

FEDERAL REPUBLIC OF GERMANY



Priority Certificate
DE10 2015 003 156.2
for the submission of a patent application

Filing number: 10 2015 003 156.2

Filing date: 14 March 2015

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Title: Mechanical functional group for a chair, and
chair having a mechanical functional group of
this type

IPC: A47C 1/032; A47C 7/14; A47C 3/026

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**MECHANICAL FUNCTIONAL GROUP FOR A CHAIR, AND CHAIR HAVING
A MECHANICAL FUNCTIONAL GROUP OF THIS TYPE**

[0001] The invention relates to a mechanical functional group for a chair, and to a chair having a mechanical functional group of this type.

[0002] A mechanical functional group for a chair, or a chair having a mechanical functional group of this type, is known from WO 2007/110732 A2. Figs. 2a and 2b therein disclose a mechanical functional group for a chair, wherein a foot element, a back element, and a seat element are articulatable on the mechanical functional group, wherein the back element and the seat element form a seat shell, wherein the mechanical functional group comprises a support, a front swing arm and a rear swing arm, wherein the front swing arm is pivotably articulated on the support and connected to the seat element, wherein the rear swing arm is pivotably articulated on the support and connected to the seat shell, wherein the mechanical functional group, in order to compensate for a body weight of a person seated, comprises at least one leaf spring, wherein the mechanical functional group furthermore comprises at least one adjustable bearing, an adjustment mechanism for the bearing or the bearings, and at least one track for the bearing or bearings, wherein the leaf spring or the leaf springs, by way of a first end region, is or are fixed to the support, each bears on the bearing or bear on the bearings outside the end region, and in each case supports or support, the seat shell outside the end region.

[0003] It is the object of the invention to propose a mechanical functional group for a chair, or a chair having a mechanical functional group of this type, by way of which improved, in particular more precise or more free-moving tuning or adapting to the body weight of a person is made possible.

[0004] This object is achieved, proceeding from the features of the preamble of claim 1 or 15 or 17, by the characterizing features of claim 1 or 15 or 17. Advantageous and expedient further developments are stated in the dependent claims.

[0005] The mechanical functional group according to the invention is configured in such a manner that it

- either comprises at least one further spring element, wherein the elastic restoring force of the at least one further spring element and the elastic

restoring force of the leaf spring or the leaf springs supports the seat shell by way of a total restoring force;

- or comprises at least two of the leaf springs and at least two of the bearings (13, 14), wherein each bearing is assigned to one of the leaf springs, wherein at least two of the bearings are displaceable below the leaf springs by the adjustment mechanism and are displaceable on the track or tracks by variable paths;
- or comprises both at least one further spring element, wherein the elastic restoring force of the at least one further spring element and the elastic restoring force of the leaf spring or the leaf springs supports the seat shell by way of a total restoring force, and at least two of the leaf springs and at least two of the bearings, wherein each bearing is assigned to one of the leaf springs, wherein at least two of the bearings are displaceable below the leaf springs by the adjustment mechanism and are displaceable on the track or tracks by variable paths.

[0006] On account of the at least one further spring element which is employed in addition to the leaf spring or leaf springs, which is or are, supported by the displaceable bearing or the displaceable bearings, it is possible to achieve improved tuning to the body weight of a person, since the weight of a very light person weighing, for example, only 30 kg, is initially able to be absorbed only by a fixed pre-setting of the further spring element or the further spring elements, such that lower pre-tensioning of the adjustable leaf spring or leaf springs is required and an adjustment is thus performed under lower pre-tensioning and thus in a more free-moving manner, and also more precise tuning is thus made possible. On account of the design of the mechanical functional group such that the bearings are displaceable by variable paths below the leaf springs by the adjustment mechanism, improved tuning to the body weight of a person is likewise made possible, since the total restoring force may be adjusted in more precise steps.

[0007] On account of an embodiment of the mechanical functional group corresponding to both of the previously mentioned designs, both free movement and precise adjustability may be achieved, such that improved tuning to the body weight of a person is achieved to a particular degree.

