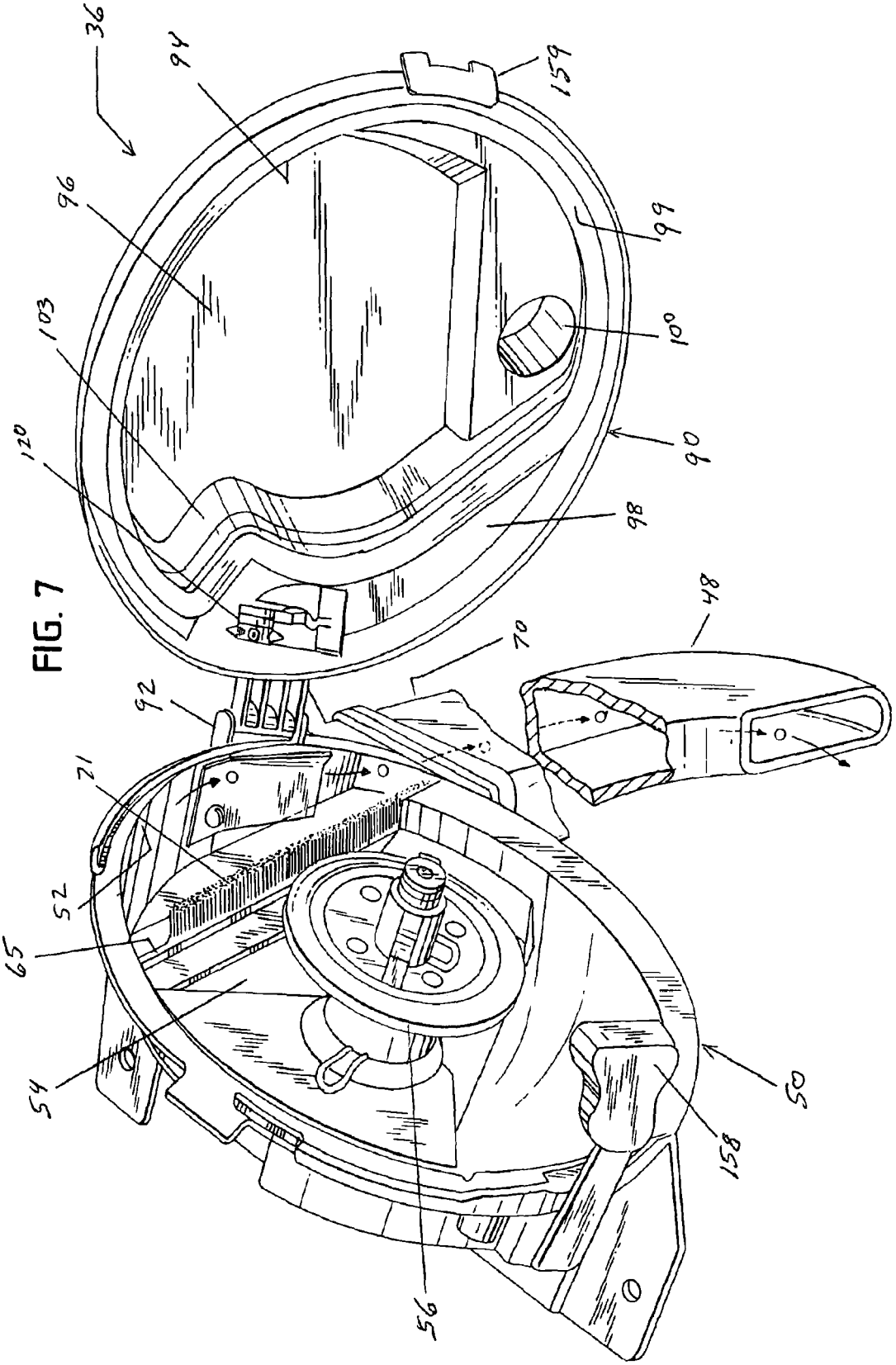


FIG. 7

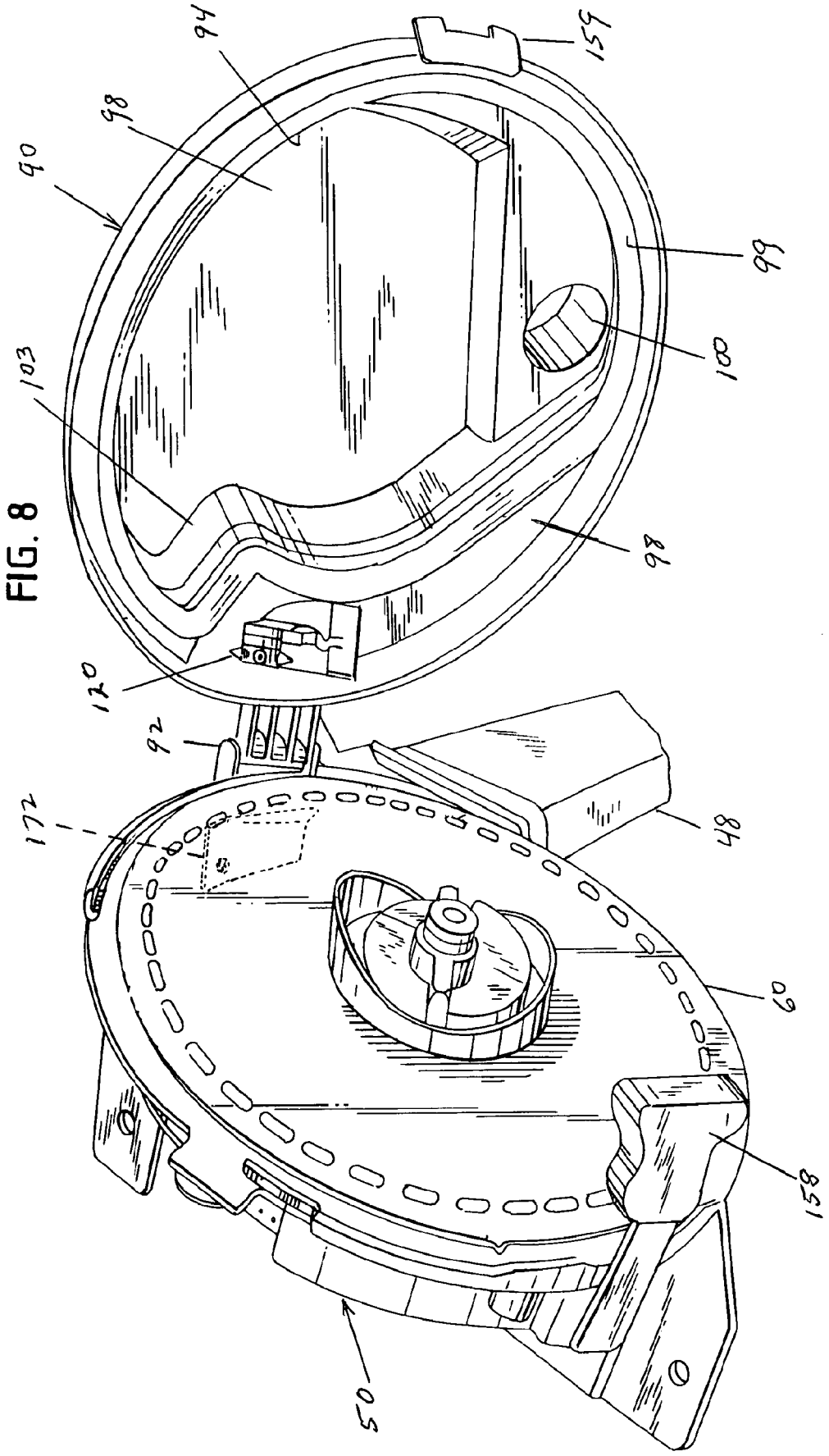


FIG. 8

FIG. 9

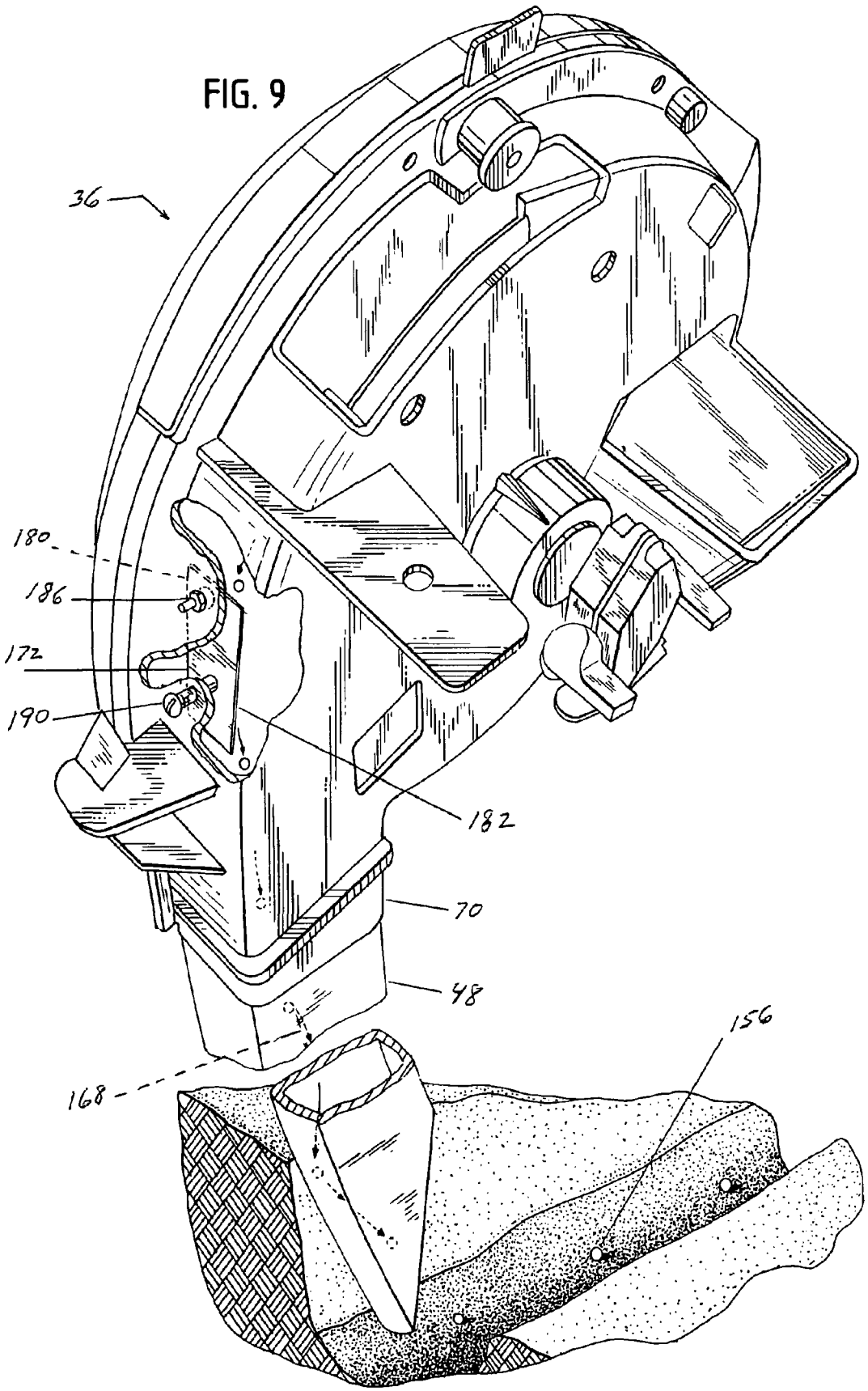
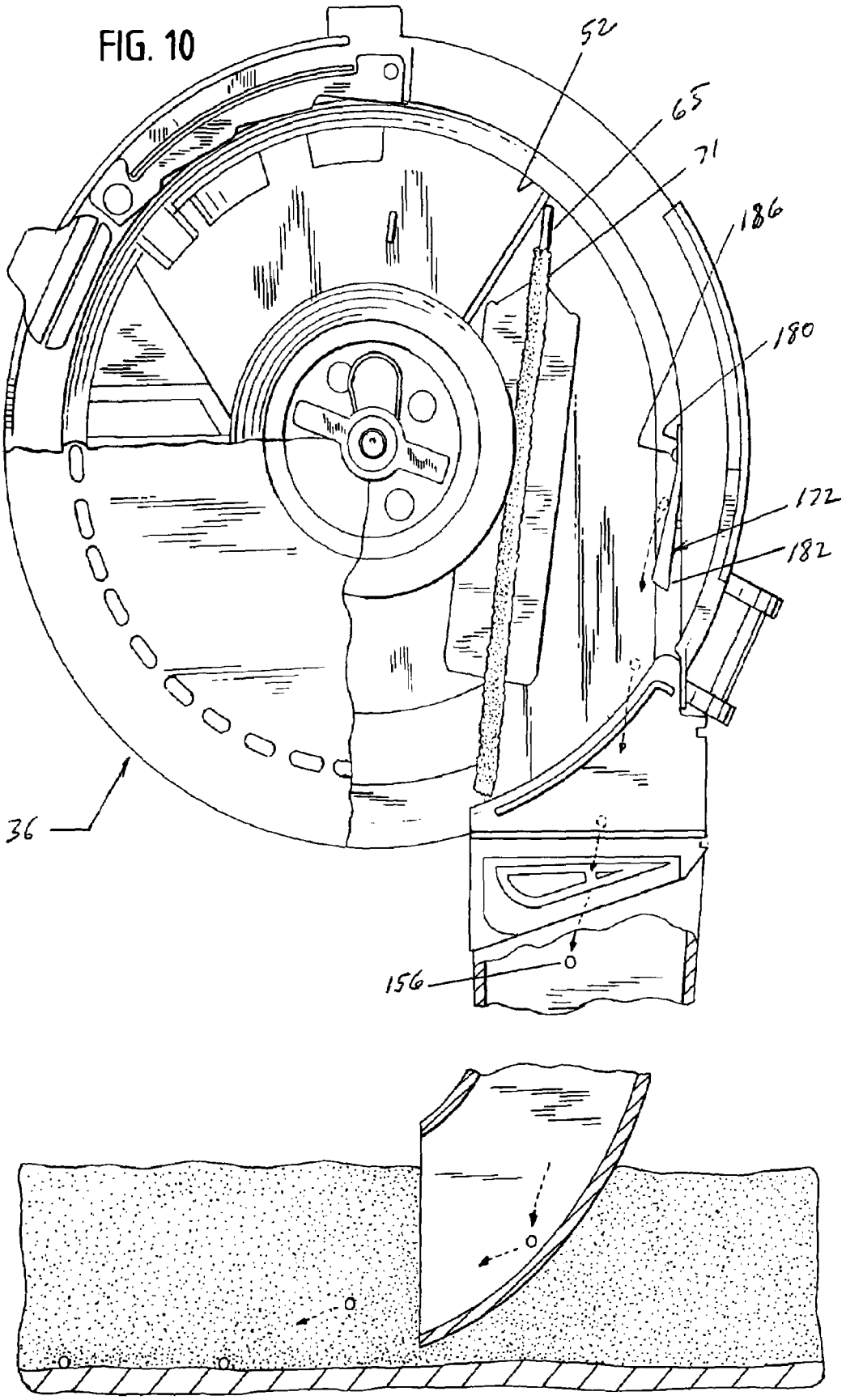


FIG. 10



DEVICE FOR IMPROVING THE SPACING BETWEEN SEEDS PLANTED BY A JOHN DEERE VACUUM PLANTER

The present invention relates to seed planters of the type manufactured by John Deere which receive a rotatable seed disk and, in particular, to a method and apparatus for retaining equal spacing between seeds that are planted by such machines.

BACKGROUND OF THE INVENTION

John Deere manufactures a Max Emerge Drawn Conservation Flex-fold planter. The heart of the John Deere planter is a metering unit which retains a circular rotatable seed disk that separates the interior of the metering unit into two chambers, one on each side of the disk. The seed disks employed in the machine have a plurality of holes, with the centers thereof spaced to define a circle having a radius a little less than the radius of the disk. A vacuum is drawn in the chamber formed on one side of the disk and seeds are introduced into the chamber on the opposite side of the disk. The diameter of the holes in the seed disks are sized such that, when operating properly, the vacuum will draw one seed against the aperture of each hole in the disk and retain the seed as the disk rotates to a position above a seed tube, at which point the disk moves away from the vacuum chamber and the seed falls away from the disk and into the seed tube to be planted.

The planter is intended for use with many types of seed, including sunflower, cotton, soybean, sorghum, sugar beets, popcorn, sweet corn, and corn seed (feed corn seed). Each type of seed has a different size and configuration and the planter is, therefore, provided with a plurality of seed disks, which each of the seed disks having a different configuration of holes through which the vacuum is drawn to move seeds from the input to the seed tube.

The manual for the 7200 Max Emerge, 16 row, narrow flex-fold planter, for example, describes and depicts thirteen different seed disks. According to the manual, the seed size for certain grains, such as corn seed, vary widely. The manual recommends disk H136478 for the smallest sized corn seed, recommends disk A43215 for medium sized corn seed, and recommends disk A50617 for large sized corn seed.

The proper operation of the John Deere planter, therefore, requires the selection of the appropriate seed disk for use with the size and type of seed to be planted. To compensate for differences in weight, size, and shape of the various seeds, the proper operation of the planter also requires adjustments to the vacuum drawn to one side of the seed disk and depending on the size of seed being planted, the installation or removal of certain optional features. It is also recommended that the machine be monitored during its use and that the strength of the vacuum be adjusted if the machine is found to be under planting or over planting seed.

The machine scratches a trough in the ground and when the machine is operating properly it will deposit one seed every six inches along the trough or one hundred seeds along a six hundred inch length of ground. When the one hundred seeds are all equally spaced from one another, the stalks of corn, or other produce that grows from the seed, will not interfere with each other and the harvest from a tract of land will be maximized. When the machine drops two seeds at once through the seed tube the stalks that grow from the two seeds compete for the same nutrients from the ground and the same light from the sun resulting in both stalks being

stunted and a reduced harvest from the tract of land. Similarly, when the machine fails altogether to drop a seed at one of the planting locations, the harvest is also reduced. A machine is considered to be operating at one hundred percent efficiency if it will plant one hundred seeds in one hundred equally spaced planting locations along a length of ground. Where the machine plants ninety-eight seeds in one hundred locations, it is considered to be operating at ninety-eight percent efficiency and where it is planting one hundred and two seeds in every one hundred locations (a second seed into each of two locations), the machine is considered to be operating at one hundred and two percent efficiency. A farmer will consider a machine that is operating outside the range of ninety-five percent to one hundred and five percent to be unacceptably inefficient and in either case will be required to adjust the vacuum or replace the seed disks of the machine to improve its efficiency. The desired operating range for such machines is between ninety-nine percent and one hundred and one percent efficiency. The planters manufactured by John Deere are adapted to plant from four to thirty-one rows simultaneously with a metering unit including a hopper retaining seed and a seed disk for each row to be planted by the machine.

The difficulties of maintaining proper efficiency are accentuated in the case of corn seed, which is one of the major grains for which the John Deere planter is employed. Although it would be desirable for a farmer to obtain seed which is of all the same size, as a practical matter, he must deal with seeds of varying size. As previously stated, John Deere offers three different seed disks for use in planting corn seed, one disk for each of three ranges of seed size.

In my patent application filed Mar. 28, 2002, now U.S. Pat. No. 6,932,236 B2, I disclosed a kit that includes an improved seed disk for insertion into the metering unit of a John Deere planter to improve the efficiency with which seed, especially corn seed, is planted. Specifically, machines having metering units fitted with the parts described in my patent no. 6,932,236 B1 will reliably deposit between ninety-nine and one hundred and one corn seeds along a length of ground that should receive one hundred seeds.

Another factor that effects the harvest produced by a tract of land is the spacing between the seeds along a row. Even though a row of seeds may have the correct number of seeds spaced along its length, if the seeds are not equally spaced apart from each other, the seeds that are spaced too close together will experience the problems of crowding and seeds that are spaced too far apart will not flourish enough to compensate for the stalks that are crowded.

Farmers have long recognized that John Deere planters have difficulty maintaining the spacing between seeds needed to maximize the harvest for a tract of land. The recognized solution to improve spacing is to operate the planter at a slower rate of speed. Although John Deere recommends that its planter be pulled at five miles per hour, farmers who want to avoid having a harvest that is reduced by poor seed spacing will choose to pull their planters at four miles per hour. Reducing the speed at which the planter is pulled increases the time required for planting and farmers who plant large acreage often encounter weather conditions and the like that allow a short planning season. In such cases, the farmer may be forced to pull the planter at six miles per hour, causing the spacings of the seeds to be even more uneven than when pulled at five miles per hour.

Even planters having metering units fitted with parts in accordance with my U.S. Pat. No. 6,932,236 B1 experience uneven spacing between seeds. This problem has been partially dealt with in my co-pending application Ser. No.

10/803,265 filed Mar. 18, 2004, but that has not resulted in a total solution the problem. It would be desirable; therefore, to provide an improvement to a vacuum seed planter that would improve the spacings between seeds planted without requiring that the machine be pulled at a slower rate of speed.

SUMMARY OF THE INVENTION

Briefly, the present invention is embodied in a method and apparatus for improving the spacing of seeds planted by a seed planter of the type manufactured by John Deere, having a metering unit for retaining a circular rotatable seed disk wherein seed is introduced into a first cavity in the metering unit defined by a first surface of the seed disk and a vacuum in drawn in a second cavity defined by the second surface of the seed disk. The vacuum draws individual seeds against transverse holes in the seed disk and releases the seeds to drop through a seed chute in the bottom of the metering unit and into the upper end of a seed tube that directs the seed into the ground for planting.

The seed chute is a channel having a generally rectangular opening with two approximately four inch long sides that are generally parallel to the seed disk and shorter, two inch long leading and trailing ends perpendicular to the long sides. The seed tube is an elongate tubular member having a generally rectangular cross-section which flares outward at the upper end thereof. The upper end of the seed tube is rectangular in shape with long sides that are a little longer than the outer dimensions of the long sides of the seed chute and short sides that are a little longer than the short sides of the seed chute.

During operation, seeds are drawn by the vacuum against the holes at the outer circumference of the rotating seed disk where they are retained as the disk moves through an arc that carries the seeds to a position above the seed chute and the seed tube. As the seeds reach a position above the seed chute, the disk moves away from the vacuum and the seeds fall away from the disk and through the rectangular opening of the seed chute and into the upper end of the seed tube. I have observed that all of the seeds that fall away from a given seed disk follow the same arc or path as they drop away from the seed disk and fall through the opening of the seed chute and into the seed tube below. Since each seed disk is intended for a different size and type of seed, each seed disk has a different thickness and surface configuration and therefore the path of the seeds falling away from one seed disk may be greatly different from the path of seeds falling away from another seed disk, but seeds falling away from a single seed disk all follow substantially the same path. Where the vacuum holes of the seed disk are positioned around the perimeter of the seed disk, as are the vacuum holes for all seed disks intended for use with corn, including a disk in accordance with my U.S. Pat. No. 6,932,236 B2, the seeds will be released very near to the leading wall of the seed tube where the leading wall is the narrow wall that is in the direction of motion of the planter as it moves across the field.

Where the path of seeds falling away from the seed disk carries the seeds along one wall of the seed tube, the moving seeds encounter the surface of the seed tube and some of the seeds are deflected by the irregularities in the inner surface of the seed tube. As the seeds become deflected by contact with the surfaces of the seed tube, they begin to ricochet or bounce down the remaining portion of the seed tube until they reach the lower end thereof and fall into the trough in the ground cut by the planter after which they are covered up and allowed to grow. Although the seeds falling away from a seed disk follow the same path as they move through the air, each seed follows a different path once it makes contact with the surface of the seed tube. Whereas one seed may slide along the surface and move smoothly down the length of the tube until it is expelled, a second seed following the first seed may be deflected from one surface to another of the seed chute and ricochet down its length causing it to be emitted into the trough after a longer period of time than the first seed. If the third seed slides through the seed tube without being deflected as severely as the second seed, it will be expelled into the trough as rapidly as the first seed and follow shortly behind the second seed such that the second seed is planted near the third seed and spaced a longer distance away from the first seed resulting in the uneven spacing of the seeds. To minimize the deflection of the seeds within the seed tube, it is desirable that the seeds follow a path that carries them near a vertical centerline of the seed tube such that the free fall of the seeds is maximized. It is desirable that the falling seeds do not contact the leading end or either of the side walls of the seed tube until the seed has dropped as far as possible down the length of the seed tube. It should be noted that the seed tube, as manufactured by John Deere, is somewhat tapered at the upper end thereof such that the walls are angled rather than vertical and seeds that engage the angled walls of the upper portion of the seed tube will be more highly deflected than seeds that fall between the sloping walls of the upper portions of the seed tube and do not engage the walls of the seed tube until the midportion thereof is reached where the side walls are vertical.

To direct the path of seeds falling from the seed disk so as to carry them near the center line of the seed tube, a deflector in accordance with the present invention is positioned on the outer wall of the first cavity of the metering unit immediately following the position at which the seed disk moves away from the vacuum. The deflector is configured so as to urge the path of seeds falling away from the seed disk away from the leading wall of the seed tube, and toward a centerline between the side walls of the seed tube to thereby maximize the free fall of the seeds before engaging a surface of the seed tube.

BRIEF DESCRIPTION OF THE DRAWINGS

A better and more complete understanding of the invention will be had after a reading of the following detailed description taken in conjunction with the drawings wherein:

FIG. **1** is a an isometric view of a John Deere planter;

FIG. **2** is a side elevational view of a row unit of the planter shown in FIG. **1** with the metering unit therein shown in broken lines;

FIG. **3** is an enlarged fragmentary side elevational view of the row unit shown in FIG. **2** with the metering unit visible within, the metering unit being without a deflecting member in accordance with the invention;

FIG. **4** is a front elevational view of a seed disk for use in the metering unit shown in FIG. **2**;

FIG. **5** is a rear elevational view of the seed disk shown in FIG. **4**;

FIG. **6** is a cross-sectional view of a metering unit such as shown in FIG. **2** but fitted with a deflector in accordance with the present invention;

FIG. **7** is an isometric view of the metering unit shown in FIG. **6** with the metering unit open and the seed disk removed;

FIG. **8** is an isometric view of the metering unit in the open condition with the seed disk inserted;

FIG. **9** is an isometric view of the metering unit shown in FIG. **6** with the unit closed and a portion of the wall broken away so the deflector is visible; and

FIG. **10** is a front elevational view of one side of the metering unit shown in FIG. **6** with a portion of the seed disk broken away.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Referring to FIG. **1**, a John Deere planter such as a 7200 Max Emerge Flex-fold planter **10** includes a pair of elongate tow bars **12**, **14** at the rearward end of which is a cross bar **16** having wheels, not shown, for transporting the planter **10** across the open highway. Extending along the length of the cross bar **14** are a plurality of row units **30**-**30**. John Deere manufactures planters **10** which vary in width from four to thirty one row units.

The model 7200 planter was first offered for sale in 1987 and since then John Deere has placed several other models on the market including models 1750, 1760, 1770, and 1780, each of which has corresponding parts and the performances of all of which are improved by the use of the present invention.

Referring to FIGS. **2** and **3**, each row unit **20** has a frame **24** supported by a pair of spaced apart wheels, one of which **26** is visible in FIG. **2**. Mounted above the frame **24** are a first hopper **32** for retaining seed and a second hopper **34** for retaining a dry herbicide. Below the seed hopper **32** is a metering unit **36** and a chute, not shown, directs seed from the hopper **32** to the metering unit **36**. Below the metering unit **36** are opener discs **40**. Rearward of the opener discs **40** are closing wheels **44**, the elevation of which is adjustable through a pivot **46** to thereby permit the opener discs **44** to create a trench of the depth desired for the seed being planted.

A seed tube **48** extends from the metering unit **36** to a position between the opener discs **40** for directing individual seeds singulated by the metering unit **36** into the furrow of ground formed by the opener discs **40**, thereby planting the seed. A gearing assembly, not shown, connected to the wheels **26** rotates a drive member, also not show, which rotates a shaft **42** that extends through the metering unit and drives the metering unit **36** such that the rate at which the metering unit discharges seed is coordinated to the ground speed of the planter **10**.

When the planer **10** operates properly, the planted seed will have a predetermined spacing, such as six inches, between adjacent seeds. If the spacing between adjacent seeds is too close, the plants that grow from the seed will interfere with each other and thereby reduce the yield of the field. If the spacing between seeds is too far apart, the yield from the field will also be reduced and therefore, yield is maximized when the seed is consistently planted with the desired spacing between seed.

Referring to FIGS. **6** through **10**, the metering unit **36** includes a first housing member **50**, having a generally cylindrical outer wall **52** and a planar rear wall **54** thereby forming a cavity. Extending from the rear wall **54**, axially with respect to the cylindrical outer wall **52**, is a tubular retaining hub **56** at the distal end of which is a handle **58** which is rotatable between a first position for receiving or removing a seed disk **60** and a second position for removably retaining a seed disk **60** on the hub **56**.

Referring to FIGS. **6**, **7**, and **8**, the retaining hub **56** is threaded on a cylindrical drive shaft **55** at the distal end of which are a pair of flanges **57** for drivingly engaging a drive member, not shown, which in turn is drivingly connected by the gearing, also not shown, to the wheels **26**. A removable spring locking pin, not shown, locks the tubular retaining hub **56** to the inner drive shaft **55**. By removing the spring locking pin, the retaining hub **56** can be rotated with respect to the inner shaft to thereby axially move the retaining hub **56** with respect to the rear wall **54** of the first housing member **50**. Rotating the retaining hub **56** clockwise with respect to the drive shaft moves a seed disk **60** retained thereon toward the rear wall **54** and rotating the retaining hub **56** counterclockwise moves a seed disk **60** thereon away from the rear wall **54** of the first housing member **50**. Adjusting the retaining hub **56** causes the axial adjustment of the seed disk **60**, after which the parts are locked into their desired orientation by locking pin **59**.

