

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

STARA S.A.-INDÚSTRIA DE IMPLEMENTOS AGRÍCOLAS,
Petitioner,

v.

AGCO CORPORATION,
Patent Owner.

Case IPR2024-_____
Patent No. 11,665,989 B1

PETITION FOR *INTER PARTES* REVIEW OF
CLAIMS 1-4, 6-8, 10-13 AND 15-18 OF
U.S. PATENT NO. 11,665,989

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Pursuant to 35 U.S.C. §§311-319 and 37 C.F.R. §42, STARA S.A.-INDÚSTRIA DE IMPLEMENTOS AGRÍCOLAS, (“Petitioner”) respectfully petitions for *Inter Partes* Review (“IPR”) of Claims 1-4, 6-8, 10-13 and 15-18 of U.S. Patent No. 11,665,989 (“the ’989 Patent,” EX1001), which is assigned to AGCO CORPORATION (“Patent Owner”). Petitioner submits the Expert Declaration of Paul R. Weckler, PhD (EX1002) in support of this Petition. As demonstrated herein with reference to prior art not previously before the Office, with grounds never previously considered by the Office, and with the support of testimonial evidence, there is a reasonable likelihood that Petitioner will prevail in establishing that at least one of the challenged claims is unpatentable. Accordingly, institution of an IPR under 37 C.F.R. §42.108 is earnestly requested.

I. INTRODUCTION

The ’989 patent describes a farm implement – like a plow or planter -- that has a toolbar coupled to a frame member with a hinged joint, and an actuator configured to move the toolbar based on the sensed position of the toolbar. EX1001, Abstract. The purpose of the invention is to handle uneven or contoured fields -- a

field may comprise gullies and/or terraces. *Id.*, 1:10-18.¹ The actuator is configured to maintain the tools (e.g., coupled row units) properly engaged with the soil (e.g., seeding) despite the contoured surfaces of the field. *Id.*, 2:2-15. The toolbar system uses the sensed position of the toolbar to enable in-field planting operations, including lifting and turning at the end of the field. *Id.*

The '989 patent explains problems with the prior art as follows:

[M]ost implement designs (e.g., planters) comprise a row unit toolbar *that remains rigid* as the implement moves over contoured field surfaces. When the implement is towed over a terrace, for instance, the row unit may be lifted off of the ground *due to the rigid structures* involved, resulting in a shallow or surface-level seed depth. In other instances, such as when the row unit is approaching a valley or gulley where the towing vehicle is at a higher elevation, the row unit may receive the entire weight load of the frame, resulting in a seed depth that is excessive and possibly causing damage to the row unit. (*Id.*, 2:17-27 (emphasis added).)

The '989 patent describes that the invention solves this problem:

In contrast, certain embodiments of a contouring tool bar system actively control the rotation of the row unit tool bar, adapting the

¹ Citations to U.S. patents in this petition will be to column:lines, e.g., col. 1, lines 2-5 will be expressed as EX10## 1:2-5.

rotation to follow the contoured field surfaces and hence *always attempting to keep the row units engaged with the ground* (e.g., *by attempting to control the toolbar to be at a level position relative to the ground, or stated otherwise, maintain a relatively consistent elevation of the toolbar relative to ground*). (*Id.*, 2:27-35 (emphasis added).)

Thus, the '989 patent attempts to solve problems rigid tool bar arrangements had keeping row units engaged with the ground. The '989 patent did this by actively controlling the tool bar position.

The '989 patent claims are directed to obvious combinations of known components. To keep tools engaged with the ground, the claims recite an arrangement for controlling the tool bar position. The arrangement includes a hinge coupling the frame to the tool bar, and an actuator that moves the tool bar relative to the frame based on a sensed position of the tool bar. EX1002 ¶32. This, however, was well-known prior to the '989 patent. *Id.* ¶33.

The coupling being a hinge causes the movement of the tool bar to be a rotational movement about the hinge. Using hinges to couple a row tool bar to a farm implement frame was also well-known. EX1002 ¶27, 30.

Because all of the limitations of the claims can be found in the prior art, as demonstrated herein, there is a reasonable likelihood that Petitioner will prevail in

establishing that at least one of Claims 1-4, 6-8, 10-13 and 15-18 is unpatentable over the prior art. EX1002 ¶¶33, 34-46, 68, 266-464, and Appendix A.1-A.6.

II. MANDATORY NOTICES UNDER 37 C.F.R. §42.8(a)(1)

As set forth below and pursuant to 37 C.F.R. §42.8(a)(1), the following mandatory notices are provided as part of this Petition.

A. Real Party-In-Interest Under 37 C.F.R. §42.8(b)(1)

Pursuant to 37 C.F.R. §42.8(b)(1), Petitioner STARA S.A.-INDÚSTRIA DE IMPLEMENTOS AGRÍCOLAS certifies that it is the real party-in-interest in this proceeding.

B. Related Matters Under 37 C.F.R. §42.8(b)(2)

Pursuant to 37 C.F.R. §42.8(b)(2), Petitioner submits there are no related matters.

C. Lead and Back-Up Counsel Under 37 C.F.R. §42.8(b)(3)

Pursuant to 37 C.F.R. §§42.8(b)(3) and 42.10(a), Petitioner provides the following designation of lead and back-up counsel and related service information.

Pursuant to 37 C.F.R. §42.10(b), a Power of Attorney accompanies this Petition.

Lead Counsel	Back-Up Counsel
Brian A. Tollefson (Reg. No. 46,338) Tollefson IP 326 First Street, Suite 202 Annapolis, MD 21403 brian@tollefsonip.com 443-699-2450	Terry Kramer (Reg. No. 41,541) KramerAmado, P.C. 225 Reinekers Ln, Suite 300 Alexandria VA 22314 terry@krameramado.com Office: 703-519-9801 Fax: 703-519-9802

D. Service Information Under 37 C.F.R. §42.8(b)(4)

Service information (by e-mail, postal mailing, or hand-delivery) for lead and back-up counsel is provided in the above designation of lead and back-up counsel. Petitioner also consents to electronic service by e-mail at brian@tollefsonip.com, with a copy to info@tollefsonip.com and terry@krameramado.com.

III. PAYMENT OF FEES UNDER 37 C.F.R. §42.103

The undersigned hereby provides authorization to charge Deposit Account No. 603855 to cover the \$41,500 fee for this Petition. 37 C.F.R. §42.15(a). If this amount is insufficient or excessive, the Commissioner is authorized to deduct any underpayment from, or credit any overpayment to, Account No. 603855.

IV. GROUNDS FOR STANDING UNDER 37 C.F.R. §42.104(a)

Petitioner certifies that: (1) the '989 Patent is available for IPR; and (2) the provisions of 35 U.S.C. §§315(a), 315(b), and 315(e)(1) do not bar or estop

Petitioner from requesting IPR of Claims 1-4, 6-8, 10-13 and 15-18 of the '989 Patent on the grounds raised herein.

V. IDENTIFICATION OF CHALLENGE UNDER 37 C.F.R. §42.104(b) AND RELIEF REQUESTED

A. Claims for Which IPR Is Requested Under 37 C.F.R. §42.104(b)(1)

Petitioner requests IPR of Claims 1-4, 6-8, 10-13 and 15-18 of the '989 Patent.

B. The Specific Art and Statutory Grounds on Which the Challenge Is Based Under 37 C.F.R. §42.104(b)(2)

This Petition for IPR is based on the following prior art:

- (1) U.S. Patent 9,031,749 to Hubalek et al. ("Hubalek")(EX1006);
- (2) U.S. Pat. Pub. No. 2015/0230391 to Houck ("Houck")(EX1005);
- (3) DE 10 2006 034798 A1 applied for by Poettinger Landtechnik GmbH ("Poettinger")(EX1009);
- (4) U.S. Patent No. 8,573,319 to Casper et al. ("Deere I")(EX1007);
- (5) KR101877062 B1 - Tractor Plow Depth Control Apparatus and Method (KR'062)(EX1012);
- (6) U.S. Patent Application Publication No 2014/0209335 to Casper et al. ("Deere II")(EX1010);

(7) EP2335465 to Amazonen-Werke H. Dreyer GmbH & Co. KG (“Amazonen”)(EX1008).

(8) U.S. Patent Application Publication No. 2014/0069670 to Friesen et al. (“Friesen”)(EX1015).

This Petition requests cancellation of Claims 1-4, 6-8, 10-13 and 15-18 of the '989 Patent based on the following specific grounds:

Ground 1: Claims 1-4, 6-8 and 17-18 are unpatentable under 35 U.S.C. §103 as obvious over Hubalek in view of KR'062.

Ground 2: Claims 1-4, 6-8, 10-13 and 17-18 are unpatentable under 35 U.S.C. §103 as obvious over Hubalek in view of Houck.

Ground 3: Claims 1-4 and 6-8 and 17-18 are unpatentable under 35 U.S.C. §103 as obvious over Poettinger in view of KR'062.

Ground 4: Claims 1-4, 6-8, 10-13,15, and 17-18 are unpatentable under 35 U.S.C. §103 as obvious over Deere I alone or in combination with Deere II, in view of any of KR'062.

Ground 5: Claims 2 1-4, 6-8 and 17-18 are unpatentable under 35 U.S.C. §103 as obvious over Hubalek in view of Amazonen.

Ground 6: Claim 16 is unpatentable under 35 U.S.C. §103 as obvious over any of Grounds 1-5 in view of Friesen.

VI. SUMMARY OF THE '989 PATENT

The '989 Patent, entitled "*Implement Contouring Toolbar*," was filed on October 26, 2017, as a PCT application, entered the national stage in the U.S. on June 17, 2019, and issued on June 6, 2023. EX1001 at 1. The period for filing an IPR began on March 7, 2024. The '989 Patent claims priority to a Provisional Application filed December 16, 2016. For the purpose of this Petition, the priority date is December 16, 2016.

A. Specification of the '989 Patent

The '989 patent describes a farm implement that has a toolbar coupled to a frame member by a hinged joint, and an actuator configured to move the toolbar based on a sensed position of the toolbar. EX1001, Abstract. The farm implement 14 is shown below in Fig. 1 of the '989 patent.

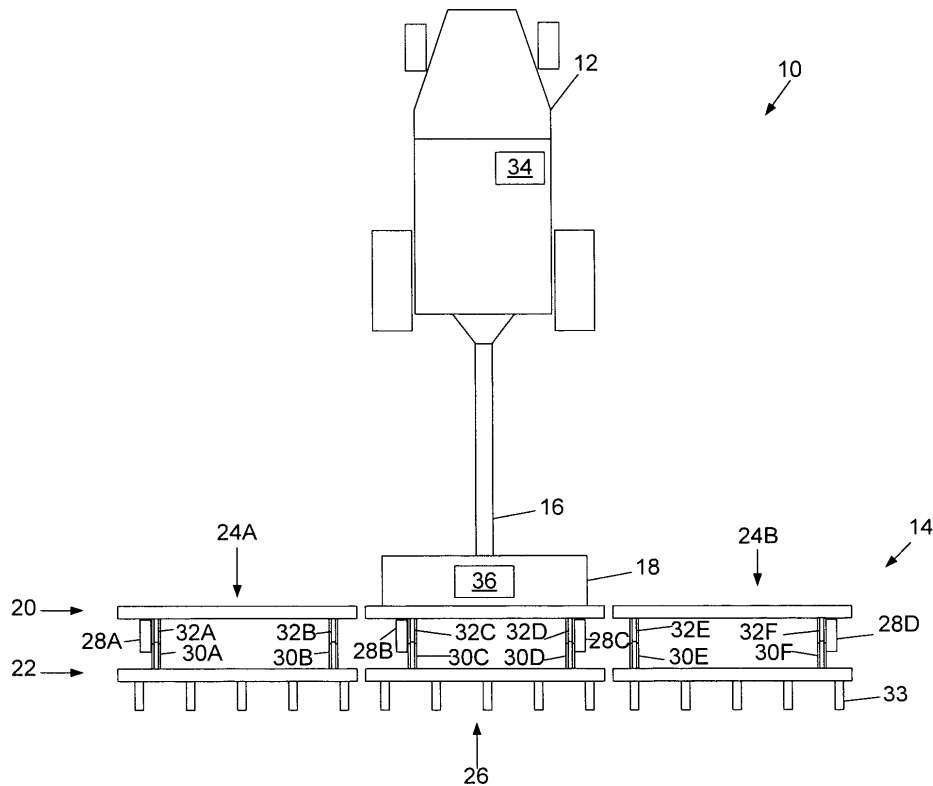
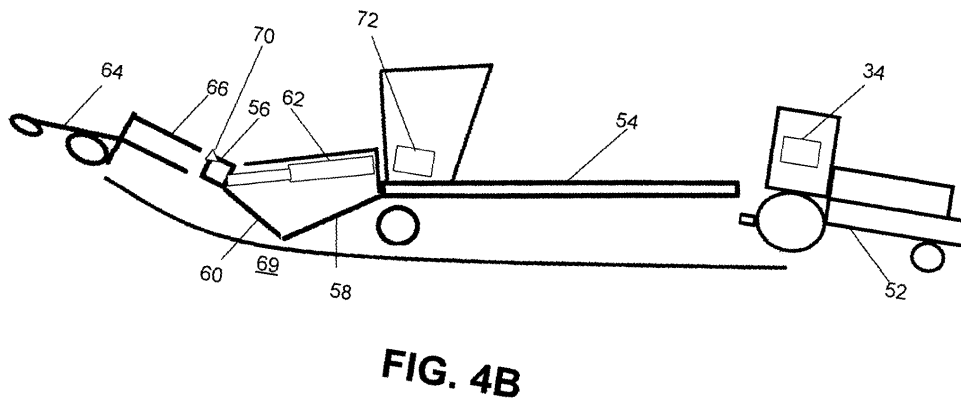
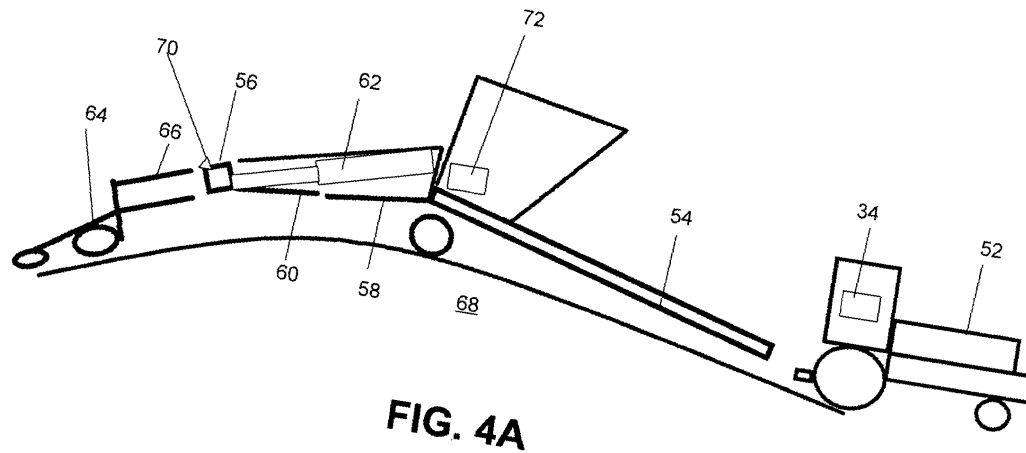


FIG. 1

The implement could be a cultivator or planter. EX1002 ¶22. The purpose of the invention was to improve handling of the implement on uneven or contoured fields -- a field may comprise gullies and/or terraces. EX1001 1:10-18; EX1002 ¶23. An actuator is configured to maintain the tools 33 properly engaged with the soil (e.g., seeding) despite the contoured surfaces of the field. EX1001 2:2-15. The toolbar system uses the sensed position of the toolbar to enable adjustment by the actuator. EX1002 ¶23.



Figs. 4A-4B illustrate a planter being towed. The actuator 62 can extend (Fig. 4A) to rotate the toolbar 56 toward the ground (e.g., going over a hill). The actuator 62 can be retracted to rotate the toolbar 56 away from the ground (e.g., coming off a hill). EX1002 ¶25.

Fig. 3 is the only figure showing any detail of the hinged coupling. EX1002 ¶26.



¶27.



The '989 patent is not limited to any particular kind of hinged joint and the hinged joint itself is not an invention. *Id.*

The patent discloses using sensors to detect the position of the toolbar, and by extension, the position of the tools, using one or more sensors. EX1001 6:1-7:40. The sensors may sense rotation between the toolbar and the frame, and the control of the actuation is based on the sensed position of the toolbar. *Id.* 6:22-24. “In general, to enable the toolbar 38A (and hence toolbar 38A) to follow the contour of the field, sensor information is received about the (relative) position of the toolbar 38A (and by extension, the relative position of the row unit 33B) relative to the ground. A row unit sensor, such as sensor 50, is used for the contouring operation. In one embodiment, at least one row unit sensor 50 is used, though in some embodiments, there may be a row unit sensor 50 per every row unit 33B.” *Id.* 6:26-34. “The sensor 48 senses the angular position and/or change in angular position between the toolbar 38A and the frame member 20. The sensor 50 may be located at the pivot point between the linkage 44 and the toolbar 38A, and used to sense the position of the toolbar 38A (and hence the position of the row unit 33B) relative to the ground.” *Id.* 6:57-63. Thus, the sensors of the '989 patent can sense the position relative to the ground by sensing a position of the

toolbar relative to the frame. EX1002 ¶29. The measurement of the position of the toolbar relative to the ground can be accomplished directly or indirectly. *Id.*

The invention disclosed by the '989 patent was already known in the art.
EX1002 ¶30.

B. Claims of the '989 Patent

The '989 Patent has 18 claims. A complete listing of the claims is found in the Appendix of Claims. Claim 1 is independent, from which claims 2-4, 6-8, 10-13, 15-16 and 18 depend:

1. A system, comprising:
 - [A] an elongate frame member;
 - [B] an elongate toolbar coupled to the frame member via a hinged joint, the toolbar oriented parallel to the frame member;
 - [C] a plurality of row units coupled to the toolbar;
 - [D] a first sensor configured to sense a position of the toolbar relative to ground;
 - [E] a second sensor configured to sense an angle of the toolbar relative to the frame member; and
 - [F] an actuator coupled between the frame member and the toolbar, the actuator configured to rotate the toolbar relative to the frame member based on a sensed position of the toolbar, wherein the toolbar remains parallel to the frame member throughout the rotation of the toolbar.

EX1001 12:11-28.

Claim 1 has 6 elements, A-F, and can be paraphrased as a towed farm implement (e.g., a planter or cultivator) having a main frame, a toolbar coupled to the frame by a pivoting joint, and an actuation system for moving the toolbar (e.g., to follow undulating ground). The actuation system includes at least two sensors, one for sensing a distance to the ground and another for sensing an angle of the toolbar relative to the frame (e.g., the angle of the joint). EX1002 ¶32. Such devices were well-known by December 2016. EX1002 ¶33.

The dependent claims add common-place limitations relating to the types of sensors, a generic “controller”, and “control components,” none of which impart novelty or nonobviousness. EX1002 ¶34.

As will be demonstrated more fully below, it is more likely than not that at least one of claims 1-4, 6-8, 10-13 and 15-18 is not patentable and an IPR should be instituted.