Referring briefly to FIGS. **4** and **5**, the seed disk **60** has a generally circular body with first and second planar surfaces **61**, **62**, and having a wing shaped central opening **53**. The opening **53** is shaped to receive the winged hub handle **58**, not shown, at the distal end of the retaining hub **56** of first housing member **50**. Surrounding the central opening **53** on the second side **62** are two arcuately shaped opposing ramped surfaces **63**, **64** and opposing locking notches **65**,**66** for locking the seed disk **60** to the hub **56**. Extending around a circle which is spaced a short distance within the outer circumference of the seed disk **60** are a plurality of spaced transverse holes **67**-**67**. The diameter of the cylindrical outer end of the seed disc **60** is a little less than the inner diameter of the tubular outer wall **52** of the first housing member **50** of the metering unit **36** (and of the cylindrical outer wall of the second housing member **90**, as is further described below).

Referring further to FIGS. **3** and **6**, the first housing **50** includes an upwardly opening access port **69** in the rear wall **52** into which the lower end of the chute from the hopper **32** extends, allowing seeds to enter the first housing member **50**. Approximately diametrically opposite the access port **69** is a seed chute **70** in the cylindrical wall **52** of the housing member **50** through which singulated seeds drop and fall into the seed tube **48** for planting. When assembled on a row unit **30**, the metering unit **36** is oriented with the axis of the hub **56** horizontal and the seed chute **70** extending downward as is shown in FIG. **3**.

Referring to FIGS. **11** and **12**, the seed chute **70** is a short, tubular member with a generally rectangular cross-section having parallel long sides **122**, **124** and parallel short sides **126**, **128**. The short sides **126**, **128** and long side **122** are formed as part of the casting for first housing member **50** and create a channel. Long side **124**, extends generally parallel to long side **122** and is formed by a plastic member **129** that extends across the ends of short sides **126**, **128** and is held in place by hooks **132**, **133** that are received in holes **134**, **135** in the ends of short side **128** and by a removable snap **136** that attaches to a catch **138** on the short side **126**.

Referring to FIGS. **3**, **11** and **12**, the seed tube **48** is an elongate, tapered, tubular member having a rectangular cross-section consisting of first and second opposing side walls **140**, **142** and generally perpendicular thereto, leading and trailing walls **144**, **146**. The seed tube **48** is molded of plastic and has formed into the body thereof and has a plurality of mounting points along the length thereof, now shown, except for hook **154** shown on FIG. **3**, for the attachment of the seed tube **48** to the row unit **30**.

Referring to FIG. **7**, extending across the rear surface of the first housing member **50** and adjacent the hub **56** is an elongate brush **71** having one end connected to the outer wall **52** and the second end spaced a short distance from the cylindrical outer wall **52** leaving a gap **65** between the distal end of the brush **71** and the inner surface of the cylindrical outer wall **52**. The brush **71** is positioned to separate seed entering the access port **69** from inadvertently reaching the seed chute **70**. The bristles of the brush **71** extend axially away from the rear wall **52** and brush against the first surface **61** of a seed disk **60** which has been retained thereto by the retaining hub **56** thereby creating a partial barrier between the outer wall **52** and the seed disk **60**. The brush **71** insures that seeds singulated by the seed disk **60** are removed therefrom as the disk passes over the seed chute **70** in the wall **52** and further separates the loose seeds entering through the port **69** from inadvertently entering the seed chute **70** and falling into the seed tube **48**.

Referring further to FIGS. **6**, **7**, and **8**, the metering unit **36** includes a second housing member **90** attached by a pivot pin **92** to the first housing member **50**. The second housing member **90** has a generally tubular outer wall **94** and a planar rear surface **96** such that it too has a cavity therein. The tubular outer wall **96** includes an intrusions portion **98** including a generally radial wall **103**, and around the inner edge of the outer wall **94** and the intrusion portion **98** is a rubberized sealing member **99** which seals against the second surface **62** of a seed disk **60** when the housing members **50**, **90** are assembled against each other as further described below.

The second housing member **90** further has an aperture **100** in the rear wall **96** and the outer surface of the second housing member has a tubular protrusion **101** the inner opening of which communicates with the aperture **100** and is adapted to receive a vacuum hose, not shown, leading from a vacuum pump. Most John Deere planters **10** have one or two vacuum pumps, not shown.

Within the intrusion portion **98** of the second housing member **90** is a third cavity defined by a portion of the cylindrical outer wall **94** and the wall of the intrusion portion **98**, and mounted thereon is a knockout assembly **120** of the type manufactured by John Deere.

Referring to FIGS. **7** and **8**, a latch assembly **158** on the first housing member **50** is adapted to engage a second latch member **159** on the second housing member **90** for retaining the two housing members **50**, **90** engaged with one another, to thereby form the assembled metering unit **36**.

As shown in FIGS. **3**, **5**, and **7**, when the two housing members **50**, **90** are latched in assembled relationship, with a seed disk **60** retained on the retaining hub **56** of the housing member **50**, the interior of the metering unit **36** will be divided into two chambers. The first chamber is defined by the cavity in the first housing member **50** and the first surface **61** of the seed disk **60**. The second chamber is defined by the cavity in the second housing member **90** and the second surface **62** of the seed disk **60**. It should be appreciated that the second chamber excludes the intrusion portion **98** of the second housing member **90**.

A vacuum is drawn by the vacuum pumps through lines connected to the second housing member **90** and through the aperture **100** creating a vacuum in the second chamber of the metering unit **36**. Meanwhile, seeds **156** from within the seed hopper **32** drops through the chute **38** and through the port **69** into the first chamber. When the metering unit **36** is operating properly, the vacuum in the second chamber is drawn through the plurality of holes **67-67** of the seed disk **60** except for those holes **67-67** positioned beyond the sealing member **99** (defined by the intrusion portion **98**). The intrusion portion **98** sections off from the cavity of the second housing member **90** the portion of the seed disk **60** for which a vacuum is not drawn through the vacuum holes **67-67**. As the disk **60** rotates through the mass of seeds **156** which accumulate near the port **69**, one seed is drawn by the vacuum against each of the transverse holes **67-67**. As the seed disk **60** continues to rotate within the metering unit **36**, the singulated seeds are moved through the gap **65** at the distal end of the brush **71** and over the seed chute **70** in the outer wall **52** of the second housing member **50**. As each of the singulated seeds is moved over the seed chute **70**, the aperture of the associated hole **67** on the second side **62** of the seed disk **60** crosses the vacuum barrier formed by the sealing member **99** across the radial wall **103** thereby releasing the seed from the first side **61**. The seeds then fall away from the seed disk **60** and fall in an arc or path through the seed chute **70** in the outer wall **52** of the first housing member **50** and through the seed tube **48** to be planted.

Each seed disk **60** has a different thickness and configuration and is intended for a different size and shape of seed **156**. As a result, the seeds **156** that fall away from a first seed disk **60** fall through a different path than those that fall away from a second seed disk **60** used for a different type or different size of seed. However, all the seeds **156** that fall off a given seed disk **60** follow substantially the same path as they fall away from the seed disk **60**.

For example, the seed disks sold by John Deere, not shown, for planting corn in the planer **10** have contoured pockets with raised outer boundaries that surround the openings for the vacuum holes on the first side thereof. The pockets and raised boundaries are intended to assist in singulating the seed and they also cause the seeds to fall nearly midway between the side walls **140**, **142**. On the other hand, the seed disk disclosed in my U.S. Pat. No. 6,932,236 B2 has a flat first surface against which the seeds are held as they are moved over the seed chute **70**. The absence of raised boundaries around the vacuum holes **67** causes the seed **156** dropped from the seed disk disclosed in my U.S. Pat. No. 6,932,236 B2 to drop through the seed chute **70** nearer to the second housing **90** and nearer to side wall **142** than do seeds dropped by the disks sold by John Deere for planting corn seed.

For example, the seed disks sold by John Deere, not shown, for planting corn in the planer **10** have contoured pockets with raised outer boundaries that surround the openings for the vacuum holes on the first side thereof. The pockets and raised boundaries are intended to assist in singulating the seed and they also cause the seeds to fall nearly midway between the seeds walls **140**, **142**. On the other hand, the seed disk disclosed in my U.S. Pat. No. 6,932,236 B2 has a flat first surface against which the seeds are held as they are moved over the seed chute **70**. The absence of raised boundaries around the vacuum holes **67** causes the seed **156** dropped from the seed disk disclosed in my U.S. Pat. No. 6,932,236 B2 to drop through the seed chute **70** nearer to the second housing **90** and nearer to side wall **142** than do seeds dropped by the disks sold by John Deere for planting corn seed.

Referring to FIG. **3**, the seed tube **48** is positioned with the leading wall **144** directly below the most forward position of the seed disk **60**. The manufacturers of the product intended that the seeds **156** released by the seed disk **60** would slide along the slightly curved leading wall **144** until they fall out of the distal end **162** thereof and into the trough **164** in the ground for planting. In reality, not all of the seeds **156** slide along the curved leading wall **144** as intended, but some are

deflected and follow irregular paths, such as path **166** and encounter several of the inner surfaces of the seed tube **48** as it they are ricocheted along the tube **48** before being expelled out the discharge opening **162** for planting. For all the seed disks manufactured by John Deere, the seeds are released near the outer wall **52** of the metering unit **36** and follow a path that takes them along the leading wall **144** from the point of entry into the seed tube **48** such that many are deflected as they move downward through the length of the seed tube **48**.

Furthermore, depending on the configuration and thickness of the seed disk **60** in the metering unit **36**, the seeds falling from the seed disk **60** may follow a downward path that does not take it midway between the side walls **140**, **142**, but rather in a path that is near side wall **142** such that the seeds **156** engage the side wall **142** where it is partially sloped causing some of the seeds to be deflected and thereafter ricochet down the remaining portions of the length of the seed tube **48**.

Referring to FIGS. **6**, **7**, **8**, **9**, and **10**, it is desirable to direct the path **168** of seeds **156** so that they fall as nearly as possible to a center line **170** of the seed tube **48** that is equally spaced between the side walls **140**, **142** of the seed tube **48** and spaced from the leading wall **144** so that the seeds **156** will drop as far as possible down the length of the seed tube **48** before encountering one of the side walls **140**, **142** or the lead wall **144**. To direct the path **168** of the seed **156** toward the center line **170**, a deflector **172** is mounted on the cylindrical inner wall **52** of the first housing member **50** at a position immediately opposite the radial wall **103** that defines the position at which seeds are released from the seed disk **60** and allowed to fall. The deflector **172** is preferably made of a stainless spring steel plate so as to not be subject to corrosion and so as to retain its shape while being subjected to pressure applied by the seeds as they move along its surface. Preferably, the deflector **172** is rectangular in shape with a width **174** of approximately three-quarters inch and a length **176** of between one and one-half and two inches. The deflector **172** preferably also has a first very gentle bend **178** separating a mounting section **180** from a deflection section **182** and a transverse hole, not visible, in the mounting section **180** such that a mounting screw **186** can be extended through the hole in the mounting portion and into a threaded hole, **187**, in the cylindrical inner wall **52** of the first housing **50** for retaining the deflector **172**. The deflector **172** has a second bend in the form of a clearly definable crease **188** that extends at an angle that more closely parallels the length **176** than the width **174** of the deflector **172**. The deflector **172** is attached to the inner wall **52** of the first housing **50** with the end of the crease **188** nearest the mounting section **180** positioned at the point where the seeds **156** are released from the seed disk **60**. Since the seeds **156** are released by the seed disk very near the outer wall **54**, soon after they are released, they will contact the surface of the deflector **182**. Once released from the seed disk **60**, the seeds **156** will be directed by the surfaces of the deflector along the crease **188** and the deflector **172** will cause the path **168** of the seeds to be directed towards a centerline **170** generally midway between the side walls **140**, **142** of the seed tube **48**.

Referring to FIG. **9**, a threaded adjustment screw **190** is threaded into a tapped hole in the cylindrical wall **52** of the first housing member **50** until the distal end of the screw **190** contacts the rear surface of the deflection section **182** of the deflector **172**. Further tightening of the screw **190** causes the distal end of the deflection section **182** to move further outward of the cylindrical wall **52** thereby deflecting the path **168** of the seeds **156** further from the leading wall **144** of the seed tube **48**. By adjusting the screw **190**, the path **168** of the falling seeds **156** can be set so they do not follow the curve of the leading wall **144** of the seed tube **48** but free fall through down half the length of the seed tube **48** or more before first contacting a portion of the leading wall **144**. Since the path **168** of falling seeds results in the seeds not encountering the walls of the seed tube **48** until the seeds have dropped approximately half the length of the seed tube **48**, the seeds that are planted are more nearly equally spaced apart as they are emitted through the aperture **162** at the lower end of the seed tube **48**. As a consequence of the seeds being equally spaced apart as they are emitted through the aperture **162**, the seeds planted by the planter **10** are very nearly equally spaced apart so as to minimize any reduction in harvest caused by the unequal spacing of seeds.

While the present invention has been described with respect to a single embodiment, it will be appreciated that many modifications and variations may be made without departing from the true spirit and scope of the invention. It is, therefore, the intent of the following claims to cover all such modifications and variations which fall within the true spirit and scope of the invention.

What is claimed:

1. In a seed planter having a metering unit having a housing retaining a circular rotatable seed disk, said seed disk having a center, a first surface, a second opposing surface, and a plurality of transverse spaced vacuum holes extending from said first surface to said second surface, wherein seeds are introduced into a first cavity in said housing defined by said first surface and a vacuum is drawn into a second cavity in said housing defined by an inner wall of said housing and by said second surface, such that seeds are retained against said vacuum holes until they are released from said vacuum and dropped through a seed chute and into a seed tube, said seeds follow a predetermined path as they fall away from said seed disk and into said seed tube, the improvement comprising

said seed tube having generally parallel side walls, a leading wall and a trailing wall,

said side walls spaced apart from each other by a distance significantly greater than a diameter of one of said seeds,

said leading wall and said trailing wall spaced from each other by a distance significantly greater than said diameter of one of said seeds,

a deflector on said inner wall, said deflector deflecting said path toward a vertical centerline between said leading and trailing walls wherein said seeds will free fall between said leading and trailing walls for a portion of a length of said seed tube.

2. The improvement of claim **1** and wherein said deflector further deflects said path toward a vertical centerline between said opposing side walls.

3. The improvement of claim **1** wherein said deflector comprises

a metal body,

said body having a mounting portion for attaching said body to said housing, and

a deflecting portion,

said deflecting portion has a surface angled with respect to a surface of said mounting portion wherein said deflecting portion deflects said predetermined path toward said centerline between said leading and trailing walls.

4. The improvement of claim **3** and further comprising a crease in said deflecting portion wherein said crease also

deflects said predetermined path toward a centerline between said opposing side walls.

5. The improvement of claim **3** wherein said deflector is made of stainless steel.

6. The improvement of claim **3** wherein said deflector is made of spring steel.

7. The improvement of claim **3** and further comprising an adjustment screw for changing an angle of said deflecting portion to thereby adjust said path towards said centerline.

8. In a seed planter having a metering unit having a housing retaining a circular rotatable seed disk, said seed disk having a center, a first surface, a second opposing surface, and a plurality of transverse spaced vacuum holes extending from said first surface to said second surface, wherein seeds are introduced into a first cavity in said housing defined by said first surface and a vacuum is drawn into a second cavity in said housing defined by an inner wall of said housing and by said second surface, such that seeds are retained against said vacuum holes until they are released from said vacuum and dropped through a seed chute and into a seed tube, said seeds follow a predetermined path as they fall away from said seed disk and into said seed tube, the improvement comprising

said seed tube having generally parallel side walls, a leading wall and a trailing wall,

said side walls spaced apart from each other by a distance significantly greater than a diameter of one of said seeds,

said leading wall and said trailing wall spaced from each other by a distance significantly greater than said diameter of one of said seeds,

a deflector on said inner wall, said deflector deflecting said path toward a vertical centerline between said opposing side walls wherein said seeds will free fall between said opposing side walls for a portion of a length of said seed tube.

9. The improvement of claim **8** wherein said deflector comprises a metal body,

said body having a mounting portion for attaching said deflector to said housing, and

a deflecting portion,

said deflecting portion having a surface angled with respect to a surface of said mounting portion wherein said deflecting portion deflects said predetermined path toward said centerline.

10. The improvement of claim **9** and further comprising an adjustment screw of changing an angle of said deflecting portion to thereby adjust said path toward said centerline.

11. A seed planter comprising

a metering unit having a housing,

a rotating seed disk in said housing,

said seed disk having a first surface, a second surface opposite said first surface, a plurality of vacuum holes extending from said first surface to said second surface,

said first surface defining a first cavity in said housing and said second surface defining a second cavity therein,

a vacuum drawn in said second cavity,

a seed chute extending downward from said first cavity wherein seeds released from said first side fall in a path through said seed chute,

a seed tube extending downward from said seed chute,

said seed tube having generally parallel side walls, a leading wall and a trailing wall,

said side walls spaced apart from each other by a distance significantly greater than a diameter of one of said seeds,

said side walls spaced apart from each other by a distance significantly greater than a diameter of one of said seeds,

said leading wall and said trailing wall spaced from each other by a distance significantly greater than said diameter of one of said seeds,

a deflector on an inner wall of said housing,

said deflector deflecting said path toward a centerline generally midway between said side walls and midway between said leading wall and said trailing wall wherein said seeds will free fall through a portion of a length of said seed tube.

12. The seed planter of claim **11** wherein said deflector comprises a metal body,

said body having a mounting portion for attaching said deflector to said housing, and

a deflecting portion,

said deflecting portion having a surface angled with respect to a surface of said mounting portion wherein said deflecting portion deflects said predetermined path toward said centerline.

13. The seed planter of claim **12** and further comprising an adjustment screw for changing an angle of said deflecting portion to thereby adjust said path toward said centerline.

* * * * *

DESCRIPTION

The present invention relates to a distributor element of the seed for pneumatic seed drill precision, a seeding element for such machinery and a seed drill including a plurality of such sowing elements.

In the pneumatic seed drill precision sowing elements are known to be used each fitted with an element of the seed distributor (hereinafter, in short, distributor) to distribute one seed at a time in the controlled delivery while the seeding element moves along a track of sowing.

It 'also known backstop devices of distributors of the seed which use a differential air pressure between opposing faces of a sowing disc (or selector) provided with one or more rings of through holes. The principle of operation is based on the fact that, due to the pressure differential between the opposing faces of the disc, a seed adheres to each hole and is then transported with the rotation of the seeding disc from the area of seed selection fi no to the point which ceases the pressure differential and the seed is released to fall through a duct in the sowing furrow or track seeding. In practice, on one of the faces of the disk is exerted a strong air suction that holds the seeds on the opposite face at the respective holes.

For the good functioning of such distributors it is necessary to ensure a pneumatic seal ef fi cient between the disk face subject to suction and a gasket that delimits the suction chamber pneumatic. The same suction effect leads to a substantial compression of the disk against the seal. If the one hand this guarantees an adequate adherence of the gasket to the disc surface subject to depression, on the other hand this leads to a strong abrasion of the seal which limits the duration ef fi cient. E 'therefore necessary to periodically replace the gasket to prevent sowing errors arising from an insufficient depressurization of the suction chamber.

On the other hand, even if replace this seal it is a simple operation, in each case it involves an undesired machine downtime, besides the cost itself of the parts.

To overcome this drawback it has been developed seeding machines equipped with a thrust element which relieves the load on the gasket. In all cases, however, the thrust element, which must be driven in rotation with the disc, is mounted on the part of the fixed | 'casing, that is to say one that is fixed aII'intelaiatura of the seeding units. This entails that the disc must be hooked to the element thrust bearing; so it must be provided a coupling system that in phase of disc replacement must be switched off by stretching consequently that operation. This is inevitable in the known machines because on the fixed must be mounted transmission which leads in rotation the motorized shaft that leads in rotation the disc.

Place the thrust element on the fixed part entails, however, that the suction chamber is realized on the pneumatic part fixed, ie on the same side in which is placed the element of thrust, while the collection chamber of the seed must be realized in the mobile part. This is a source of numerous drawbacks, including the fact that the opening of the housing necessarily involves the removal of the part containing the collection chamber of the seed from the hopper storage above which must necessarily be fixed to the frame element of sowing .

In addition to the replacement of the seeding disc it is necessary to remove some parts of the dispenser, such as the adjustable selector of the seed, and the seed epulsore, where provided. The problem underlying the present invention is to make available a distributor element of the seed designed structurally and functionally so as to overcome all of the problems complained of with reference to the prior art mentioned. This problem is solved by | to the invention by means of an element of the seed distributor formed in accordance with one or more of the appended claims.

The characteristics and advantages of the invention will become clearer from the detailed description that follows of a preferred example of embodiment illustrated, by way of indication and not of limitation with reference to the accompanying drawings in which:

- Fig. 1 is a view in perspective of a distributor element of the seed produced in accordance with the present invention;

- The fi g. 2 is a perspective view with parts separated of a detail of the element of Fig. 1;

- Fig. 3 is a perspective view of a seed drill with sowing elements with the seed distributor element according to the invention.

In the figures, 1 generally indicates a distributor element of the seed is intended to equip a sowing element 2 of a pneumatic seed drill Precision 3.

The distributor 1 is the body intended to deposit a seed 4 at a time at a predetermined adjustable distance in a furrow opened by a furrow opener 5. The seeding element 2, in addition to the distributor element 1 comprises a frame 6 and a warehouse of the seed or hopper 7, in addition to other organs known in themselves and not necessary for an understanding of the present invention; The seed drill 3 in turn comprises a supporting structure 8 on which is mounted a plurality of sowing elements 2, all connected to a suction pneumatic 9.

The seeding element 1 in turn comprises a casing 10 with a part 11 fixed fixed firmly on the frame 6 and a movable part 12 hinged at a hinge 12a on the fixed 11 via a hinge pin 13 removable. The part fixed includes a mouth 14 through which it is connected to below a outflow mouth of the warehouse or hopper 7 so as to be powered directly from this.

Dall'imboccatura 14 the seed flows through a port 14a of inflow of the seed in a chamber 15 for collecting the seed.

A sowing disc 16 separates the chamber 15 for collecting the seed from a suction chamber 17 formed in the movable part 12. A vacuum cleaner 18 mounted on the supporting structure 8 is connected to the suction chamber 17 through piping 19 to generate a pressure differential between the opposing surfaces 16a, b of the selector disc 16.

The seed disc 16 is mounted in a removable manner on a driving shaft 20 powered, supported nellaparte fixing 11 and driven in rotation at speeds pre fixed and

adjustable by a transmission not shown. The presence of such transmission requires that the shaft 20 is mounted on the fixed part 11 of the casing 10. The shrink fit between the shaft 20 and disk 16 is obtained by means of a pro fi polygon 21 to the free end of the shaft 20 that protrudes beyond the disc 16 and preferably it has chamfers 22 which serve as invitation for the functions clarified below.

At the periphery of the disc 16 is formed a (or more) crown of holes 23 passing through the opposing faces of the seeding disc 16.

A gasket 24 is applied in the suction chamber 17 and is placed in sliding contact with the surface facing the disc 16, when the movable part 11 is closed on the fixed 12, to delimit a segment circumferential in which the holes 23 are subject to the pressure differential aforesaid. This circumferential segment extends between the chamber 15 and a duct collection of the semen of fall of the seed 25 in which the seeds are released one at a time in the path traced by the | 'assolcatore 5.

By reason of the pressure differential between the two super fi opposing sowing disc, the seeds 4 are retained, one for each hole 23, when the holes pass in the chamber 15 for collecting the seed and are released at the duct 25 when the operator stops 'pneumatic effect of the differential pressure or for the presence of an ejector of the seed (not shown).

To limit the wear of the gasket 24 as a result of sliding against the surface of the disc 16 on the mobile part is mounted a thrust element indicated overall by 26.

The thrust element 26 comprises a shaft 27 rotatably mounted by means of bearings 28 in a seat 29 of the mobile part 12. The shaft 27 bears a flange 30 via which it is fixed to a thrust plate 31 susceptible of support to the surface of the disc facing to the seal 24 at a radially internal to the crown of holes 23 to support at least part of the axial load generated by the disc 16 on the seal 24.

The support between the thrust plate 31 and the disc 16 takes place in correspondence of a crown 31a in relief on the surface of the plate facing the disc 16.

The thrust element 26 is driven in rotation with the seed disc 16 when the parts fixed and mobile 11,12 are closed on one another by means of a drive element 32 which comprises a coupler secured to the thrust plate in rotation but with radial and / or circumferential so self-centered in coupling with the rotational drive shaft of the disc 16. For this purpose, in the present embodiment, the drive element 32 is coupled with limited radial play and / or circumferential element 26 via one (or more) appendix 33 projecting radially outwards and nested in corresponding seats 34 of the plate. The element day drive 32 is coupled via a pro fi polygonal inner 35 (similar to that adopted for key star or box-end wrench) to pro fi polygon 21 of the free end of the shaft 20, whose bevels 22 serve as a call for facilitate the centering of the two profiles and the respective clutch.

The driving element 32 is thus self-centering with respect all'albero drag 20 from which it is conducted. The positioning between gasket 24 and plate 31 will be such that the rotation of the latter will not be hindered by the presence of the seal 24 and, at the same time, both will be maintained in support of the disc 16.

It is also envisaged that the thrust element 26 can be realized neutral and not driven in rotation from the shaft 20.

The assembly of the movable part 12 full thrust element 26 and gasket 24 lends itself advantageously to the realization of a kit for retro fi tting of existing seeders. It is suf fi cient in this case separate the movable part of the old type by removing the hinge pin 13 and replace it with the kit aforesaid. Reconnecting the pneumatic lines previously dropped the drill is ready to work.

Among the main advantages of the distributor according I'invenzione there is the fact that is greatly reduced, if not eliminated, the seal wear due to the sliding contact with the selector disc of the seed; the element is self-centering thrust bearing which allows a facilitated opening and closing of the mobile part on the fixed wrap; the system also lends itself to easy retrofitting, all without removal of mobile parts and / or operations of release of the sowing disc.

CLAIMS

1. Element distributor of seed for precision pneumatic seed drill, the type including:
• a sowing disc driven by a motorized shaft transmission in rotation at a controlled speed in solid with said shaft,
• a casing with a fixed part in which is supported on said shaft and a movable part with respect to said part fixed and closable on it,
• in that party being fixed defined a collection chamber of the seed,
• in it said mobile part being defined a pneumatic suction chamber,
• said seed plate being interposed between those parties and having super fi opposing delimiting said chambers
• said seed plate having at least one circle pattern selectors passing between those surfaces opposing us,
• means for generating a pressure differential between said opposing surfaces in correspondence of a segment of said circumferential crown of holes,
• said means including said suction chamber pneumatic and
• a gasket on the mobile part capable of sliding contact with the surface facing the disc when said parts are closed upon one another,
• characterized in that it comprises
• a thrust element of the seed disc rotatably supported in said movable part, to support at least part of the axial load generated by the disc of said gasket.

2. Element distributor of the seed according to claim 1 in which said thrust element is driven in rotation with said disk when said parts are closed upon one another.

3. Element distributor of the seed according to claim 1 or 2, wherein said thrust bearing comprises a thrust plate susceptible of support to the surface of the seeding disc facing said gasket zone to the radially inner crown of holes.

4. An element of the seed distributor according to claim 3 wherein the thrust bearing comprises a drive element for rotation with the plate and susceptible of coupling with the drive shaft of the disc when said parts are closed upon one another.

5. Element distributor of the seed according to claim 4 wherein the entrainment element is self-centering relative to the shaft of dragging.

6. Element distributor of the seed according to claim 4 or 5, wherein the entrainment element comprises a coupler secured to the thrust plate in rotation but with radial play and / or circumferential so self-centered in the rotational coupling with the shaft entrainment of the disc.

7. An element of the seed distributor according to one or more of the preceding claims, wherein the movable part is hinged to the fixed part.

8. Seeding element for precision drills including a frame on which is mounted a distributor element of the seed according to one or more of the preceding claims.

9. Seed drill comprising a supporting structure on which is mounted a plurality of sowing elements according to claim 8.

10. Kit for retrofitting of the elements of the seed distributors of precision pneumatic sowers in which the distributor elements are of the type including:
• a sowing disc driven by a motorized shaft transmission in rotation at a controlled speed in solid with said shaft,
• a casing with a part fixed in which said shaft is supported and a movable part with respect to said part fixed and closable on it,
• in the said part fixed being defined a collection chamber of the semen,
• in it said movable part being defined a suction chamber pneumatic,
• said seed plate being interposed between those parties and having super fi opposing delimiting said chambers
• said seed disc having at least a crown of holes selectors loops between said opposing surfaces, means for generating a pressure differential between said opposing surfaces in correspondence of a segment of said circumferential crown of holes,
• said means including said suction chamber pneumatic and
• a gasket on the mobile part capable of sliding contact with the surface facing

the disc when said parts are closed upon one another,

characterized in that it comprises:

• said mobile part with pre-assembled

• a thrust element of the seed disc rotatably supported in said movable part, to support at least part of the axial load generated by the disc of said gasket.

11. Kit according to claim 10 wherein said movable part and said thrust element comprise one or more of the features of claims 2 to 7.

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Locas, Davide
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35122 Padova
ITALIE

Date
05.12.14

Reference	Application No./Patent No.
PBP11900-EP	11779702.7 - 1656 / 2637492
Applicant/Proprietor	
Maschio Gaspardo S.p.A.	

Transmission of the certificate for a European patent pursuant to Rule 74 EPC

The certificate for a European patent is herewith transmitted.

The European patent specification can be downloaded from the EPO publication server **https://data.epo.org/publication-server/** (see OJ EPO 2005, 126).

Note:
A corrected title page of the European patent specification will be published, if the bibliographic data have been changed after completion of the technical preparations.

For the Examining Division

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Contact Customer Services at www.epo.org/contact

Locas, Davide
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Date
06.11.14

Reference	Application No./Patent No.
PBP11900-EP	11779702.7 - 1656 / 2637492
Applicant/Proprietor	
Maschio Gaspardo S.p.A.	