C. Prosecution History of the '989 Patent

An explanation of relevant portions of the prosecution history can be found at paragraphs 44-63 of Dr. Weckler’s declaration, EX1002. The following highlights are noted.

*The Applicant argued only that the difference between the '989 patent and Deere I was that in the '989 patent the toolbar **rotated** relative to the frame, rather*

than revolve. No argument was made as to why rotation of the tool bar was important nor that rotation provided a different or better result than revolution.

As explained by Dr. Weckler and below, the Examiner erred in evaluating Deere I. EX1002 ¶¶336-344.

Houck was distinguished based on differences in the physical limitations relating to the linkages, not relating to the second sensor. The Applicant convinced the Examiner to eliminate Hubalek by adding the second sensor of claim 3 to claim 1, and at the same time to eliminate Houck on different grounds. It's important to note that the rejections were over Hubalek and Houck were based on anticipation, not obviousness. **The Examiner clearly never considered, and certainly never discussed, the combination of Hubalek with Houck despite both being directed to the same subject matter.** EX1002 ¶¶61-62.

The Examiner also never considered the KR'062, Deere II, Amazonen or Poettinger references. EX1001 at 1. The Examiner never considered any of the combinations of prior art in the Grounds of this Petition.

VII. CLAIM CONSTRUCTION UNDER 37 C.F.R. §42.104(b)(3)

Except as set forth below in Section VII, Petitioner submits that, for purposes of this Petition only, the terms of the challenged claims should be given their ordinary and customary meaning of such claim as understood by one of ordinary

skill in the art in the field of agricultural implements in the December 2016 time frame. 37 C.F.R. §42.100(b).

VIII. APPLICATION OF CITED PRIOR ART TO EVERY CLAIM FOR WHICH IPR IS REQUESTED UNDER 37 C.F.R. §42.104(b)(4)-(5) .

A. Level Of Ordinary Skill In The Art

For purposes of the obviousness analyses presented below, Petitioner submits that the level of ordinary skill in the art (POSITA) is reflected by the prior art of record. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001).

To the extent necessary to define further, Petitioner asserts that a POSITA for the '989 Patent in the relevant field in December 2016 would have a bachelor's degree in mechanical or agricultural engineering, or a related study, and two years of experience building or using agricultural implements, such as cultivators, planters, or other implements, or an equivalent combination of education and experience. EX1002 ¶¶64-66.

B. Ground 1: Claims 1-4, 6-8 and 17-18 are unpatentable over Hubalek in view of KR'062

Hubalek in view of KR'062 discloses each and every element of Claim 1-4, 6-8 and 17-18 either expressly or inherently. EX1002 ¶¶114-138, 234-244, 229-358, 441-443, Appendix A.1; see also Section VIII.H below.

1. Hubalek

Hubalek issued on May 12, 2015, and is prior art to the '989 patent. EX1006 at 1. Although Hubalek was considered by the Office, it was eliminated chiefly because it only disclosed a single sensor.² As disclosed below, with citation to new art not previously considered, it would have been obvious to add the second sensor to the implement of Hubalek.

Hubalek discloses a cultivation air seeder having operating tools that operate in sequence to carry out the planting. EX1006 Abstract. The planting system includes an elongated frame element 12. *Id.* 2:59 and Fig. 1.

² The Examiner found that sensor 83 of Hubalek corresponded to the claimed “first sensor,” but as Dr. Weckler discusses in his Declaration, sensor 83 could be considered as performing the functions of either the first or second sensor. EX1002 ¶ 308.

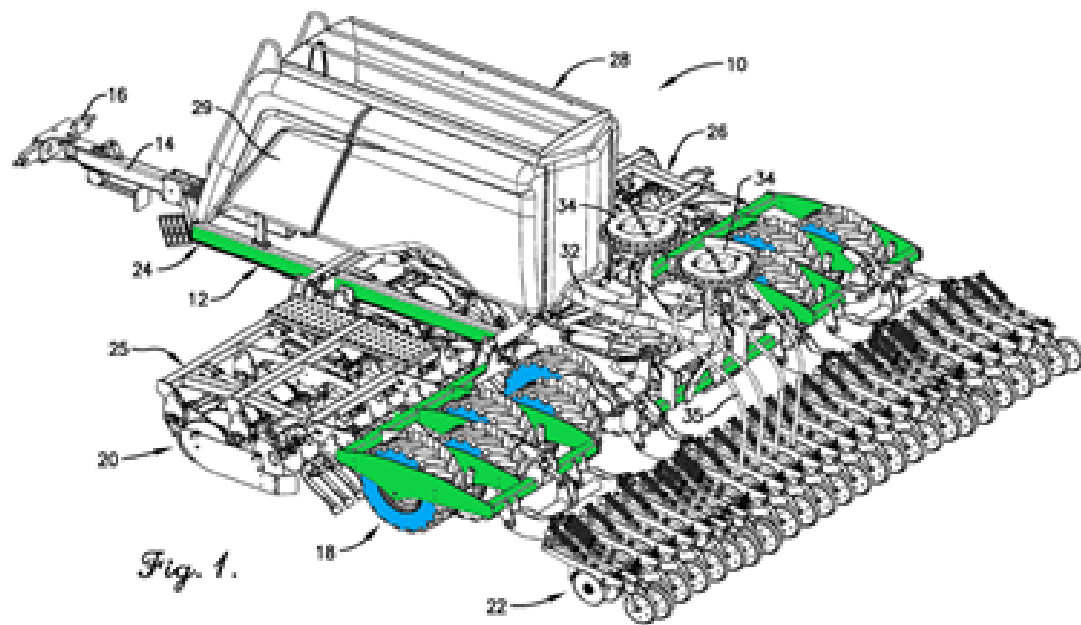


Fig. 1 (annotated)

An elongate toolbar 78 is coupled to the frame element 12 by means of a *pivoting* articulation link 70, 72. *Id.* 4:29-38, Figs. 1, 11; EX1002 ¶286. A plurality of row units 22 are coupled to the toolbar. *Id.*

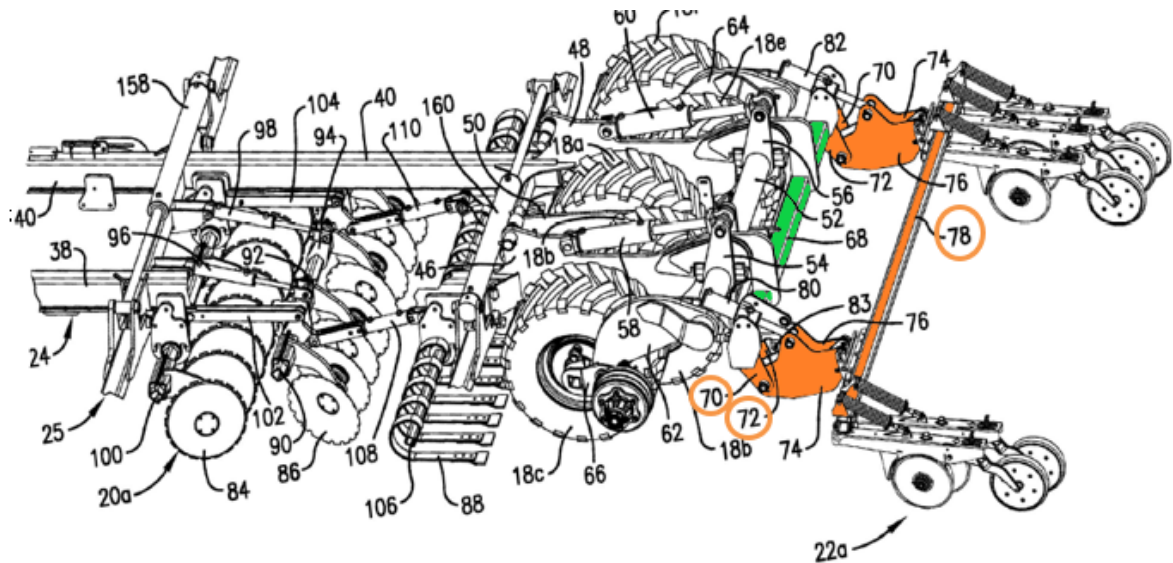


Fig. 11 (annotated)

The center frame section 24 includes a rear transverse beam 68 fixed to the lower rear ends of upright support plates 46, 48 and to support plate 50. Two sets of lugs 70, 72 are fixed to beam 68 to *pivotally* support a pair of rearwardly projecting links 74, 76 joined at their rearmost ends to a transverse toolbar 78 that supports a center gang 22a of the (tools) openers 22. (*Id.* 4:29-38.) The POSITA would understand that the toolbar 78 is arranged in parallel and at the back of the frame element 12. *Id.*; EX1002 ¶124.

Sensor 83 is coupled to the frame element annotated below in Fig. 11. *Id.* 4:47-51.

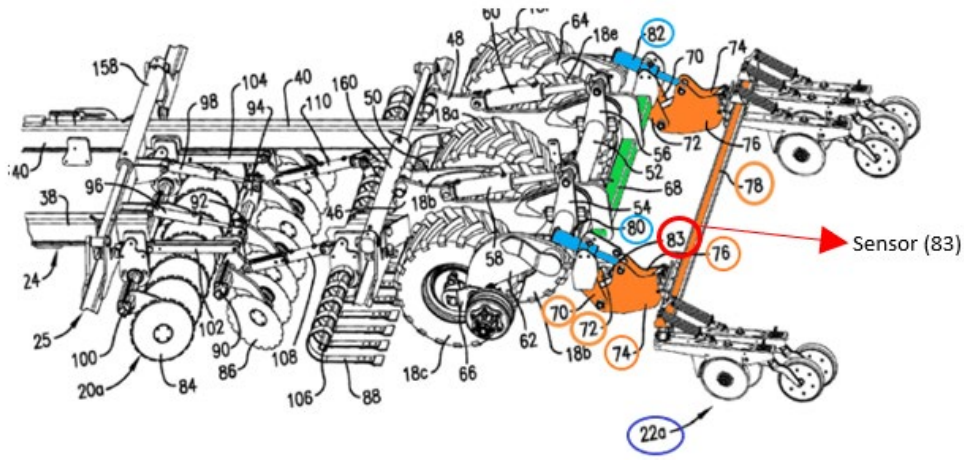


Fig. 11 (annotated)

Sensor 83 is a position sensor, which may be a switch, mounted between one pair of the links 74, 76 for detecting when openers 22a are in their lowered position. *Id.* The sensor 83 is therefore configured to detect the position of the toolbar relative to the ground (e.g., lowered position or raised). The POSITA would also understand sensor 83 also can detect the position of the toolbar relative to the frame because of the position of the sensor. EX1002 ¶129.

Hubalek discloses a “pair of hydraulic cylinders 80, 82 have their rod ends connected to links 74, 76 respectively and their base ends supported on upstanding structure fixed to transverse beam 68 for raising and lowering links 74, 76.” EX1006, 4:39-42, Fig. 11. The actuators 80, 82 are configured to lift or lower, and *rotate*, the toolbar 78 in relation to the frame element 12. *Id.* When the actuators 80, 82 are

activated, the link 74, 76 *rotates* around the link 70, 72, and as a consequence, executes the *rotation* motion of the toolbar 78 around its own axis, as provided in presentation below, which shows the full cylinder stroke 80, 82 when activated. EX1002 ¶134.

In Hubalek, the toolbar 78 remains in parallel to the frame element 12 because the pivoting linkages coupling the toolbar 78 to the frame element 12 are perpendicular the frame element 12. EX1002 ¶¶134, 137.

Hubalek therefore discloses all the principal features of claim 1 of the '989 patent except two sensors. *Id.* ¶138.

2. KR101877062 B1

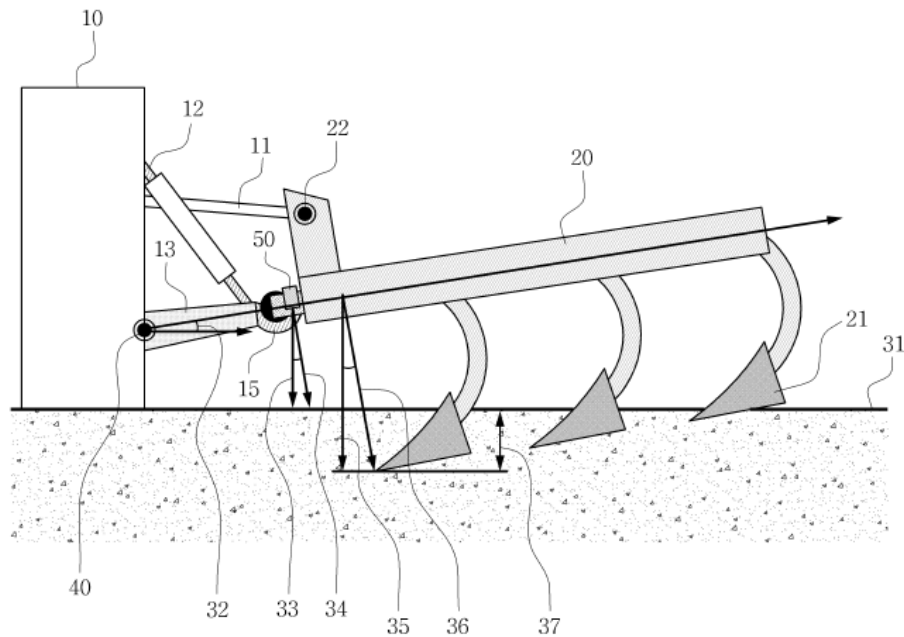
KR'062 is a Korean patent publication published on May 15, 2014, and is therefore prior art to the '989 patent under 35 U.S.C. § 102. EX1012.

KR'062 discloses a device and a method for controlling a plowing depth of a plow (akin to a tools attached to a toolbar) pivotably connected to a tractor.

EX1012 at 1. The device includes a distance sensor measuring the distance from the toolbar to the ground and transmitting the distance to a control unit. *Id.* The device also includes an angle sensor measures the angle of a lower link and transmits the angle of the lower link to the control unit. *Id.* The control unit controls a flow control valve for controlling the plowing depth according to adjust

the depth of a plow by lifting or lowering the plow frame with a lift rod (actuator).

Id.



EX1019 at 9.

Referring to the figure above from KR'062, a plough frame 20 (i.e., a toolbar) has a plurality of tools 21 is mounted thereto, is coupled to a frame member 10 of a tractor with a fixed linkage 11 and a lower linkage 13 via two hinges or pivot portions 22, 15. Lift rod 12 can be driven up and down by an actuator and is coupled with the lower link 13 to drive up and down the lower link 13 to raise and lower a plough frame 20 connected to the lower connecting portion 15, thereby rotating the tool bar 20 relative to frame member 10. EX1012 at 6; EX1002 ¶243.

A distance sensor 50 is provided at a connection portion of the toolbar 20 connected to measure distance to the ground. EX1012 at 6. Sensor 50 is a laser sensor; it emits laser light to the ground surface 31, measures the distance from the ground surface 31 based on the laser light reflected from the ground surface 31, and transmits (a signal) the measured distance to the control portion 70. *Id.*

An angle sensor 40 is provided in a tractor coupling unit for coupling the lower link 13 to the frame 10, measures the angle of the lower link 13, and transmits (a signal) the measured angle to the control unit 70. EX1012 at 6.

In Figure 2, ground surface vertical distance 33 is the vertical distance between distance sensor 50 and ground surface 31, ground surface distance 34 is the distance between distance sensor 50 and ground surface 31 measured via distance sensor 50, plough blade vertical distance 35 is the vertical distance from plough frame 20 to plough blade 21. *Id.*

Thus, KR'062 discloses the sensor, actuator and controller arrangement in the challenged claims. EX1002 ¶244.

3. Claims 1-4, 6-8 and 17-18 are unpatentable over the combination of Hubalek and KR'062.

As discussed above, Hubalek discloses the basic arrangement claim 1, including each of elements of claim 1 but only discloses a single sensor and does not disclose the use of the second sensor. It would have been obvious to the POSITA

by December 2016, to use the two sensors of KR'062, a first sensor for measuring the distance to the ground, and a second sensor for measuring the angle of the coupling for the toolbar relative to the frame, in order to calculate more accurately and maintain the proper ground depth for the ground working tools as taught by KR'062. EX1002 ¶244. It therefore would have been obvious, and the skilled person would have been motivated, to add the sensors of KR'062 to the implement of Hubalek in order to improve the operation of the tools 22 in Hubalek to better control the depth of the tools 22. EX1002 ¶353.

Such modification would result in a device having each and every element of claim 1. Hubalek and KR'062 are in the same field of endeavor and the additional of a second sensor to Hubalek would have been well within the skill of the POSITA by December 2016, and the POSITA would have had an expectation that such modification would have been successful. EX1002 ¶¶442-443.

Claim 17 is nearly identical to claim 1 except the structural features regarding the implement itself is recited in the preamble of the claim and the body of the claim

is directed to a control system including the controller³, first sensor, second sensor, and actuator. EX1002 ¶434. As described above, Hubalek and KR’062 describe all the features of claim 17 as well, and claim 17 would have been obvious for the same reasons.

Claims 2-4, 6-8 and 18 depend from claim 1. Each of those claims are likewise disclosed by Hubalek and KR’062. Claim charts in Subsection H below illustrate where each and every element of claims 1-4, 6-8 and 17-18 can be found in Hubalek and KR’062.

C. Ground 2: Claims 1-4, 6-8, 10-13 and 17-18 are unpatentable as obvious over Hubalek in view of Houck

Hubalek in view of Houck discloses each and every element of Claim 1-4, 6-8, 10-13 and 17-18 either expressly or inherently. EX1002 ¶¶78-138, 266-440, 454-456, Appendix A.4; see also Section VIII.H below.

³ Claim 1 lacks the controller, but claim 2 includes limitations of the controller that are equivalent to those of claim 17. Thus, Claim 17 is invalid for at least the same reasons as claim 2. EX1002 ¶¶434-437; *see also* Section VIII.H.

1. Houck

Houck's title is "Depth Control for a Seed Planting System." EX1005 at 1. Houck was published on August 20, 2015, and is prior art to the '989 patent under 35 U.S.C. 102.

Houck discloses a planting system that also comprises an elongated frame element 34. EX1005 Fig. 1, ¶0027; EX1002 ¶80.

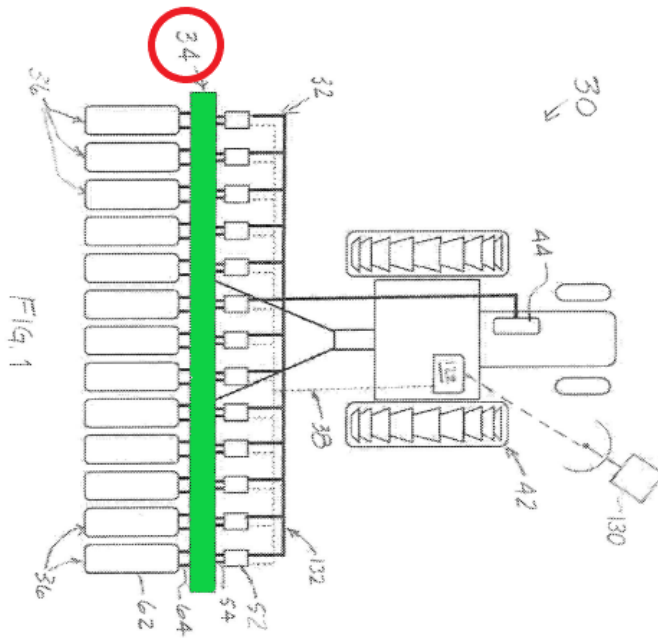


Fig. 1 (annotated).