Decision to grant a European patent pursuant to Article 97(1) EPC

Following examination of European patent application No. 11779702.7 a European patent with the title and the supporting documents indicated in the communication pursuant to Rule 71(3) EPC dated 20.05.14 is hereby granted in respect of the designated Contracting States.

Patent No. : 2637492
Date of filing : 10.11.11
Priority claimed : 12.11.10/ITA PD20100338

Designated Contracting States and Proprietor(s) : AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Maschio Gaspardo S.p.A.
Via Marcello 73
35011 Campodarsego (PD)/IT

This decision will take effect on the date on which the European Patent Bulletin mentions the grant (Art. 97(3) EPC).

The mention of the grant will be published in European Patent Bulletin 14/49 of 03.12.14.

Examining Division

Bunn D Simson G Lang D

Europäisches Patentamt • European Patent Office • Office européen des brevets

Registered letter
EPO Form 2006A 12.07 (31/10/14)

to EPO postal service: 31.10.14

Precision Exhibit 1005

ANMERKUNG ZUR ENTSCHEIDUNG ÜBER DIE ERTEILUNG
EINES EUROPÄISCHEN PATENTS (EPA Form 2006)

1. **EPA Informationsbroschüre "Nationales Recht zum EPÜ"**
Diese Broschüre enthält nützliche Informationen zu den formalen Erfordernissen und den Handlungen, die vor den Patentbehörden der Vertragsstaaten vorzunehmen sind, um Rechte in diesen Staaten zu erlangen. Da diese Handlungen einem ständigen Wandel unterworfen sind, sollte immer nur die neueste Ausgabe der Broschüre benutzt werden. Nachträgliche Informationen werden im Amtsblatt veröffentlicht.

2. **Übersetzung der europäischen Patentschrift nach Artikel 65 (1) des Europäischen Patentübereinkommens**
Sie werden erneut darauf hingewiesen, dass bestimmte Vertragsstaaten nach Artikel 65 (1) EPÜ eine Übersetzung der europäischen Patentschrift verlangen; hierauf wird in der Mitteilung gemäß Regel 71 (5) EPÜ verwiesen. Die Nichteinreichung dieser Übersetzung kann zur Folge haben, dass das Patent in dem betreffenden Staat/in den betreffenden Staaten als von Anfang an nicht eingetreten gilt. Weitere Einzelheiten entnehmen Sie bitte der oben genannten Broschüre.

3. **Zahlung von Jahresgebühren für europäische Patente**
Nach Artikel 141 EPÜ können "nationale" Jahresgebühren für das europäische Patent für die Jahre erhoben werden, die an das Jahr anschließen, in dem der Hinweis auf die Erteilung des europäischen Patents im "Europäischen Patentblatt" bekanntgemacht wird. Weitere Einzelheiten entnehmen Sie bitte der oben genannten Broschüre.

NOTE RELATING TO THE DECISION TO GRANT A
EUROPEAN PATENT (EPO Form 2006)

1. **EPO Information Brochure "National law relating to the EPC"**
This brochure provides useful information regarding formal requirements and the steps to be taken before the patent authorities of the Contracting States in order to acquire rights in those states. Since the necessary steps are subject to change the latest edition of the brochure should always be used. Subsequent information is published In the Official Journal.

2. **Translation of the European patent application under Article 65(1) of the European Patent Convention**
Your attention is again drawn to the requirements regarding translation of the European patent specification laid down by a number of Contracting States under Article 65(1) EPC, to which reference is made in the communication under Rule 71(5) EPC. Failure to supply such translation(s) may result in the patent being deemed to be void "ab initio" in the State(s) in question. For further details you are recommended to consult the above-mentioned brochure.

3. **Payment of renewal fees for European patents**
Under Article 141 EPC "national" renewal fees in respect of a European patent may be imposed for the years which follow that in which the mention of the grant of the European patent is published in the "European Patent Bulletin". For further details you are recommended to consult the above-mentioned brochure.

REMARQUE RELATIVE A LA DECISION DE DELIVRANCE
D'UN BREVET EUROPEEN (OEB Form 2006)

1. **Brochure d'information de l'OEB "Droit national relatif à la CBE"**
Cette brochure fournit d'utiles renseignements sur les conditions de forme requises et sur les actes à accomplir auprès des offices de brevet des Etats contractants aux fins d'obtenir des droits dans les Etats contractants. Etant donné que les actes indispensables sont susceptibles de modifications, il serait bon de toujours consulter la dernière édition de la brochure. Toute information ultérieure est publiée au Journal Officiel.

2. **Traduction du fascicule du brevet européen en vertu de l'article 65(1) de la Convention sur le brevet européen**
Votre attention est de nouveau attirée sur l'obligation faite par certains États contractants, en vertu de l'article 65(1) CBE, da fournir une traduction du fascicule du brevet européen, à laquelle il est fait référence dans la notification établie conformément à la règle 71(5) CBE. Si la(les) traduction(s) n'est(ne sont) pas fournie(s), le brevet européen peut, dès l'origine, être réputé sans effet dans cet(ces) Etat(s). Pour plus de détails, nous vous renvoyons à la brochure susmentionnée.

3. **Paiement des taxes annuelles pour le brevet européen**
Conformément à l'article 141 CBE des taxes annuelles "nationales" dues au titre du brevet européen peuvent être perçues pour les années suivant celle au cours de laquelle la mention de la délivrance du brevet européen est publiée au "Bulletin européen des brevets. Pour plus de détails, nous vous renvoyons à la brochure susmentionnée.

Europäisches Patentamt
European Patent Office
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Acknowledgement of receipt

We hereby acknowledge receipt of the following subsequently filed document(s):

Submission number	3032810
Application number	EP11779702.7
Date of receipt	30 September 2014
Receiving Office	European Patent Office, The Hague
Your reference	PBP11900-EP
Applicant	All applicants as on file
Documents submitted	package-data.xml epf1038.pdf (2 p.) CLMSTRAN-2.pdf\Claims FR.pdf (4 p.) ep-sfd-request.xml CLMSTRAN-1.pdf\Claims DE.pdf (3 p.)
Submitted by	CN=Davide Locas 24895
Method of submission	Online
Date and time receipt generated	30 September 2014, 17:54 (CEST)
Message Digest	F8:D1:8E:3B:CE:57:A9:7E:89:FC:69:DE:52:42:57:AE:6C:B1:98:E3

Correction by the EPO of errors in debit instructions filed by eOLF
Errors in debit instructions filed by eOLF that are caused by the editing of Form 1038E entries or the continued use of outdated software (all forms) may be corrected automatically by the EPO, leaving the payment date unchanged (see decision T 152/82, OJ EPO 1984, 301 and point 6.3 ff ADA, Supplement to OJ EPO 10/2007).

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Europäisches Patentamt
European Patent Office
Office européen des brevets

Letter accompanying subsequently filed items

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The document(s) listed below is (are) subsequently filed documents pertaining to the following application:

Application number	11779702.7
Applicant's or representative's reference	PBP11900-EP

	Description of document	Original file name	Assigned file name
1	Translation of claims	Claims DE.pdf	CLMSTRAN-1.pdf
2	Translation of claims	Claims FR.pdf	CLMSTRAN-2.pdf

	Fees	Factor applied	Fee schedule	Amount to be paid
15-1	007 Fee for grant, including fee for publication of the European patent specification (R71(3))	1	915.00	915.00
	Total:		**EUR**	**915.00**

	Payment	
1	Mode of payment	Debit from deposit account
	Currency:	EUR
	The European Patent Office is hereby authorised, to debit from the deposit account with the EPO any fees and costs indicated on the fees page.	
	Deposit account number:	28070123
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	submission date. In this case, the payment date will be deemed to be the deferred execution date, provided that you have sufficient funds on your deposit account on that date. • Please choose the deferred execution date option only if the fees are to be debited on a future date, as otherwise the default execution date is date of receipt. • The deferred execution date can be a maximum of 40 days in the future.	
2	Refund/Reimburserment	
	Reimbursement (if any) to be made to EPO deposit account: Account holder:	28070123 Cantaluppi & Partners s.r.l.

Signatures

Place:	**Padova, Italy**
Date:	**30 September 2014**
Signed by:	**Davide Locas 24895**
Capacity:	**(Representative)**

REVENDICATIONS

1. Elément de distribution de semences (1) pour des semoirs pneumatiques de précision (3), du type comprenant :

- un disque de semis (16) qui est entraîné en rotation par un arbre de transmission motorisé (20) à une vitesse contrôlée,

- un boîtier (10) avec une partie fixe (11) dans laquelle l'arbre (20) est supporté et une partie (12) qui est mobile par rapport à la partie fixe (11) et peut être fermée contre cette dernière,

- une chambre de collecte de semences (15) étant définie dans la partie fixe (11),

- une chambre d'aspiration pneumatique (17) étant définie dans la partie mobile (12),

- le disque de semis (16) étant intercalé entre les parties (11, 12) et ayant des surface opposées délimitant les chambres (15, 17),

- le disque de semis (16) ayant au moins une bague de trous sélecteurs (23) s'étendant entre les surfaces opposées, et

- un joint d'étanchéité (24) qui est agencé sur la partie mobile (12) et est capable d'entrer en contact coulissant avec la surface en vis-à-vis du disque (16) lorsque les parties (11, 12) sont fermées l'une contre l'autre,

caractérisé en ce que l'élément de distribution de semences (1) comprend en outre un élément de palier de butée (26) du disque de semis (16), lequel élément de palier de butée (26) est supporté en rotation dans la partie mobile (12) afin de résister au moins à une certaine partie de la force axiale produite par le disque (16) sur le joint d'étanchéité (24).

2. Elément de distribution de semences (1) selon la revendication 1, dans lequel l'élément de palier de butée (26) est entraîné en rotation avec le disque (16) lorsque les parties (11, 12) sont fermées l'une contre l'autre.

3. Elément de distribution de semences (1) selon la revendication 1 ou la revendication 2, dans lequel l'élément de palier de butée (26) comprend une plaque de palier de butée (31) qui peut s'appuyer sur cette surface du disque de semis (16) qui fait face au joint d'étanchéité (24), dans une zone radialement à l'intérieur de la bague de trous (23).

4. Elément de distribution de semences (1) selon la revendication 3, dans lequel l'élément de palier de butée (26) comprend un élément d'entraînement (32) qui est fixé pour tourner avec la plaque (31) et peut être couplé avec l'arbre d'entraînement (20) du disque (16) lorsque les parties (11, 12) sont fermées l'une contre l'autre.

5. Elément de distribution de semences (1) selon la revendication 4, dans lequel l'élément d'entraînement (32) se centre automatiquement par rapport à l'arbre d'entraînement (20).

6. Elément de distribution de semences (1) selon la revendication 4 ou la revendication 5, dans lequel l'élément d'entraînement (32) comprend un élément de couplage (33) qui tourne conjointement avec la plaque de palier de butée (31), mais a un jeu radial et/ou circonférentiel afin d'être centrée automatiquement pendant le couplage rotatif avec l'arbre d'entraînement (20) du disque (16).

7. Elément de distribution de semences (1) selon une ou plusieurs des revendications précédentes, dans lequel la partie mobile (12) est articulée par rapport à la partie fixe (11).

8. Elément de semis pour des semoirs de précision (3) comprenant un bâti (6) sur lequel est monté un élément de distribution de semences (1) selon une ou plusieurs des revendications précédentes.

9. Semoir (3) comprenant une structure de support sur laquelle est montée une pluralité d'éléments de semis selon la revendication 8.

10. Kit pour la modernisation des éléments de distribution de semences (1) de semoirs pneumatiques de précision (3), dans lequel les éléments de distribution (1) sont du type comprenant :

- un disque de semis (16) qui est entraîné en rotation par un arbre de transmission motorisé (20) à une vitesse contrôlée,
- un boîtier (10) avec une partie fixe (11) dans laquelle l'arbre (20) est supporté et une partie (12) qui est mobile par rapport à la partie fixe (11) et peut être fermée contre cette dernière,
- une chambre de collecte de semences (15) qui est définie dans la partie fixe (11),
- une chambre d'aspiration pneumatique (17) qui est définie dans la partie mobile (12),
- le disque de semis (16) étant intercalé entre les parties (11, 12) et ayant des surfaces opposées délimitant les chambres (15, 17),

- le disque de semis (16) ayant au moins une bague de trous sélecteurs (23) s’étendant entre les surfaces opposées, et

- un joint d’étanchéité (24) qui est agencé sur la partie mobile (12) et est capable d’entrer en contact coulissant avec la surface en vis-à-vis du disque (16) lorsque les parties (11, 12) sont fermées l'une contre l'autre,

caractérisé en ce que le kit comprend :

- la partie mobile (12) pré-assemblée avec :

- un élément de palier de butée (26) du disque de semis (16), lequel élément de palier de butée (26) est supporté en rotation dans la partie mobile (12) afin de résister au moins à une certaine partie de la force axiale produite par le disque (16) sur le joint d’étanchéité (24).

11. Kit selon la revendication 10, dans lequel la partie mobile (12) et l’élément de palier de butée (26) comprennent une ou plusieurs des caractéristiques selon les revendications 2 à 7.

Ansprüche 1 bis 11

1. Samenverteilungselement (1) für pneumatische Präzisionssämaschinen (3), umfassend:
   - eine Aussaatscheibe (16), die durch eine motorbetriebene Getriebewelle (20) mit kontrollierter Geschwindigkeit gedreht wird,
   - ein Gehäuse (10) mit einem fixierten Bereich (11), in dem die Welle (20) abgestützt ist, und mit einem Bereich (12), der bezüglich des fixierten Bereichs (11) beweglich ist und gegen diesen geschlossen werden kann,
   - ein Saatgut-Sammelbehälter (15), der im fixierten Bereich (11) ausgebildet ist,
   - eine pneumatische Ansaugkammer (17), die im beweglichen Bereich (12) ausgebildet ist,
   - wobei die Aussaatscheibe (16) zwischen den Bereichen (11, 12) angeordnet ist und gegenüberliegende Flächen aufweist, die die Kammern (15, 17) begrenzen,
   - wobei die Aussaatscheibe (16) zumindest einen Ring von Auswahllöchern (23) aufweist, die sich zwischen den gegenüberliegenden Flächen erstrecken, und
   - eine Dichtung (24), die auf dem beweglichen Bereich (12) angeordnet ist und einen Gleitkontakt mit der zugewandten Fläche der Scheibe (16) bilden kann, wenn die Bereiche (11, 12) gegeneinander geschlossen sind,

   dadurch gekennzeichnet, dass das Samenverteilungselement (1) ferner ein Drucklagerelement (26) der Aussaatscheibe (16) aufweist, wobei das Drucklagerelement (26) drehbeweglich im beweglichen Bereich (12) abgestützt ist, um zumindest etwas der axialen Last standzuhalten, die durch die Scheibe (16) auf der Dichtung (24) erzeugt wird.

2. Samenverteilungselement (1) gemäß Anspruch 1, wobei das Drucklagerelement (26) mit der Scheibe (16) gedreht wird, wenn die Bereiche (11, 12) gegeneinander geschlossen sind.

3. Samenverteilungselement (1) gemäß Anspruch 1 oder Anspruch 2, wobei das Drucklagerelement (26) eine Drucklagerplatte (31), die sich auf der Fläche der Aussaatscheibe (16) abstützen kann, die der Dichtung (24) zugewandt ist, in einem Bereich aufweist, der radial innerhalb des Lochrings (23) liegt.

4. Samenverteilungselement (1) gemäß Anspruch 3, wobei das Drucklagerelement (26) ein Antriebselement (32) aufweist, das zur Drehung mit der Platte (31) fixiert ist und mit der Antriebswelle (20) der Scheibe (16) gekoppelt werden kann, wenn die Bereiche (11, 12) gegeneinander geschlossen sind.

5. Samenverteilungselement (1) gemäß Anspruch 4, wobei das Antriebselement (32) bezüglich der Antriebswelle (20) selbstzentrierend ist.

6. Samenverteilungselement (1) gemäß Anspruch 4 oder Anspruch 5, wobei das Antriebselement (32) ein Kopplungselement (33) aufweist, das sich mit der Drucklagerplatte (31) gemeinsam dreht, aber einen radialen und/oder umfangsmäßigen Abstand aufweist, um somit während einer drehbeweglichen Kopplung mit der Antriebswelle (20) der Scheibe (16) selbstzentrierend zu sein.

7. Samenverteilungselement (1) gemäß einem oder mehreren der vorhergehenden Ansprüche, wobei der bewegliche Bereich (12) gegen den fixierten Bereich (11) drehbar angeordnet ist.

8. Saatgutelement für Präzisionssämaschinen (3) mit einem Rahmen (6), auf dem ein Samenverteilungselement (1) gemäß einem oder mehreren der vorhergehenden Ansprüche befestigt ist.

9. Sämaschine (3) mit einer Abstützanordnung, auf der eine Mehrzahl von Saatgutelementen gemäß Anspruch 8 befestigt ist.

10. Bausatz zur Nachrüstung von Samenverteilungselementen (1) von pneumatischen Präzisionssämaschinen (3), wobei die Verteilungselemente (1) umfassen:

- eine Aussaatscheibe (16), die durch eine motorbetriebene Getriebewelle (20) mit kontrollierter Geschwindigkeit gedreht wird,
- eine Gehäuse (10) mit einem fixierten Bereich (11), in dem die Welle (20) abgestützt ist, und mit einem Bereich (12), der bezüglich des fixierten Bereichs (11) beweglich ist und gegen diesen geschlossen werden kann,
- ein Saatgut-Sammelbehälter (15), der im fixierten Bereich (11) ausgebildet ist,
- eine pneumatische Ansaugkammer (17), die im beweglichen Bereich (12) ausgebildet ist,
- wobei die Aussaatscheibe (16) zwischen den Bereichen (11, 12) angeordnet ist und gegenüberliegende Flächen aufweist, die die Kammern (15, 17) begrenzen,
- wobei die Aussaatscheibe (16) zumindest einen Ring von Auswahllöchern (23) aufweist, die sich zwischen den gegenüberliegenden Flächen erstrecken, und
- eine Dichtung (24), die auf dem beweglichen Bereich (12) angeordnet ist und einen Gleitkontakt mit der zugewandten Fläche der Scheibe (16) bilden kann, wenn die Bereiche (11, 12) gegeneinander geschlossen sind,

dadurch gekennzeichnet, dass der Bausatz aufweist:

- den beweglichen Bereich (12), der vormontiert ist mit:
- einem Drucklagerelement (26) der Aussaatscheibe (16), wobei das Drucklagerelement (26) drehbeweglich im beweglichen Bereich (12) abgestützt ist, um zumindest etwas der axialen Last standzuhalten, die durch die Scheibe (16) auf der Dichtung (24) erzeugt wird.

11. Bausatz gemäß Anspruch 10, wobei der bewegliche Bereich (12) und das Drucklagerelement (26) ein oder mehrere der Merkmale der Ansprüche 2 bis 7 aufweisen.

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Annex to EPO Form 2004, Communication pursuant to Rule 71(3) EPC

Bibliographical data of European patent application No. 11 779 702.7

For the intended grant of the European patent, the bibliographical data are set out below, for information:

Title of invention:
- SAMENVERTEILUNGSELEMENT FÜR PRÄZIONSSÄMASCHINE UND SÄMASCHINE MIT DIESEM ELEMENT
- SEED DISTRIBUTION ELEMENT FOR PRECISION SEED DRILLS, SEED DRILL INCLUDING SAID ELEMENT
- ÉLÉMENT DE DISTRIBUTION DE SEMENCES POUR SEMIS MONOGRAINE DE PRÉCISION, SEMOIR COMPRENANT CET ÉLÉMENT

Classification: INV. A01C7/04

Date of filing: 10.11.2011

Priority claimed: IT / 12.11.2010 / ITAPD20100338

Contracting States* for which fees have been paid: AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

Extension States* for which fees have been paid:

Validation States* for which fees have been paid:

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*) If the time limit for the payment of designation fees according to Rule 39(1) EPC has not yet expired and the applicant has not withdrawn any designation, **all Contracting States/Extension States/Validation States** are currently still deemed to be designated. See also Rule 71(8) EPC and, if applicable, the above Note to users of the automatic debiting procedure.

**) If two or more applicants have designated different Contracting States, this is indicated here.

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Application No.	Ref.	Date
11 779 702.7 - 1656	PBP11900-EP	20.05.2014
Applicant: Maschio Gaspardo S.p.A.		

Communication under Rule 71(3) EPC

1. Intention to grant

You are informed that the Examining Division intends to grant a European patent on the basis of the above application with the text and drawings and the related bibliographic data as indicated below.

A copy of the relevant documents is enclosed.

1.1 In the text for the Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

Description, Pages

1-7 as published

Claims, Numbers

1-11 filed in electronic form on 02-01-2014

Drawings, Sheets

1/2, 2/2 as published

1.2 Bibliographic data

The title of the invention in the three official languages of the European Patent Office, the international patent classification, the designated Contracting States, the registered name(s) of the applicant(s) and the other bibliographic data are shown on the **enclosed EPO Form 2056.**

Registered letter
EPO Form 2004C 06.13TRI

2. Invitation

You are invited, **within a non-extendable period of four months** of notification of this communication,

2.1 to EITHER approve the text communicated above and verify the bibliographic data (R. 71(5) EPC)

(1) by filing a translation of the claim(s) in the other two official languages of the EPO

	Fee code	EUR
(2a) by paying the fee for grant including the fee for publication:	**007**	915.00
minus any amount already paid (R. 71a(5) EPC):		0.00
Total amount:		915.00
(3) by paying additional claims fees under Rule 71(4) EPC; number of claims fees payable: 0	**016**	0.00
minus any amount already paid (R. 71a(5) EPC):		0.00
Total amount:		0.00

Important: If the translations of the claims and fees have already been filed and paid respectively in reply to a previous communication under Rule 71(3) EPC, e.g. in the case of resumption of examination after approval (see Guidelines C-V, 6), **agreement as to the text to be granted** (R. 71a(1) EPC) must be expressed within the same time limit (e.g. by approving the text and verifying the bibliographic data, by confirming that grant proceedings can go ahead with the documents on file and/or by stating which translations of the claims already on file are to be used).

Note 1: See "Important notes concerning fee payments" below.
Note 2: Any overpaid "minus" amounts will be refunded when the decision to grant (EPO Form 2006A) has been issued.

2.2 OR, in the case of disapproval, to request reasoned amendments or corrections to the text communicated above or keep to the latest text submitted by you (R. 71(6) EPC).

In this case the translations of the claims and fee payments mentioned under point 2.1 above are NOT due.

The terms "amendment(s)" and "correction(s)" refer only to amendments or corrections of the application documents and not of other documents (e.g. bibliographic data, the designation of the inventor, etc.).

If filing amendments, you must identify them and indicate the basis for them in the application as filed. Failure to meet either requirement may lead to a communication from the Examining Division requesting that you correct this deficiency (R. 137(4) EPC).

2.3 Bibliographic data

Where you request a change or correction of bibliographic data in response to the Rule 71(3) communication, this will **not** cause the sending of a second communication under Rule 71(3) EPC. You will still have to pay the fees and file translations in reply to the Rule 71(3) communication in the case of 2.1 above, unless you also file a reasoned request for amendments or corrections in response to the Rule 71(3) communication (see case 2.2 above).

3. Loss of rights

If neither of the two possible actions above (see points 2.1 or 2.2) is performed in due time, the European patent application will be deemed to be withdrawn (R. 71(7) EPC).

4. Further procedure

4.1 In the case of point 2.1 above

4.1.1 The decision to grant the European patent will be issued, and the **mention of the grant** of the patent will be published in the European Patent Bulletin, if the requirements concerning the translation of the claims and the payment of all fees are fulfilled and there is agreement as to the text to be granted (R. 71a(1) EPC).

Note on payment of the renewal fee:
If a renewal fee becomes due before the next possible date for publication of the mention of the grant of the European patent, publication will be effected only after the renewal fee and any additional fee have been paid (R. 71a(4) EPC).

Under Article 86(2) EPC, the obligation to pay renewal fees to the European Patent Office terminates with the payment of the renewal fee due in respect of the year in which the mention of the grant of the European patent is published.

Note on payment of the designation fee(s):
If the designation fee(s) become(s) due after the communication under Rule 71(3) EPC, the mention of the grant of the European patent will not be published until the designation fee(s) has/have been paid (R. 71a(3) EPC).

4.1.2 After publication, the **European patent specification** can be downloaded free of charge from the EPO publication server https://data.epo.org/publication-server or ordered from the Vienna sub-office upon payment of a fee (OJ EPO 2005, 126).

Until 31 December 2013, each proprietor may request in writing to receive the certificate for the European patent together with one copy of the new patent specification only if the request is filed within three-month or the additional two-month period (R. 95(3) and (4) EPC). If such request has been previously filed, it has to be confirmed within the same period. The requested copy is free of charge. Any request or confirmation of a request filed after 31 December 2013 or after expiry of these periods will not be dealt with and the certificate will be delivered without a copy of the new European patent specification (cf. Notice from the European Patent Office dated 16 July 2013 concerning communication of the certificate for a European patent, OJ 2013, 418).

4.1.3 Filing of translations in the Contracting States

As regards translation requirements prescribed by the Contracting States under Article 65(1) EPC, please consult the website of the European Patent Office
www.epo.org ➞Law & practice ➞Legal texts, National law relating to the EPC
www.epo.org ➞Law & practice ➞All Legal texts ➞London Agreement

In the case of a valid extension or validation

As regards translation requirements prescribed by the Extension or or Validation States, please consult the website of the European Patent Office
www.epo.org ➞Law & practice ➞Legal texts, National law relating to the EPC

Failure to supply a prescribed translation in a Contracting State, or in an Extension or Validation State may result in the patent being deemed to be void *ab initio* in the State concerned (Art. 65(3) EPC).

4.2 In case of 2.2 above

If the present communication under Rule 71(3) EPC is based on an auxiliary request and, within the time limit, you maintain the main request or a higher ranking request which is not allowable, the application will be refused (Art. 97(2) EPC).

If the Examining Division gives its consent to the requested amendments or corrections, it will issue a new communication under Rule 71(3) EPC; otherwise, it shall resume the examination proceedings (R. 71(6) EPC).

5. Filing of a divisional application

Any divisional application relating to this European patent application must be filed directly with the European Patent Office in Munich, The Hague or Berlin and will be in the language of the proceedings for the present application, or if the latter was not in an official language of the EPO, the divisional application may be filed in the language of the present application as filed (see Article 76(1) and Rule 36(2) EPC). Any such divisional application must be filed while the present application is still pending and the time limit for filing divisional applications must be observed (R. 36(1) EPC; Guidelines A-IV, 1.1.1).

6. Important notes concerning fee payments

6.1 For all payments, please refer to the relevant **fee code(s).**

6.2 Automatic debiting procedure

The fee for grant, including the fee for publication, and any additional claims fees due under Rule 71(4) EPC will be debited automatically on the date of filing of the translations of the claims, or on the last day of the period of this communication. However, if the designation fee(s) become(s) due as set out in Rule 71a(3) EPC and/or a renewal fee becomes due as set out in Rule 71a(4) EPC, these should be paid separately by another permitted way of payment in order not to delay the publication of the mention of the grant. The same applies in these circumstances to the payment of extension fees. For further details see the Arrangements for the automatic debiting procedure (AAD) and accompanying information from the EPO concerning the automatic debiting procedure (Annexes A.1 and A.2 to the Arrangements for deposit accounts (ADA) in Supplementary publication 4 - OJ EPO 2014).

6.3 Important information relating to fee amounts

Following any amendment to the Rules relating to Fees, the amount(s) mentioned in this communication may be different from the amount(s) **actually due on the date of payment.** The latest version of the Schedule of fees and expenses, published as a Supplement to the Official Journal of the EPO, is also available on the EPO website (www.epo.org) and can be found under www.epo.org/schedule-of-fees, which allows the viewing, downloading and searching for individual fee amounts, both current and previous.
Please note that procedural fees are usually adjusted every two years, on even years, with effect from 1 April.

6.4 **Payments by cheque** delivered or sent direct to the EPO are no longer accepted as from 1 April 2008 (see OJ EPO 2007, 626).

Examining Division:

Chairman: Lang, Denis
2nd Examiner: Simson, Guenter
1st Examiner: Bunn, David

Voinot, Jacques
For the Examining Division
Tel. No.: +49 89 2399 - 8782

Enclosure(s): Text intended for grant (13 pages)

EPO Form 2056

Registered letter
EPO Form 2004C 06.13TRI

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Application No.: 11 779 702.7

IV.2. Patent classification

The classification indicated on the published patent application remains unchanged. It is as follows:

INV. A01C7/04

IV.3. Title of the invention

The title has been changed. It now is as follows:

SAMENVERTEILUNGSELEMENT FÜR PRÄZIONSSÄMASCHINE UND SÄMASCHINE MIT DIESEM ELEMENT

SEED DISTRIBUTION ELEMENT FOR PRECISION SEED DRILLS, SEED DRILL INCLUDING SAID ELEMENT

ÉLÉMENT DE DISTRIBUTION DE SEMENCES POUR SEMIS MONOGRAINE DE PRÉCISION, SEMOIR COMPRENANT CET ÉLÉMENT

IV.4. Documentation

07-05-14
Date

Lang, Denis
Chairman

Bunn, David
1st examiner

Simson, Guenter
2nd examiner

Enclosure(s):

"Seed distribution element for precision seed drills, seed drill including said element"

DESCRIPTION

The subject of the present invention is a seed distribution element for precision pneumatic seed drills, a sowing element for such machines and a seed drill including a plurality of such sowing elements.

In precision pneumatic seed drills it is known to use sowing elements which are each equipped with a seed distribution element (hereinafter, in brief, distributor) for distributing one seed at a time in a controlled delivery while the sowing element moves along a sowing track.