Referring to FIGS. 1, 2, and 2A through 2D, a seed planting system 30 is depicted in an embodiment of the disclosure. The seed planting system 30 includes a seeding implement 32 including an implement frame 34, a plurality of seeding row assemblies 36 operatively coupled with the implement frame 34, and a control system 38

operatively coupled with each of the seeding row assemblies 36.
(EX1005 ¶0027.)

Houck does not disclose a toolbar identical to the toolbar 38 of the '989 patent, but structure 70 is coupled with a toolbar 34 by an articulation link 64, which rotates around a pivot 65, and provides support to the assembly of tools 72, 74, 76, etc. EX1002 ¶¶ 83-85; EX1005 ¶0028 (“Each seed row assembly further includes a seeding row unit 62 including a second linkage 64 operatively coupled with the implement frame 34 and rotatable about a pivot 65 for accommodation of an elevation 66 of the seeding row unit 62 relative to the implement frame 34.”). The structure 70 is also oriented in parallel and at the back of the frame element 34. EX1002 ¶87.

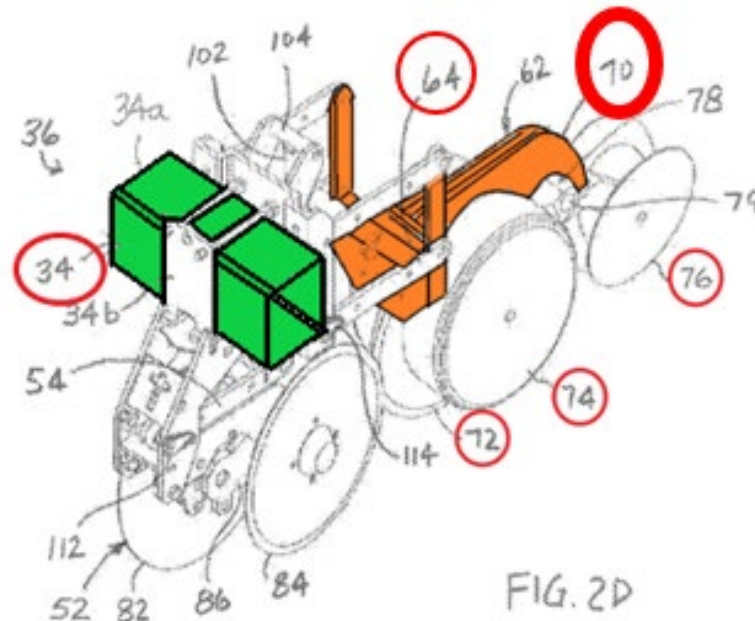


Fig. 2D (annotated) (EX1002 ¶0084)

Houck also teaches a pair of position sensors 112, 114. EX1005 ¶0033, Fig. 2.

Each of the seeding row assemblies 36 can further comprise a position sensing module 110. In certain embodiments, the position sensing module 110 includes position sensors 112 and 114 operatively coupled to the first linkage 54 and the second linkage 64, respectively, that output signals 116 and 118, respectively, corresponding to the sensed position. The position sensors 112 and 114 are arranged to detect an angular rotation of the respective linkages 54 and 64 about their respective pivots 55 and 65, as depicted herein, for example by a rotating potentiometer. In other embodiments, position sensing can be

including a second linkage 64 operatively coupled with the implement frame 34 and rotatable about a pivot 65 for accommodation of an elevation 66 of the seeding row unit 62 relative to the implement frame 34. In various embodiments, the seeding row unit 62 is in substantial forward/aft alignment with the tillage row unit 52. (Id. ¶0028.)

The sensor 112 of Houck is also configured to detect the position of structure 53 in relation to the frame. *Id.* ¶0033.

Houck discloses an additional position sensor 206 with respect to Fig. 6. Position sensor 206 measures the elevation 204 of structure 70, which is equivalent to a toolbar. *Id.* ¶0047; EX1002 ¶87. Thus, claimed first sensor is disclosed by sensor 206 while the claimed second sensor is disclosed by sensor 112 and 114. EX1002 ¶100.

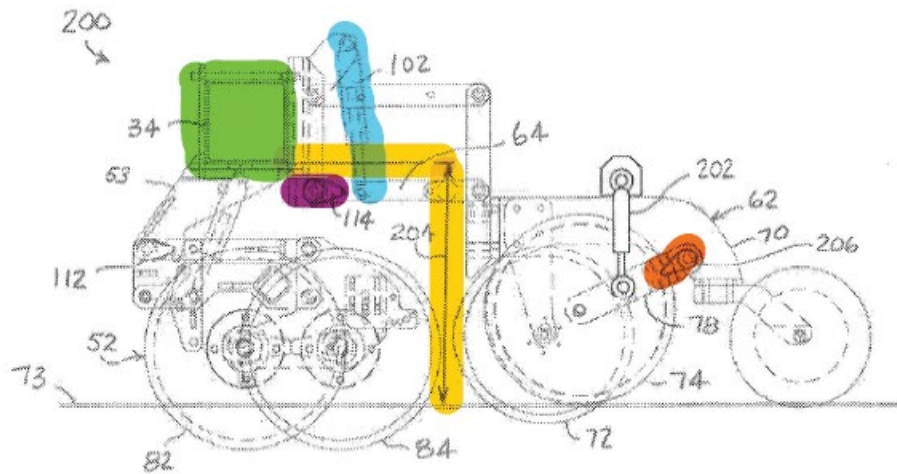
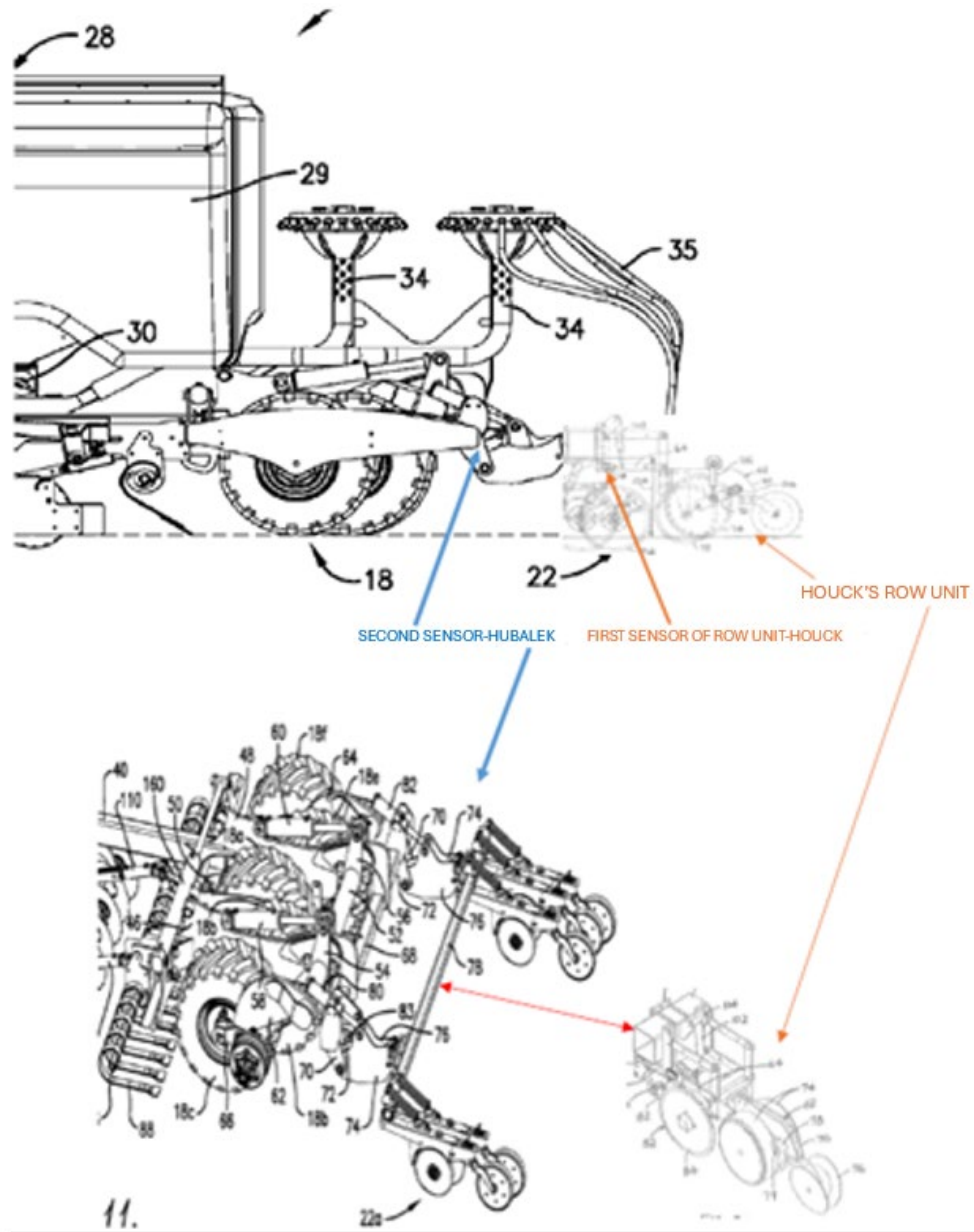


Fig. 6 (annotated, EX1002 ¶98)

It would have been obvious to the POSITA to add the second sensor 112, 114 of Houck to Hubalek to improve the measurement of the position of the tools and allow the tools to better follow the contours of the ground. EX1002 ¶¶356, 454. Moreover, the POSITA would have found it obvious to simply replace the tool assemblies 22a of Hubalek with tool assemblies (70, 72, 74, 76, 112) of Houck in order to improve further the ability of the tools to follow the contour of the earth being worked. *Id.* This is shown below. EX1002 ¶¶356-358.



As Dr. Weckler explains, the POSITA would have understood this to be a natural modification to Hubalek after reviewing both references. EX1002 ¶358. Hubalek teaches the older concept of raising and lowering the tool bar for travelling and for cultivation, with automation, and the tools use a simple downpressure system

to try to maintain contact with the ground. *Id.* On the other hand, Houck is directed to the ‘next generation’ of improvements over Hubalek. *Id.* Houck focuses on features that adjust the tools to follow the contours of the land at a desired depth. Thus, it would have been obvious to add the tool assembly of Houck to Hubalek, which would result in a farm implement having all the elements of claims 1-4, 6-8, 10-13, 17-18. EX1002 ¶454.

2. Claims 1-4, 6-8, 10-13 and 17-18 are unpatentable over the combination of Hubalek and Houck.

As discussed above, Hubalek discloses the basic arrangement of claim 1, including each of elements of claim 1, but does not expressly disclose two sensors. It would have been obvious to the POSITA by December 2016, add a second sensor to Hubalek after reviewing Houck, to improve the performance therefore. Moreover, the POSITA would have found it obvious to replace the tool arrangement of Hubalek with the tool arrangement of Houck, in order to improve further the ground-following ability of the tools. The combination of Hubalek and Houck therefore includes a first sensor for measuring the distance to the ground as disclosed by Hubalek or Houck, and a second sensor for measuring the angle of the coupling for the tool bar as disclosed by Houck, in order to calculate and maintain the proper ground depth for the ground working tools as taught by Houck. EX1002 ¶¶454-456.

Such modification would result in a device having each and every element of claim 1. Hubalek and Houck are in the same field of endeavor and the modification of Hubalek in light of Houck would have been well within the skill of the POSITA by December 2016, and the POSITA would have had an expectation that such modification would have been successful. *Id.*

Claim 17 nearly identical to claim 1 except the structural features regarding the implement itself is recited in the preamble of the claim and the body of the claim is directed to a control system including the controller, first sensor, second sensor, and actuator. EX1002 ¶¶433-434. As described above, Hubalek and Houck describe all the features of claim 17 as well, and claim 17 would have been obvious for the same reasons.

Claims 2-4, 6-8, 10-13 and 18 depend from claim 1. Each of those claims are likewise disclosed by Hubalek and Houck. EX1002 ¶¶329-424. Claim charts in Subsection H below illustrate where each and every element of claims 1-4, 6-8, 10-13 and 17-18 can be found in Hubalek and Houck.

D. Ground 3: Claims 1-4, 6-8 and 17-18 are unpatentable over Poettinger in view KR'062

Poettinger in view of KR'062 discloses each and every element of Claim 1-4, 6-8 and 17-18 either expressly or inherently. EX1002 ¶¶198-224, 234-244, 266-440, 447-449, Appendix A.2; see also Section VIII.H below.

1. Poettinger

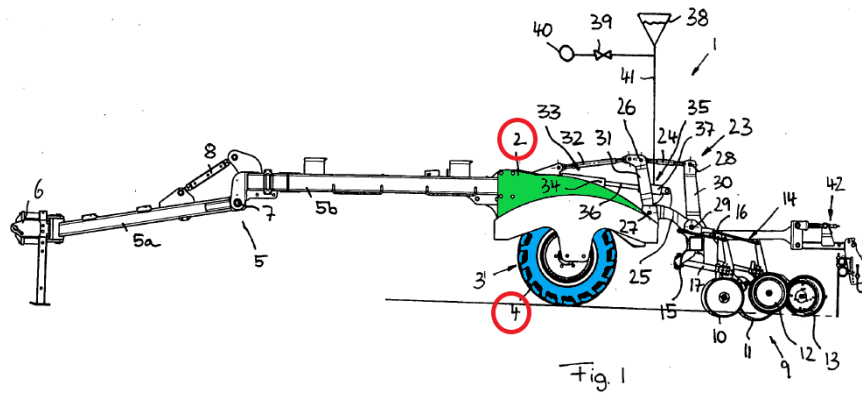
Poettinger is titled “Designation: Agricultural machinery” and was published on February 13, 2014. Poettinger is prior art to the '989 patent under 35 U.S.C. § 102.

Poettinger refers to a planting system since it is intended to an agricultural implement that comprises ground-engaging tools used for planting operations.

The present invention relates to an agricultural machine, in particular a semi-mounted seed drill, with a machine frame supported on the ground by a running gear, and at least one work unit, in particular a sowing unit comprising at least one seed coulter and a depth control roller or pressure roller, which is mounted on the machine frame in a vertically adjustable manner, wherein the work unit is mounted in a vertically adjustable manner by a first four-bar linkage on a cross-member, which in turn is mounted in a vertically adjustable manner by a second four-bar linkage on the machine frame. EX1009, 1.

The planting system includes a frame element 2 with wheels 4 coupled to it.

Id. at 8.



The seed drill 1 shown in the Figures comprises a machine frame 2 supported on the ground by a running gear 3, which in the illustrated version is single-axle and has wheels 4. The machine frame 2 can be attached to an undrawn tractor by a drawbar 5 by means of a coupling piece 6 at the front end of the drawbar, which allows the drawbar 5 to pivot about an upright pivoting axle. In the illustrated embodiment, the drawbar 5 also comprises a front drawbar section 5a connected to a rear drawbar section 5b so that it can pivot about a horizontal transverse axle 7, so that the inclination of the machine frame 2 can be adjusted independently of the height of the tractor-side coupling piece by bending the drawbar about the transverse axle 7 by means of an actuator 8. *Id.*)

Poettinger also teaches an elongate toolbar 15 coupled to the frame element 2 by means of a pivoting link. *Id.*, 9, Fig. 1; EX1002 ¶204. A plurality of row units 9 are coupled with the toolbar. “The sowing unit 9 is articulated by a first four-bar

linkage 14 to a cross-member 15 trailing the running gear 3, so that the sowing unit 9 can move up and down relative to the cross-member 15. ...” *Id.* at 9; EX1002 ¶205.

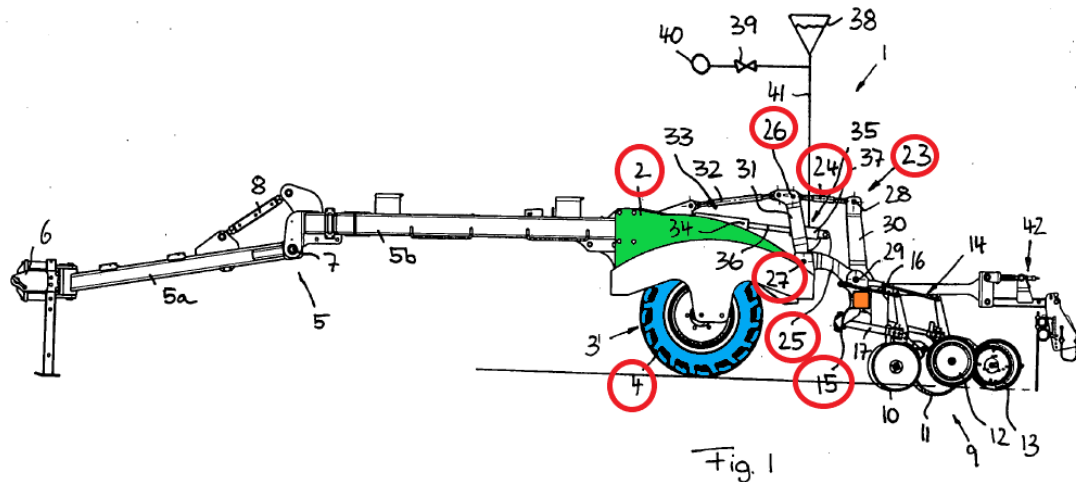


Fig. 1 (annotated)

The cross-member 15, to which the first four-bar linkage 14 is attached, is, as shown in Fig. 1, articulated to the machine frame 2 by a second four-bar linkage 23. This second four-bar linkage 23 has a geometry that differs from a parallelogram. In the embodiment shown, the two links 24 and 25 of the second four-bar linkage 23 are arranged in a slightly diverging manner toward the sowing unit 9. The two articulated points 26 and 27 on the machine frame-side, to which one of the links 24 and 25 is articulated, are slightly closer to one another than the two articulated points 28 and 29 on the cross-member-side, which are provided on a cross-member arm 30 that is connected in a rotationally fixed manner to the cross-member 15. ... EX1009 at 9-10 (underlining added).

From the figures of Poettinger, the POSITA would see that the toolbar 15 is arranged in parallel and at the back of the frame element 2. EX1002 ¶208.

Poettinger teaches the presence of a sensor in the row unit 9 to control the pressure that keeps the ground-engaging tools in the desired position. *See Id.* Fig. 2 below.