It is equally known to use seed distributors which use an air pressure differential between opposed faces of a sowing disc (or selector) provided with one or more rings of through holes. The operating principle is based on the fact that, as a result of the pressure differential between the opposed faces of the disc, a seed adheres to each hole and is then transported by the rotation of the sowing disc from the seed selection zone to the point at which the pressure differential ceases and the seed is released to drop through a sowing pipe into the furrow or sowing track. In practice, on one of the faces of the disc a strong air suction is exerted which retains the seeds on the opposite face in the region of the respective holes. An example of such devices is disclosed in US 7 228 807.

For the correct functioning of such distributors it is necessary to ensure an effective pneumatic seal between the face of the disc that is subjected to suction and a seal which delimits the pneumatic suction chamber. The

suction effect itself effects a substantial compression of the disc against the seal. If on the one hand this ensures adequate adherence of the seal to the disc surface which is subjected to negative pressure, on the other hand it involves severe abrasion of the seal which limits the effective service life thereof. It is therefore necessary periodically to replace the seal in order to prevent sowing errors arising from insufficient depressurization of the suction chamber.

On the other hand, even if replacing the seal is a simple operation, in each case it entails an unwanted machine stoppage, besides the cost of the spare part itself.

In order to remedy this drawback, seed drills have been developed which are equipped with a thrust-bearing element which relieves the heavy load on the seal. In all cases, however, the thrust-bearing element, which must be rotated with the disc, is mounted on the fixed portion of the housing, that is to say, that portion which is fixed to the framework of the sowing elements. This means that the disc must be attached to the thrust-bearing element; therefore an attachment system must be provided which in the stage of replacement of the disc must be removed, consequently lengthening the operation. This is inevitable in the known machines since it is obligatory to mount on the fixed portion the transmission which drives in rotation the motor-driven shaft which rotates the disc.

However, positioning the thrust-bearing element on the fixed portion entails the pneumatic suction chamber being provided on the fixed portion, or on the same side at which the thrust-bearing element is placed, while the seed collection chamber must be provided in the

movable portion. This is the source of numerous drawbacks, including the fact that the opening of the housing necessarily involves the removal of the portion containing the seed collection chamber from the hopper type store located above, which must necessarily be fixed to the framework of the sowing element.

Furthermore, for the replacement of the sowing disc it is necessary to remove some parts of the distributor, such as the adjustable seed selector, and the seed ejector, where provided.

The problem underlying the present invention is that of providing a seed distribution element structurally and functionally designed to make it possible to remedy all the drawbacks mentioned with reference to the prior art cited.

This problem is solved by the invention by means of a seed distribution element produced in accordance with one or more of the attached claims.

The features and advantages of the invention will become clearer from the following detailed description of a preferred exemplary embodiment thereof, illustrated by way of non-limiting example with reference to the appended drawings, in which:

- Fig. 1 is a perspective view of a seed distribution element produced according to the present invention;
- Fig. 2 is an exploded perspective view of a detail of the element of Fig. 1;
- Fig. 3 is a perspective view of a seed drill equipped with sowing elements with a seed distribution element according to the invention.

In the drawings the reference 1 indicates as a whole a seed distribution

element intended for equipping a sowing element 2 of a precision pneumatic seed drill 3.

The distribution element 1 is the device intended to deposit one seed 4 at a time at a predetermined adjustable spacing in a sowing furrow opened by a coulter 5. The sowing element 2, besides the distribution element 1, comprises a frame 6 and a seed store or hopper 7, besides other devices which are known per se and not necessary for the understanding of the present invention. The seed drill 3 itself comprises a bearing structure 8 on which a plurality of sowing elements 2 are mounted, all connected to a pneumatic suction device 9.

The sowing element 1 itself comprises a housing 10 with a fixed portion 11 fixed in a stable manner on the frame 6 and a movable portion 12 hinged in the region of a hinge 12a on the fixed portion 11 by means of a removable hinge pin 13. The fixed portion includes a throat 14 by means of which it is connected below an outflow mouth of the store or hopper 7 in such a way as to be fed directly by the latter.

From the throat 14 the seed flows through a gate 14a through which the seed flows into a seed collection chamber 15.

A sowing disc 16 separates the seed collection chamber 15 from a suction chamber 17 provided in the movable portion 12. A suction device 18 mounted on the bearing structure 8 is connected to the suction chamber 17 by means of pipes 19 for producing a pressure differential between the opposed surfaces 16a, 16b of the selector disc 16.

The sowing disc 16 is removably mounted on a motor-driven drive shaft 20, supported in the fixed portion 11 and driven in rotation at

predetermined adjustable speeds by a transmission which is not shown. The presence of the transmission requires the shaft 20 to be mounted on the fixed portion 11 of the housing 10. The keying between the shaft 20 and the disc 16 is obtained by means of a polygonal profile 21 at the free end of the shaft 20 which protrudes beyond the disc 16 and preferably has chamfers 22 which serve to facilitate the functions explained hereinafter.

At the periphery of the disc 16 is/are provided one (or several) ring(s) of holes 23 passing between the opposed faces of the sowing disc 16.

A seal 24 is fitted in the suction chamber 17 and is placed in sliding contact with the facing surface of the disc 16, when the movable portion 11 is closed on the fixed portion 12, to delimit a circumferential segment in which the holes 23 are subjected to the aforesaid pressure differential. The circumferential segment extends between the seed collection chamber 15 and a seed fall pipe 25 in which the seeds are released one at a time into the furrow formed by the coulter 5.

By reason of the pressure differential between the two opposed surfaces of the sowing disc, the seeds 4 are held, one to each hole 23, when the holes pass in the seed collection chamber 15, and are released in the region of the pipe 25 when the pneumatic effect of the pressure differential ceases or owing to the presence of a seed ejector (not shown).

In order to limit the wear on the seal 24 resulting from sliding against the surface of the disc 16, a thrust-bearing element indicated as a whole by 26 is mounted on the movable portion.

The thrust-bearing element 26 comprises a shaft 27 rotatably mounted by means of bearings 28 in a seat 29 of the movable portion 12. The shaft 27

has flanging 30 by means of which it is fixed to a thrust-bearing plate 31 which can bear on that surface of the disc which faces the seal 24 in a zone radially inside the ring of holes 23 in order to withstand at least some of the axial load produced by the disc 16 on the seal 24.

The bearing between the thrust-bearing plate 31 and the disc 16 takes place in the region of a ring 31a in relief on the surface of the plate which faces the disc 16.

The thrust-bearing element 26 is driven in rotation with the sowing disc 16 when the fixed and movable portions 11, 12 are closed against one another by means of a drive element 32 which comprises a coupling device constrained for rotation with the thrust-bearing plate but with radial and/or circumferential clearance in such a way as to be self-centred in the rotational coupling with the drive shaft of the disc 16. For this purpose, in the present form of embodiment, the drive element 32 is coupled with limited radial and/or circumferential clearance to the element 26 by means of one (or more) appendage(s) 33 protruding radially towards the outside and fitted into corresponding seats 34 of the plate. The drive element 32 is coupled by means of an internal polygonal profile 35 (similar to that adopted for box-end wrenches) to the polygonal profile 21 of the free end of the shaft 20, the chamfers 22 of which serve to facilitate the centring of the two profiles and the respective engagement.

The drive element 32 is thus self-centring relative to the drive shaft 20 by which it is driven. The positioning between seal 24 and plate 31 is such that the rotation of the latter will not be hindered by the presence of the seal 24 and, at the same time, both will be kept bearing against the disc

16.

Provision is also made for the thrust-bearing element 26 to be made idle and not driven in rotation by the shaft 20.

The whole of the movable portion 12 complete with thrust-bearing element 26 and seal 24 lends itself advantageously to the production of a kit for the retrofitting of existing seed drills. It is sufficient in this case to separate the old type of movable portion by removing the hinge pin 13 and replacing the old movable portion with the aforesaid kit. By re-connecting the pneumatic pipes previously disconnected, the seed drill becomes ready for use.

Among the principal advantages of the distribution element according to the invention is the fact that the wear on the seal resulting from the sliding contact with the seed selector disc is substantially reduced, if not eliminated; the thrust-bearing element is self-centring, thereby allowing easy opening and closing of the movable portion on the fixed portion of the housing; the system additionally lends itself to easy retrofitting, all without removing movable parts and/or operations of disconnecting the sowing disc.

Amended claims - clean copy

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

- a seed collection chamber (15) being defined in the fixed portion (11),

- a pneumatic suction chamber (17) being defined in the movable portion (12),

- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

Amended claims - clean copy

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

Amended claims - clean copy

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
- a seed collection chamber (15) being defined in the fixed portion (11),
- a pneumatic suction chamber (17) being defined in the movable portion (12),
- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),
- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and
- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

Amended claims - clean copy

characterized in that the kit comprises:

- the movable portion (12) pre-assembled with:

- a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

1/2

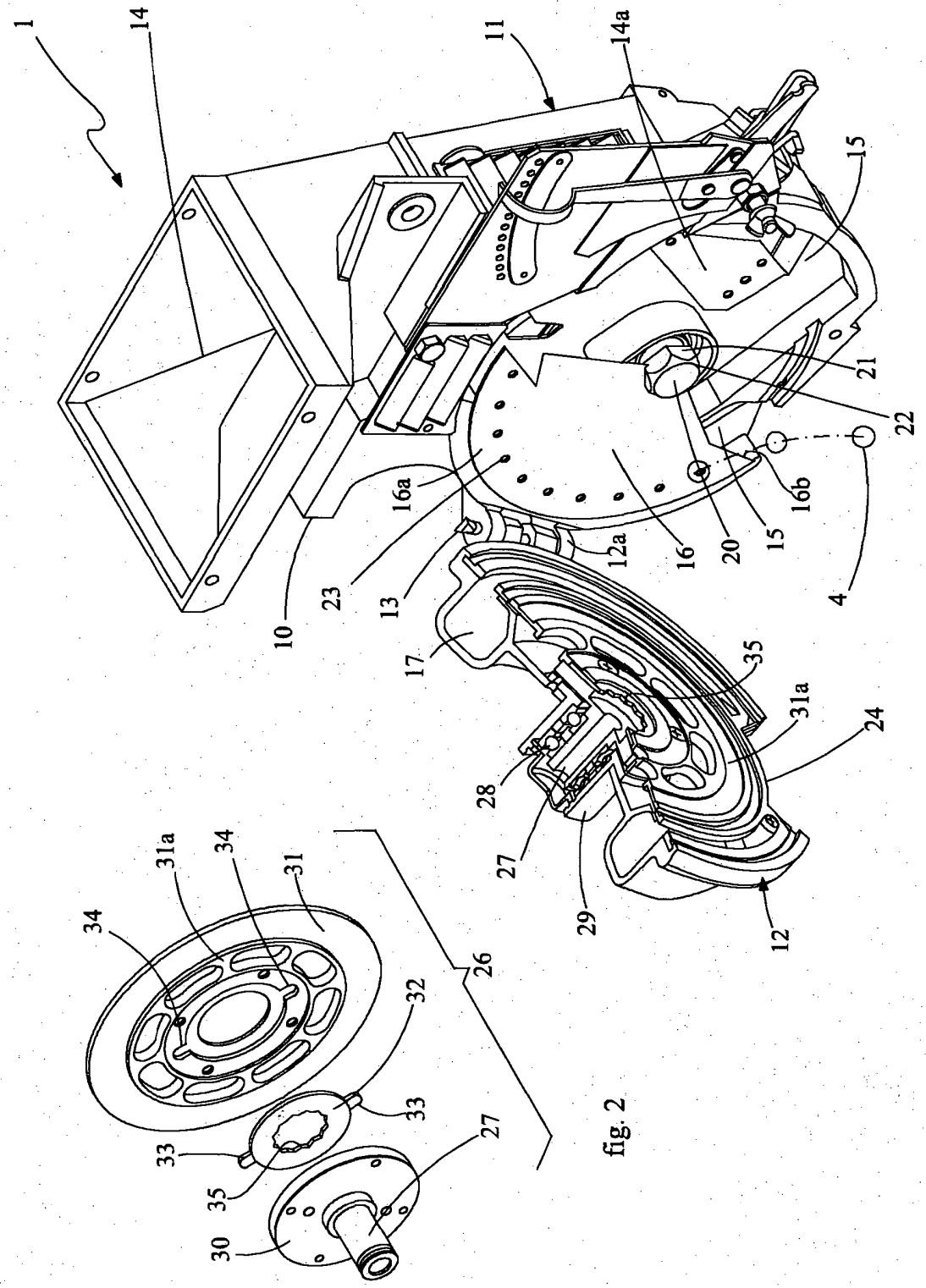

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fig. 1

fig. 2

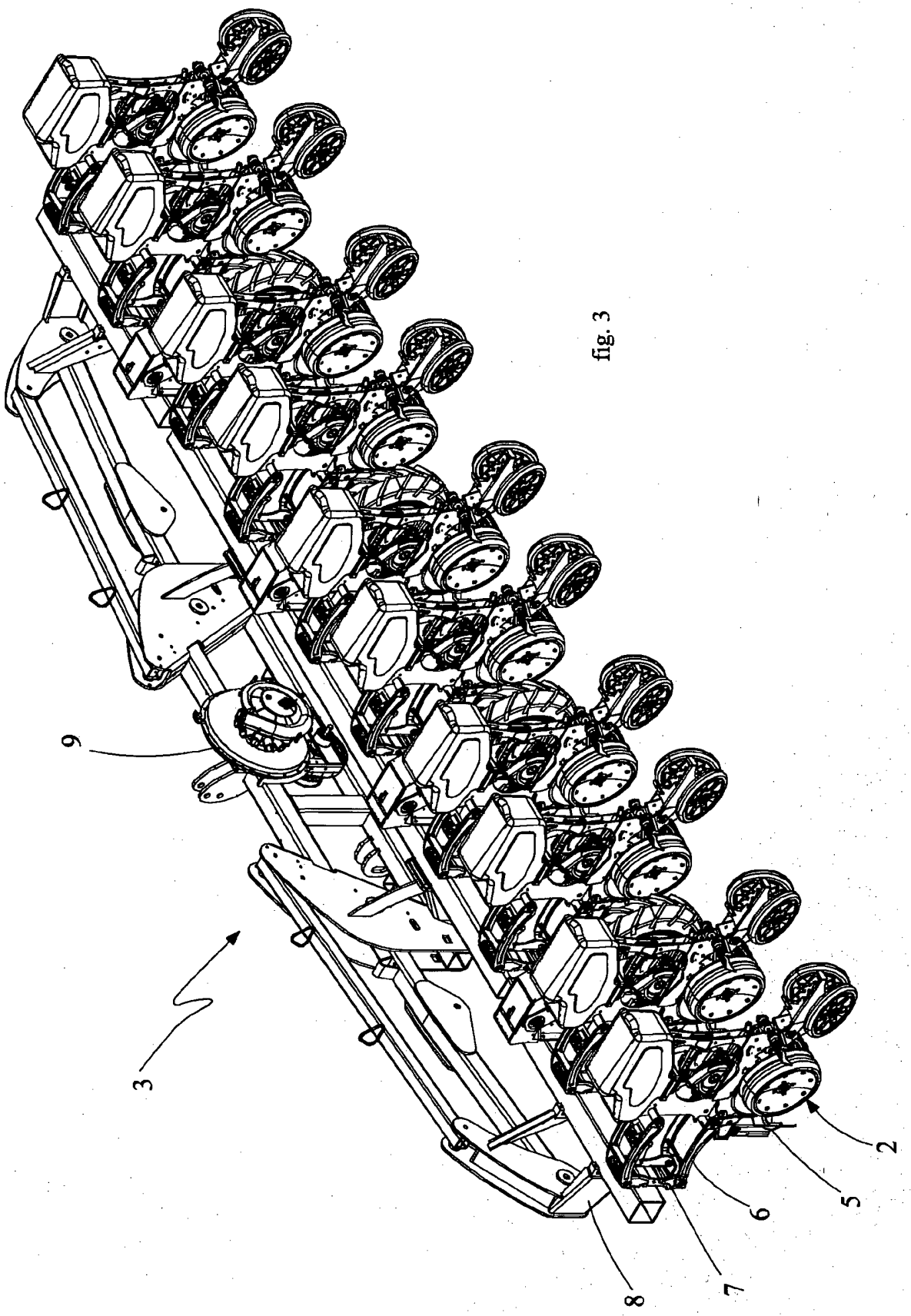


fig. 3

Europäisches Patentamt
European Patent Office
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Application No.: 11779702.7

Substantive examination has started on 02.04.14 (see Notice from the European Patent Office dated 29.01.2013, OJ EPO 2013, 153).

For the Examining Division

Europäisches Patentamt
European Patent Office
Office européen des brevets

Acknowledgement of receipt

We hereby acknowledge receipt of the following subsequently filed document(s):

Submission number	2503888
Application number	EP11779702.7
Date of receipt	02 January 2014
Receiving Office	European Patent Office, The Hague
Your reference	PBP11900-EP
Applicant	All applicants as on file
Documents submitted	package-data.xml epf1038.pdf (1 p.) CLMS-1.pdf\Amended claims - clean copy.pdf (4 p.) ep-sfd-request.xml WOREPLY-1.pdf\Response to communication under rule 161.pdf (2 p.) CLMS-HWA-1.pdf\Amended claims - marked copy.pdf (4 p.)
Submitted by	CN=S. Morabito 30548,O=Cantaluppi & Partners s.r.l.,C=IT
Method of submission	Online
Date and time receipt generated	02 January 2014, 17:01 (CET)
Message Digest	15:84:2A:82:32:F7:B6:09:47:C5:B1:76:4E:68:A8:BD:41:84:41:ED

Correction by the EPO of errors in debit instructions filed by eOLF
Errors in debit instructions filed by eOLF that are caused by the editing of Form 1038E entries or the continued use of outdated software (all forms) may be corrected automatically by the EPO, leaving the payment date unchanged (see decision T 152/82, OJ EPO 1984, 301 and point 6.3 ff ADA, Supplement to OJ EPO 10/2007).

/European Patent Office/

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

- a seed collection chamber (15) being defined in the fixed portion (11),

- a pneumatic suction chamber (17) being defined in the movable portion (12),

- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
- a seed collection chamber (15) being defined in the fixed portion (11),
- a pneumatic suction chamber (17) being defined in the movable portion (12),
- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),
- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and
- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

characterized in that the kit comprises:

- the movable portion (12) pre-assembled with:

- a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

~~wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),~~

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the

movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
- a seed collection chamber (15) being defined in the fixed portion (11),
- a pneumatic suction chamber (17) being defined in the movable portion (12),
- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),
- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and
- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

~~wherein a pressure differential is provided between the opposed~~

~~surfaces in the region of a circumferential segment of the ring of holes (23),~~

characterized in that the kit comprises:

– the movable portion (12) pre-assembled with:

– a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

CANTALUPPI & PARTNERS
PROPRIETA' INDUSTRIALE
INTELLECTUAL PROPERTY

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SCHUBERT
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By EPOLINE

Padova, January 2, 2014

Your ref.: 11779702.7
Our ref.: PBP11900-EP - DL/ms

Re.: European Patent Application No. 11779702.7
Applicant: Maschio Gaspardo S.p.A.

Dear Sirs,

with reference to the communication under Rule 161 issued on June 16, 2013 for the European Patent Application in subject, please find herewith our comments to the International Preliminary Report on Patentability issued during the corresponding International Phase.

A complete set of amended claims both in clean and marked up version is attached to this letter for your reference.

* * *

AMENDMENTS

Claims:

A new set of claims is hereby enclosed wherein, claims 1 and 10 has been amended by deleting the feature that *a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes*.

According to the Guidelines, H-V, 3.1, the removal of a feature from a claim does not violate Art. 123(2) if the skilled person would directly and unambiguously recognise that:

(i) the feature was not explained as essential in the disclosure;
(ii) the feature is not, as such, indispensable for the function of the invention in the light of the technical problem the invention serves to solve; and
(iii) the replacement or removal requires no real modification of other features to compensate for the change.

In the present case, no element in the description could make the skilled person believe that the presence of the pressure differential is essential. In particular, since the invention relates to the technical problem of limiting the operations required in order to replace the seal in a seed distribution element, no connection between such problem and the provision of a pressure differential can be envisaged. Furthermore, a person skilled in the art is well aware that the pressure differential can be provided (as typically occurs) by a suction device which not part of the seed distribution element *per se* and, accordingly, it can be surely excluded that the removal of the feature in issue requires any modification to the structure.

The same arguments are also applicable to claim 10.

Accordingly, the amendments to the claims herein submitted do not entail addition of subject matter extending beyond the content of the application as originally filed, therefore fulfilling the requirement laid down in Art. 123(2) EPC.

* * *

CONCLUSIONS

It is respectfully submitted that the amendments hereby proposed now fulfils the requirements of EPC. In particular, novelty and inventive step of the invention as claimed, have been already acknowledge in the International Preliminary Report on Patentability.

If the Examiner considers that the application is to refused without issuing any other Communication pursuant to Art. 94(3) and Rule 71(1) EPC, a telephone interview with the Examiner is preferably requested. In case no informal contact with the Applicant can be established, Oral Proceedings under Art. 116 EPC are requested.

Respectfully Submitted,

The Representative

Davide Locas
CANTALUPPI & PARTNERS

Encl.: amended claims (clean copy and marked up copy)
MASCHIO GASPARDO\PBP11900-EP\015

Europäisches Patentamt
European Patent Office
Office européen des brevets

Letter accompanying subsequently filed items

Representative:

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The document(s) listed below is (are) subsequently filed documents pertaining to the following application:

Application number	11779702.7
Applicant's or representative's reference	PBP11900-EP

	Description of document	Original file name	Assigned file name
1	Reply to search opinion/written opinion/IPER	Response to communication under rule 161.pdf	WOREPLY-1.pdf
2	Amended claims (clean copy)	Amended claims - clean copy.pdf	CLMS-1.pdf
3	Amended claims with annotations	Amended claims - marked copy.pdf	CLMS-HWA-1.pdf

Signatures

Place:	**Padova - ITALY**
Date:	**02 January 2014**
Signed by:	**IT, Cantaluppi & Partners s.r.l., S. Morabito 30548**
Capacity:	**(Representative)**

Europäisches Patentamt
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Office européen des brevets

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Date
21.08.13

Reference	Application No./Patent No.
PBP11900-EP	11779702.7 - 1656 / 2637492
Applicant/Proprietor	
Maschio Gaspardo S.p.A.	

Communication of European publication number and information on the application of Article 67(3) EPC

The provisional protection under Article 67(1) and (2) EPC in the individual Contracting States becomes effective only when the conditions referred to in Article 67(3) EPC have been fulfilled (for further details, see information brochure of the European Patent Office "National Law relating to the EPC" and additional information in the Official Journal of the European Patent Office).

Pursuant to Article 153(3) EPC the publication under Article 21 PCT of an international application for which the European Patent Office is a designated or elected Office takes the place of the publication of a European patent application.

The bibliographic data of the above-mentioned Euro-PCT application will be published on 18.09.13 in Section I.1 of the European Patent Bulletin. The European publication number is 2637492.

In all future communications to the European Patent Office, please quote the application number plus Directorate number.

For the Examining Division

Europäisches Patentamt • European Patent Office • Office européen des brevets •

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Locas, Davide
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Date
19.06.13

Reference	Application No./Patent No.
PBP11900-EP	11779702.7 - 1656
Applicant/Proprietor	
Maschio Gaspardo S.p.A.	

Communication pursuant to Rules 161(1) and 162 EPC

1. Correction of deficiencies noted in the written opinion and amendment of the application (R. 161(1) EPC)

The above-mentioned international (Euro-PCT) application has entered the European phase.

The EPO as International Searching Authority and, where a demand under Article 31 PCT was filed, also as International Preliminary Examining Authority has drawn up a written opinion on this application or the EPO as Supplementary International Searching Authority has issued explanations pursuant to Rule 45*bis*.7(e) PCT to the supplementary international search report.

You are invited to correct any deficiencies noted in the written opinion of the International Searching Authority or in the International Preliminary Examination Report, or in the explanations to the supplementary international search report and to amend the description, claims and any drawings within a **non-extendable period of six months** after notification of the present invitation.

Should you not comply with or comment on this invitation within the time limit, **the application will be deemed to be withdrawn** in accordance with Rule 161(1) EPC.

2. Amendment of application

Under Articles 28, 41 PCT and Rules 52, 78 PCT the application may be amended before a designated or elected Office, and in accordance with Rule 137(2) EPC the applicant may amend the description, claims and drawings of his own volition together with any comments, corrections or amendments made in response to the communication under Rule 161(1) EPC.

Whether or not you have already done so, you now have a further opportunity to file amended claims or other application documents within the above-mentioned period.

If filing amendments, you must identify them and indicate the basis for them in the application as filed. Failure to meet either requirement may lead to a communication from the Examining Division requesting that you correct this deficiency (R. 137(4) EPC).

The claims applicable on expiry of the above period, i.e. those filed on entry into the European phase or in response to the present communication, will form the basis for the calculation of any claims fee to be paid (see page 2).

3. Claims fees under Rule 162 EPC

If the application documents on which the European grant procedure is to be based comprise more than fifteen claims, a claims fee shall be payable for the sixteenth and each subsequent claim within the period provided for in Rule 159(1) EPC.

☑ Based on the application documents currently on file, all necessary claims fees have already been paid (or the documents do not comprise more than 15 claims).

☐ All necessary fees will be/have been debited automatically according to the automatic debit order.

☐ The claims fees due for the claims ..... to ..... were not paid within the above-mentioned period.

Any outstanding claims fee, either based on the current set of claims or on any amended claims to be filed pursuant to Rule 161 EPC (see page 1), may still be validly paid within a **non-extendable period of six months** after notification of this communication (R. 162(2) EPC).

If a payment is made for only some of the claims, you must indicate for which claims it is intended. If a claims fee is not paid in due time, the claim concerned is deemed to be abandoned (R. 162(4) EPC).

If claims fees have already been paid, but on expiry of the above-mentioned period there is a new set of claims containing fewer fee-incurring claims than before, the claims fees in excess of those due under Rule 162(2), second sentence EPC will be refunded (R. 162(3) EPC).

The claims fee is currently

EUR 225 for the 16th and each subsequent claim up to the limit of 50
EUR 555 for the 51st and each subsequent claim

Note to users of the automatic debiting procedure
Unless the EPO receives prior instructions to the contrary, the fees for all claims incurring fees will be debited on the last day of the period for payment. For further details see the Arrangements for the automatic debiting procedure, Supplement to OJ EPO 3/2009.

Important information concerning fee amounts
Following any amendment to the Rules relating to Fees, the amount(s) mentioned in this communication may be different from the amount(s) **actually due on the date of payment.** The latest version of the Schedule of fees and expenses, published as a Supplement to the Official Journal of the EPO, is also available on the EPO website (**www.epo.org**) and can be found under **www.epo.org/schedule-of-fees**, which allows the viewing, downloading and searching for individual fee amounts, both current and previous.

Payments by cheque delivered or sent direct to the EPO are no longer accepted as from 1 April 2008 (see OJ EPO 2007, 626).

For the Examining Division



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Date
17.06.13

Reference	Application No./Patent No.
	11779702.7 - 1656

Applicant/Proprietor
Maschio Gaspardo S.p.A.

Notification of the data mentioned in Rule 19(3) EPC

In the above-identified patent application you are designated as inventor/co-inventor.
Pursuant to Rule 19(3) EPC the following data are notified herewith:

DATE OF FILING	: 10.11.11
PRIORITY	: IT/12.11.10/ ITA PD20100338
TITLE	: SEED DISTRIBUTION ELEMENT FOR PRECISION SEED DRILLS, SEED DRILL INCLUDING SAID ELEMENT
DESIGNATED STATES	: AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

Receiving Section

Europäisches Patentamt • European Patent Office • Office européen des brevets

V. Reasoned statement

1 US-B1-7 228 807 (D1) discloses a seed spreader element 36 including a sowing disk 60, transmission shaft 55, fixed housing portion 50, movable housing portion 90, seed collection chamber (col.6, l.36-41), pneumatic suction chamber (col.7, l.31-36), selector holes 67, means for producing a pressure differential (col.7, l.31-36) and a seal 99 as set out in the preamble of claim 1.

The spreader element of claim 1 differs from that of D1 in further comprising a thrust-bearing element 26 supported rotatably in the movable housing portion 12 in order to withstand the axial load produced by the disk 16 on the seal 24. In this way, wear on the seal as a consequence of its sliding against the disk is reduced (description, para. [0020], [0021]). Such a solution not being derivable from the available prior art, it follows that the subject matter of claim 1 fulfils the requirements of both novelty and inventive step.

2 Claims 2-7 relate to preferred embodiments of the element of claim 1, while claims 8 & 9 relate to a sowing element and sowing machine respectively each comprising the element of claim 1. Claim 11 relates to a kit for suitable for being fitted to an element of the sort known from D1, and comprising a movable housing portion 12 preassembled with a thrust bearing element as defined in claim 1. Consequently, the subject matter of claims 2-11also fulfils the requirements of novelty and inventive step.

VII. Certain defects in the application

1 The features of the claims are not provided with reference signs placed in parentheses.

2 The relevant background art disclosed in D1 is not mentioned in the description, nor is this document identified therein.

N. domanda

OPINIONE SCRITTA

ITPD20100338

Riquadro N. I Base dell'opinione

1. Questa opinione è stata redatta sulla base delle ultime rivendicazioni depositate prima dell'inizio della ricerca nella tecnica anteriore.

2. Per quanto concerne eventuali sequenze di nucleotidi e/o amminoacidi descritte nella domanda e necessarie per l'invenzione di cui oggetto nelle rivendicazioni, questa opinione è stata redatta sulla base di:

   a. tipo di materiale:

   ☐ una sequenza di DNA

   ☐ una o più tabelle relative alla sequenza di DNA

   b. formato del materiale:

   ☐ cartaceo

   ☐ elettronico

   c. momento di deposito o presentazione:

   ☐ depositato insieme alla domanda al momento del deposito della medesima

   ☐ depositato insieme alla domanda in formato elettronico

   ☐ presentato successivamente al fine della ricerca d'anteriorità

3. ☐ Inoltre, ove sia stata depositata o presentata più di una versione o copia di una sequenza di DNA e/o tabella ad essa relativa, è stata presentata anche la dichiarazione obbligatoria che le informazioni contenute nelle copie successive o addizionali sono identiche a quelle nella domanda come depositata o che, in ogni caso, non vanno oltre il contenuto della domanda depositata originariamente.