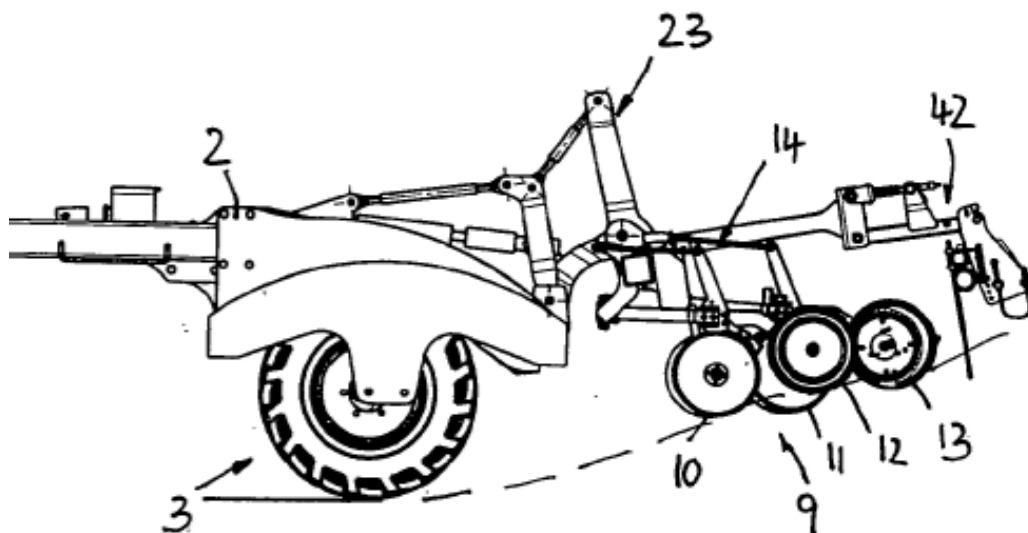


Fig. 2

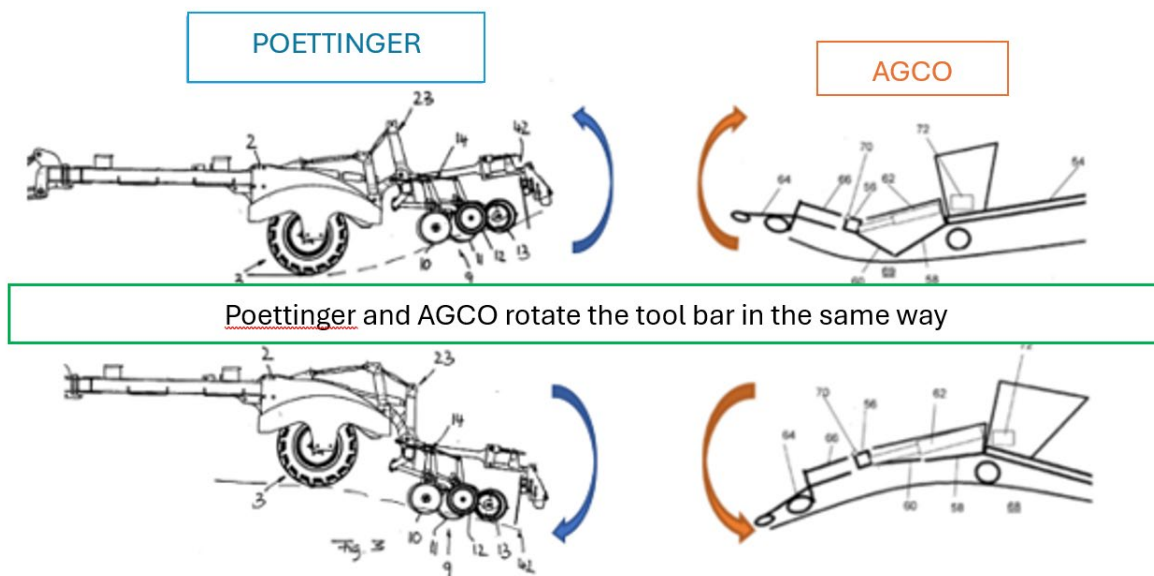
Poettinger discloses that the working units are mounted in a height-adjustable manner via a first four-bar linkage 14 on a cross member 15, which in turn is mounted via a second four-bar linkage 23 “the second four-bar linkage (23) is formed in such a way that, during lifting movements of the second four-bar linkage

(23), the cross-member (15) undergoes a rotary [rotational] movement which, in the working position, gives a section of the work unit (9) further away from the running gear (3) a greater lifting movement than a section of the work unit (9) less far away from the running gear (3)” *Id.*, 12 (underlining added). The sensor detects the relative position of the toolbar in relation to the ground. EX1002 ¶212.

Poettinger discloses an actuator 34 coupled between a frame element 2 and the toolbar 15. EX1009 at 10, Figs. 1, 2. Poettinger discloses that a pressure cylinder 37 is connected to a controllable pressure source to influence the contact pressure of the bar with the ground. *Id.*, 14. A sensor device detects an actual value for contact pressure with the ground of the operating unit 9 and the supply of pressure can be controlled by a control device, depending on a sensor device signal. *Id.*

“To excavate the sowing unit 19, an excavation device 33 is provided which comprises a pressure cylinder 34 which acts on the machine frame 2 on the one hand and on one of the links 25 of the second four-bar linkage 23 on the other hand in order to pivot the four-bar linkage upwards and thus lift the sowing unit 9 from the ground.” *Id.* at 10. This arrangement rotates the tools so that the tools are travelling at an angle relative to the frame, and the tool bar is visibly rotated. EX1002 ¶¶204, 220, 222. Thus, the POSITA would understand this arrangement to be a hinged arrangement and the actuator (lifting device) rotates the toolbar 15. *Id.* ¶224.

This arrangement results in an implement that performs in the same way as the one from the '989 patent. Below is a side by side comparison of Poettinger and the '989 Patent.



EX1002 ¶¶220-224. As shown, both devices have toolbars that rotate and follow the contours of the grounds.

Thus, Poettinger discloses each and every element of claim 1 except the use of a second sensor as claimed. *Id.* ¶224.

2. Claims 1-4, 6-8 and 17-18 are unpatentable over Poettinger in view of KR'062

Poettinger teaches each and every element of claim 1 but only teaches the use of a single sensor. It would have been obvious to use two sensors in the device of

Poettinger as taught by KR'062. As discussed above, KR'062 discloses the use of a first position sensor measure the distance from the frame to the ground, and a second angular sensor measuring the angle of the toolbar. It would have been obvious to the skilled person to add the second sensor to Poettinger in order to further improve its ability to finely control the depth of the tools in the soil. EX1002 ¶¶403-405.

Claim 17 nearly identical to claim 1 except the structural features regarding the implement itself is recited in the preamble of the claim and the body of the claim is directed to a control system including the controller, first sensor, second sensor, and actuator. EX1002 ¶434. As described above, Poettinger in view of KR'062 describe all the features of claim 17 as well, and claim 17 would have been obvious for the same reasons.

Claims 2-4, 6-8 and 18 depend from claim 1. Each of those claims are likewise disclosed by Poettinger as taught by KR'062. Claim charts in Subsection H below illustrate where each and every element of claims 1-4, 6-8 and 17-18 can be found in Poettinger as taught by KR'062.

E. Ground 4: Claims 1-4, 6-8, 10-13, 15, 17-18 are unpatentable over Deere I alone or in view of Deere II, in view of KR'062.

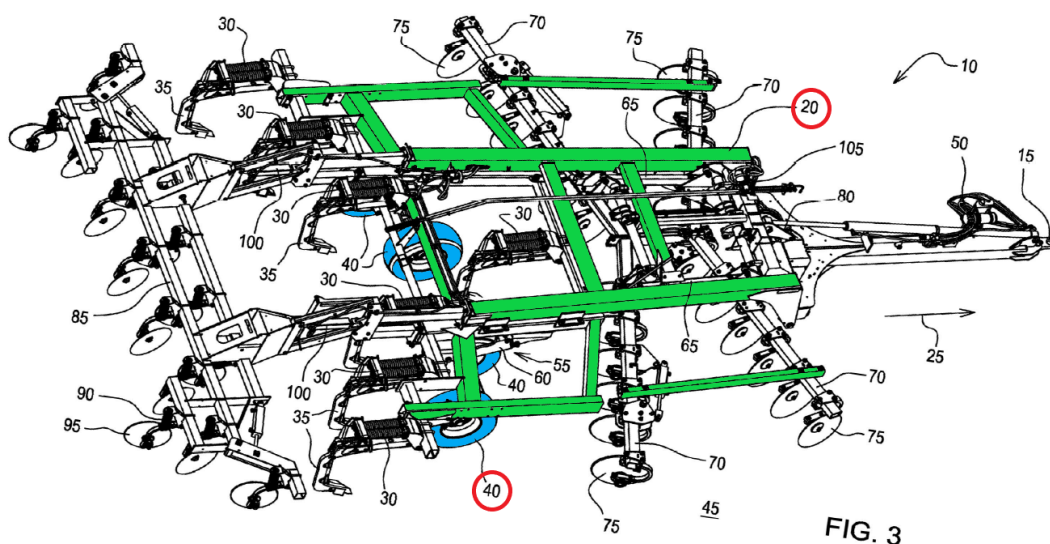
Deere I alone or in view of Deere II, in view of KR'062 discloses each and every element of Claim 1-4, 6-8, 10-13, 15, 17-18 either expressly or inherently.

EX1002 ¶¶139-171, 225-230, 234-244, 266-440, 444-446, Appendix A.3; see also Section VIII.H below.

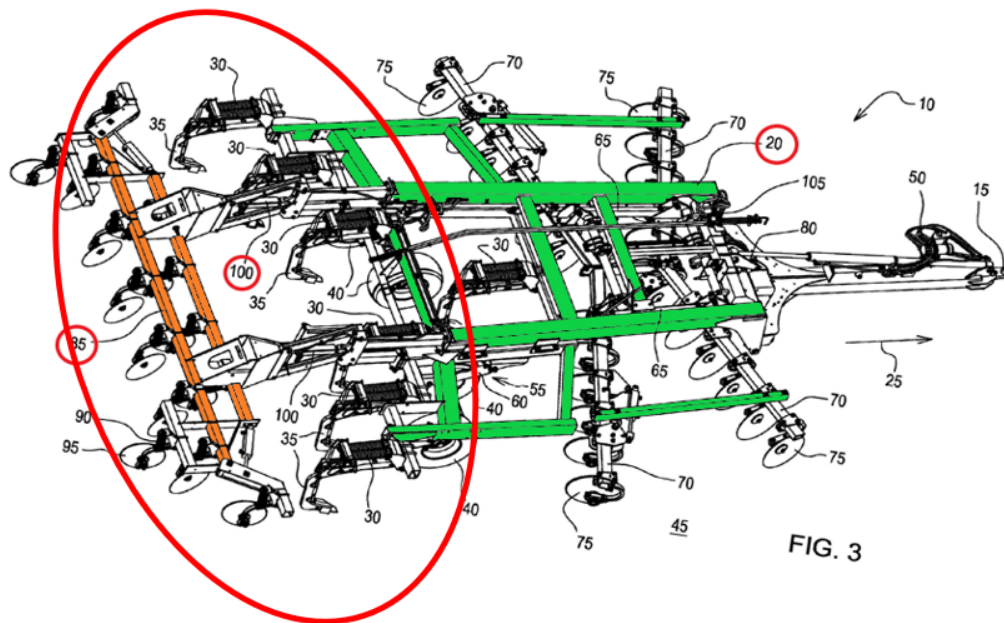
1. Deere I

Deere I issued on November 5, 2013, and is prior art to the ‘989 patent under 35 U.S.C. § 102(b).

Deere I discloses an agricultural implement that comprises ground-engaging tools used for planting operations. EX1007, Abstract. “A control system for an agricultural implement is disclosed. The control system includes a position sensor configured to measure a depth indication of an actual operating depth of a ground-engaging tool and configured to generate a corresponding position signal.” EX1007, 1:52-59. The planting system also comprises an elongated frame element 20. *Id.* Figs. 1-3, 3:27-29; EX1002 ¶142.



As seen in the figure above, toolbar 85, 285 is oriented in parallel and at the back of the frame element 20, 220. EX1002 ¶150.



Deere I teaches a control system 105 comprising position sensors for each one of the toolbars of the row unit of the agricultural implement, which is, a first sensor position 110 for the first ground-engaging tool 30, a second position sensor 120 for the second ground-engaging tool 70, and a third position sensor 130 for the third ground-engaging tool 90. EX1007 4:27-38, 47-55, 64-5:4.

With continued reference to FIG. 3, a control system 105 is coupled to the agricultural implement 10. Illustratively, the control system 105 is coupled to the first frame section 20. Referring to FIGS. 5 and 6, the control system 105 includes a first position sensor 110 (e.g., hall effect rotational sensor, potentiometer) configured to measure a first

depth indication (e.g., relative position) of an actual operating depth of the first ground-engaging tool 30 and configured to generate a corresponding first position signal 115. The illustrated first position sensor 110 is a first Hall Effect rotational sensor 112. Other types of the first position sensor 110 are contemplated by this disclosure.

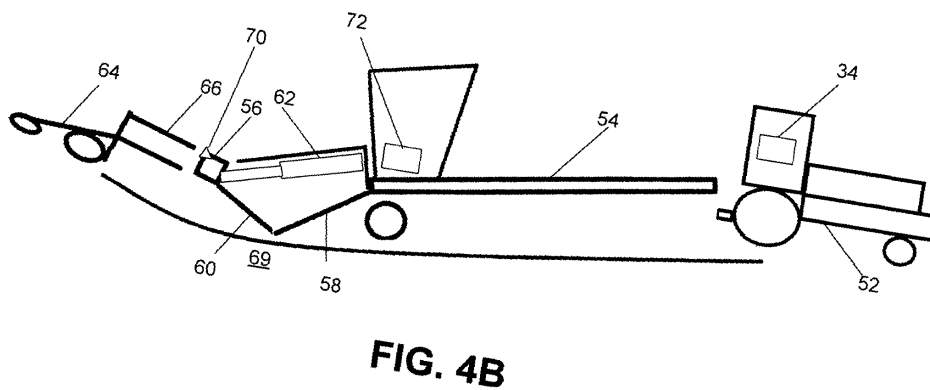
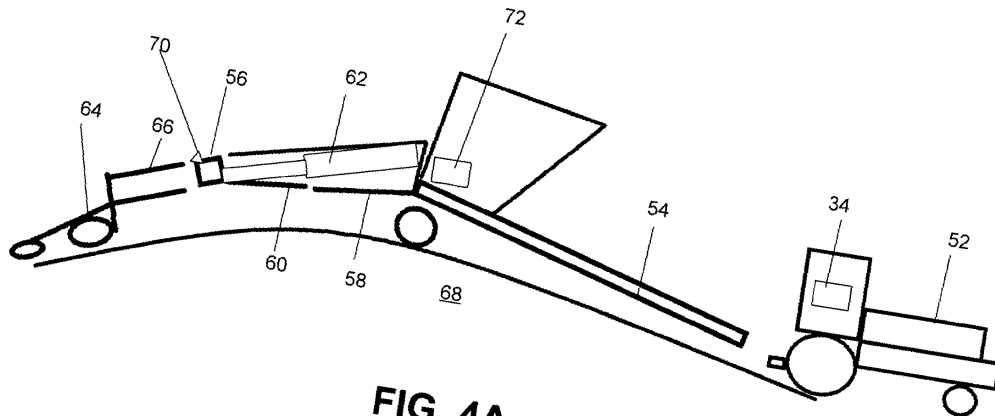
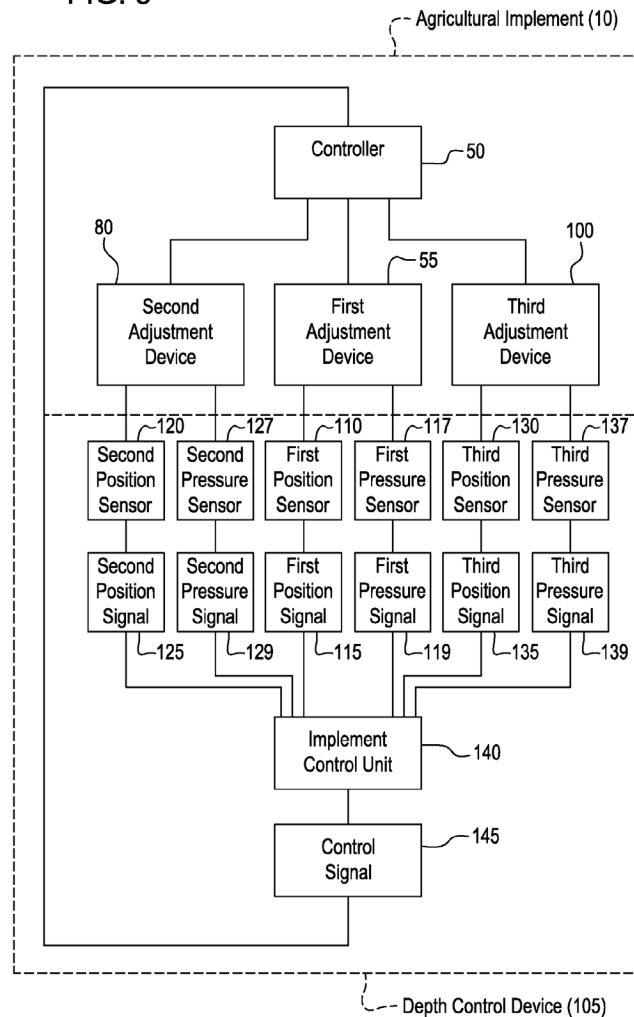


FIG. 5



With reference to FIGS. 4A-B and 5, a second position sensor 120 (e.g., hall effect rotational sensor, potentiometer) is configured to measure a second depth indication (e.g., relative position) of an actual operating depth of the second ground-engaging tool 70 and configured to generate a corresponding second position signal 125. The illustrated second position sensor 120 is a second Hall Effect rotational sensor 122. Other types of the second position sensor 120 are contemplated by 55 of this disclosure. (*Id.* 4:47-55.)

With reference to FIGS. 5-7, a third position sensor 130 (e.g., hall effect rotational sensor, potentiometer) is configured to measure a third depth indication (e.g., relative position) of an actual operating depth of the third ground-engaging tool 90 and configured to generate a corresponding third position signal 135. The illustrated third position sensor 130 is a third Hall Effect rotational sensor 132. Other types of the third position sensor 130 are contemplated by this disclosure. (*Id.*, 4:64-5:4.)

A third pressure sensor 137 (e.g., pressure transducer, load cell, draft link, instrumented pin) is configured to measure a third pressure indication (e.g., line pressure) of an actual operating pressure of the third ground-engaging tool 90 and configured to generate a corresponding third pressure signal 139. The illustrated third pressure sensor 137 is a third pressure transducer 138. Other types of the third pressure sensor 137 are contemplated by this disclosure. (*Id.*, 5:5-13.)

Thus, **Deere I** teaches the use of multiple sensors to measure the position of the tools and at least two sensors to measure the position of tools 90 on toolbar 85, connected to the most rearward portion of implement. EX1002 ¶157. Sensor 110 may correspond to the first sensor while sensor 130 may correspond to the second sensor. Sensor 130 is an angle sensor. EX1002 ¶153.

Deere I teaches control system 105 includes the position sensors to measure the position in relation to the ground depth and send signals to the control unit 140 for adjusting the depth through adjustment devices 80, 55, 100. Col. 4, lines 27-38 and Fig. 5. The actuator 100, 300 is coupled between the frame element 20, 220 and the toolbar 85, 285, as observed in the figure below.