4. Note aggiuntive:

Riquadro N. VDichiarazione motivata a riguardo di novità, attività inventiva o applicazione industriale; citazioni e spiegazioni giustificative della dichiarazione

1. 1. Dichiarazione

Novità (N)	Sì:	Rivendicazioni 1-11
	No:	Rivendicazioni
Attività inventiva (IS)	Sì:	Rivendicazioni 1-11
	No:	Rivendicazioni
Applicazione industriale (IA)	Sì:	Rivendicazioni 1-11
	No:	Rivendicazioni

2. 2. Citazioni e spiegazioni

si veda l'allegato

Riquadro N. VII Difetti particolari nella domanda

si veda l'allegato

Ministero dello Sviluppo Economico

DIREZIONE GENERALE SVILUPPO PRODUTTIVO E COMPETITIVITA' - UFFICIO ITALIANO BREVETTI E MARCHI

OPINIONE SCRITTA

N. dossier	Data di deposito *(gg/mm/aa)*	Data di priorità *(gg/mm/aa)*	N. domanda
IO19992	12.11.2010		ITPD20100338

Classificazione Internazionale dei Brevetti (IPC)
INV. A01C7/04

Richiedente
MASCHIO GASPARDO S.P.A.

Questa opinione fornisce indicazioni riguardanti i seguenti elementi:

- ☒ Riquadro N. I — Base dell'opinione
- ☐ Riquadro N. II — Priorità
- ☐ Riquadro N. III — Non-redazione di un'opinione a riguardo di novità, attività inventiva e applicazione industriale
- ☐ Riquadro N. IV — Violazione del requisito d'unità dell'invenzione
- ☒ Riquadro N. V — Dichiarazione motivata a riguardo di novità, attività inventiva o applicazione industriale; citazioni e spiegazioni giustificative della dichiarazione
- ☐ Riquadro N. VI — Particolari documenti citati
- ☒ Riquadro N. VII — Difetti particolari nella domanda
- ☐ Riquadro N. VIII — Osservazioni particolari a riguardo della domanda

	Esaminatore
	Bunn, David

Ministero dello Sviluppo Economico
DIREZIONE GENERALE SVILUPPO PRODUTTIVO E COMPETITIVITA'-
UFFICIO ITALIANO BREVETTI E MARCHI

RAPPORTO DI RICERCA

Numero della domanda
IO 19992
IT PD20100338

DOCUMENTI CONSIDERATI DI RILIEVO

Categoria	Citazione del documento con indicazione, se appropriata, delle parti rilevanti	Rivendicazioni rilevanti	CLASSIFICAZIONE DELLA DOMANDA (IPC)
A	US 7 228 807 B1 (VENHUIZEN DALE [US]) 12 June 2007 (2007-06-12) * column 5, line 59 - column 7, line 37; figures 6-10 * -----	1	INV. A01C7/04
A	EP 0 536 543 A1 (MATERMACC SRL [IT]) 14 April 1993 (1993-04-14) * column 5, line 7 - column 8, line 6; figures * -----	1	

CAMPI TECNICI RICERCATI (IPC)
A01C

Questo rapporto di ricerca è stato redatto sulla base di tutte le rivendicazioni

Munich	Data di completamento della ricerca 8 July 2011	Esaminatore Bunn, David

CATEGORIA DEI DOCUMENTI CITATI

X : di particolare rilevanza se considerato singolarmente
Y : di particolare rilevanza se combinato con un altro documento della stessa categoria
A : informazione generica
O : divulgazione orale
P : documento intermedio

T : teoria o principio alla base dell'invenzione
E : documento brevettuale antecedente, ma pubblicato dopo o alla data di deposito
D : documento citato nella domanda
L : documento citato per altre ragioni
.....
& : membro della stessa famiglia di brevetti, documento corrispondente

EPO FORM 1503 07.08 (P04C74)

ALLEGATO AL RAPPORTO DI RICERCA SULLA DOMANDA DI BREVETTO ITALIANO N.

IO 19992
IT PD20100338

Questo allegato enumera i membri della famiglia di brevetti relativi a documenti brevettuali citati nel summenzionato rapporto di ricerca.
I membri sono indicati come da database dell'Ufficio Europeo dei Brevetti al 08-07-2011
L'Ufficio Europeo dei Brevetti non si assume alcuna responsabilità per queste indicazioni, che vengono fornite a solo scopo informativo.

Documenti brevettuali citati nel rapporto di ricerca	Data di pubblicazione	Membri della famiglia di brevetti	Data di pubblicazione
US 7228807 B1	12-06-2007	NONE	
EP 0536543 A1	14-04-1993	IT 1253373 B	08-08-1995
		US 5325801 A	05-07-1994

EPO FORM P04A3

Per ulteriori dettagli riguardanti questo allegato, si veda la Gazzetta Ufficiale (OJ) dell'Ufficio Europeo dei Brevetti, N. 12/82

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44*bis*)

Applicant's or agent's file reference PBW11900-PCT	**FOR FURTHER ACTION**	See item 4 below
International application No. PCT/EP2011/069875	International filing date *(day/month/year)* 10 November 2011 (10.11.2011)	Priority date *(day/month/year)* 12 November 2010 (12.11.2010)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant MASCHIO GASPARDO S.P.A.		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

   In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☒	Box No. VIII	Certain observations on the international application

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44*bis*.3(c) and 93*bis*.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44*bis* .2).

	Date of issuance of this report 14 May 2013 (14.05.2013)
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. +41 22 338 82 70	Authorized officer Agnès Wittmann-Regis e-mail: pt06.pct@wipo.int

Form PCT/IB/373 (January 2004)

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/EP2011/069875	10.11.2011	12.11.2010

International Patent Classification (IPC) or both national classification and IPC
INV. A01C7/04

Applicant
MASCHIO GASPARDO S.P.A.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notifed the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:	Date of completion of this opinion	Authorized Officer
European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Fax: +49 89 2399 - 4465	see form PCT/ISA/210	Bunn, David Telephone No. +49 89 2399-2086

Form PCT/ISA/237 (Cover Sheet) (July 2009)

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ the international application in the language in which it was filed

   ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:

   a. (means)

   ☐ on paper

   ☐ in electronic form

   b. (time)

   ☐ in the international application as filed

   ☐ together with the international application in electronic form

   ☐ subsequently to this Authority for the purposes of search

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-11
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-11
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-11
	No:	Claims	

2. Citations and explanations

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

V. Reasoned statement

1 US-B1-7 228 807 (D1) discloses a seed distribution element 36 including a sowing disk 60, transmission shaft 55, fixed housing portion 50, movable housing portion 90, seed collection chamber (col.6, l.36-41), pneumatic suction chamber (col.7, l.31-36), selector holes 67, pressure differential (col.7, l.31-36) and seal 99 as in the preamble of claim 1.

The distribution element of claim 1 differs from that of D1 in comprising a thrust-bearing element 26 supported rotatably in movable housing portion 12 to withstand axial load produced by disk 16 on seal 24. In this way, wear on the seal due to its sliding against the disk is reduced (description, para. [0020], [0021]). As such a solution is not derivable from the available prior art, it follows that the subject matter of claim 1 fulfils the requirements of novelty and inventive step, Article 33(2),(3) PCT.

2 Claims 8 & 9 relate to a sowing element and seed drill respectively each comprising the element of claim 1. Claim 10 relates to a kit capable of being fitted to the element of D1, and comprising a movable housing portion 12 preassembled with a thrust bearing element as defined in claim 1. Claims 2-7 & 11 relate to preferred embodiments of the element of claim 1 and to the kit of claim 10 respectively.

Consequently, the subject matter of claims 2-11also fulfils the requirements of novelty and inventive step, Article 33 PCT.

VIII. Certain observations on the application (clarity)

1 The feature of claim 1 "wherein a pressure differential is provided..." relates to **a method of using** the apparatus, rather than clearly defining the apparatus in terms of its technical features. The intended limitations are therefore not clear, contrary to the requirements of Article 6 PCT. In this regard, reference is made to application IO19992, where this problem is avoided by using the wording "means for producing a pressure differential...".

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

CORRECTED VERSION

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
18 May 2012 (18.05.2012)

WIPO | PCT

(10) International Publication Number
WO 2012/062876 A8

(51) International Patent Classification:
A01C 7/04 (2006.01)

(21) International Application Number:
PCT/EP2011/069875

(22) International Filing Date:
10 November 2011 (10.11.2011)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
PD2010A000338 12 November 2010 (12.11.2010) IT

(71) Applicant *(for all designated States except US)*: **MASCHIO GASPARDO S.P.A.** [IT/IT]; via Marcello, 73, I-35011 Campodarsego (PD) (IT).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **BRAGATTO, Enrico** [IT/IT]; Via Strada Nuova, 36, I-30021 Caorle (VE) (IT).

(74) Agents: **LOCAS, Davide** et al.; Cantaluppi & Partners s.r.l., Piazzetta Cappellato Pedrocchi, 18, I-35122 Padova (IT).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *of inventorship (Rule 4.17(iv))*

[Continued on next page]

(54) **Title**: SEED DISTRIBUTION ELEMENT FOR PRECISION SEED DRILLS, SEED DRILL INCLUDING SAID ELEMENT

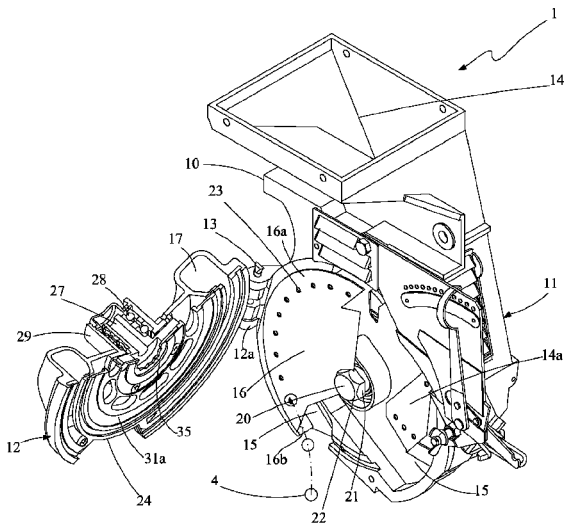


fig. 1

(57) **Abstract**: A seed distribution element (1) includes: -a sowing disc (16) rotated by a motor-driven transmission shaft (20) -a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) movable relative to the fixed portion and can be closed against it, with a seed collection chamber (15) in the fixed portion (11) and a pneumatic suction chamber (17) in the movable portion(12), -the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces (16a, 16b) delimiting the chambers, and provided with a ring of selector holes (23) extending between the opposed surfaces, -means for producing a pressure differential between the opposed surfaces in the region of a circumferential segment of the ring of holes, including the pneumatic suction chamber, and -a seal (24) on the movable portion (12) capable of sliding contact with the facing surface (16a) of the disc (16) when the portions are closed against one another, -a thrust -bearing element (26) of the sowing disc (16), supported rotatably in the movable portion (12), to withstand the axial load produced by the disc (16) on the seal (24).

WO 2012/062876 A8

Published:

— *with international search report (Art. 21(3))*

(48) Date of publication of this corrected version:
23 August 2012

(15) Information about Correction:
see Notice of 23 August 2012

Copy for (DO-EP) 31
PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

COMMUNICATION IN CASES FOR WHICH NO OTHER FORM IS APPLICABLE

To:

LOCAS, Davide
Cantaluppi & Partners s.r.l.
Piazzetta Cappellato Pedrocchi, 18
I-35122 Padova
ITALIE

Date of mailing *(day/month/year)* 17 July 2012 (17.07.2012)	
Applicant's or agent's file reference PBW11900-PCT	**REPLY DUE** **see paragraph 1 below**
International application No. PCT/EP2011/069875	International filing date *(day/month/year)* 10 November 2011 (10.11.2011)
Applicant MASCHIO GASPARDO S.P.A. et al	

1. ☐ REPLY DUE within months/days from the above date of mailing
   ☐ NO REPLY DUE, however, see below
   ☒ IMPORTANT COMMUNICATION
   ☐ INFORMATION ONLY

2. COMMUNICATION:

It has been brought to the attention of the International Bureau that in respect of the above-identified international application, The inventor's address is not correctly indicated. The Inventor's address is contains an erroneously postale code reported as " I-35021Caorle (Ve) (IT).
in the international publication no. WO 2012/062876 published on 18 May 2012 (18.05.2012).

The International Bureau will publish a corrected version of the front page reflecting the correct postale code, I-30021 Caorle (Ve) (IT). on 23 August 2012 (23.08.2012).

Please be also informed that the correct bibliographic data will be available within 24 hours on the WIPO' s Internet site, at
http://www.wipo.int/patentscope/search/en/search.jsf
A copy of this Notification is being sent to the receiving Office (RO/EP) and to the designated Offices concerned.

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. +41 22 338 89 70

Authorized officer
Bentobbal Ryad
e-mail pt06.pct@wipo.int
Telephone No. +41 22 338 74 06

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PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

COMMUNICATION IN CASES FOR WHICH NO OTHER FORM IS APPLICABLE

To:

LOCAS, Davide
Cantaluppi & Partners s.r.l.
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ITALIE

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International application No. PCT/EP2011/069875	International filing date *(day/month/year)* 10 November 2011 (10.11.2011)
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Authorized officer
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Telephone No. +41 22 338 74 06

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PATENT COOPERATION TREATY

CORRECTED VERSION

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF THE RECORDING OF A CHANGE

(PCT Rule 92*bis*.1 and Administrative Instructions, Section 422)

To:

LOCAS, Davide
Cantaluppi & Partners s.r.l.
Piazzetta Cappellato Pedrocchi, 18
I-35122 Padova
ITALIE

Date of mailing *(day/month/year)*
17 July 2012 (17.07.2012)

Applicant's or agent's file reference
PBW11900-PCT

IMPORTANT NOTIFICATION

International application No.
PCT/EP2011/069875

International filing date *(day/month/year)*
10 November 2011 (10.11.2011)

1. The following indications appeared on record concerning:

☒ the applicant ☒ the inventor ☐ the agent ☐ the common representative

Name and Address

BRAGATTO, Enrico
Via Strada Nuova, 36
I-35021 Caorle (VE)
Italy

State of Nationality: IT
State of Residence: IT
Telephone No.:
Facsimile No.:
E-mail address:

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☐ the person ☐ the name ☒ the address ☐ the nationality ☐ the residence

Name and Address

BRAGATTO, Enrico
Via Strada Nuova, 36
I-30021 Caorle (VE)
Italy

State of Nationality: IT
State of Residence: IT
Telephone No.:
Facsimile No.:
E-mail address:
☐ Notifications by e-mail authorized

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

☒ the receiving Office
☐ the International Searching Authority
☐ the Authority(ies) specified for supplementary search
☐ the International Preliminary Examining Authority
☒ the designated Offices concerned
☐ the elected Offices concerned
☐ other:

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. +41 22 338 89 70

Authorized officer
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PATENT COOPERATION TREATY

CORRECTED VERSION

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF THE RECORDING OF A CHANGE

(PCT Rule 92*bis*.1 and Administrative Instructions, Section 422)

To:

LOCAS, Davide
Cantaluppi & Partners s.r.l.
Piazzetta Cappellato Pedrocchi, 18
I-35122 Padova
ITALIE

Date of mailing *(day/month/year)*
17 July 2012 (17.07.2012)

Applicant's or agent's file reference
PBW11900-PCT

IMPORTANT NOTIFICATION

International application No.
PCT/EP2011/069875

International filing date *(day/month/year)*
10 November 2011 (10.11.2011)

1. The following indications appeared on record concerning:

☒ the applicant ☒ the inventor ☐ the agent ☐ the common representative

Name and Address
BRAGATTO, Enrico
Via Strada Nuova, 36
I-35021 Caorle (VE)
Italy

State of Nationality: IT
State of Residence: IT
Telephone No.:
Facsimile No.:
E-mail address:

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☐ the person ☐ the name ☒ the address ☐ the nationality ☐ the residence

Name and Address
BRAGATTO, Enrico
Via Strada Nuova, 36
I-30021 Caorle (VE)
Italy

State of Nationality: IT
State of Residence: IT
Telephone No.:
Facsimile No.:
E-mail address:
☐ Notifications by e-mail authorized

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

☒ the receiving Office
☐ the International Searching Authority
☐ the Authority(ies) specified for supplementary search
☐ the International Preliminary Examining Authority
☒ the designated Offices concerned
☐ the elected Offices concerned
☐ other:

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. +41 22 338 89 70

Authorized officer
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Europäisches Patentamt
European Patent Office
Office européen des brevets

Acknowledgement of receipt

We hereby acknowledge receipt of the form for entry into the European phase (EPO as designated or elected Office) as follows:

Submission number	1699709
PCT application number	PCT/EP2011/069875
EP application number	11779702.7
Date of receipt	21 June 2012
Receiving Office	European Patent Office, The Hague
Your reference	PBP11900-EP
Applicant	
Country	
Documents submitted	package-data.xml application-body.xml ep-euro-pct.xml epf1200.pdf (6 p.)
Submitted by	CN=D. Locas 24895,O=Cantaluppi & Partners,C=IT
Method of submission	Online
Date and time receipt generated	21 June 2012, 17:50 (CEST)
Message Digest	48:3C:2F:73:A8:A9:6F:ED:24:97:0A:AA:EC:EA:65:FF:1B:A3:FA:35

Correction by the EPO of errors in debit instructions filed by eOLF
Errors in debit instructions filed by eOLF that are caused by the editing of Form 1038E entries or the continued use of outdated software (all forms) may be corrected automatically by the EPO, leaving the payment date unchanged (see decision T 152/82, OJ EPO 1984, 301 and point 6.3 ff ADA, Supplement to OJ EPO 10/2007).

/European Patent Office/

Europäisches Patentamt
European Patent Office
Office européen des brevets

Entry into the European phase (EPO as designated or elected Office)

To the European Patent Office

European application number	EP11779702.7
PCT application number	PCT/EP2011/069875
PCT publication number	WO2012062876
Applicant's or representative's reference	PBP11900-EP
International Filing Date	10.11.2011
International Searching Authority (ISA)	EP
International Preliminary Examining Authority (IPEA)	not applicable

1. Applicant

Indications concerning the applicant(s) are contained in the international publication or were recorded by the International Bureau after the international publication. ☒

Changes which have not yet been recorded by the International Bureau are set out here: ☐

2. Representative

This is the representative who will be listed in the Register of European Patents and to whom notifications will be made

Representative 1

Name:	LOCAS, Mr. Davide
Company:	Cantaluppi & Partners s.r.l.
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Representative 2

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Representative 4

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Representative 5

Name:	MONTEVECCHI, Ms. Emma
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Fax:	0039 049 666090
e-mail:	main@cantaluppi.com

Representative 6

Name:	MORABITO , Ms. Sara
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Fax:	0039 049 666090
e-mail:	main@cantaluppi.com

Representative 7

Name:	SPADARO, Mr. Marco
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Telephone:	0039 049 8774181
Fax:	0039 049 666090
e-mail:	main@cantaluppi.com

Representative 8

Name:	SUSANETTO, Mr. Carlo
Company:	Cantaluppi & Partners s.r.l.
Address of place of business:	Piazzetta Cappellato Pedrocchi, 18 35122 Padova, Italy
Telephone:	0039 049 8774181
Fax:	0039 049 666090
e-mail:	main@cantaluppi.com

3. Authorisation

An individual authorisation is attached.	☐
A general authorisation has been registered under No:	☐
A general authorisation has been filed, but not yet registered.	☐
The authorisation filed with the EPO as PCT receiving Office expressly includes the European phase.	☐
4. Request for examination	
Examination of the application under Art. 94 EPC is hereby requested. The examination fee is being (has been, will be) paid.	☒
Request for examination in an admissible non-EPO language:	☒
	Si richiede di esaminare la domanda ai sensi dell'art. 94.
The applicant waives his right to be asked under Rule 70(2) EPC whether he wishes to proceed further with the application.	☐
5. Copies	
Additional copies of the documents cited in the supplementary European search report are requested.	☐
Number of additional sets of copies	
6. Documents intended for proceedings before the EPO	
Number of claims on entry into the European phase:	11
6.1 Proceedings before the EPO as designated Office (PCT I) are to be based on the following documents:	
the application documents published by the International Bureau (with all claims, description and drawings), where applicable with amended claims under Art. 19 PCT	☒
unless replaced by the amendments attached.	☐
Where necessary, clarifications should be attached as `Other documents`	
6.2 Proceedings before the EPO as elected Office (PCT II) are to be based on the following documents:	
the documents on which the international preliminary examination report is based, including any annexes	☐
unless replaced by the amendments attached.	☐
Where necessary, clarifications should be attached as `Other documents`	
If the EPO as International Preliminary Examining Authority has been supplied with test reports, these may be used as the basis of proceedings before the EPO.	☐
6.3 A copy of the results of the search carried out by the authority with which the previous application(s) whose priority is claimed was (were) filed is attached (R. 141(1) EPC).	☐
6.4 The applicant waives his right to the communication under Rules 161(1) or (2) and 162 EPC.	☐
7. Translations	
Translations in one of the official languages of the EPO (English, French, German) are attached as crossed below:	☐
** In proceedings before the EPO as designated or elected Office (PCT I + II):*	
Translation of the international application (description, claims, any text in the drawings) as originally filed, of the abstract as published and of any indication under Rule 13bis.3 and 13bis.4 PCT regarding biological material	☐
Translation of the priority application(s) (to be filed only at the EPO's request, Rule 53(3) EPC)	☐
It is hereby declared that the international application as originally filed is a complete translation of the previous application (Rule 53(3) EPC)	☐
** In addition, in proceedings before the EPO as designated Office (PCT I):*	
Translation of amended claims and any statement under Art. 19 PCT, if the claims as amended are to form the basis for the proceedings before the EPO (see Section 6).	☐
** In addition, in proceedings before the EPO as elected Office (PCT II):*	
Translation of annexes to the international preliminary examination report	☐

8. Biological material

The invention uses and/or relates to biological material deposited under Rule 31 EPC. ☐

The particulars referred to in Rule 31(1)(c) EPC (if not yet known, the depositary institution and the identification reference(s)) [number, symbols, etc.] of the depositor) are given in the international publication or in the translation submitted in Section 7 on: ☐

page(s) / line(s)

The receipt(s) of deposit issued by the depositary institution

is (are) enclosed. ☐

will be filed later. ☐

Waiver of the right to an undertaking from the requester pursuant to Rule 33(2) EPC attached. ☐

9. Nucleotide and amino acid sequences

The international application contains a sequence listing as part of the description ☐

9.1 The sequence listing was filed under Rule 5.2(a) PCT, or furnished to the EPO as ISA under Rule 13ter.1(a) PCT, or is otherwise available to the EPO, in computer-readable format in accordance with WIPO ST.25. ☐

9.2

The sequence listing is attached in computer-readable format in accordance with WIPO Standard ST.25 ☐

The sequence listing is attached in PDF format. ☐

The sequence listing does not include matter which goes beyond the content of the application as filed. ☐

10. Designation fees

All the contracting states party to the EPC at the time of filing of the international patent application and designated in the international application are deemed to be designated (see Article 79(1) EPC). ☒

The following states, which were contracting states to the EPC at the time of filing of the international application, are designated:

AL AT BE BG CH&LI CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

11. Extension of the European patent

This application is deemed to be a request to extend the European patent application and the European patent granted in respect of it to all the non-contracting states to the EPC designated in the international application and with which extension agreements are in force on the date on which the international application is filed. However, the extension only takes effect if the prescribed extension fee is paid. ☐

It is currently intended to pay the extension fee for the following states:

Note: Under the automatic debiting procedure, extension fees will only be debited for states indicated here, unless the EPO is instructed otherwise before expiry of the period for payment.

12. List of enclosed documents

	Description of document	Original file name	Assigned file name

13. Mode of payment: Debit from deposit account ☒

Currency: EUR

The European Patent Office is hereby authorised, to debit from the deposit account with the EPO any fees and costs indicated on the fees page.

Deposit account number: 28070123

Account holder: Cantaluppi & Partners s.r.l.

14. Any refunds should be made to the following EPO deposit account: ☒

Number and account holder: Cantaluppi & Partners s.r.l., 28070123

15. Fees

		Factor/reduction applied	Fee schedule	Amount to be paid

15-1	002 Fee for a European search - Applications filed on/after 01.07.2005	-1165	1 165.00	0.00
15-2	005e Designation fee - For all contracting States designated for applications filed on/after 01.04.2009	1	555.00	555.00
15-3	006e Examination fee - For applications filed before 01.07.2005 and for international applications filed on/after 01.07.2005 without supplementary European search report	0.8	1 730.00	1 384.00
15-4	015 Claims fee - For the 16th to the 50th claim	0	225.00	0.00
15-5	15e Claims fee - For the 51st and each subsequent claim	0	555.00	0.00
15-6	020 Filing fee - entry EP phase - online	1	115.00	115.00
15-7	520 Additional filing fee for the 36th and each subsequent page - entry into EP phase	0	14.00	0.00
	Total:		EUR	**2 054.00**

16. Annotations

17. Signature(s) of applicant(s) or representative

Place:	**Padova - ITALY**
Date:	**21 June 2012**
Signed by:	**IT, Cantaluppi & Partners, D. Locas 24895**
Capacity:	**(Representative)**

Table for section 6 of Form 1200.3

In accordance with the Notice from the European Patent Office dated 26 January 2009 concerning the 2009 fee structure (OJ EPO 2009, 118, and Guidelines for Examination in the EPO, April 2009, A-III, 13.2), the amount of the additional fee (Art. 2, item 1a, Rules relating to Fees) for the pages of this European patent application is calculated as follows:

Documents intended for proceedings before the EPO (R. 159 (1) (b) EPC) and for calculating the additional fee (Art. 2, item 1a, RFees):

		Page(s) from ... to ...	Number of pages
Description:	International application as published	1 to 7	7
Claims:	International application as published	8 to 11	4
Drawings:	International application as published	1 to 2	2
Abstract:	Default count: one page		1
Total number of pages			14
Fee-exempt pages (Art. 2, item 1a, RFees)			-35
Number of pages to be paid for			0
			(x 14 EUR per page)
Total amount payable		EUR	0

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DOCUMENT MADE AVAILABLE UNDER THE PATENT COOPERATION TREATY (PCT)

International application number:		**PCT/EP2011/069875**
International filing date:		**10 November 2011 (10.11.2011)**
Document type:		**Certified copy of priority document**
Document details:	Country/Office:	**IT**
	Number:	**PD2010A000338**
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Date of receipt at the International Bureau:		**26 January 2012 (26.01.2012)**

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a),(b) or (b-*bis*)

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Ministero dello Sviluppo Economico

Dipartimento per l'impresa e l'internazionalizzazione
Direzione Generale Per La Lotta Alla Contraffazione - UIBM

Ufficio Italiano Brevetti e Marchi – Divisione IX

Autenticazione di copia di documenti relativi alla domanda di brevetto per:
INVENZIONE INDUSTRIALE N. PD 2010 A 000338.

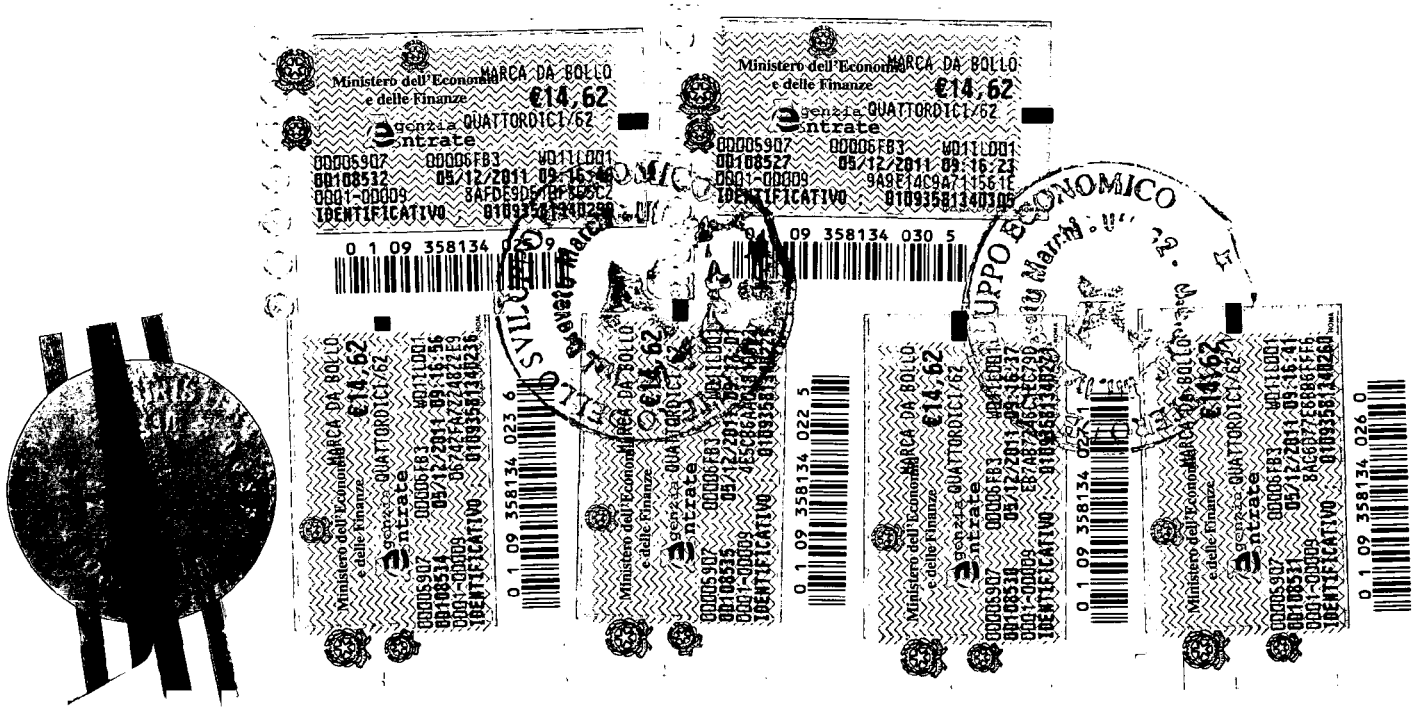
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Si compone di pagg. 21

06 DIC. 2011

ROMA li.....