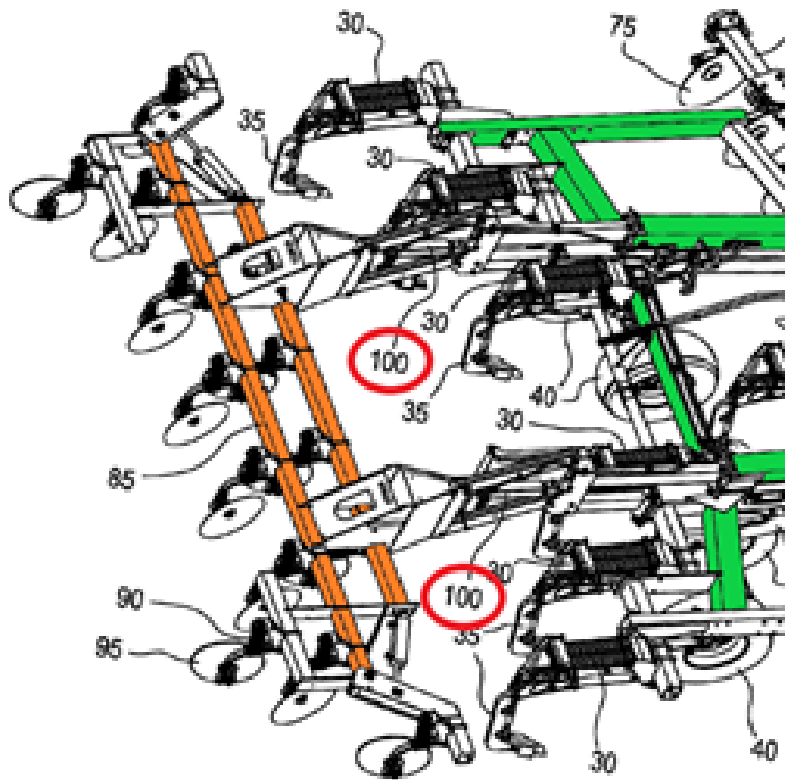


Fig. 3 (annotated portion)

EX1002 ¶161.

The actuator 100 of **Deere I** can be better seen in Fig. 7 below, which connects to the frame element 20 to the toolbar 85 by means of articulation links arranged at its ends.

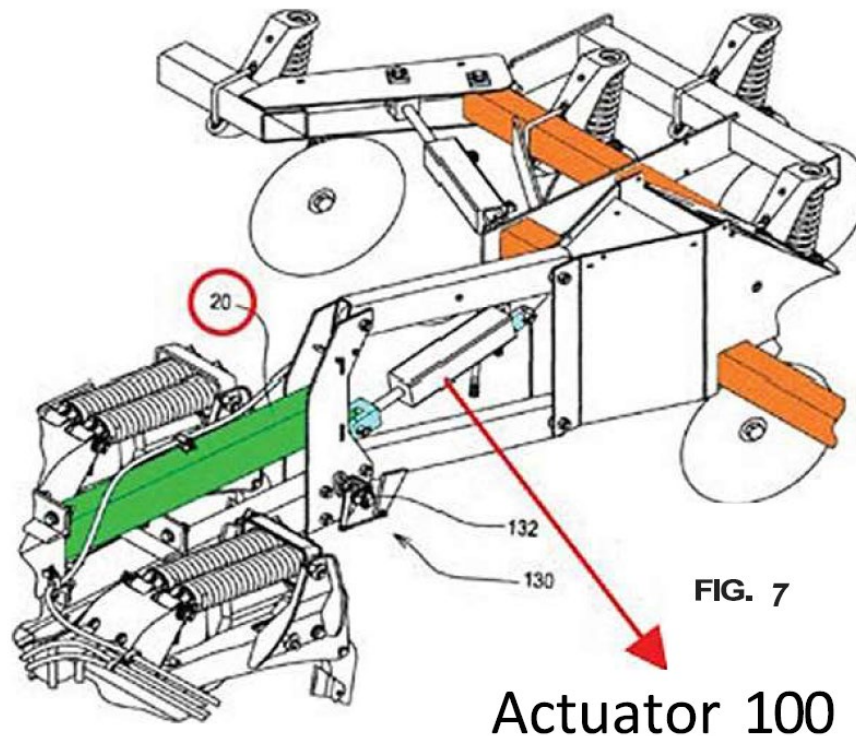
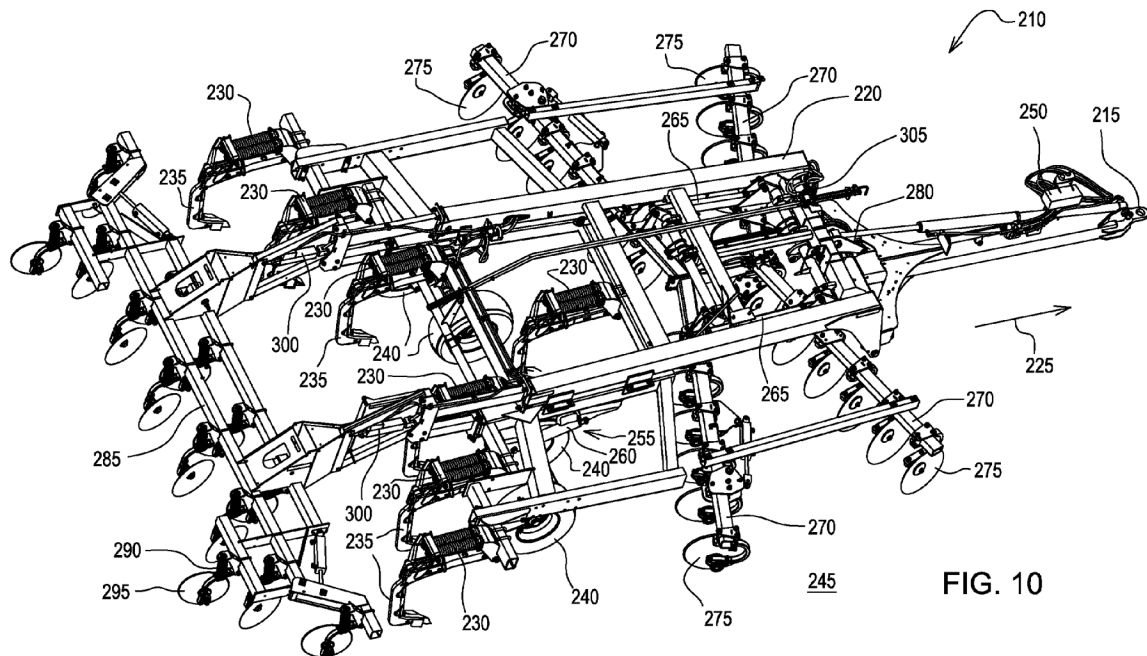


Fig. 7 (Annotated)

EX1002 ¶167. The toolbars 85 of Deere I, which are connected to the ground-engaging tools (90)(row units), are also configured to be articulated based on the position detected by the position sensor 130 and pressure sensor 137. *Id.* 4:64-5:4.

It is clear from Deere I that the toolbar remains in parallel to the frame element under any rotation motion. EX1002 ¶170.

FIG. 10 shows a third adjustment device 300 (e.g., electronic linear actuator, electronic rotational actuator) is coupled to the first frame section 220 and a third frame section 285.



Thus, **Deere I** discloses each and every element of claim 1. To the extent that Deere's parallel linkages between the frame and the toolbar is considered not to rotate, it would have been obvious to modify the linkages according to Deere II. Also, to the extent is determined not to disclose both sensors, it would have been obvious in view of KR'062 as already described above in subsection B.2, to modify

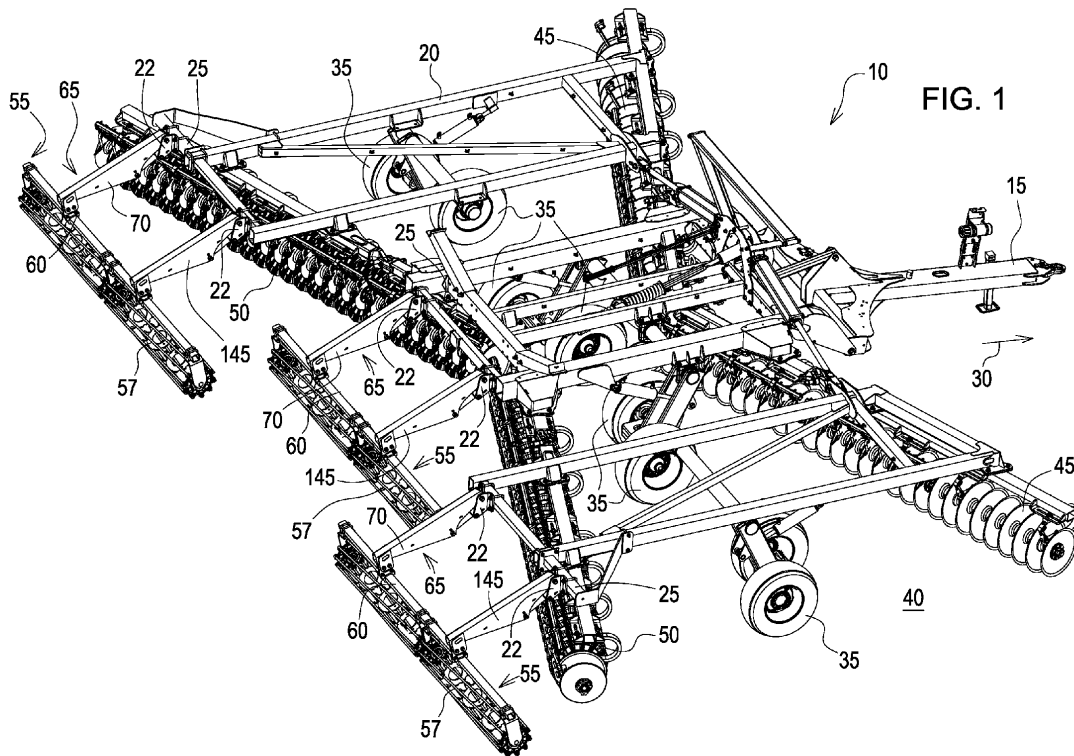
Deere I to include the additional position sensor disclosed by KR'062, to better control the depth of the tools 90 during use. EX1002 ¶445.

2. Deere II

Deere II published on July 31, 2014, and is titled “Drawbar Apparatus of an Agricultural Implement.” Deere II is prior art to the ‘989 patent.

Deere II teaches that prior to December 2016, “in order to support an earth-working tool on an agricultural implement, agricultural implements commonly include rearwardly-projecting arms. The arms are pivotally mounted to a frame of the agricultural implement.” EX1010 ¶0020.

Deere II teaches a hinged drawbar that couples earth-working tools on a toolbar to a farm implement frame similar to the implements of Deere I. EX1002 ¶226.



The agricultural implement 10 may include earth-working tools 55 (e.g., rolling basket, harrow, leveler system). *Id.* ¶0035. A drawbar apparatus 65 may comprise a first drawbar 70. Referring to FIGS. 2 and 3, the first drawbar 70 may comprise a first portion 75 and a second portion 80. The first portion 75 may be pivotally coupled to the frame 20 (FIG. 1) using the mounting brackets 22. The mounting brackets 22 may form a tight pin joint. *Id.* ¶0036. Thus, the toolbar 60 is coupled to the implement frame with a hinged joint. EX1002 ¶230. See Fig. 3 below.

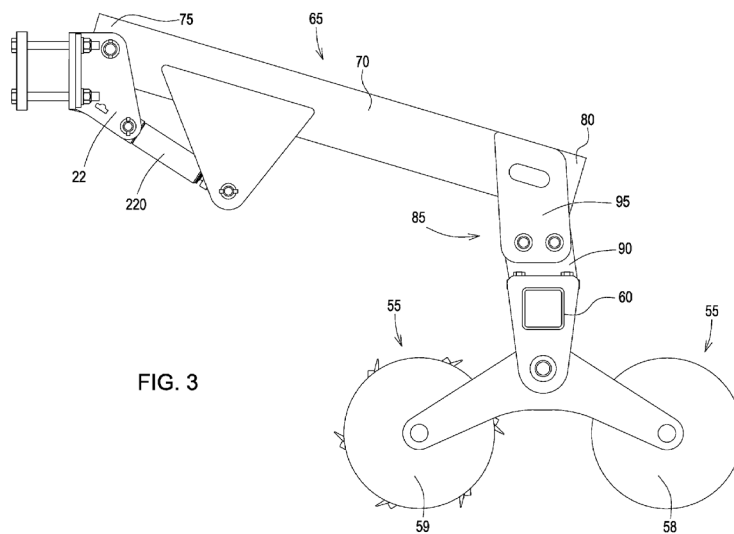


FIG. 3

Thus, Deere II teaches that using hinged joints to couple a toolbar to an implement frame was well-known, and further discloses a hinged, actuated joint for coupling a tool bar to a farm implement frame that provides goods range of rotation and helps the tools to follow the contour of the ground surface. EX1002 ¶230. The joint of Deere II, when the actuator 220 is extended or contracted, will cause the toolbar 60 to rotate relative to the implement frame. *Id.*

3. The Examiner Erred by Eliminating Deere I

During prosecution of the '989 patent, AGCO filed an Appeal Brief arguing that the linkages disclosed in Deere I connected its toolbar to its implement do not allow the toolbar to rotate, but rather revolves. EX1004, 41-62. In response, the Examiner withdrew his appeal and made new rejections based on different prior art.

The Examiner never revisited Deere I as a reference. The Examiner erred for a number a reasons.

First, the difference between revolving and rotating in the context of the patent claims is a distinction without a different. EX1002 ¶337. AGCO made no argument why rotating the toolbar provides an advantage of Deere I. *Id.* The Specification likewise fails to disclose any advantage of rotation versus revolution. *Id.* AGCO admitted that Deere I moves the toolbar both vertically and laterally. EX1004, 51. The arrangement of Deere I performs the same function as that of the ‘989 patent. See EX1001, Col. 6, lines 24-30 (“In general, to enable the toolbar 38A (and hence toolbar 38A) to follow the contour of the field, sensor information is received about the (relative) position of the toolbar 38A (and by extension, the relative position of the 30 row unit 33B) relative to the ground.” (underlining added)). EX1002 ¶337. The ‘989 patent measure the relative angle of the toolbar using a sensor 48 positioned in an angular position between the toolbar and the frame at a pivot point. *Id.*, lines 54-59. In Deere I, the position sensor 132 is likewise located on a pivot point to measure the relative angle of the toolbar to the frame, using a Hall Effect rotational sensor. EX1002 ¶¶337-338. This arrangement is the same, if not equivalent, to the arrangement of claim 1. *Id.*

Second, it is not clear from the disclosure of Deere I, that rotation does not occur. EX1002 ¶338. Deere I merely discloses that “a third frame section 85 is pivotally coupled to the first frame section 20, rearward of the first ground engaging tool 30.” EX1007, Col. 4, lines 7-9. **Pivotally connected suggests rotation.** There is no description that a parallel linkage is required, although one is shown in the figures. Fig. 7 shows an enlarged view of an embodiment of Deere I. EX1002 ¶338.

Coupling the toolbar to a farm implement frame using a hinged joint was well-known by December 2016, as disclosed by Deere II. Therefore, it would have been obvious to the POSITA to modify the device of Deere I to include a hinged joint similar to the one discloses by Deere II. Both patents are in the same field of endeavor and the skilled person would not have any problem making the proposed modification. EX1002 ¶339.

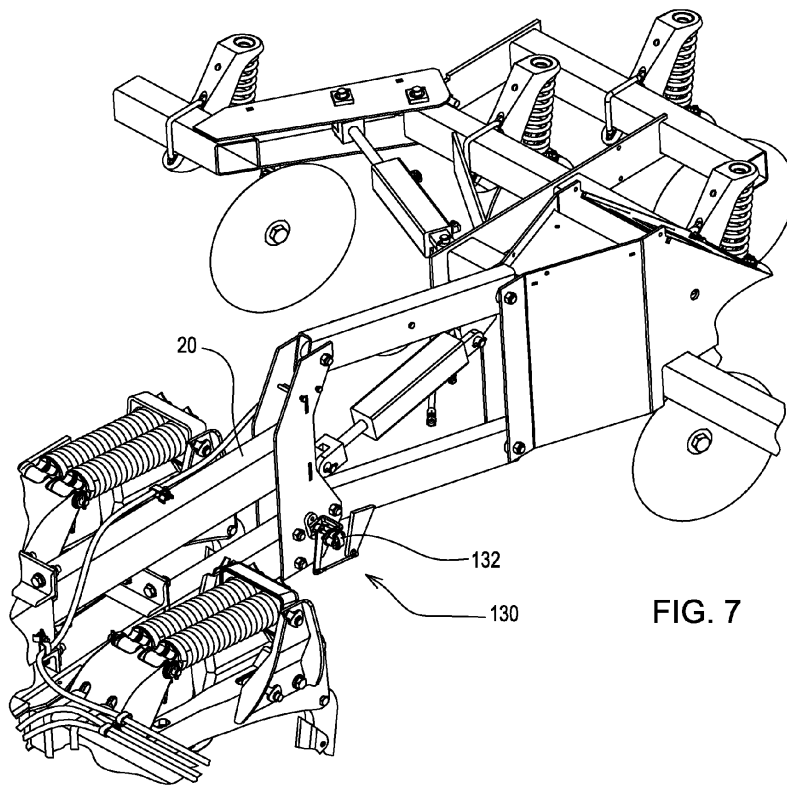
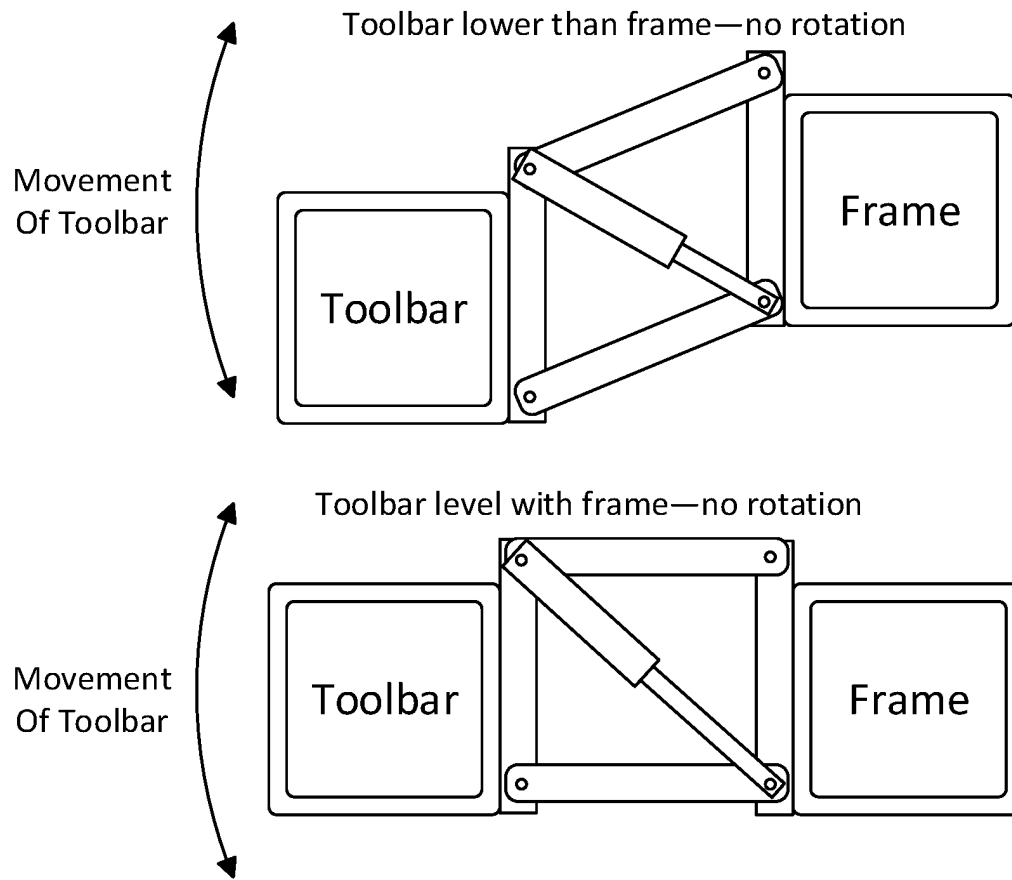
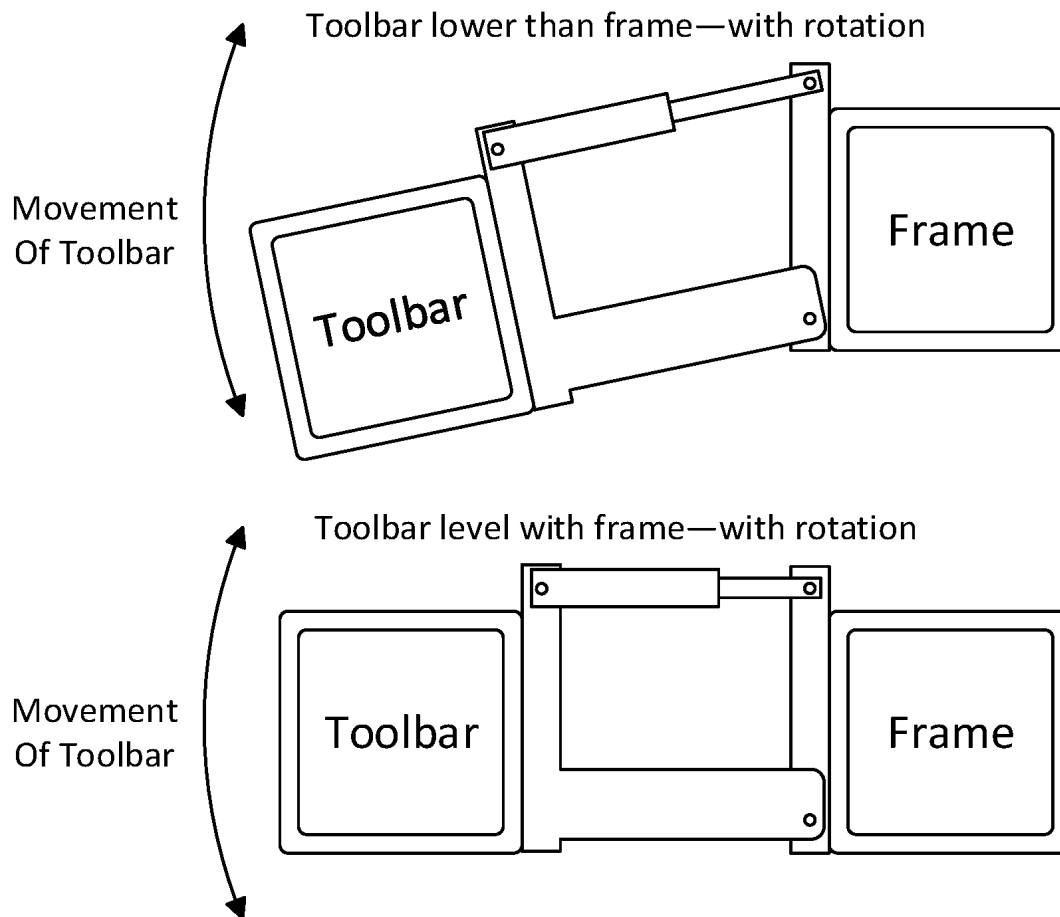


FIG. 7

Although parallel linkages are shown, the arrangement is clearly not a perfect parallelogram and the position of the actuator suggests that some rotation likely occurs. EX1002 ¶341. Compare the figure submitted during appeal with the one above.



Deere I as represented by AGCO during prosecution

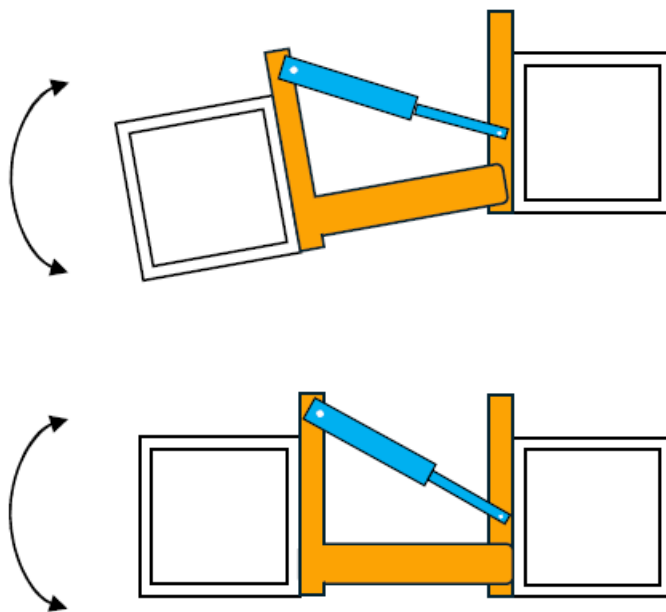


The claimed arrangement as represented by AGCO during prosecution

EX1004 at 50-51. In the Deere I drawing, the position of the actuator is different as is the shape of the linkages as compared to Deere I. In neither drawing are the tools shown and the claims do not include any limitations regarding how the tools are attached to the toolbar. EX1002 ¶341.

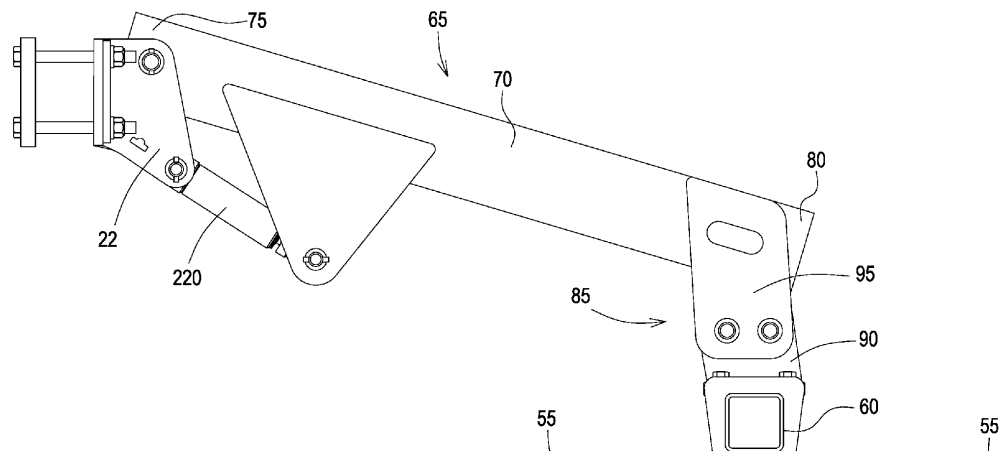
Since AGCO failed to provide evidence as to why rotation is preferred over, and scientific evidence that the device of Deere I does not rotate, claim 1 should be unpatentable in view of Deere I.

Third, given no evidence that the operation of the linkage in the challenged claims operates differently in use, it would have been an obvious design consideration to modify the linkage of Deere I to rotate. EX1002 ¶342. A POSITA would obviously know that by just removing one of the parallel tie rods from Deere I, which would eliminate one of the articulation points of the parallel link, would result in a rotation movement. See image below:

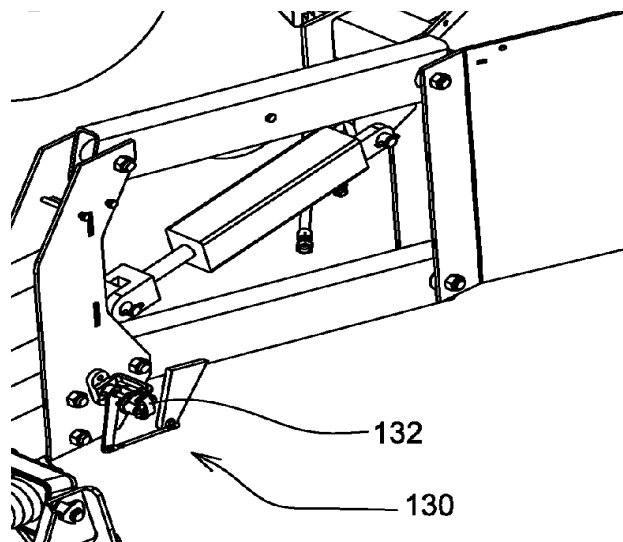


EX1002 ¶343. Thus, it would have been obvious to modify Deere's linkage to pivot to provide more range of movement. EX1002 ¶¶344-345. As a result, Deere I includes each and every element of claim 1.

Even if it would not have been an obvious design choice to modify the linkages in Deere I, Deere II teaches that a hinged linkage that rotates in nearly an identical machine as Deere I. EX1002 ¶345. Compare the linkages below.



Deere II



Deere I

Id. It would have been obvious to the POSITA to modify a parallel linkage to rotate in order to provide a better range of motion. EX1002 ¶¶346-350.

4. Claims 1-4, 6-8, 10-13, 15, 17-18 are unpatentable over Deere I alone or in view of Deere II, in view of KR'062

Deere I alone or in view of Deere II teaches each and every element of claim 1. It would have been obvious to use the sensors of KR'062 in the device of Deere I and Deere II. As discussed above, KR'062 discloses the use of a first position sensor measure the distance from the frame to the ground, and a second angular sensor measuring the angle of the toolbar. It would have been obvious to the skilled person to add the sensors to Deere I and Deere II in order to further improve its ability to finely control the depth of the tools in the soil. EX1002 ¶445.

Claim 17 nearly identical to claim 1 except the structural features regarding the implement itself is recited in the preamble of the claim and the body of the claim is directed to a control system including the controller, first sensor, second sensor, and actuator. EX1002 ¶434. As described above, Deere I alone or in view of Deere II, in view of KR'062, describe all the features of claim 17 as well, and claim 17 would have been obvious for the same reasons.

Claims 2-4, 6-8, 10-13, 15, 18 depend from claim 1. Each of those claims are likewise disclosed by Deere I alone or in view of Deere II, in view of KR'062. Claim

charts in Subsection H below illustrate where each and every element of claims 2-4, 6-8, 10-13, 15, 17-18 can be found in Deere I, Deere II, and KR'062.

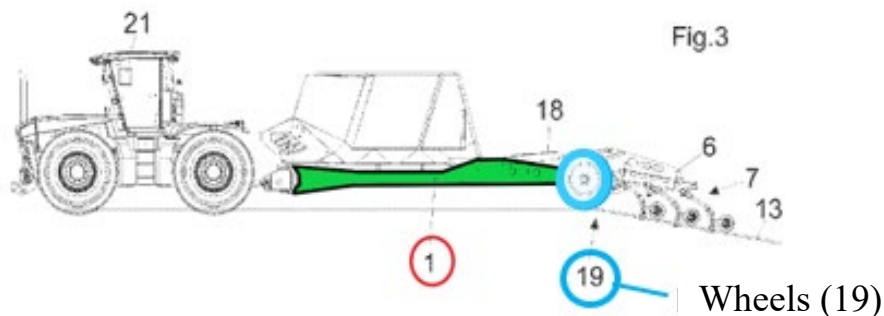
F. Ground 5: Claims 1-4, 6-8, 17-18 are unpatentable over Hubalek in view of Amazonen.

Hubalek view of Amazonen discloses each and every element of Claim 1-4, 6-8, and 17-18 either expressly or inherently. EX1002 ¶¶114-138, 172-197, 266-440, 457-459, Appendix A.6; see also Section VIII.H below.

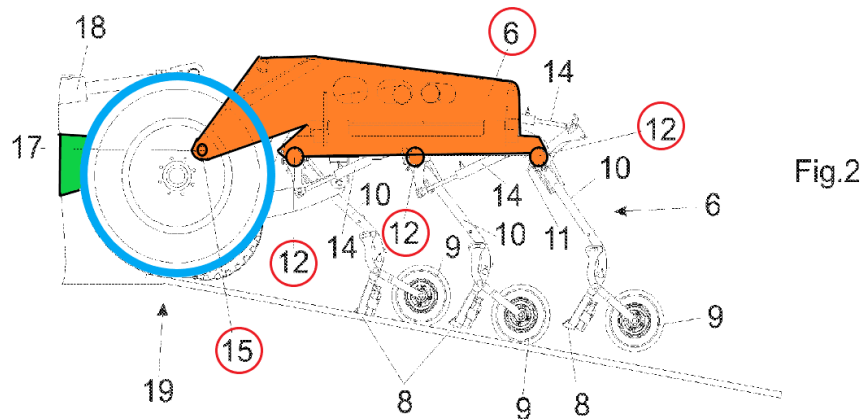
1. EP2335465 to Amazonen-Werke H. Dreyer GmbH & Co. KG (“Amazonen”)

Amazonen is titled, “Agricultural machine” and was published on May 23, 2012. Amazonen is prior art to the ‘989 patent under 35 U.S.C. § 102(b). Amazonen also refers to a planting system. EX1008 at 2; EX1002 ¶173.

The planting system of Amazonen also comprises a frame element 1 with wheels 19. EX1008 at 3.



Amazonen teaches a toolbar 12 coupled to the frame element 1 by means of an articulation link 15 formed by the structure 6. EX1008 at 4, figure 2. A plurality of row units 7 are coupled with the toolbar 12.



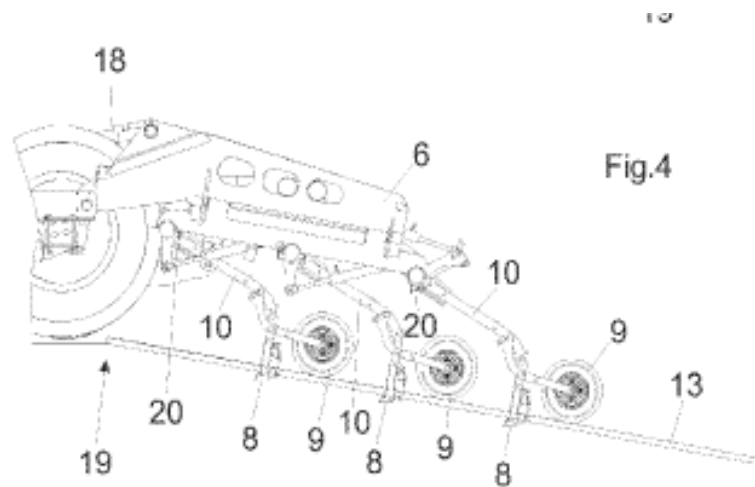
“A supporting frame 6 is arranged on the rear of the machine frame 1. A work unit 7 is arranged on this supporting frame 6. The work unit 7 comprises soil cultivating elements designed as seed coulters 8 with associated depth control rollers and/or pressure rollers 9. In the embodiment example, the soil cultivating elements designed as seed coulters 8 are arranged in three cross- rows at a distance from one another one behind the other. The soil cultivating elements 8 with the associated depth control rollers 9 are each arranged on the spaced-apart cross beams 12 of the support frame 6 so that they can be moved in the vertical direction by means of a retaining arm 10 with an articulated connection 11.” EX1008 at 3.

“The supporting frame 6 is attached to the machine frame 1 by means of an articulated coupling 15. This articulated coupling 15 has a pivot axle 17 running

transversely to the direction of travel 16. Furthermore, at least one motor-driven actuating device in the form of a hydraulic cylinder 18 is arranged between the supporting frame 6 and the machine frame 1. By means of this hydraulic cylinder 18, the supporting frame 6 with the soil cultivating elements 8 and associated rollers 9 arranged thereon can be pivoted about the pivot axle 18 running transversely to the direction of travel 16.” EX1008 at 4.

From the figures Amazonen, the toolbar 12 is arranged in parallel and at the back of the frame element. EX1002 ¶182.

Amazonen teaches a first sensor 20 to detect the position of the ground-engaging tools 8. EX1008 at 5, Fig. 4.

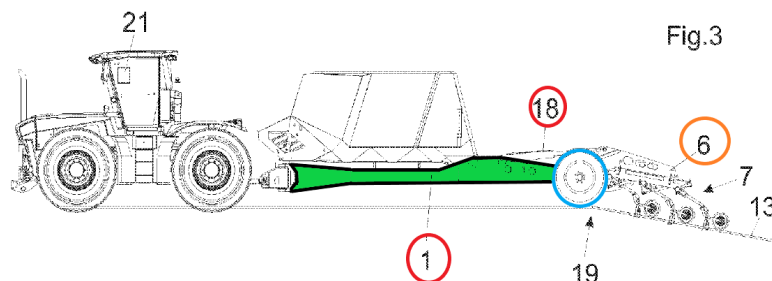


Sensor 20 detects the deflection of the holding arm 10 of the soil cultivation element 8 relative to the support frame 6. *Id.* This sensor 20 sends signals and data

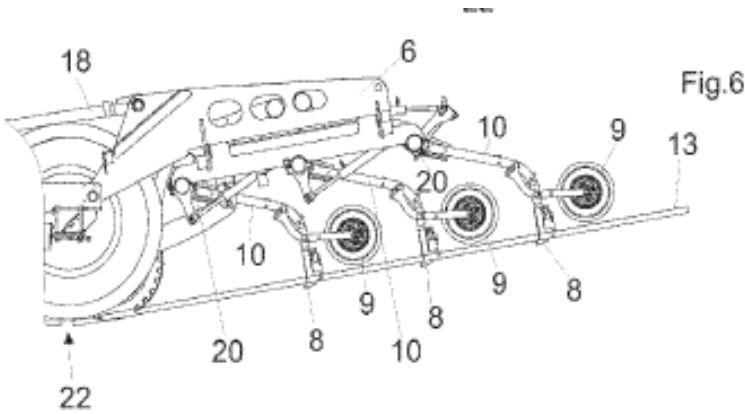
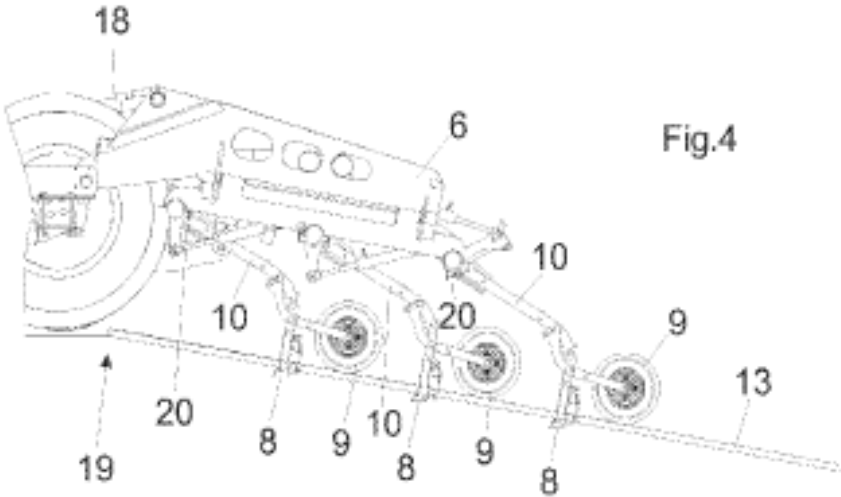
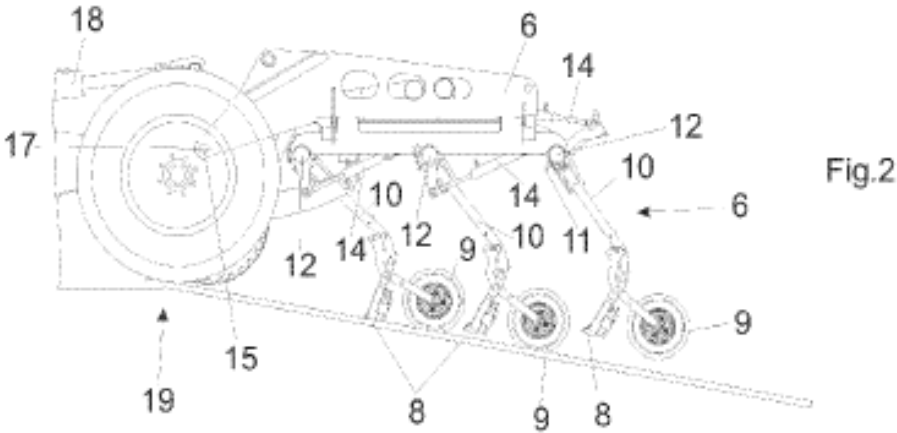
to an on-board computer 21 that has an “evaluation program” which actuates the control elements of motorized actuating device 18. *Id.* at 4.