IL FUNZIONARIO
Elena Marinelli
Sig.ra E. MARINELLI



Domanda di Brevetto per Invenzione Industriale

Richiedente/i

Denominazione: **MASCHIO GASPARDO S.P.A.;**
Natura Giuridica: ***PG*** *(Persona Giuridica);*
Codice Fiscale: **03272800289;**
Indirizzo: **VIA MARCELLO 73;** *Localita' Residenza:* ; *Comune:* **CAMPODARSEGO;** *Cap:* **35011;** *Provincia Residenza:* **PADOVA (PD);** *Stato:* **ITALIA (IT);**

Recapito

Cognome/Denominazione: ; *Nome:* ;
Indirizzo recapito: ; *Localita' Recapito:* ; *Comune:* ; *Provincia:* **();** *Cap:* ;

Titolo

Descrizione: **ELEMENTO DISTRIBUTORE DEL SEME PER SEMINATRICI DI PRECISIONE, SEMINATRICE INCLUDENTE DETTO ELEMENTO**

Inventori Designati

Cognome: ; *Nome:* ; *Nazionalita':*

Classi Proposte

Sezione: **A;** *Classe:* **01;** *Sottoclasse:* **C;**

Centro Abilitato di Raccolta Colture di Microorganismi

Denominazione:

Mandatario abilitato presso UIBM

Numero Iscrizione Albo: **00436**
Cognome: **CANTALUPPI** *Nome:* **STEFANO**

Denominazione Studio: **CANTALUPPI & PARTNERS S.R.L.**
Indirizzo: **PIAZZETTA CAPPELLATO PEDROCCHI,18**
Comune: **PADOVA** *Cap:* **35122** *Provincia:* **PADOVA**
Numero Domicilio Professionale: **865**

Annotazioni Speciali

Descrizione:

Documentazione Allegata o con Riserva di Presentazione

Tipo Documento: **Tavole Disegno;** *N. Es. All. :* **1;** *N.Es.Ris.:* **1;** *N. Pag. per Esemplare:* **2;**

Tipo Documento: **Lettera di Incarico;** *N. Es. All. :* **0;** *N.Es.Ris.:* **1;** *N. Pag. per Esemplare:* **0;**

Tipo Documento: **Riassunto in Italiano;** *N. Es. All. :* **1;** *N.Es.Ris.:* **0;** *N. Pag. per Esemplare:* **1;**

Tipo Documento: **Rivendicazione in Italiano;** *N. Es. All. :* **1;** *N.Es.Ris.:* **0;** *N. Pag. per Esemplare:* **4;**

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Tipo Documento: **Designazione di Inventore;** *N. Es. All. :* **0;** *N.Es.Ris.:* **1;** *N. Pag. per Esemplare:* **0;**

Tipo Documento: **Descrizione in Italiano;** *N. Es. All. :* **1;** *N.Es.Ris.:* **0;** *N. Pag. per Esemplare:* **7;**

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Tipo Documento: **Attestato Versamento; SI;**

Attestato di Versamento

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Del Presente Atto si Richiede Copia Autentica

Data Compilazione: **2010-11-12**

Camera di Commercio Padova

Camera di Commercio Industria, Artigianato e Agricoltura di PADOVA

Verbale di Deposito Domanda di Brevetto per INVENZIONE INDUSTRIALE

Numero domanda: PD2010A000338
CCIAA di deposito: PADOVA
Data di deposito: 12/11/2010

In data 12/11/2010 il richiedente ha presentato a me sottoscritto la seguente domanda di brevetto per Invenzione Industriale.

PADOVA, 12/11/2010

L'Ufficiale Rogante

Diritti di Segreteria	**15,00 EURO**
Bollo Virtuale	**20,00 EURO**

A. RICHIEDENTE

Cognome Nome/ Denominazione **MASCHIO GASPARDO S.P.A.**
Codice fiscale: 03272800289
Indirizzo: CAMPODARSEGO (PD)
VIA MARCELLO 73 cap 35011
Natura Giuridica: Persona Giuridica

C. TITOLO

Titolo **ELEMENTO DISTRIBUTORE DEL SEME PER SEMINATRICI DI PRECISIONE, SEMINATRICE INCLUDENTE DETTO ELEMENTO**

E. CLASSE PROPOSTA

Classe A01C - PIANTAGIONE; SEMINAGIONE; FERTILIZZAZIONE

I. MANDATARIO ABILITATO PRESSO L'UIBM

Mandatario Numero iscrizione albo: 436
CANTALUPPI STEFANO

Denominazione Studio CANTALUPPI & PARTNERS S.R.L.
Indirizzo: PADOVA (PD)
PIAZZETTA CAPPELLATO PEDROCCHI,18 cap 35122

M. DOCUMENTAZIONE DICHIARATA

Lista documenti **Attestato Versamento**
Numero esemplari allegati : 1
Numero esemplari di cui si riserva la presentazione: 0
Numero pagine per esemplare : 0

Tavole Disegno
Numero esemplari allegati : 1
Numero esemplari di cui si riserva la presentazione: 1
Numero pagine per esemplare : 2

Rivendicazione in Italiano
Numero esemplari allegati : 1
Numero esemplari di cui si riserva la presentazione: 0
Numero pagine per esemplare : 4

Rivendicazione in Inglese
Numero esemplari allegati : 0
Numero esemplari di cui si riserva la presentazione: 1
Numero pagine per esemplare : 0

Descrizione in Italiano
Numero esemplari allegati : 1
Numero esemplari di cui si riserva la presentazione: 0
Numero pagine per esemplare : 7

Riassunto in Italiano
Numero esemplari allegati : 1
Numero esemplari di cui si riserva la presentazione: 0
Numero pagine per esemplare : 1

Documento Generico
Numero esemplari allegati : 1
Numero esemplari di cui si riserva la presentazione: 0
Numero pagine per esemplare : 1

Designazione di Inventore
Numero esemplari allegati : 0
Numero esemplari di cui si riserva la presentazione: 1
Numero pagine per esemplare : 0

Lettera di Incarico/Autocertificazione
Numero esemplari allegati : 0
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Numero pagine per esemplare : 0

Versamento in euro Importo: 95,00

Copia autentica Richiesta

Anticipata accessibilità al pubblico Non concessa

PROSPETTO MODULO A

DOMANDA DI BREVETTO PER INVENZIONE INDUSTRIALE

NUMERO DI DOMANDA:		DATA DI DEPOSITO:	

A. RICHIEDENTE/I COGNOME E NOME O DENOMINAZIONE, RESIDENZA O STATO

MASCHIO GASPARDO S.P.A.
VIA MARCELLO 73
35011 CAMPODARSEGO (PD)

C. TITOLO

Elemento distributore del seme per seminatrici di precisione, seminatrice includente detto elemento.

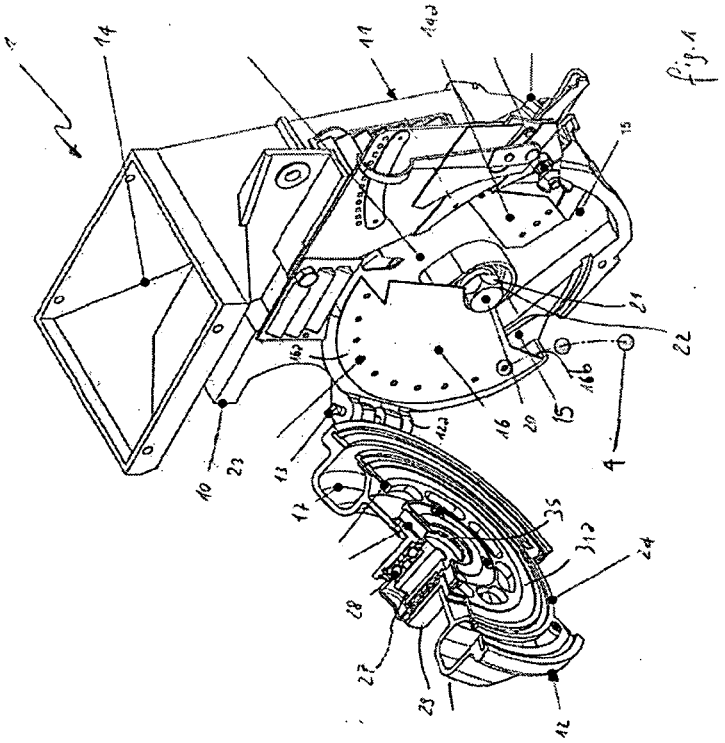
	SEZIONE	CLASSE	SOTTOCLASSE	GRUPPO	SOTTOGRUPPO
E. CLASSE PROPOSTA	A	01	C		

O. RIASSUNTO

Un elemento distributore del seme per macchine seminatrici pneumatiche di precisione, include:

- un disco di semina trascinato da un albero motorizzato di trasmissione in rotazione a velocità controllata in solido con detto albero,
- un involucro con una parte fissa nella quale è supportato detto albero ed una parte mobile rispetto a detta parte fissa e richiudibile su di essa, con una camera di raccolta del seme nella parte fissa e una camera di aspirazione pneumatica nella parte mobile,
- il disco di semina essendo interposto tra dette parti ed avente superfici contrapposte delimitanti dette camere, ed essendo provvisto di almeno una corona di fori selettori passanti tra dette superfici contrapposte,
- mezzi per generare un differenziale di pressione tra le dette superfici contrapposte in corrispondenza di un segmento circonferenziale di detta corona di fori, includenti la camera di aspirazione pneumatica ed
- una guarnizione sulla parte mobile suscettibile di contatto di strisciamento con la superficie affacciata del disco quando dette parti sono chiuse l'una sull'altra,
- un elemento reggispinta del disco di semina girevolmente supportato nella parte mobile, per sostenere almeno parte del carico assiale generato dal disco sulla guarnizione.

P. DISEGNO PRINCIPALE



FIRMA DEL/DEI RICHIEDENTE/I

DESCRIZIONE

La presente invenzione ha per oggetto un elemento distributore del seme per macchine seminatrici pneumatiche di precisione, un elemento di semina per tali macchine ed una macchina seminatrice includente una pluralità di tali elementi di semina.

Nelle macchine seminatrici pneumatiche di precisione vengono notoriamente utilizzati elementi di semina dotati ciascuno di un elemento distributore del seme (di seguito, in breve, distributore) per distribuire un seme alla volta in erogazione controllata mentre l'elemento di semina si muove lungo una traccia di semina.

E' parimenti noto l'impiego di distributori del seme che utilizzano un differenziale di pressione d'aria tra facce contrapposte di un disco di semina (o selettore) munito di una o più corone di fori passanti. Il principio di funzionamento si basa sul fatto che, per effetto del differenziale di pressione tra le facce contrapposte del disco, un seme aderisce a ciascun foro ed è quindi trasportato con la rotazione del disco di semina dalla zona di selezione del seme fino al punto in cui cessa il differenziale di pressione ed il seme è rilasciato per caduta attraverso un condotto di semina nel solco o traccia di semina. In pratica su di una delle facce del disco viene esercitata una forte aspirazione d'aria che trattiene i semi sulla faccia contrapposta in corrispondenza dei rispettivi fori.

Per il buon funzionamento di tali distributori è necessario garantire una tenuta pneumatica efficace tra la faccia del disco soggetta ad aspirazione ed una guarnizione che delimita la camera di aspirazione pneumatica. L'effetto stesso di aspirazione determina una sostanziale compressione del disco

contro la guarnizione. Se ciò da un lato garantisce una adeguata aderenza della guarnizione alla superficie del disco soggetta a depressione, dall'altro lato ciò comporta una forte abrasione della guarnizione che ne limita la durata efficace. E' quindi necessario sostituire periodicamente la guarnizione per prevenire errori di semina derivanti da una insufficiente depressurizzazione della camera di aspirazione.

D'altro canto, anche se sostituire tale guarnizione è una operazione semplice, in ogni caso essa comporta un indesiderato fermo macchina, oltre al costo in sé del ricambio.

Per ovviare a tale inconveniente sono state sviluppate macchine seminatrici dotate di un elemento reggispinta che allevia il carico gravante sulla guarnizione. In tutti i casi, tuttavia, l'elemento reggispinta, che deve essere condotto in rotazione con il disco, è montato sulla parte fissa dell'involucro, vale a dire quella che viene fissata all'intelaiatura degli elementi di semina. Questo comporta che il disco debba essere agganciato all'elemento reggispinta; quindi deve essere previsto un sistema di aggancio che in fase di sostituzione del disco deve essere disinserito allungando conseguentemente tale operazione. Ciò è inevitabile nelle macchine note poiché sulla parte fissa deve obbligatoriamente essere montata la trasmissione che conduce in rotazione l'albero motorizzato che conduce in rotazione il disco.

Posizionare l'elemento reggispinta sulla parte fissa comporta tuttavia che la camera di aspirazione pneumatica sia realizzata sulla parte fissa, ovvero dalla stessa parte in cui è posto l'elemento reggispinta, mentre la camera di raccolta del seme deve essere realizzata nella parte mobile. Ciò è fonte di

numerosi inconvenienti, tra i quali il fatto che l'apertura dell'involucro comporta necessariamente l'allontanamento della parte contenente la camera di raccolta del seme dal magazzino a tramoggia soprastante che deve necessariamente essere fissato alla intelaiatura dell'elemento di semina.

Inoltre per la sostituzione del disco di semina è necessario rimuovere alcune parti del distributore, quali il selettore registrabile del seme, e l'epulsore del seme, ove previsto.

Il problema alla base della presente invenzione è quello di mettere a disposizione un elemento distributore del seme strutturalmente e funzionalmente concepito così da consentire il superamento di tutti gli inconvenienti lamentati con riferimento alla tecnica nota citata.

Questo problema è risolto dall'invenzione mediante un elemento distributore del seme realizzato in accordo con una o più delle unite rivendicazioni.

Le caratteristiche ed i vantaggi del trovato meglio risulteranno dalla descrizione dettagliata che segue di un suo esempio preferito di realizzazione illustrato, a titolo indicativo e non limitativo, con riferimento agli uniti disegni in cui:

- la fig. 1 è una vista in prospettiva di un elemento distributore del seme realizzato in accordo con la presente invenzione;
- la fig. 2 è una vista prospettica a parti staccate di un particolare dell'elemento di fig. 1;
- la fig. 3 è una vista prospettica di una seminatrice dotata di elementi di semina con elemento distributore del seme secondo l'invenzione.

Nelle figure con 1 è complessivamente indicato un elemento distributore del

seme destinato ad equipaggiare un elemento di semina 2 di una seminatrice pneumatica di precisione 3.

L'elemento distributore 1 è l'organo destinato a depositare un seme 4 alla volta ad una prefissata distanza regolabile in un solco di semina aperto da un assolcatore 5. L'elemento di semina 2, oltre all'elemento distributore 1 comprende un telaio 6 ed un magazzino del seme o tramoggia 7, oltre ad altri organi in sé noti e non necessari per la comprensione della presente invenzione; La seminatrice 3 a sua volta comprende una struttura portante 8 sulla quale è montata una pluralità di elementi di semina 2, tutti collegati ad un aspiratore pneumatico 9.

L'elemento di semina 1 a sua volta comprende un involucro 10 con una parte fissa 11 fissata stabilmente sul telaio 6 ed una parte mobile 12 incernierata in corrispondenza di una cerniera 12a sulla parte fissa 11 tramite un perno di cerniera 13 rimovibile. La parte fissa include una imboccatura 14 tramite la quale essa è collegata al di sotto di una bocca di efflusso del magazzino o tramoggia 7 in modo tale da essere alimentata direttamente da questo.

Dall'imboccatura 14 il seme fluisce attraverso una porta 14a di afflusso del seme in una camera 15 di raccolta del seme.

Un disco di semina 16 separa la camera 15 di raccolta del seme da una camera di aspirazione 17 ricavata nella parte mobile 12. Un aspiratore 18 montato sulla struttura portante 8 è collegato alla camera di aspirazione 17 mediante tubazioni 19 per generare un differenziale di pressione tra le superfici contrapposte 16a,b del disco selettore 16.

Il disco di semina 16 è montato in modo rimovibile su di un albero di

trascinamento 20 motorizzato, supportato nella parte fissa 11 e condotto in rotazione a velocità prefissate e regolabili da una trasmissione non rappresentata. La presenza di tale trasmissione impone che l'albero 20 sia montato sulla parte fissa 11 dell'involucro 10. Il calettamento tra albero 20 e disco 16 è ottenuto mediante un profilo poligonale 21 alla estremità libera dell'albero 20 che sporge oltre il disco 16 ed ha preferibilmente smussi 22 i quali servono da invito per le funzioni chiarite di seguito.

Alla periferia del disco 16 è ricavata una (o più) corona di fori 23 passanti tra le facce contrapposte del disco di semina 16.

Una guarnizione 24 è applicata nella camera di aspirazione 17 ed è posta in contatto di strisciamento con la superficie affacciata del disco 16, quando la parte mobile 11 è chiusa sulla parte fissa 12, a delimitare un segmento circonferenziale in cui i fori 23 sono assoggettati al differenziale di pressione anzidetto. Tale segmento circonferenziale si estende tra la camera 15 di raccolta del seme ed un condotto di caduta del seme 25 in cui i semi sono rilasciati uno alla volta nel solco tracciato dall'assolcatore 5.

In ragione del differenziale di pressione tra le due superfici contrapposte del disco di semina , i semi 4 sono trattenuti, uno per ciascun foro 23, quando i fori transitano nella camera 15 di raccolta del seme e sono rilasciati in corrispondenza del condotto 25 quando cessa l'effetto pneumatico del differenziale di pressione ovvero per la presenza di un espulsore del seme (non rappresentato).

Per limitare l'usura della guarnizione 24 in conseguenza dello strisciamento contro la superficie del disco 16 sulla parte mobile è montato un elemento reggispinta complessivamente indicato con 26.

L'elemento reggispinta 26 comprende un albero 27 montato girevolmente mediante cuscinetti 28 in una sede 29 della parte mobile 12. L'albero 27 reca una flangiatura 30 tramite la quale esso è fissato ad un piattello reggispinta 31 suscettibile di appoggio alla superficie del disco affacciata alla guarnizione 24 in una zona radialmente interna alla corona di fori 23 per sostenere almeno parte del carico assiale generato dal disco 16 sulla guarnizione 24.

L'appoggio tra il piattello reggispinta 31 ed il disco 16 avviene in corrispondenza di una corona 31a in rilievo sulla superficie del piattello affacciata al disco 16.

L'elemento reggispinta 26 è condotto in rotazione con il disco di semina 16 quando le parti fissa e mobile 11,12 sono chiuse l'una sull'altra mediante un elemento di trascinamento 32 che comprende un organo accoppiatore vincolato al piattello reggispinta in rotazione ma con gioco radiale e/o circonferenziale in modo da auto-centrarsi nell'accoppiamento rotazionale con l'albero di trascinamento del disco 16. A tale scopo, nella presente forma di realizzazione, l'elemento di trascinamento 32 è accoppiato con limitato gioco radiale e/o circonferenziale all'elemento 26 tramite una (o più) appendice 33 sporgente radialmente verso l'esterno ed annidata in corrispondenti sedi 34 del piattello. L'elemento di trascinamento 32 si accoppia tramite un profilo poligonale interno 35 (simile a quello adottato per le chiavi a stella o box-end wrench) al profilo poligonale 21 della estremità libera dell'albero 20, i cui smussi 22 servono da invito per facilitare la centratura dei due profili ed il rispettivo innesto.

L'elemento di trascinamento 32 risulta così auto-centrante rispetto all'albero

di trascinamento 20 da cui esso è condotto. Il posizionamento tra guarnizione 24 e piattello 31 sarà tale per cui le rotazione di quest'ultimo non sarà ostacolata dalla presenza della guarnizione 24 e, al tempo stesso, verranno entrambi mantenuti in appoggio al disco 16.

È altresì previsto che l'elemento reggispinta 26 possa essere realizzato folle e non condotto in rotazione dall'albero 20.

L'assieme della parte mobile 12 completa di elemento reggispinta 26 e guarnizione 24 si presta vantaggiosamente alla realizzazione di un kit per il retrofitting di seminatrici già esistenti. È sufficiente in tal caso separare la parte mobile di vecchio tipo rimuovendo il perno di cerniera 13 e sostituirla con il kit anzidetto. Ricollegando le tubazioni pneumatiche preventivamente sganciate la seminatrice è pronta al lavoro.

Tra i principali vantaggi dell'elemento distributore secondo l'invenzione vi è il fatto che viene sensibilmente ridotta, se non eliminata, l'usura della guarnizione per effetto del contatto di strisciamento con il disco selettore del seme; l'elemento reggispinta è autocentrante il che consente una facilitata apertura e chiusura della parte mobile sulla parte fissa dell'involucro; il sistema si presta inoltre ad un agevole retrofitting, il tutto senza rimozioni di parti mobili e/o operazioni di sgancio del disco di semina.

RIVENDICAZIONI

1. Elemento distributore del seme per macchine seminatrici pneumatiche di precisione, del tipo includente:

- un disco di semina trascinato da un albero motorizzato di trasmissione in rotazione a velocità controllata in solido con detto albero,
- un involucro con una parte fissa nella quale è supportato detto albero ed una parte mobile rispetto a detta parte fissa e richiudibile su di essa,
- in detta parte fissa essendo definita una camera di raccolta del seme,
- in detta parte mobile essendo definita una camera di aspirazione pneumatica,
- detto disco di semina essendo interposto tra dette parti ed avente superfici contrapposte delimitanti dette camere,
- detto disco di semina avente almeno una corona di fori selettori passanti tra dette superfici contrapposte,
- mezzi per generare un differenziale di pressione tra le dette superfici contrapposte in corrispondenza di un segmento circonferenziale di detta corona di fori,
- detti mezzi includenti detta camera di aspirazione pneumatica ed
- una guarnizione sulla parte mobile suscettibile di contatto di strisciamento con la superficie affacciata del disco quando dette parti sono chiuse l'una sull'altra,
- caratterizzato dal fatto di comprendere
- un elemento reggispinta del disco di semina girevolmente supportato

in detta parte mobile, per sostenere almeno parte del carico assiale generato dal disco su detta guarnizione.

2. Elemento distributore del seme secondo la rivendicazione 1 in cui detto elemento reggispinta è condotto in rotazione con detto disco quando dette parti sono chiuse l'una sull'altra.
3. Elemento distributore del seme secondo la rivendicazione 1 o 2, in cui detto elemento reggispinta comprende un piattello reggispinta suscettibile di appoggio alla superficie del disco di semina affacciata a detta guarnizione in zona radialmente interna alla corona di fori.
4. Elemento distributore del seme secondo la rivendicazione 3 in cui l'elemento reggispinta comprende un elemento di trascinamento solidale in rotazione al piattello e suscettibile di accoppiamento con l'albero di trascinamento del disco quando dette parti sono chiuse l'una sull'altra.
5. Elemento distributore del seme secondo la rivendicazione 4 in cui l'elemento di trascinamento è auto-centrante rispetto all'albero di trascinamento.
6. Elemento distributore del seme secondo la rivendicazione 4 o 5 in cui l'elemento di trascinamento comprende un organo accoppiatore vincolato al piattello reggispinta in rotazione ma con gioco radiale e/o circonferenziale in modo da auto-centrarsi in accoppiamento rotazionale con l'albero di trascinamento del disco.
7. Elemento distributore del seme secondo una o più delle rivendicazioni precedenti in cui la parte mobile è incernierata alla parte fissa.
8. Elemento di semina per seminatrici di precisione includente un telaio

sul quale è montato un elemento distributore del seme secondo una o più delle rivendicazioni precedenti.

9. Seminatrice comprendente una struttura portante sulla quale è montata una pluralità di elementi di semina secondo la rivendicazione 8.

10. Kit per retrofitting degli elementi distributori del seme di seminatrici pneumatiche di precisione in cui gli elementi distributori sono del tipo includente:

- un disco di semina trascinato da un albero motorizzato di trasmissione in rotazione a velocità controllata in solido con detto albero,
- un involucro con una parte fissa nella quale è supportato detto albero ed una parte mobile rispetto a detta parte fissa e richiudibile su di essa,
- in detta parte fissa essendo definita una camera di raccolta del seme,
- in detta parte mobile essendo definita una camera di aspirazione pneumatica,
- detto disco di semina essendo interposto tra dette parti ed avente superfici contrapposte delimitanti dette camere,
- detto disco di semina avente almeno una corona di fori selettori passanti tra dette superfici contrapposte,
- mezzi per generare un differenziale di pressione tra le dette superfici contrapposte in corrispondenza di un segmento circonferenziale di detta corona di fori,
- detti mezzi includenti detta camera di aspirazione pneumatica ed

- una guarnizione sulla parte mobile suscettibile di contatto di strisciamento con la superficie affacciata del disco quando dette parti sono chiuse l'una sull'altra,

caratterizzato dal fatto di comprendere:

- detta parte mobile preassemblata con
- un elemento reggispinta del disco di semina girevolmente supportato in detta parte mobile, per sostenere almeno parte del carico assiale generato dal disco su detta guarnizione.

11. Kit secondo la rivendicazione 10 in cui detta parte mobile e detto elemento reggispinta comprendono una o più delle caratteristiche delle rivendicazioni da 2 a 7.

RIASSUNTO

Un elemento distributore del seme per macchine seminatrici pneumatiche di precisione, include:

- un disco di semina trascinato da un albero motorizzato di trasmissione in rotazione a velocità controllata in solido con detto albero,
- un involucro con una parte fissa nella quale è supportato detto albero ed una parte mobile rispetto a detta parte fissa e richiudibile su di essa, con una camera di raccolta del seme nella parte fissa e una camera di aspirazione pneumatica nella parte mobile,
- il disco di semina essendo interposto tra dette parti ed avente superfici contrapposte delimitanti dette camere, ed essendo provvisto di almeno una corona di fori selettori passanti tra dette superfici contrapposte,
- mezzi per generare un differenziale di pressione tra le dette superfici contrapposte in corrispondenza di un segmento circonferenziale di detta corona di fori, includenti la camera di aspirazione pneumatica ed
- una guarnizione sulla parte mobile suscettibile di contatto di strisciamento con la superficie affacciata del disco quando dette parti sono chiuse l'una sull'altra,
- un elemento reggispinta del disco di semina girevolmente supportato nella parte mobile, per sostenere almeno parte del carico assiale generato dal disco sulla guarnizione.

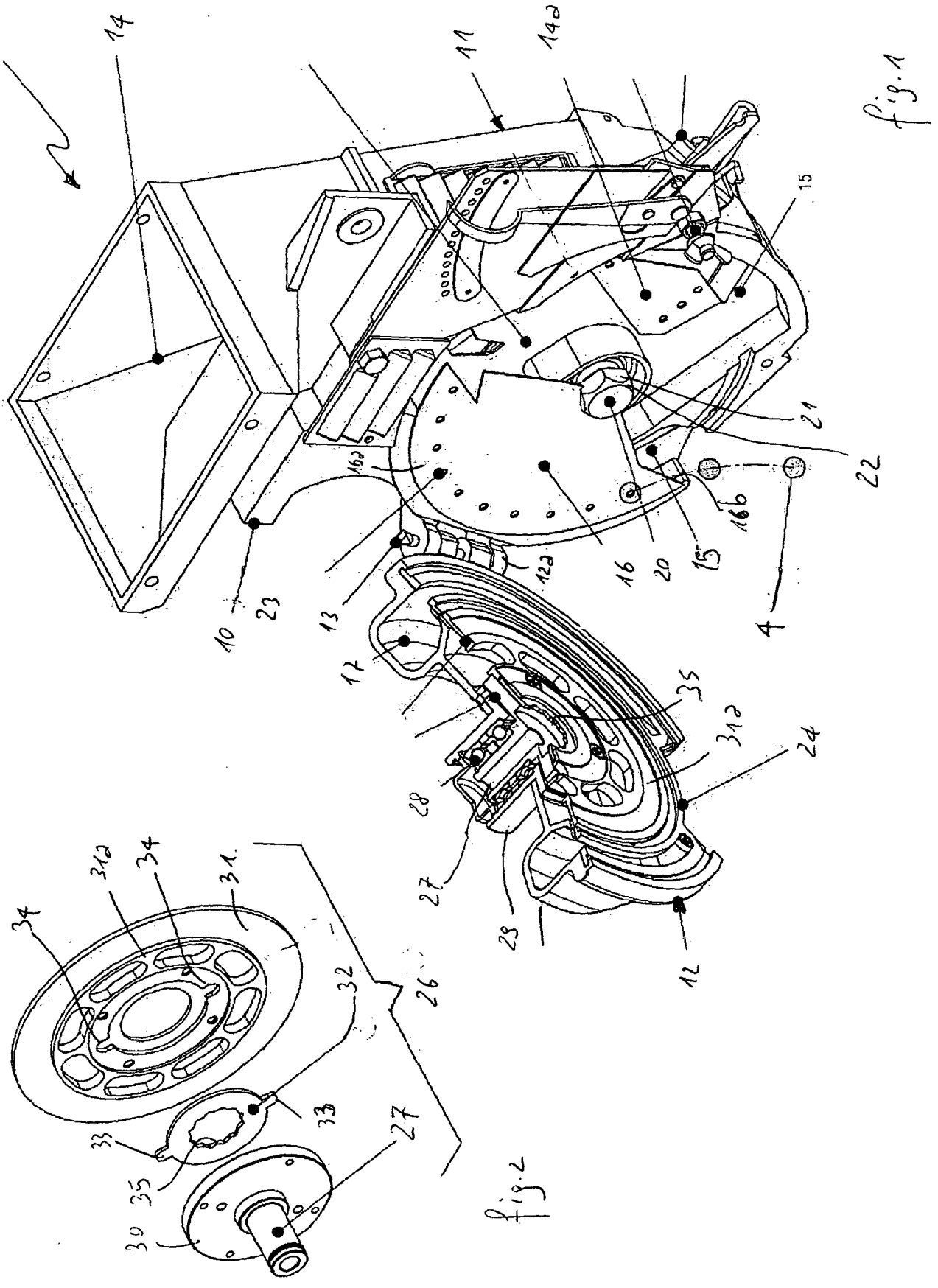

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fig.1

fig.2

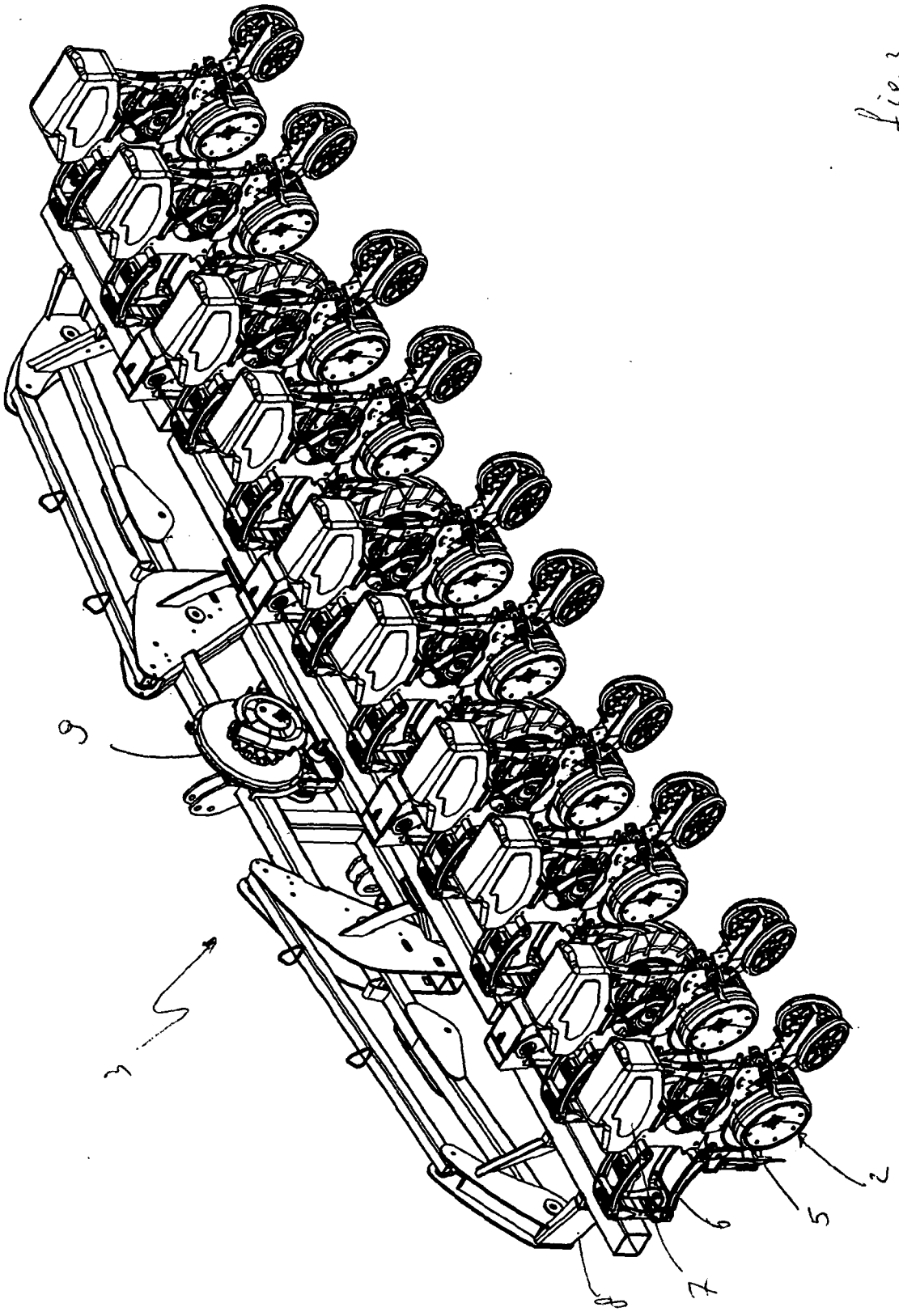


Fig. 3

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2011/069875

A. CLASSIFICATION OF SUBJECT MATTER
INV. A01C7/04
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A01C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 7 228 807 B1 (VENHUIZEN DALE [US]) 12 June 2007 (2007-06-12) column 5, line 59 - column 7, line 37; figures 6-10 -----	1
A	EP 0 536 543 A1 (MATERMACC SRL [IT]) 14 April 1993 (1993-04-14) column 5, line 7 - column 8, line 6; figures -----	1

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
9 February 2012	17/02/2012

Name and mailing address of the ISA/	Authorized officer
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1

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2011/069875

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 7228807 B1	12-06-2007	NONE	
EP 0536543 A1	14-04-1993	EP 0536543 A1	14-04-1993
		IT 1253373 B	08-08-1995
		US 5325801 A	05-07-1994

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Declarations under Rule 4.17:

— *of inventorship (Rule 4.17(iv))*

Published:

— *with international search report (Art. 21(3))*

(54) Title: SEED DISTRIBUTION ELEMENT FOR PRECISION SEED DRILLS, SEED DRILL INCLUDING SAID ELEMENT

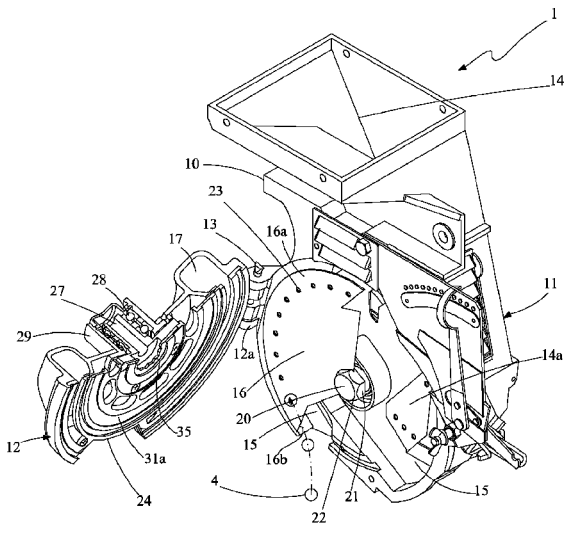


fig. 1

(57) Abstract: A seed distribution element (1) includes: -a sowing disc (16) rotated by a motor-driven transmission shaft (20) -a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) movable relative to the fixed portion and can be closed against it, with a seed collection chamber (15) in the fixed portion (11) and a pneumatic suction chamber (17) in the movable portion(12), -the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces (16a, 16b) delimiting the chambers, and provided with a ring of selector holes (23) extending between the opposed surfaces, -means for producing a pressure differential between the opposed surfaces in the region of a circumferential segment of the ring of holes, including the pneumatic suction chamber, and -a seal (24) on the movable portion (12) capable of sliding contact with the facing surface (16a) of the disc (16) when the portions are closed against one another, -a thrust -bearing element (26) of the sowing disc (16), supported rotatably in the movable portion (12), to withstand the axial load produced by the disc (16) on the seal (24).

WO 2012/062876 A1

"Seed distribution element for precision seed drills, seed drill including said element"

DESCRIPTION

The subject of the present invention is a seed distribution element for precision pneumatic seed drills, a sowing element for such machines and a seed drill including a plurality of such sowing elements.

In precision pneumatic seed drills it is known to use sowing elements which are each equipped with a seed distribution element (hereinafter, in brief, distributor) for distributing one seed at a time in a controlled delivery while the sowing element moves along a sowing track.

It is equally known to use seed distributors which use an air pressure differential between opposed faces of a sowing disc (or selector) provided with one or more rings of through holes. The operating principle is based on the fact that, as a result of the pressure differential between the opposed faces of the disc, a seed adheres to each hole and is then transported by the rotation of the sowing disc from the seed selection zone to the point at which the pressure differential ceases and the seed is released to drop through a sowing pipe into the furrow or sowing track. In practice, on one of the faces of the disc a strong air suction is exerted which retains the seeds on the opposite face in the region of the respective holes. An example of such devices is disclosed in US 7 228 807.

For the correct functioning of such distributors it is necessary to ensure an effective pneumatic seal between the face of the disc that is subjected to suction and a seal which delimits the pneumatic suction chamber. The

suction effect itself effects a substantial compression of the disc against the seal. If on the one hand this ensures adequate adherence of the seal to the disc surface which is subjected to negative pressure, on the other hand it involves severe abrasion of the seal which limits the effective service life thereof. It is therefore necessary periodically to replace the seal in order to prevent sowing errors arising from insufficient depressurization of the suction chamber.

On the other hand, even if replacing the seal is a simple operation, in each case it entails an unwanted machine stoppage, besides the cost of the spare part itself.

In order to remedy this drawback, seed drills have been developed which are equipped with a thrust-bearing element which relieves the heavy load on the seal. In all cases, however, the thrust-bearing element, which must be rotated with the disc, is mounted on the fixed portion of the housing, that is to say, that portion which is fixed to the framework of the sowing elements. This means that the disc must be attached to the thrust-bearing element; therefore an attachment system must be provided which in the stage of replacement of the disc must be removed, consequently lengthening the operation. This is inevitable in the known machines since it is obligatory to mount on the fixed portion the transmission which drives in rotation the motor-driven shaft which rotates the disc.

However, positioning the thrust-bearing element on the fixed portion entails the pneumatic suction chamber being provided on the fixed portion, or on the same side at which the thrust-bearing element is placed, while the seed collection chamber must be provided in the

movable portion. This is the source of numerous drawbacks, including the fact that the opening of the housing necessarily involves the removal of the portion containing the seed collection chamber from the hopper type store located above, which must necessarily be fixed to the framework of the sowing element.

Furthermore, for the replacement of the sowing disc it is necessary to remove some parts of the distributor, such as the adjustable seed selector, and the seed ejector, where provided.

The problem underlying the present invention is that of providing a seed distribution element structurally and functionally designed to make it possible to remedy all the drawbacks mentioned with reference to the prior art cited.

This problem is solved by the invention by means of a seed distribution element produced in accordance with one or more of the attached claims.

The features and advantages of the invention will become clearer from the following detailed description of a preferred exemplary embodiment thereof, illustrated by way of non-limiting example with reference to the appended drawings, in which:

- Fig. 1 is a perspective view of a seed distribution element produced according to the present invention;
- Fig. 2 is an exploded perspective view of a detail of the element of Fig. 1;
- Fig. 3 is a perspective view of a seed drill equipped with sowing elements with a seed distribution element according to the invention.

In the drawings the reference 1 indicates as a whole a seed distribution

element intended for equipping a sowing element 2 of a precision pneumatic seed drill 3.

The distribution element 1 is the device intended to deposit one seed 4 at a time at a predetermined adjustable spacing in a sowing furrow opened by a coulter 5. The sowing element 2, besides the distribution element 1, comprises a frame 6 and a seed store or hopper 7, besides other devices which are known per se and not necessary for the understanding of the present invention. The seed drill 3 itself comprises a bearing structure 8 on which a plurality of sowing elements 2 are mounted, all connected to a pneumatic suction device 9.

The sowing element 1 itself comprises a housing 10 with a fixed portion 11 fixed in a stable manner on the frame 6 and a movable portion 12 hinged in the region of a hinge 12a on the fixed portion 11 by means of a removable hinge pin 13. The fixed portion includes a throat 14 by means of which it is connected below an outflow mouth of the store or hopper 7 in such a way as to be fed directly by the latter.

From the throat 14 the seed flows through a gate 14a through which the seed flows into a seed collection chamber 15.

A sowing disc 16 separates the seed collection chamber 15 from a suction chamber 17 provided in the movable portion 12. A suction device 18 mounted on the bearing structure 8 is connected to the suction chamber 17 by means of pipes 19 for producing a pressure differential between the opposed surfaces 16a, 16b of the selector disc 16.

The sowing disc 16 is removably mounted on a motor-driven drive shaft 20, supported in the fixed portion 11 and driven in rotation at

predetermined adjustable speeds by a transmission which is not shown. The presence of the transmission requires the shaft 20 to be mounted on the fixed portion 11 of the housing 10. The keying between the shaft 20 and the disc 16 is obtained by means of a polygonal profile 21 at the free end of the shaft 20 which protrudes beyond the disc 16 and preferably has chamfers 22 which serve to facilitate the functions explained hereinafter.

At the periphery of the disc 16 is/are provided one (or several) ring(s) of holes 23 passing between the opposed faces of the sowing disc 16.

A seal 24 is fitted in the suction chamber 17 and is placed in sliding contact with the facing surface of the disc 16, when the movable portion 11 is closed on the fixed portion 12, to delimit a circumferential segment in which the holes 23 are subjected to the aforesaid pressure differential. The circumferential segment extends between the seed collection chamber 15 and a seed fall pipe 25 in which the seeds are released one at a time into the furrow formed by the coulter 5.

By reason of the pressure differential between the two opposed surfaces of the sowing disc, the seeds 4 are held, one to each hole 23, when the holes pass in the seed collection chamber 15, and are released in the region of the pipe 25 when the pneumatic effect of the pressure differential ceases or owing to the presence of a seed ejector (not shown).

In order to limit the wear on the seal 24 resulting from sliding against the surface of the disc 16, a thrust-bearing element indicated as a whole by 26 is mounted on the movable portion.

The thrust-bearing element 26 comprises a shaft 27 rotatably mounted by means of bearings 28 in a seat 29 of the movable portion 12. The shaft 27

has flanging 30 by means of which it is fixed to a thrust-bearing plate 31 which can bear on that surface of the disc which faces the seal 24 in a zone radially inside the ring of holes 23 in order to withstand at least some of the axial load produced by the disc 16 on the seal 24.

The bearing between the thrust-bearing plate 31 and the disc 16 takes place in the region of a ring 31a in relief on the surface of the plate which faces the disc 16.

The thrust-bearing element 26 is driven in rotation with the sowing disc 16 when the fixed and movable portions 11, 12 are closed against one another by means of a drive element 32 which comprises a coupling device constrained for rotation with the thrust-bearing plate but with radial and/or circumferential clearance in such a way as to be self-centred in the rotational coupling with the drive shaft of the disc 16. For this purpose, in the present form of embodiment, the drive element 32 is coupled with limited radial and/or circumferential clearance to the element 26 by means of one (or more) appendage(s) 33 protruding radially towards the outside and fitted into corresponding seats 34 of the plate. The drive element 32 is coupled by means of an internal polygonal profile 35 (similar to that adopted for box-end wrenches) to the polygonal profile 21 of the free end of the shaft 20, the chamfers 22 of which serve to facilitate the centring of the two profiles and the respective engagement.

The drive element 32 is thus self-centring relative to the drive shaft 20 by which it is driven. The positioning between seal 24 and plate 31 is such that the rotation of the latter will not be hindered by the presence of the seal 24 and, at the same time, both will be kept bearing against the disc

16.

Provision is also made for the thrust-bearing element 26 to be made idle and not driven in rotation by the shaft 20.

The whole of the movable portion 12 complete with thrust-bearing element 26 and seal 24 lends itself advantageously to the production of a kit for the retrofitting of existing seed drills. It is sufficient in this case to separate the old type of movable portion by removing the hinge pin 13 and replacing the old movable portion with the aforesaid kit. By re-connecting the pneumatic pipes previously disconnected, the seed drill becomes ready for use.

Among the principal advantages of the distribution element according to the invention is the fact that the wear on the seal resulting from the sliding contact with the seed selector disc is substantially reduced, if not eliminated; the thrust-bearing element is self-centring, thereby allowing easy opening and closing of the movable portion on the fixed portion of the housing; the system additionally lends itself to easy retrofitting, all without removing movable parts and/or operations of disconnecting the sowing disc.

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the

movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
- a seed collection chamber (15) being defined in the fixed portion (11),
- a pneumatic suction chamber (17) being defined in the movable portion (12),
- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),
- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and
- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed

surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the kit comprises:

– the movable portion (12) pre-assembled with:

– a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

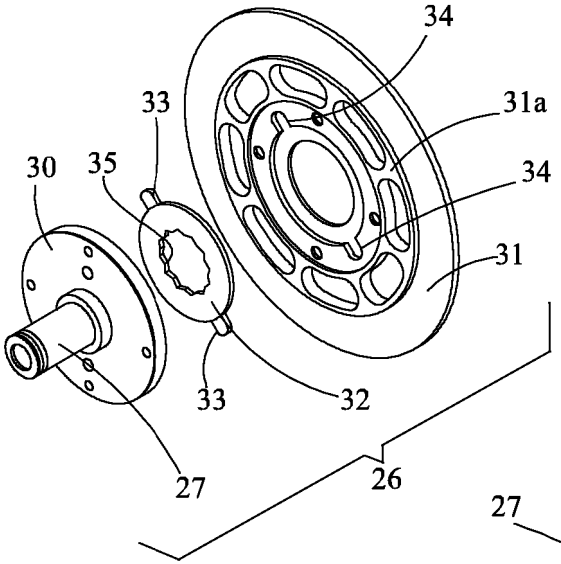

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fig. 2

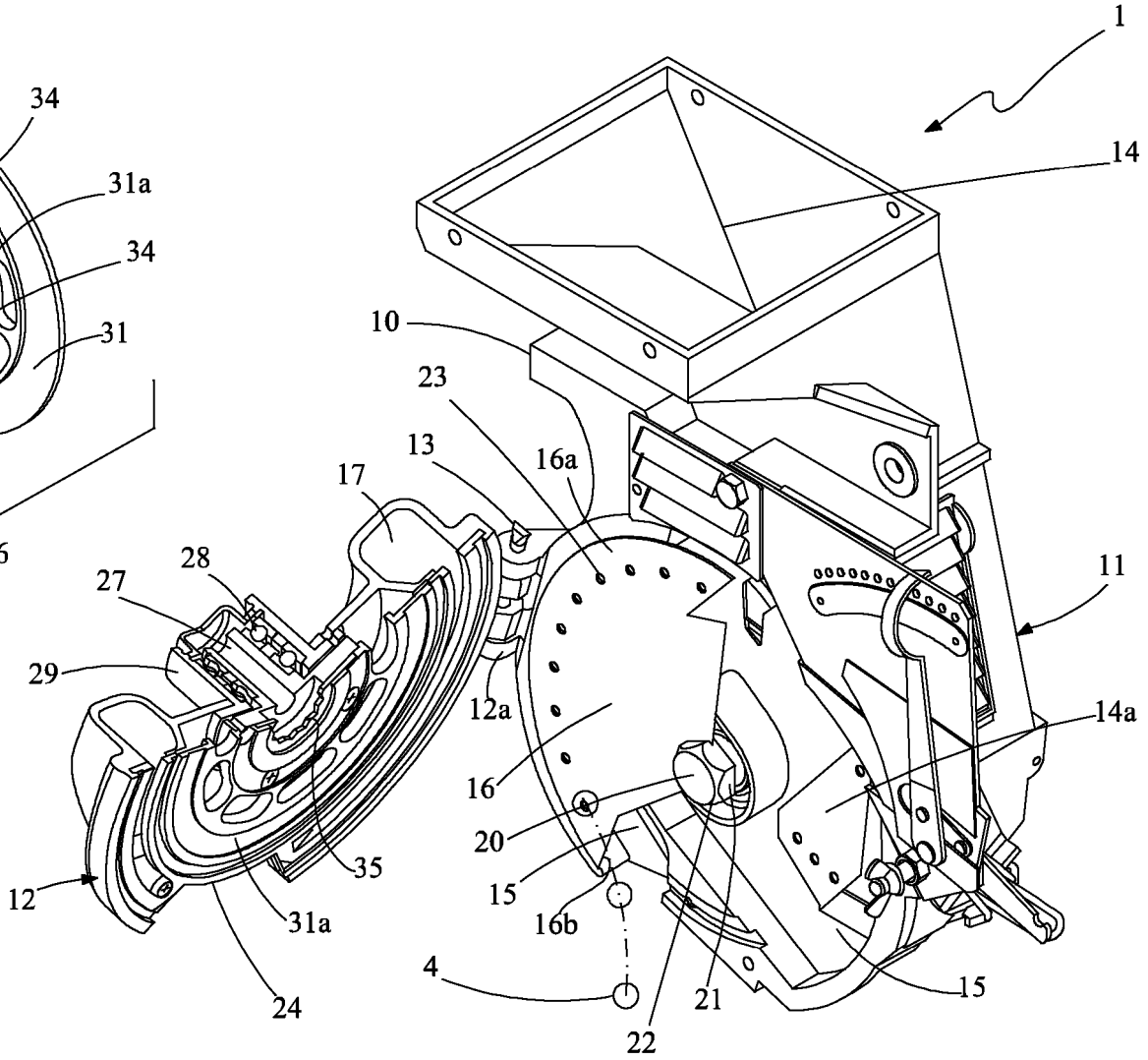

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31a
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fig. 1

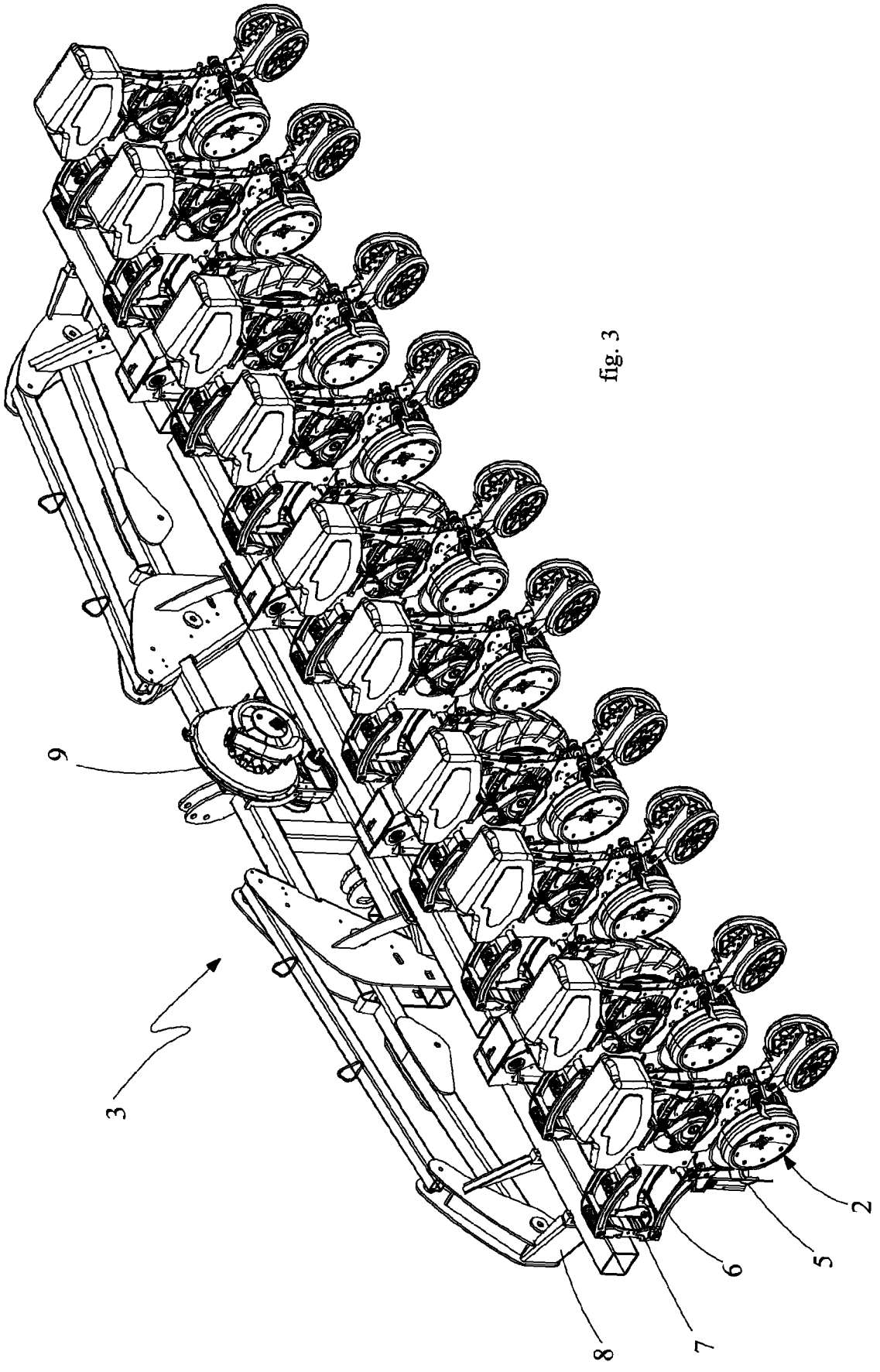


fig. 3

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ the international application in the language in which it was filed

   ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:

   a. (means)

   ☐ on paper

   ☐ in electronic form

   b. (time)

   ☐ in the international application as filed

   ☐ together with the international application in electronic form

   ☐ subsequently to this Authority for the purposes of search

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-11
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-11
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-11
	No:	Claims	

2. Citations and explanations

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/EP2011/069875	10.11.2011	12.11.2010

International Patent Classification (IPC) or both national classification and IPC
INV. A01C7/04

Applicant
MASCHIO GASPARDO S.P.A.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notifed the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:	Date of completion of this opinion	Authorized Officer
European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Fax: +49 89 2399 - 4465	see form PCT/ISA/210	Bunn, David Telephone No. +49 89 2399-2086

Form PCT/ISA/237 (Cover Sheet) (July 2009)

V. Reasoned statement

1 US-B1-7 228 807 (D1) discloses a seed distribution element 36 including a sowing disk 60, transmission shaft 55, fixed housing portion 50, movable housing portion 90, seed collection chamber (col.6, l.36-41), pneumatic suction chamber (col.7, l.31-36), selector holes 67, pressure differential (col.7, l.31-36) and seal 99 as in the preamble of claim 1.

The distribution element of claim 1 differs from that of D1 in comprising a thrust-bearing element 26 supported rotatably in movable housing portion 12 to withstand axial load produced by disk 16 on seal 24. In this way, wear on the seal due to its sliding against the disk is reduced (description, para. [0020], [0021]). As such a solution is not derivable from the available prior art, it follows that the subject matter of claim 1 fulfils the requirements of novelty and inventive step, Article 33(2),(3) PCT.

2 Claims 8 & 9 relate to a sowing element and seed drill respectively each comprising the element of claim 1. Claim 10 relates to a kit capable of being fitted to the element of D1, and comprising a movable housing portion 12 preassembled with a thrust bearing element as defined in claim 1. Claims 2-7 & 11 relate to preferred embodiments of the element of claim 1 and to the kit of claim 10 respectively.

Consequently, the subject matter of claims 2-11also fulfils the requirements of novelty and inventive step, Article 33 PCT.

VIII. Certain observations on the application (clarity)

1 The feature of claim 1 "wherein a pressure differential is provided..." relates to **a method of using** the apparatus, rather than clearly defining the apparatus in terms of its technical features. The intended limitations are therefore not clear, contrary to the requirements of Article 6 PCT. In this regard, reference is made to application IO19992, where this problem is avoided by using the wording "means for producing a pressure differential...".