Although the Amazonen doesn’t define where the position sensor 20 is arranged, Figure 4 makes it clear that the sensor 20 is found on the toolbar 12. EX1002 ¶186. Therefore, Amazonen teaches arranging a position sensor on the toolbar in relation to the ground.

Amazonen also discloses an actuator 18, e.g. a hydraulic cylinder, between the frame element 1 and the articulation link 15 formed by the structure 6 that comprises the toolbar 12. EX1008 at 4, figure 1.



As provided in Figures 2, 4 and 6 of Amazonen, the actuator 18 arranged between the frame element 1 and the articulation link 15 formed by the structure 6 rotates the toolbar 12 in relation to the frame element 1. EX1002 ¶¶ 185-186.



2. Claims 1-4, 6-8, 17-18 are unpatentable over the combination of Hubalek and Amazonen.

As discussed above, Hubalek discloses the basic arrangement claim 1, including each of elements thereof, but does not expressly disclose two sensors. Hubalek's sensor, detects, inter alia, the position toolbar relative to the frame, and therefore can be considered the claimed second sensor for the purposes of this Ground. EX1002 ¶129.

Amazonen discloses a farm implement that uses a joint between the toolbar and the frame member to maintain the toolbar parallel to the frame member when it is rotated is widely known in the prior art. EX1002 ¶457. Amazonen also discloses the claimed first sensor, i.e., sensor 20 positioned on toolbar 12 configured to detect deflection of the tools and therefore, the position of the toolbar 12 relative to the ground. EX1002 ¶183. It therefore would have been obvious to add sensor of Amazonen to the implement of Hubalek in order to improve the operation of the tools 22 in Hubalek to better control the depth of the tools 22. EX1002 ¶¶314, 457-459.

Such modification would result in a device having each and every element of claim 1. *Id.* Hubalek and Amazonen are in the same field of endeavor and the additional of a second sensor to Hubalek would have been well within the skill of

the POSITA by December 2016, and the POSITA would have had an expectation that such modification would have been successful. *Id.*

Claim 17 nearly identical to claim 1 except the structural features regarding the implement itself is recited in the preamble of the claim and the body of the claim is directed to a control system including the controller, first sensor, second sensor, and actuator. EX1002 ¶434. As described above, Hubalek and Amazonen describe all the features of claim 17 as well, and claim 17 would have been obvious for the same reasons.

Claims 2-4, 6-8, 8 depend from claim 1. Each of those claims are likewise disclosed by Hubalek and Amazonen. Claim charts in Subsection H below illustrate where each and every element of claims 2-4, 6-8, 117-18 can be found in Hubalek and Amazonen.

G. Ground 6: Claim 16 is unpatentable over Grounds 1-5 in view of Friesen.

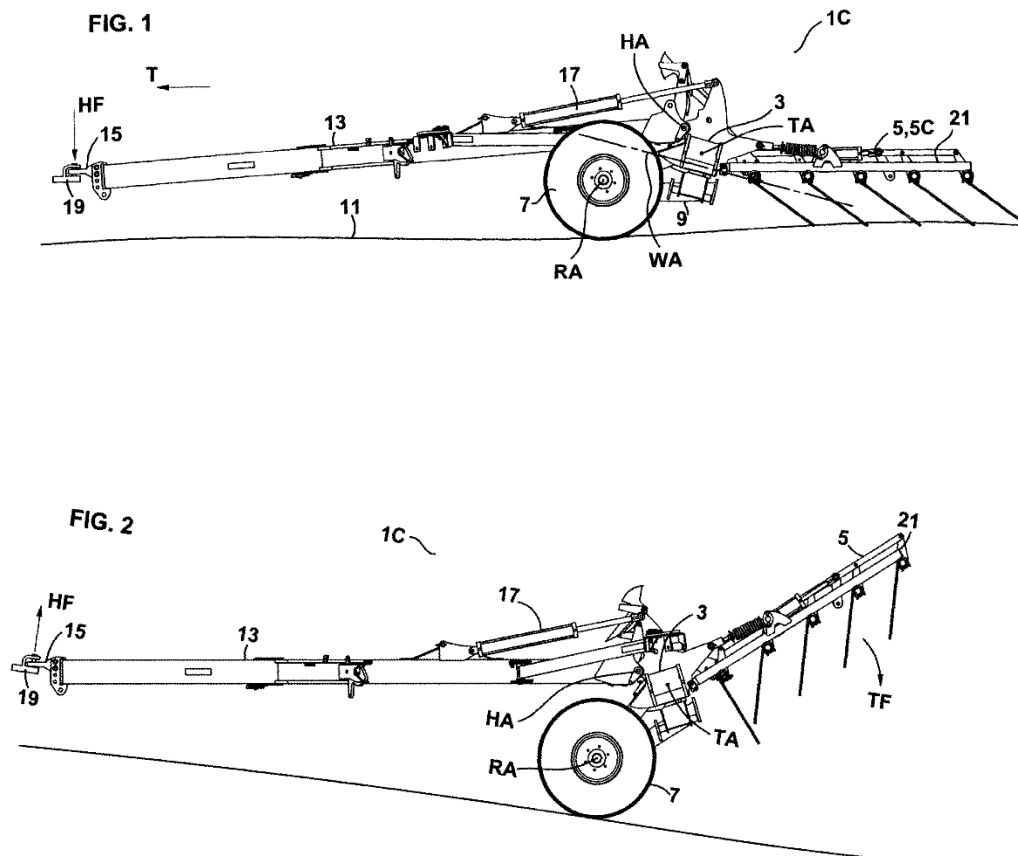
As set forth in Sections VIII.B-F above, each of Grounds 1-5 discloses each and every element of Claim 1 either expressly or inherently.

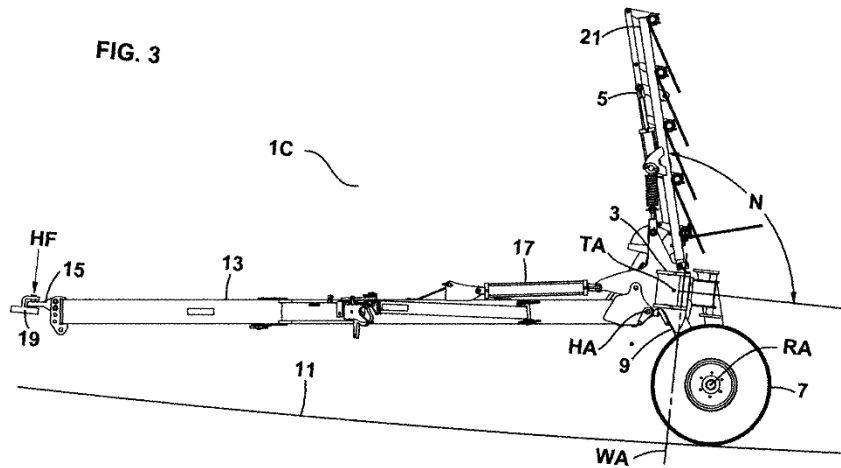
1. Friesen

Friesen was published on March 13, 2014, and therefore is prior art to the '989 patent under 35 U.S.C. § 102(b).

Friesen discloses a tool bar apparatus for a farm implement. EX1015 ¶0001.

Fig. 1 shows ground engaging position, Fig. 2 shown an intermediate position, and Fig. 3 shows the transport position.





See, EX1015 ¶¶0012-0014. The center tool bar 3 pivots about the hitch pivot axis HA through an angle N greater than ninety degrees. *Id.* ¶0026. The rotation of the toolbar is the same in Friesen as in the '989 patent. EX1002 ¶264.

It would have been obvious to modify the implements of Hubalek, Deere I, Amazonen, or Poettinger, so that the transport position is similar to that in Friesen. EX1002 ¶¶431-432; see also Section H below.

H. Claim Charts

Sections VIII.B-E above describe where each and every feature of claim 1 can be found in the prior art for each of Grounds I-VI, and describe that it would have been obvious to the POSITA to combine the features to arrive at the claimed system.

Sections VIII.B-F are incorporated by reference into this Section and the below Claim Charts. *See also* EX1002 at Appendix A.1-A.5 for claim charts of Claim 1.

The below Claim Chart illustrate examples of where each of claims 2-4, 6-8, 10-13, and 15-18 can be found in the prior art. All of the cited prior art is in the same field of endeavor. Adding other features, such as the controller, types of sensors, etc. below, would also have been well within the skill of the POSITA by December 2016, and the POSITA would have had an expectation that such modification would have been successful. EX1002 ¶¶397-417. Thus, each of the dependent claims would have been obvious.

Claim Elements of the '989 Patent	Disclosure of the Prior Art.
2. The system of claim 1, further comprising a controller configured to receive first and second signals from the first and second sensors and cause actuation of the actuator based on the first and second signals.	GROUND 1 Hubalek discloses a programmable controller 274, which is the “brains” of a control circuit for controlling the components of its system, including receiving signals from its sensor 83 and controlling various valves and electric motors. EX1006, Fig. 15, 8:44-55. KR'062 describes a controller (control unit 70) that receives the distance to the ground from a first sensor (distance sensor 50) and receives the angle of the tool bar from a second sensor (angle sensor

Claim Elements of the '989 Patent	Disclosure of the Prior Art.
	40) and causes the actuator to raise or lower the toolbar based on the received signals. GROUND 2 Hubalek discloses this element. See above. Houck discloses a controller for controlling the elevation of the toolbar based on signals from the sensors. EX1002 ¶338; EX1005 ¶0034. GROUND 3 Poettinger discloses an agricultural machine according wherein the impression cylinder can be connected to a controllable pressure supply for influencing the ground contact pressure, a sensor device for detecting an actual value of the ground contact pressure of the working unit is provided and by <u>an electronic control device</u>, the pressure supply in response to a signal of the sensor device is controlled. EX1009, 14. Naturally, such a controller communicates using signals. EX1002 ¶390. GROUND 4 Deere I discloses a control unit configured to receive the position signal and configured to control an adjustment device so that the depth

Claim Elements of the '989 Patent	Disclosure of the Prior Art.
	indication targets a depth set point. EX1007, Abstract, Fig. 5, 5:13-20; EX1002 ¶¶164,367. GROUND 5 Hubalek discloses this element. See above.
3. The system of claim 2, further comprising a control component that actuates the actuator, wherein the controller is configured to cause actuation by sending a signal to the control component.	GROUND 1 Hubalek's controller is programmable and naturally would communicate by using signals. EX1002 ¶370. KR'062 disclosures that its controller communicates using signals. EX1002 ¶371. GROUND 2 Hubalek discloses this element. See above. Houck discloses that each adjustment device 146 is controlled by the central controller 122 via a multi-line cable 148. Therefore, its controller communicates using signals. GROUND 3 Poettinger discloses an electronic control device that naturally would use a signal. GROUND 4

Claim Elements of the '989 Patent	Disclosure of the Prior Art.
	Deere I discloses a control unit 140 that generates a control signal 145, which is received by the controller 50. EX1007 5:13-21; EX1002 ¶383. GROUND 5 Hubalek discloses this element. See above.
4. The system of claim 3, wherein the control component comprises a control valve, an air valve, an electronic control component, a magnetic control component, or an electromagnetic control component.	GROUND 1 Hubalek discloses control components (solenoid valves 268, 270 that are controlled by the controller 274, thereby controlling the actuator to rotate the toolbar. EX1006 13:15-31. Solenoid valves satisfy this limitation. KR'062 describes a controller (control unit 70) that controls a control component (flow rate control valve 85) to drive the actuator. A control valve satisfies this limitation. GROUND 2 Hubalek discloses this element. See above. As described above with reference to claim 3, Houck discloses that the control component is an electro-hydraulic control valve. Thus, Houck discloses this element. GROUND 3

Claim Elements of the '989 Patent	Disclosure of the Prior Art.
	Poettinger discloses a controllable pressure supply for influencing the ground contact pressure including a pump and a valve. EX1009, 14. GROUND 4 Deere I discloses a control unit 140 (e.g., PID controller), using open loop, closed loop, or preferably proportional-integral-derivative “PID control methodology, is configured to receive the first, second, and third position signals 115, 125, 135 and the first, second, and third pressure signals 119, 129, 139, and generate a control signal 145, which is received by the controller 50. EX1007 5:13-21; EX1002 ¶383. The controller 50 is an electrical component. <i>Id.</i> GROUND 5 Hubalek discloses this element. See above.
6. The system of claim 1, further comprising a controller, the controller configured to receive a signal from the first sensor and cause actuation of the actuator based on the signal.	GROUND 1 Hubalek discloses a programmable controller 274, which is the “brains” of a control circuit for controlling the components of its system, including receiving signals from its sensor 83 and controlling various valves and electric motors. EX1006 Fig. 15, 8:44-55. KR’062 describes a controller (control unit 70) that receives the distance to the ground from a first sensor (distance sensor 50) and receives the angle

Claim Elements of the '989 Patent	Disclosure of the Prior Art.
	of the tool bar from a second sensor (angle sensor 40) and causes the actuator to raise or lower the toolbar based on the received signals. EX1002¶386. GROUND 2 Hubalek discloses this element. See above. Houck discloses a controller for controlling the elevation of the toolbar. EX1002 ¶¶332,352. GROUND 3 Poettinger discloses an agricultural machine according wherein the impression cylinder can be connected to a controllable pressure supply for influencing the ground contact pressure, a sensor device for detecting an actual value of the ground contact pressure of the working unit is provided and by <u>an electronic control device</u>, the pressure supply in response to a signal of the sensor device is controlled. EX1009, 14. GROUND 4 Deere I discloses a control unit 140 (e.g., PID controller), using open loop, closed loop, or preferably proportional-integral-derivative “PID control methodology, is configured to receive the first, second, and third position signals 115, 125, 135 and the first, second, and third pressure

Claim Elements of the '989 Patent	Disclosure of the Prior Art.
	signals 119, 129, 139, and generate a control signal 145, which is received by the controller 50. EX1007 5:13-21; EX1002 ¶383. GROUND 5 Hubalek discloses this element. See above.
7. The system of claim 6, further comprising a control component that actuates the actuator, wherein the controller is configured to cause actuation by sending a signal to the control component.	GROUND 1 The combination of Hubalek with KR'062 would include a control component that actuates the actuator, wherein the controller is configured to cause actuation by sending a signal to the control component. EX1006 13:15-31; EX1002 ¶396. GROUND 2 Hubalek discloses this element. See above. As described above with reference to claim 3, Houck discloses that the control component is an electro-hydraulic control valve. Thus, Houck discloses this element. GROUND 3 Poettinger discloses a controllable pressure supply for influencing the ground contact pressure is controlled in response to a signal of the sensor device via the electronic control device. EX1009, 14.

Claim Elements of the '989 Patent	Disclosure of the Prior Art.
	GROUND 4 Deere I discloses a control unit 140 (e.g., PID controller), using open loop, closed loop, or preferably proportional-integral-derivative “PID control methodology, is configured to receive the first, second, and third position signals 115, 125, 135 and the first, second, and third pressure signals 119, 129, 139, and generate a control signal 145, which is received by the controller 50. EX1007 5:13-21; EX1002 ¶383. GROUND 5 Hubalek discloses this element. See above.
8. The system of claim 7, wherein the control component comprises a control valve, an air valve, an electronic control component, a magnetic control component, or an electromagnetic control component.	GROUND 1 Hubalek discloses control components (solenoid valves 268, 270) that are controlled by the controller 274, thereby controlling the actuator to rotate the toolbar. EX1006 13:15-31. Solenoid valves satisfy this limitation. EX1002 ¶402. KR’062 describes a controller (control unit 70) that controls a control component (flow rate control valve 85) to drive the actuator. A control valve satisfies this limitation. EX1002 ¶403. The combination of Hubalek with KR’062 would therefore include a control component as claimed. EX1002 ¶404.

Claim Elements of the '989 Patent	Disclosure of the Prior Art.
	GROUND 2 Hubalek discloses this element. See above. As described above with reference to claim 3, Houck discloses that the control component is an electro-hydraulic control valve. Thus, Houck discloses this element. GROUND 3 Poettinger discloses a controllable pressure supply for influencing the ground contact pressure including a pump and a valve. EX1009, 14. GROUND 4 Deere I discloses a control unit 140 (e.g., PID controller), using open loop, closed loop, or preferably proportional-integral-derivative “PID control methodology, is configured to receive the first, second, and third position signals 115, 125, 135 and the first, second, and third pressure signals 119, 129, 139, and generate a control signal 145, which is received by the controller 50. EX1007 5:13-21; EX1002 ¶159. The controller 50 is an electrical component. EX1002 ¶383. GROUND 5 Hubalek discloses this element. See above.

Claim Elements of the '989 Patent	Disclosure of the Prior Art.
10. The system of claim 1, wherein the sensed position is relative to a field surface, further comprising one or more electromagnetic sensors coupled to the frame member, the toolbar, or a combination of the frame member and the toolbar, the one or more electromagnetic sensors configured to sense an absolute elevation or change in elevation between the field surface and the toolbar or a combination of both the frame member and the toolbar.	GROUND 2 Houck discloses adding an additional sensor to its system (that already includes two sensors). “Alternatively, the seeding row assembly 172 can utilize a second position sensor (not depicted) for control of the elevation of the seeding row unit 62 to a predetermined depth, akin to the second position sensor 114 of FIGS. 2 and 3. Use of the second position sensor can be alternative to or in addition to the pressure sensor 192.” EX1005 ¶0042. GROUND 4 KR’062 describes a controller (control unit 70) that receives the distance to the ground from distance sensor 50, which measures the elevation directly utilizing electromagnetic energy in a laser. EX1002 ¶410.
11. The system of claim 10, further comprising a controller configured to receive one or more signals from the one or more electromagnetic sensors and cause actuation of the actuator based on the one or more signals.	GROUND 2 As described above, Houck discloses adding an additional sensor to its system for control of the elevation of the seeding row unit 62. Houck and describes the use of controllers. Naturally, it would have been obvious to modify the controller of Houck to cause actuation of the actuator based on the one or more signals. EX1002 ¶413.