Copy for (ISA-EP) 33
PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF THE RECORDING OF A CHANGE

(PCT Rule 92*bis*.1 and Administrative Instructions, Section 422)

To:

LOCAS, Davide
Cantaluppi & Partners s.r.l.
Piazzetta Cappellato Pedrocchi, 18
I-35122 Padova
ITALIE

Date of mailing *(day/month/year)*
02 February 2012 (02.02.2012)

Applicant's or agent's file reference
PBW11900-PCT

IMPORTANT NOTIFICATION

International application No.
PCT/EP2011/069875

International filing date *(day/month/year)*
10 November 2011 (10.11.2011)

1. The following indications appeared on record concerning:

☒ the applicant ☒ the inventor ☐ the agent ☐ the common representative

Name and Address
DONADON, Gianfranco
c/o Maschio Gaspardo S.p.A.
via Marcello, 73
I-35011 Campodarsego (PD)
Italy

State of Nationality: IT
State of Residence: IT
Telephone No.:
Facsimile No.:
E-mail address:

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☒ the person ☒ the name ☒ the address ☐ the nationality ☐ the residence

Name and Address
BRAGATTO, Enrico
Via Strada Nuova, 36
I-35021 Caorle (VE)
Italy

State of Nationality: IT
State of Residence: IT
Telephone No.:
Facsimile No.:
E-mail address:
☐ Notifications by e-mail authorized

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

☒ the receiving Office
☒ the International Searching Authority
☐ the Authority(ies) specified for supplementary search
☐ the International Preliminary Examining Authority
☐ the designated Offices concerned
☐ the elected Offices concerned
☐ other:

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. +41 22 338 89 70

Authorized officer
Bentobbal Ryad
e-mail pt06.pct@wipo.int
Telephone No. +41 22 338 74 06

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PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF THE RECORDING OF A CHANGE

(PCT Rule 92*bis*.1 and Administrative Instructions, Section 422)

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ITALIE

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Facsimile No.:
E-mail address:

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☒ the person ☒ the name ☒ the address ☐ the nationality ☐ the residence

Name and Address
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Via Strada Nuova, 36
I-35021 Caorle (VE)
Italy

State of Nationality: IT
State of Residence: IT
Telephone No.:
Facsimile No.:
E-mail address:
☐ Notifications by e-mail authorized

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

☒ the receiving Office
☒ the International Searching Authority
☐ the Authority(ies) specified for supplementary search
☐ the International Preliminary Examining Authority
☐ the designated Offices concerned
☐ the elected Offices concerned
☐ other:

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1211 Geneva 20, Switzerland

Facsimile No. +41 22 338 89 70

Authorized officer
Bentobbal Ryad
e-mail pt06.pct@wipo.int
Telephone No. +41 22 338 74 06

Copy for (RO-EP) 32
PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION RELATING TO
DECLARATION MADE UNDER PCT RULE 4.17

(PCT Rules 26*ter* and 48.2(a)(x)
and Administrative Instructions, Section 419)

To:

LOCAS, Davide
Cantaluppi & Partners s.r.l.
Piazzetta Cappellato Pedrocchi, 18
I-35122 Padova
ITALIE

Date of mailing *(day/month/year)*
02 February 2012 (02.02.2012)

Applicant's or agent's file reference
PBW11900-PCT

IMPORTANT NOTIFICATION

International application No.
PCT/EP2011/069875

International filing date *(day/month/year)*
10 November 2011 (10.11.2011)

Applicant
MASCHIO GASPARDO S.P.A. et al

1. The applicant is hereby **notified** of the following regarding the declaration indicated below in respect of BRAGATTO, Enrico :

   (i) ☐ declaration as to the identity of the inventor (Rules 4.17(i) and 51*bis*.1(a)(i) and Section 211)

   (ii) ☐ declaration as to the applicant's entitlement, as at the international filing date, to apply for or be granted a patent (Rules 4.17(ii) and 51*bis*.1(a)(ii) and Section 212)

   (iii) ☐ declaration as to the applicant's entitlement, as at the international filing date, to claim priority of the earlier application (Rules 4.17(iii) and 51*bis*.1(a)(iii) and Section 213)

   (iv) ☒ declaration of inventorship (for the purposes of the designation of the United States of America) (Rules 4.17(iv) and 51*bis*.1(a)(iv) and Section 214)

   (v) ☐ declaration as to non-prejudicial disclosures or exceptions to lack of novelty (Rules 4.17(v) and 51*bis*.1(a)(v) and Section 215)

2. ☒ **Addition or correction of the declaration within the time limit under Rule 26*ter*.1.**

   The added or corrected declaration was received on 26 January 2012 (26.01.2012) , which was within the time limit under Rule 26*ter*.1.

   Any declaration referred to under items 1(i) to (v), whether or not the declaration complies with Rule 4.17, will be published as part of the international application pursuant to Rule 48.2(a)(x).

3. ☐ **Failure to add or correct the declaration within the time limit under Rule 26*ter*.1.**

   The declaration was received on which was **after** the expiration of the time limit under Rule 26*ter*.1; therefore, that declaration, as added or corrected, referred to under items 1(i) to (v) will **not** be published as part of the international application, and any signed declaration referred to under item 1(iv) is attached. **Such declaration should be submitted by the applicant directly to the designated Office(s) concerned.**

4. The applicant's attention is drawn to Rule 51*bis*.2 which provides that the designated Office shall not, unless it may reasonably doubt the veracity of the declaration concerned, require any document or evidence relating to the subject matter of any declaration complying with Rule 4.17(i) to (iv) which is contained in the request or submitted to the International Bureau or directly to the designated Office. Note, however, that Rule 51*bis*.2 may not apply in respect of certain States. For further information, see Notes to the request form, Box No. VIII.

5. A copy of this notification is being sent to the receiving Office and the International Searching Authority.

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. +41 22 338 89 70

Authorized officer
Bentobbal Ryad
e-mail pt06.pct@wipo.int
Telephone No. +41 22 338 74 06

Copy for (ISA-EP) 33
PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION RELATING TO
DECLARATION MADE UNDER PCT RULE 4.17

(PCT Rules 26*ter* and 48.2(a)(x)
and Administrative Instructions, Section 419)

To:

LOCAS, Davide
Cantaluppi & Partners s.r.l.
Piazzetta Cappellato Pedrocchi, 18
I-35122 Padova
ITALIE

Date of mailing *(day/month/year)*
02 February 2012 (02.02.2012)

Applicant's or agent's file reference
PBW11900-PCT

IMPORTANT NOTIFICATION

International application No.
PCT/EP2011/069875

International filing date *(day/month/year)*
10 November 2011 (10.11.2011)

Applicant
MASCHIO GASPARDO S.P.A. et al

1. The applicant is hereby **notified** of the following regarding the declaration indicated below in respect of BRAGATTO, Enrico :

   (i) ☐ declaration as to the identity of the inventor (Rules 4.17(i) and 51*bis*.1(a)(i) and Section 211)

   (ii) ☐ declaration as to the applicant's entitlement, as at the international filing date, to apply for or be granted a patent (Rules 4.17(ii) and 51*bis*.1(a)(ii) and Section 212)

   (iii) ☐ declaration as to the applicant's entitlement, as at the international filing date, to claim priority of the earlier application (Rules 4.17(iii) and 51*bis*.1(a)(iii) and Section 213)

   (iv) ☒ declaration of inventorship (for the purposes of the designation of the United States of America) (Rules 4.17(iv) and 51*bis*.1(a)(iv) and Section 214)

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5. A copy of this notification is being sent to the receiving Office and the International Searching Authority.

The International Bureau of WIPO
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1211 Geneva 20, Switzerland

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Authorized officer
Bentobbal Ryad
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Telephone No. +41 22 338 74 06

PCT

POWER OF ATTORNEY

(for an international application filed under the Patent Cooperation Treaty)

(PCT Rule 90.4)

The undersigned applicant(s) *(Names should be indicated as they appear in the request)*:

MASCHIO GASPARDO S.P.A.
Via Marcello, 73
35011 Campodarsego (PD)
ITALY

BRAGATTO Enrico
via Strada Nuova, 36
30021 Caorle (VE)

hereby appoints (appoint) the following person as: ☒ agent ☐ common representative

Name and address
(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

LOCAS Davide, CANTALUPPI Stefano, FABRIS Stefano, SUSANETTO Carlo, MONTEVECCHI Emma, SPADARO Marco, LEONE Mario and MORABITO Sara

c/o CANTALUPPI & PARTNERS S.r.l.
Piazzetta Cappellato Pedrocchi 18
35122 PADOVA
ITALY

to represent the undersigned before

☒ all the competent International Authorities
☐ the International Searching Authority only
☐ the International Preliminary Examining Authority only

in connection with the international application identified below:

Title of the invention: Seed distribution element for precision seed drills, seed drill including said element

Applicant's or agent's file reference: PBW11900-PCT

International application number (if already available): PCT/EP2011/069875

filed with the following Office EPO as receiving Office
and to make or receive payments on behalf of the undersigned.

Signature of the applicant(s) *(where there are several applicants, each of them must sign; next to each signature, indicate the name of the person signing and the capacity in which the person signs, if such capacity is not obvious from reading the request or this power)*:

MASCHIO GASPARDO S.P.A.
Mr. EGIDIO MASCHIO
- MANAGING DIRECTOR -

BRAGATTO Enrico
- inventor -
Enrico Bragatto

Date: JANUARY 16, 2012

Form PCT/Model of power of attorney (for a given international application) (July 1992)

Europäisches Patentamt
European Patent Office
Office européen des brevets

Acknowledgement of receipt

We hereby acknowledge receipt of your request for the processing of an international application according to the Patent Cooperation Treaty as follows:

Submission number	1394501
PCT application number	PCT/EP2011/069875
Date of receipt	10 November 2011
Receiving Office	European Patent Office, The Hague
Your reference	PBW11900-PCT
Applicant	Maschio Gaspardo S.p.A.
Number of applicants	2
Country	IT
Title	Seed distribution element for precision seed drills, seed drill including said element

Documents submitted		
	eolf-pkda.xml	eolf-requ.xml
	eolf-appb.xml	eolf-fees.xml
	eolf-vlog.xml	eolf-othd-000001.pdf (12 p.)
	eolf-abst.txt	eolf-appb-P000001.pdf (2 p.)

Submitted by	CN=D. Locas 24895,O=Cantaluppi & Partners,C=IT
Method of submission	Online
Date and time receipt generated	10 November 2011, 17:27 (CET)

Message Digest	3E:B5:F1:42:09:5F:94:48:24:EA:CA:D9:7F:9D:3D:3B:27:6D:94:15

Correction by the EPO of errors in debit instructions filed by eOLF

Errors in debit instructions filed by eOLF that are caused by the editing of Form 1038E entries or the continued use of outdated software (all forms) may be corrected automatically by the EPO, leaving the payment date unchanged (see decision T 152/82, OJ EPO 1984, 301 and point 6.3 ff ADA, Supplement to OJ EPO 10/2007).

/European Patent Office/

ABSTRACT

A seed distribution element for precision pneumatic seed drills, includes:

- a sowing disc which is rotated by a motor-driven transmission shaft, at controlled speed, jointly with the shaft,

- a housing with a fixed portion in which the shaft is supported and a portion which is movable relative to the fixed portion and can be closed against it, with a seed collection chamber in the fixed portion and a pneumatic suction chamber in the movable portion,

- the sowing disc being interposed between the portions and having opposed surfaces delimiting the chambers, and being provided with at least one ring of selector holes extending between the opposed surfaces,

- means for producing a pressure differential between the opposed surfaces in the region of a circumferential segment of the ring of holes, including the pneumatic suction chamber, and

- a seal on the movable portion capable of sliding contact with the facing surface of the disc when the portions are closed against one another,

- a thrust-bearing element of the sowing disc, supported rotatably in the movable portion, in order to withstand at least some of the axial load produced by the disc on the seal.

CLAIMS

1. A seed distribution element (1) for precision pneumatic seed drills (3), of the type including:

– a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,

– a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,

– a seed collection chamber (15) being defined in the fixed portion (11),

– a pneumatic suction chamber (17) being defined in the movable portion (12),

– the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),

– the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and

– a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the seed distribution element (1) further comprises a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the

movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

2. A seed distribution element (1) according to Claim 1, wherein the thrust-bearing element (26) is rotated with the disc (16) when the portions (11, 12) are closed against one another.

3. A seed distribution element (1) according to Claim 1 or Claim 2, wherein the thrust-bearing element (26) comprises a thrust-bearing plate (31) which can bear on that surface of the sowing disc (16) which faces the seal (24), in a zone radially inside of the ring of holes (23).

4. A seed distribution element (1) according to Claim 3, wherein the thrust-bearing element (26) comprises a drive element (32) which is fixed for rotation with the plate (31) and can be coupled with the drive shaft (20) of the disc (16) when the portions (11, 12) are closed against one another.

5. A seed distribution element (1) according to Claim 4, wherein the drive element (32) is self-centring relative to the drive shaft (20).

6. A seed distribution element (1) according to Claim 4 or Claim 5, wherein the drive element (32) comprises a coupling member (33) which rotates jointly with the thrust-bearing plate (31) but has radial and/or circumferential clearance so as to be self-centred during rotational coupling with the drive shaft (20) of the disc (16).

7. A seed distribution element (1) according to one or more of the preceding claims, wherein the movable portion (12) is hinged to the fixed portion (11).

8. A sowing element for precision seed drills (3) including a frame (6) on which a seed distribution element (1) according to one or more of the preceding claims is mounted.

9. A seed drill (3) comprising a supporting structure on which a plurality of sowing elements according to Claim 8 are mounted.

10. A kit for the retrofitting of seed distribution elements (1) of precision pneumatic seed drills (3) wherein the distribution elements (1) are of the type including:

- a sowing disc (16) which is rotated by a motor-driven transmission shaft (20) at controlled speed,
- a housing (10) with a fixed portion (11) in which the shaft (20) is supported and a portion (12) which is movable relative to the fixed portion (11) and can be closed against it,
- a seed collection chamber (15) being defined in the fixed portion (11),
- a pneumatic suction chamber (17) being defined in the movable portion (12),
- the sowing disc (16) being interposed between the portions (11, 12) and having opposed surfaces delimiting the chambers (15, 17),
- the sowing disc (16) having at least one ring of selector holes (23) extending between the opposed surfaces, and
- a seal (24) which is arranged on the movable portion (12) and is capable of sliding contact with the facing surface of the disc (16) when the portions (11, 12) are closed against one another,

wherein a pressure differential is provided between the opposed

surfaces in the region of a circumferential segment of the ring of holes (23),

characterized in that the kit comprises:

– the movable portion (12) pre-assembled with:

– a thrust-bearing element (26) of the sowing disc (16), which thrust-bearing element (26) is supported rotatably in the movable portion (12) in order to withstand at least some of the axial load produced by the disc (16) on the seal (24).

11. A kit according to Claim 10 wherein the movable portion (12) and the thrust-bearing element (26) comprise one or more of the features of Claims 2 to 7.

"Seed distribution element for precision seed drills, seed drill including said element"

DESCRIPTION

The subject of the present invention is a seed distribution element for precision pneumatic seed drills, a sowing element for such machines and a seed drill including a plurality of such sowing elements.

In precision pneumatic seed drills it is known to use sowing elements which are each equipped with a seed distribution element (hereinafter, in brief, distributor) for distributing one seed at a time in a controlled delivery while the sowing element moves along a sowing track.

It is equally known to use seed distributors which use an air pressure differential between opposed faces of a sowing disc (or selector) provided with one or more rings of through holes. The operating principle is based on the fact that, as a result of the pressure differential between the opposed faces of the disc, a seed adheres to each hole and is then transported by the rotation of the sowing disc from the seed selection zone to the point at which the pressure differential ceases and the seed is released to drop through a sowing pipe into the furrow or sowing track. In practice, on one of the faces of the disc a strong air suction is exerted which retains the seeds on the opposite face in the region of the respective holes. An example of such devices is disclosed in US 7 228 807.

For the correct functioning of such distributors it is necessary to ensure an effective pneumatic seal between the face of the disc that is subjected to suction and a seal which delimits the pneumatic suction chamber. The

suction effect itself effects a substantial compression of the disc against the seal. If on the one hand this ensures adequate adherence of the seal to the disc surface which is subjected to negative pressure, on the other hand it involves severe abrasion of the seal which limits the effective service life thereof. It is therefore necessary periodically to replace the seal in order to prevent sowing errors arising from insufficient depressurization of the suction chamber.

On the other hand, even if replacing the seal is a simple operation, in each case it entails an unwanted machine stoppage, besides the cost of the spare part itself.

In order to remedy this drawback, seed drills have been developed which are equipped with a thrust-bearing element which relieves the heavy load on the seal. In all cases, however, the thrust-bearing element, which must be rotated with the disc, is mounted on the fixed portion of the housing, that is to say, that portion which is fixed to the framework of the sowing elements. This means that the disc must be attached to the thrust-bearing element; therefore an attachment system must be provided which in the stage of replacement of the disc must be removed, consequently lengthening the operation. This is inevitable in the known machines since it is obligatory to mount on the fixed portion the transmission which drives in rotation the motor-driven shaft which rotates the disc.

However, positioning the thrust-bearing element on the fixed portion entails the pneumatic suction chamber being provided on the fixed portion, or on the same side at which the thrust-bearing element is placed, while the seed collection chamber must be provided in the

movable portion. This is the source of numerous drawbacks, including the fact that the opening of the housing necessarily involves the removal of the portion containing the seed collection chamber from the hopper type store located above, which must necessarily be fixed to the framework of the sowing element.

Furthermore, for the replacement of the sowing disc it is necessary to remove some parts of the distributor, such as the adjustable seed selector, and the seed ejector, where provided.

The problem underlying the present invention is that of providing a seed distribution element structurally and functionally designed to make it possible to remedy all the drawbacks mentioned with reference to the prior art cited.

This problem is solved by the invention by means of a seed distribution element produced in accordance with one or more of the attached claims.

The features and advantages of the invention will become clearer from the following detailed description of a preferred exemplary embodiment thereof, illustrated by way of non-limiting example with reference to the appended drawings, in which:

- Fig. 1 is a perspective view of a seed distribution element produced according to the present invention;
- Fig. 2 is an exploded perspective view of a detail of the element of Fig. 1;
- Fig. 3 is a perspective view of a seed drill equipped with sowing elements with a seed distribution element according to the invention.

In the drawings the reference 1 indicates as a whole a seed distribution

element intended for equipping a sowing element 2 of a precision pneumatic seed drill 3.

The distribution element 1 is the device intended to deposit one seed 4 at a time at a predetermined adjustable spacing in a sowing furrow opened by a coulter 5. The sowing element 2, besides the distribution element 1, comprises a frame 6 and a seed store or hopper 7, besides other devices which are known per se and not necessary for the understanding of the present invention. The seed drill 3 itself comprises a bearing structure 8 on which a plurality of sowing elements 2 are mounted, all connected to a pneumatic suction device 9.

The sowing element 1 itself comprises a housing 10 with a fixed portion 11 fixed in a stable manner on the frame 6 and a movable portion 12 hinged in the region of a hinge 12a on the fixed portion 11 by means of a removable hinge pin 13. The fixed portion includes a throat 14 by means of which it is connected below an outflow mouth of the store or hopper 7 in such a way as to be fed directly by the latter.

From the throat 14 the seed flows through a gate 14a through which the seed flows into a seed collection chamber 15.

A sowing disc 16 separates the seed collection chamber 15 from a suction chamber 17 provided in the movable portion 12. A suction device 18 mounted on the bearing structure 8 is connected to the suction chamber 17 by means of pipes 19 for producing a pressure differential between the opposed surfaces 16a, 16b of the selector disc 16.

The sowing disc 16 is removably mounted on a motor-driven drive shaft 20, supported in the fixed portion 11 and driven in rotation at

predetermined adjustable speeds by a transmission which is not shown. The presence of the transmission requires the shaft 20 to be mounted on the fixed portion 11 of the housing 10. The keying between the shaft 20 and the disc 16 is obtained by means of a polygonal profile 21 at the free end of the shaft 20 which protrudes beyond the disc 16 and preferably has chamfers 22 which serve to facilitate the functions explained hereinafter.

At the periphery of the disc 16 is/are provided one (or several) ring(s) of holes 23 passing between the opposed faces of the sowing disc 16.

A seal 24 is fitted in the suction chamber 17 and is placed in sliding contact with the facing surface of the disc 16, when the movable portion 11 is closed on the fixed portion 12, to delimit a circumferential segment in which the holes 23 are subjected to the aforesaid pressure differential. The circumferential segment extends between the seed collection chamber 15 and a seed fall pipe 25 in which the seeds are released one at a time into the furrow formed by the coulter 5.

By reason of the pressure differential between the two opposed surfaces of the sowing disc, the seeds 4 are held, one to each hole 23, when the holes pass in the seed collection chamber 15, and are released in the region of the pipe 25 when the pneumatic effect of the pressure differential ceases or owing to the presence of a seed ejector (not shown).

In order to limit the wear on the seal 24 resulting from sliding against the surface of the disc 16, a thrust-bearing element indicated as a whole by 26 is mounted on the movable portion.

The thrust-bearing element 26 comprises a shaft 27 rotatably mounted by means of bearings 28 in a seat 29 of the movable portion 12. The shaft 27

has flanging 30 by means of which it is fixed to a thrust-bearing plate 31 which can bear on that surface of the disc which faces the seal 24 in a zone radially inside the ring of holes 23 in order to withstand at least some of the axial load produced by the disc 16 on the seal 24.

The bearing between the thrust-bearing plate 31 and the disc 16 takes place in the region of a ring 31a in relief on the surface of the plate which faces the disc 16.

The thrust-bearing element 26 is driven in rotation with the sowing disc 16 when the fixed and movable portions 11, 12 are closed against one another by means of a drive element 32 which comprises a coupling device constrained for rotation with the thrust-bearing plate but with radial and/or circumferential clearance in such a way as to be self-centred in the rotational coupling with the drive shaft of the disc 16. For this purpose, in the present form of embodiment, the drive element 32 is coupled with limited radial and/or circumferential clearance to the element 26 by means of one (or more) appendage(s) 33 protruding radially towards the outside and fitted into corresponding seats 34 of the plate. The drive element 32 is coupled by means of an internal polygonal profile 35 (similar to that adopted for box-end wrenches) to the polygonal profile 21 of the free end of the shaft 20, the chamfers 22 of which serve to facilitate the centring of the two profiles and the respective engagement.

The drive element 32 is thus self-centring relative to the drive shaft 20 by which it is driven. The positioning between seal 24 and plate 31 is such that the rotation of the latter will not be hindered by the presence of the seal 24 and, at the same time, both will be kept bearing against the disc

16.

Provision is also made for the thrust-bearing element 26 to be made idle and not driven in rotation by the shaft 20.

The whole of the movable portion 12 complete with thrust-bearing element 26 and seal 24 lends itself advantageously to the production of a kit for the retrofitting of existing seed drills. It is sufficient in this case to separate the old type of movable portion by removing the hinge pin 13 and replacing the old movable portion with the aforesaid kit. By re-connecting the pneumatic pipes previously disconnected, the seed drill becomes ready for use.

Among the principal advantages of the distribution element according to the invention is the fact that the wear on the seal resulting from the sliding contact with the seed selector disc is substantially reduced, if not eliminated; the thrust-bearing element is self-centring, thereby allowing easy opening and closing of the movable portion on the fixed portion of the housing; the system additionally lends itself to easy retrofitting, all without removing movable parts and/or operations of disconnecting the sowing disc.

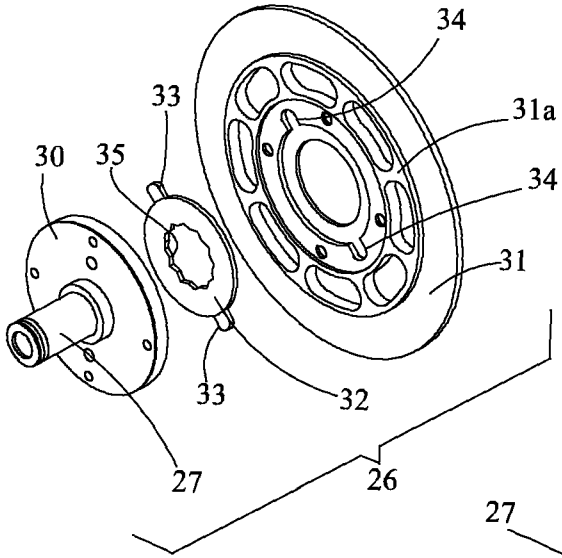

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31a
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fig. 2

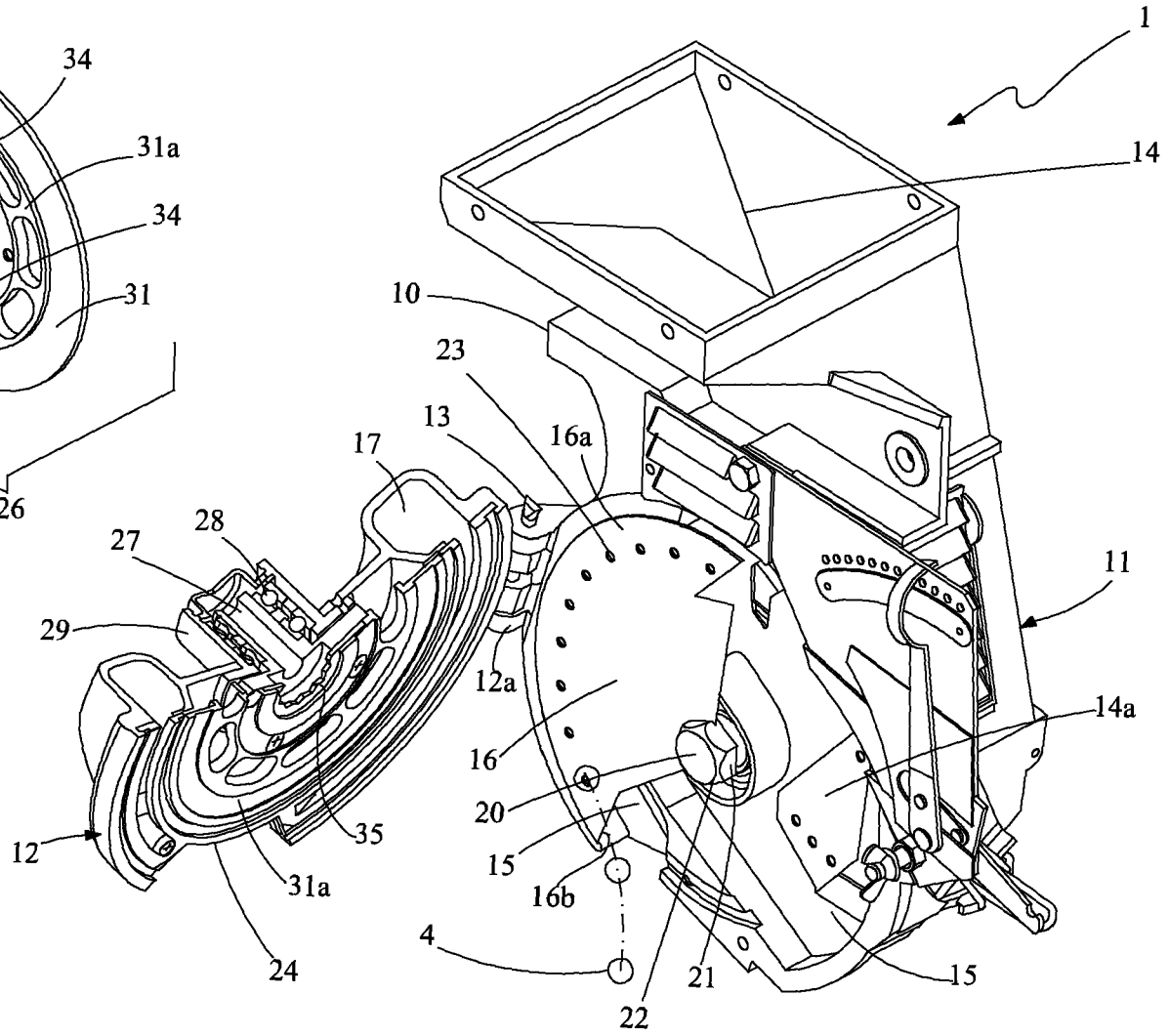

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12a
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16b
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31a
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22

fig. 1

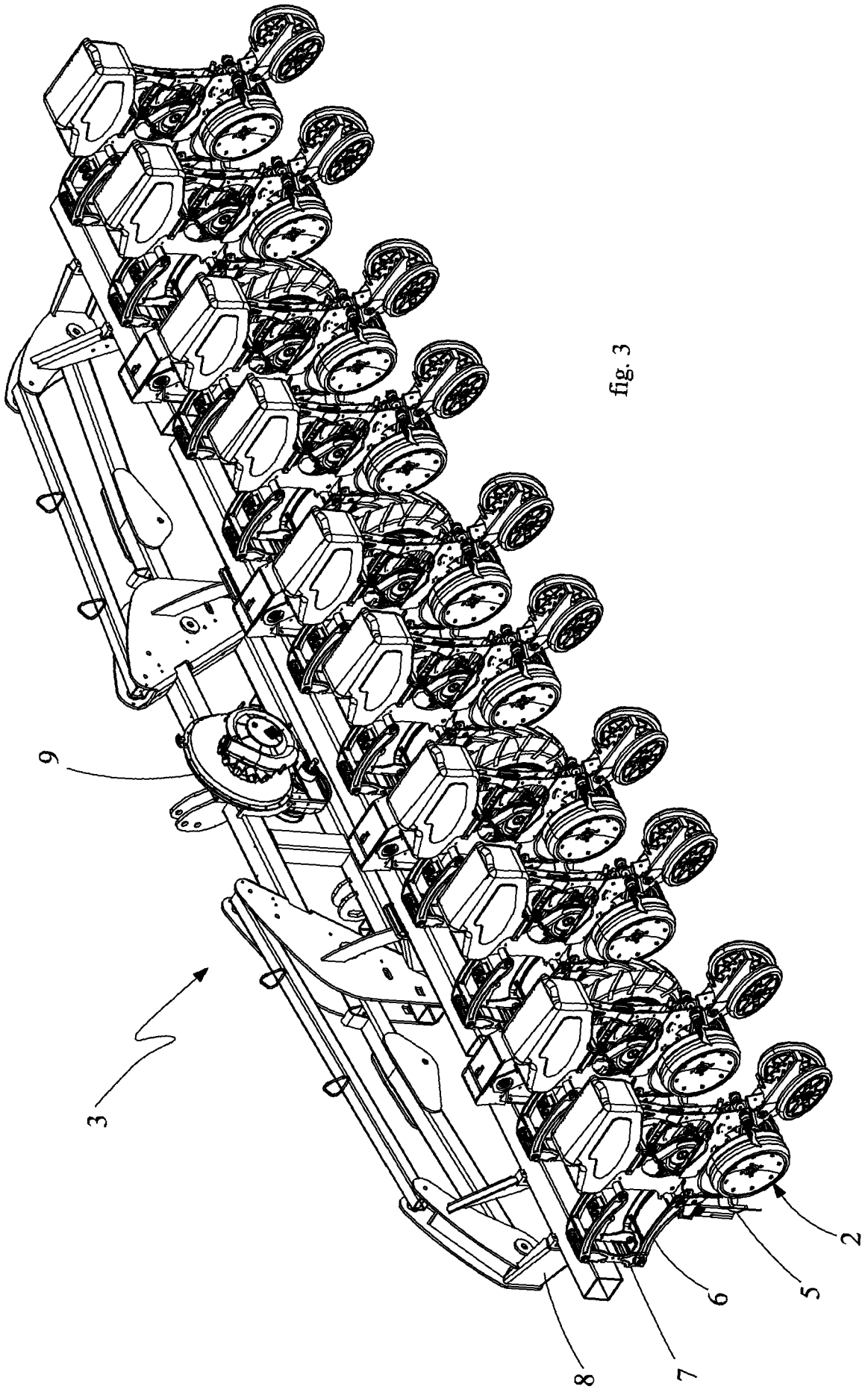


fig. 3