Claim Elements of the '989 Patent	Disclosure of the Prior Art.
	GROUND 4 Deere I discloses a control unit 140 (e.g., PID controller), using open loop, closed loop, or preferably proportional-integral-derivative “PID control methodology, is configured to receive the first, second, and third position signals 115, 125, 135 and the first, second, and third pressure signals 119, 129, 139, and generate a control signal 145, which is received by the controller 50. EX1007 5:13-21; EX1002 ¶383.
12. The system of claim 11, further comprising a control component that actuates the actuator, wherein the controller is configured to cause actuation by sending a signal to the control component.	GROUND 2 As described above with reference to claim 3, Houck discloses that the control component is an electro-hydraulic control valve. Thus, Houck discloses this element. GROUND 4 See claim 11.
13. The system of claim 12, wherein the control component comprises a control valve, an air valve, an electronic control component, a magnetic control component, or an electromagnetic control component.	GROUND 2 As described above with reference to claim 3, Houck discloses that the control component is an electro-hydraulic control valve. Thus, Houck discloses this element. GROUND 4 See claim 11.

Claim Elements of the '989 Patent	Disclosure of the Prior Art.
15. The system of claim 10, wherein the one or more electromagnetic sensors comprise ultrasonic, lidar, or radar sensors.	GROUND 4 KR'062 describes a distance sensor 50, which emits laser light to the ground and measures the reflection. This is the same kind of non-contact sensor that the 989 patent contemplated. EX1001 7:26-29. Therefore, it is equivalent to a radar sensor. EX1002 ¶¶238, 424.
16. The system of claim 1, wherein the actuator is configured to rotate the toolbar throughout an obtuse angle range.	See claim 1 above. Friesen discloses farm implement with a toolbar apparatus including an actuator configured to rotate the toolbar relative to the frame member based through an obtuse angle. EX1015 ¶¶0001, 0012-0014, 0026, Figs. 1-3. It would have been obvious to modify Hubalek, Deere I, Amazonen or Poettinger in light of Friesen in order to better protect the tools for transit. EX1002 ¶431-432.
17. A control system for an implement comprising a frame member and a toolbar coupled to the frame member parallel to the frame member via a hinged joint such that the toolbar remains parallel to the frame member throughout the rotation of the toolbar about the hinged joint, wherein a plurality of row units are secured to the toolbar, the control system comprising:	GROUND 1 Hubalek discloses a seeder system. EX1006, Abstract. The planting system of Hubalek includes an elongated frame element 12. EX1006, 2:59, Fig. 1. Hubalek discloses a plurality of row units 22 coupled to a toolbar 78. EX1006 4:29, Figs. 1, 11. Hubalek teaches an elongate toolbar 78 coupled to the frame element 12 by means of a hinged,

Claim Elements of the '989 Patent	Disclosure of the Prior Art.
	articulation link 70, 72. EX1006 4:29-38, Figs. 1, 11. Hubalek discloses the toolbar 78, which remains in parallel to the frame element 12 under any rotation motion. GROUND 2 See GROUND 1. Houck also discloses a planting system. EX1005, Abstract. GROUND 3 Poettinger discloses a planting system. EX1009 at 2. The planting system of Poettinger also includes an elongate frame element. EX1009, at 9, Fig. 1. Poettinger discloses row units 9 coupled to the toolbar 15. <i>Id.</i> Poettinger discloses an elongate toolbar 15 coupled to the frame element 2 by means of a hinged articulation link. <i>Id.</i> Poettinger discloses the toolbar 15, which remains in parallel to the frame element 2 under any rotation motion. GROUND 4

Claim Elements of the '989 Patent	Disclosure of the Prior Art.
	Deere I disclose an agricultural instrument. EX1007, Abstract. The implement comprises an elongated frame element (20) with wheels (40) coupled to it. EX1007, Figs. 1-3 and column 3, lines 27-29. Deere I discloses toolbar 85 coupled to row units 90. EX1007 4:7-16, Fig. 3 and 6:46-49, Fig. 10. Deere I discloses an elongate toolbar (85, 285) coupled to the frame element (20, 220) by means of an articulation link, the toolbar being oriented in parallel and at the back of the frame element (20, 220). Column 4, lines 7-16, Fig. 3 and col. 6, lines 46-49, Fig. 10. Deere I discloses the toolbar (85), which remains in parallel to the frame element (20) under any rotation motion. GROUND 5 See GROUND 1 for disclosures of Hubalek. Amazonen refers to a planting system. EX1008 at 2. The planting system of Amazonen also comprises an elongated frame element 1 with wheels 19. EX1008 at 3. Amazonen discloses a plurality of row units 7 are coupled with the toolbar 12. EX1008 at 4, Fig. 2.

Claim Elements of the '989 Patent	Disclosure of the Prior Art.
	Amazonen teaches a toolbar 12 coupled to the frame element 1 by means of an articulation link 15 formed by the structure 6. EX1008 at 4, Fig. 2.
a controller;	GROUND 1 Hubalek discloses a programmable controller 274. See Fig. 15, Col. 8, lines 44-55. KR'062 describes a controller (control unit 70). EX1012 at 6. GROUND 2 See GROUND 1 above for Hubalek. Houck discloses a controller for controlling the elevation of the toolbar. EX1005 ¶0034. GROUND 3 Poettinger discloses an electronic control device (controller). EX1009, 14. See Ground 1 for KR'062. GROUND 4 Deere I discloses a control unit. EX1007, Abstract, Fig. 5, 5:13-20. See Ground 1 for KR'062. GROUND 5 See GROUND 1.

Claim Elements of the '989 Patent	Disclosure of the Prior Art.
a first sensor configured to sense a position of the toolbar relative to ground;	GROUND 1 KR'062 discloses a distance sensor 50 positioned on a tool bar and configured to measure the distance from the ground surface. EX1012 at 6. GROUND 2 Hubalek discloses a sensor 83 coupled to the frame element configured to determine if the tools are in the lowered position. EX1006 4:47-51, Fig. 11. Houck discloses a position sensor 206 that measures the elevation 204 of the tool bar. EX1005 ¶0047, Fig. 6. GROUND 3 Poettinger teaches a sensor in the row unit 9 which acts as a position sensor for the ground-engaging tools to maintain the desired position. EX1009 14. See GROUND 1 for KR'062. GROUND 4 Deere I discloses position sensors for each one of the toolbars of the row unit of the agricultural implement, which is, a first sensor position (110) for the first ground-engaging tool (30), a second position sensor (120) for the second ground-engaging tool (70), and a third position sensor (130) See Deere I column 4, lines 27-38, lines 47-55 and column 4, line 64a, column 5, line 4). See GROUND 1 FOR KR'062.

Claim Elements of the '989 Patent	Disclosure of the Prior Art.
	GROUND 5 Amazonen teaches a first sensor 20 to detect the position of the ground-engaging tools 8 and the toolbar relative to the ground. EX1008 at 5 and Fig. 4.
a second sensor configured to sense an angle of the toolbar relative to the frame member;	GROUND 1 Hubalek discloses a sensor 83 coupled to the frame element configured to sense the position of the toolbar relative to the frame member. EX1006 4:47-51, Fig. 11; KR'062 discloses an angle sensor 40 provided in a coupling that measures the angle of the lower link 1 and transmits the measured angle to the control unit 70. EX1012 at 6. GROUND 2 Hubalek discloses a sensor 83 coupled to the frame element configured to determine if the tools are in the lowered position. EX1006 4:47-51, Fig. 11. Houck teaches a sensor 112, 114 configured to sense an angle of the toolbar relative to frame member. EX1005 ¶¶0033, 36-37, Fig. 2. GROUND 3 See GROUND 1 FOR KR'062. GROUND 4

Claim Elements of the '989 Patent	Disclosure of the Prior Art.
	Deere I also comprises an actuator 100, 300 coupled between the frame element 20, 220 and the toolbar 85, 285, configured to rotate the toolbar relative to the frame member based on a sensed position of the toolbar. Deere I, col. 4, line 64 – col. 5, line 4, Fig. 7, 10. GROUND 5 Hubalek discloses a sensor 83 coupled to the frame element configured to determine if the tools are in the lowered position. EX1006 4:47-51, Fig. 11.
and an actuator coupled between the frame member and the toolbar,	GROUND 1 Hubalek discloses an actuator (80, 82), known as hydraulic cylinders connected to the links (74, 76) and coupled between the frame element (12) and toolbar (78) configured to rotate the toolbar relative to the frame member based on a sensed position of the toolbar. EX1006 4:39-57, Fig. 11. GROUND 2 SEE GROUND 1. GROUND 3 Poettinger discloses an actuator 34 coupled between a frame element 2 and the toolbar 15. EX1009 at 10, Figs. 1-2. GROUND 4

Claim Elements of the '989 Patent	Disclosure of the Prior Art.
	Deere I also comprises an actuator (100, 300) coupled between the frame element (20, 220) and the toolbar (85, 285), configured to rotate the toolbar relative to the frame member based on a sensed position of the toolbar. Deere I, col. 4, line 64 – col. 5, line 4, Fig. 7, 10. GROUND 5 See GROUND 1 for Hubalek. Amazonen also discloses an actuator 18, known as a hydraulic cylinder, between the frame element 1 and the articulation link 15 formed by the structure 6 that comprises the toolbar (12). EX1008 at 4 and Figure 1.
wherein the controller is configured to receive at least one signal from the at least one sensor indicating the position of the toolbar relative to the ground and cause the actuator to rotate the toolbar based on the sensed position of the toolbar.	GROUND 1 Hubalek discloses a programmable controller 274, which is the “brains” of a control circuit for controlling the components of its system, including receiving signals from its sensor 83 and controlling various valves and electric motors. See Fig. 15, Col. 8, lines 44-55. KR'062 describes a controller (control unit 70) that receives the distance to the ground from a first sensor (distance sensor 50) and receives the angle of the tool bar from a second sensor (angle sensor 40) and causes the actuator to raise or lower the toolbar based on the received signals. EX1012 at 6.

Claim Elements of the '989 Patent	Disclosure of the Prior Art.
	It would have been obvious to the POSITA to modify the controller of Hubalek to include the features of KR'062 to use both sensors to control the actuator to rotate the tool bar. EX1002 ¶387. GROUND 2 See GROUND 1 for Hubalek. Houck discloses a controller for controlling the elevation of the toolbar based on a signal from the first sensor. EX1005 ¶0034. GROUND 3 Poettinger discloses an agricultural machine according wherein the impression cylinder can be connected to a controllable pressure supply for influencing the ground contact pressure, a sensor device for detecting an actual value of the ground contact pressure of the working unit is provided and by <u>an electronic control device</u>, the pressure supply in response to a signal of the sensor device is controlled. EX1009 at 14. Naturally, such a controller communicates using signals. See GROUND 1 FOR KR'062. GROUND 4 Deere I discloses a control unit configured to receive the position signal and configured to control an adjustment device so that the depth

Claim Elements of the '989 Patent	Disclosure of the Prior Art.
	indication targets a depth set point. EX1007, Abstract, Fig. 5, 5:13-20. See GROUND 1 for KR'062. GROUND 5 See GROUND 1 for Hubalek.
18. The system of claim 1, further comprising at least one wheel coupled to the frame member and at least partially supporting the frame member relative to the ground.	GROUND 1-2 Hubalek includes wheels 18 to support the frame member. See EX1006, Fig. 1. GROUND 3 Poettinger includes wheels 4 to support the frame member. See EX1009, Fig. 1. GROUND 4 Deere I includes a plurality of wheel assemblies 40 are coupled to the first frame section 20 to support the frame member. EX1007 at 3:27-28. GROUND 5 The planting system of Hubalek includes an elongated frame element 12. EX1006, 2:59, Fig. 1. The planting system of Amazonen also comprises an elongated frame element 1 with wheels 19. EX1008 at 3.

Claim Elements of the '989 Patent	Disclosure of the Prior Art.

IX. CONCLUSION

For the foregoing reasons, Petitioner has established a reasonable likelihood that it will prevail with respect to at least one of Claims 1-4, 6-8, 10-13 and 15-18 of the '989 Patent. Therefore, this Petition should be granted, IPR should be instituted, and Claims 1-4, 6-8, 10-13 and 15-18 should be found unpatentable and cancelled by the Board.

Dated: September 19, 2024

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X. APPENDIX OF CLAIMS

1. A system, comprising:

an elongate frame member;

an elongate toolbar coupled to the frame member via a hinged joint, the toolbar oriented parallel to the frame member;

a plurality of row units coupled to the toolbar;

a first sensor configured to sense a position of the toolbar relative to ground;

a second sensor configured to sense an angle of the toolbar relative to the frame member; and

an actuator coupled between the frame member and the toolbar, the actuator configured to rotate the toolbar relative to the frame member based on a sensed position of the toolbar, wherein the toolbar remains parallel to the frame member throughout the rotation of the toolbar.

2. The system of claim 1, further comprising a controller configured to receive first and second signals from the first and second sensors and cause actuation of the actuator based on the first and second signals.

3. The system of claim 2, further comprising a control component that actuates the actuator, wherein the controller is configured to cause actuation by sending a signal to the control component.

4. The system of claim 3, wherein the control component comprises a control valve, an air valve, an electronic control component, a magnetic control component, or an electromagnetic control component.

5. The system of claim 2, wherein the controller is further configured to cause adjustment of a rate of rotation based on the first signals from the first sensor.

6. The system of claim 1, further comprising a controller, the controller configured to receive a signal from the first sensor and cause actuation of the actuator based on the signal.

7. The system of claim 6, further comprising a control component that actuates the actuator, wherein the controller is configured to cause actuation by sending a signal to the control component.

8. The system of claim 7, wherein the control component comprises a control valve, an air valve, an electronic control component, a magnetic control component, or an electromagnetic control component.

9. The system of claim 6, wherein the controller is further configured to cause adjustment of a rate of rotation based on the signal from the first sensor.

10. The system of claim 1, wherein the sensed position is relative to a field surface, further comprising one or more electromagnetic sensors coupled to the frame member, the toolbar, or a combination of the frame member and the toolbar, the one or more electromagnetic sensors configured to sense an absolute elevation or change in elevation between the field surface and the toolbar or a combination of both the frame member and the toolbar.

11. The system of claim 10, further comprising a controller configured to receive one or more signals from the one or more electromagnetic sensors and cause actuation of the actuator based on the one or more signals.

12. The system of claim 11, further comprising a control component that actuates the actuator, wherein the controller is configured to cause actuation by sending a signal to the control component.

13. The system of claim 12, wherein the control component comprises a control valve, an air valve, an electronic control component, a magnetic control component, or an electromagnetic control component.

14. The system of claim 11, wherein the controller is further configured to cause adjustment of a rate of rotation based on the one or more signals from the one or more electromagnetic sensors.

15. The system of claim 10, wherein the one or more electromagnetic sensors comprise ultrasonic, lidar, or radar sensors.

16. The system of claim 1, wherein the actuator is configured to rotate the toolbar throughout an obtuse angle range.

17. A control system for an implement comprising a frame member and a toolbar coupled to the frame member parallel to the frame member via a hinged joint such that the toolbar remains parallel to the frame member throughout the rotation of the toolbar about the hinged joint, wherein a plurality of row units are secured to the toolbar, the control system comprising:

a controller;

a first sensor configured to sense a position of the toolbar relative to ground;

a second sensor configured to sense an angle of the toolbar relative to the frame member; and

an actuator coupled between the frame member and the toolbar, wherein the controller is configured to receive at least one signal from the at least one sensor indicating the position of the toolbar relative to the ground and cause the actuator to rotate the toolbar based on the sensed position of the toolbar.

18. The system of claim 1, further comprising at least one wheel coupled to the frame member and at least partially supporting the frame member relative to the ground.

XI. APPENDIX OF EXHIBITS

Exhibit No.	Document Description
1001	The '989 Patent – U.S. Patent No. 11,665,989
1002	Declaration of Paul R. Weckler, PhD
1003	C.V. of Paul R. Weckler, PhD
1004	The File History of the '989 Patent
1005	U.S. Patent Application Publication 2015/0230391 to Houck
1006	U.S. Patent No. 9,031,749 to Hubalek et al.
1007	U.S. Patent No. 8,573,319 to Casper et al.
1008	EP2335465 to AMAZONEN, English Translation
1009	DE102006034798 to POETTINGER LANDTECHNIK GMBH, English Translation
1010	U.S. Patent Application Publication 2014/0209335 to Casper et al.
1011	EP3192343 to POETTINGER LANDTECHNIK GMBH, English Translation

1012	KR101877062 B1 to LS MTRON, English Translation
1013	U.S. Pat. Pub. No. 2016/0302350 to Kinzenbaw (Kinze Manufacturing Inc.)(“the ’350 application”)
1014	U.S. Patent 8,567,517 to Friggstad (CNH Canada, Ltd.)(“the ’517 patent”)
1015	U.S. Patent Application Publication No. 2014/0069670 to Friesen et al.
1016	EP2335465 to AMAZONEN (Original)
1017	DE102006034798 to POETTINGER LANDTECHNIK GMBH (Original)
1018	EP3192343 to POETTINGER LANDTECHNIK GMBH (Original plus ESPACENET translation)
1019	KR101877062 B1 to LS MTRON (“KR’062”) (Original)
1020	Certificate of translation (affidavit) for DE102006034798
1021	Certificate of translation (affidavit) for EP3192343
1022	Certificate of translation (affidavit) for KR101877062 B1

CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. §42.24(d), I hereby certify that the foregoing PETITION FOR *INTER PARTES* REVIEW OF CLAIMS 1-4, 6-8, 10-13, and 15-18 OF U.S. PATENT NO. 11,665,989 B1 contains 13,865 words, excluding the parts of the petition exempted by 37 C.F.R. §42.24(a), as measured by the word-processing system used to prepare this paper.

Dated: September 19, 2024

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. §§42.6(e) and 42.105, I hereby certify that on this 11th day of September 2024, a true copy of the foregoing PETITION FOR *INTER PARTES* REVIEW OF CLAIMS 1-4, 6-8, 10-13, and 15-18 OF U.S. PATENT NO. 11,665,989 B1, together with Petitioner's Power of Attorney, Petitioner's Exhibit List, Exhibit Nos. 1001-1023 and was served via Priority Mail Express[®] on the patent owner at the following correspondence address of record for the subject patent:

JEFF ELLSWORT
IP LEGAL
AGCO CORPORATION
420 W. LINCOLN BLVD.
HESSTON, KS 67062
UNITED STATES

In addition, service is also made at the following "address known to the petitioner as likely to effect service" pursuant to 37 C.F.R. §42.105(a):

AGCO Corporation
Attention LEGAL
4205 River Green Pkwy
Duluth, GA 30096

Stara S.A.-Indústria De Implementos Agrícolas v. AGCO Corp.
IPR2024-_____

Dated: September 19, 2024

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