[0008] It is furthermore provided that the front swing arm is configured as an H-shaped bracket with four legs, wherein the bracket on the first and the second leg is fastened to the support so as to be pivotable about a common rotation axis, and wherein the seat element is articulated on the third and the fourth leg so as to be pivotable about a common rotation axis. On account of a design of this type it is possible for a free-moving connection with little play to be established between the support and the seat element, since linking of the four articulation points is obtained by a cross brace which connects

the legs.

[0009] It is also provided that the rear swing arm is configured as an H-shaped bracket with four legs, wherein the bracket on the first and the second leg is fastened to the support so as to be pivotable about a common rotation axis, wherein the seat element is articulated on the third and the fourth leg so as to be pivotable about a common rotation axis, and wherein an appendage of the third and fourth leg is connected to the back element and supports the latter. On account of a design of this type it is again possible for a free-moving connection with little play to be established between the support and the seat element, since linking of the four articulation points is obtained by a cross brace which connects the legs. This four-point bearing also allows support of the back rest which is immune to lateral forces, such that the back rest is stabilized on account of this support and thus moving of the chair by way of its back rest is possible without the chair performing evasive movements which impede movement.

[0010] It is also provided that the support is directly connected to the foot element. On account thereof, no further components are required in addition to the support for interfacing with the foot element, and the mechanical functional group remains particularly simple and thus cost-effective.

[0011] According to a first variant, it is provided that the adjustment mechanism is equipped with a drive which in particular is configured as a manual drive or as an electric drive, a first transmission with a first reduction gearing and a second transmission with a second reduction gearing, which is different from the first reduction gearing, wherein both transmissions are drivable by the drive, and wherein the first bearing is drivable by the first transmission and the second bearing is drivable by the second transmission. By selecting two reduction gearings which differ by the factor 2, for example, the mechanical functional group may be set in a more responsive manner in this way.

[0012] According to a second variant, it is also provided that the adjustment mechanism is equipped with a first drive, which in particular is configured as a manual drive or as an electric drive, a second manual drive, which in particular is configured as a manual drive or as an electric drive, a first transmission and a second transmission, wherein the first transmission is drivable by the first drive, and wherein the second transmission is drivable by the second drive. This offers the possibility of realizing a rough setting by way of one drive and a precise setting by way of a second drive.

[0013] According to a third variant it is provided that the adjustment mechanism is equipped with a drive, which in particular is configured as a manual drive or as an electric drive, and equipped with a clutch and a transmission, wherein the transmission is drivable by the drive, and wherein the first bearing in a first clutch position of the clutch is drivable by the transmission, and wherein the second bearing in a second clutch position of the clutch is drivable by the transmission. On account thereof, a rough setting

and a precise setting may be performed with one drive, while dispensing with a mechanical linkage.

[0014] Furthermore, it is provided that the support is indirectly connected to the foot element, wherein the mechanical functional group further comprises, in addition to the support, a flange, an articulation means, and a weighing means, wherein the flange is connected to the foot element, wherein the support by way of the articulation means is articulated on the flange, wherein the support by way of the weighing means is supported on the flange. On account of this construction design, a mechanical weighing action is realized, by way of which the body weight of a person seated on the chair or sitting down on the chair, is detectable.

[0015] In a complementary manner it is provided that the adjustment mechanism is equipped with a mechanical weighing action and a mechanical adjustment action, wherein the mechanical weighing action drives the mechanical adjustment action depending on the body weight of a person seated on the seat element, and the bearings, depending on the body weight of the person seated, are simultaneously displaced by the mechanical adjustment action by variable paths along their track in such a manner that the seat shell is supported on the support to a degree so as to correspond to the body weight of the person. To this end, the mechanical adjustment action comprises in particular a first transmission with a first reduction gearing and a second transmission with a second reduction gearing, which is different from the first reduction gearing. A setting of this type is automatically performed and thus relieves the user of any setting activity.

[0016] It is provided that the weighing means is configured by at least one leaf spring. Components of this type are cost-effective and may be installed in a space-saving manner.

[0017] In terms of the articulation means which interconnects the flange and the support, it is provided that the former is equipped with two levers which are guided in parallel and which are in each case connected to the flange and the support so as to be rotatable about a total of four parallel articulation axes. An articulated connection of this type is rugged and easy to assemble and can be realized in a space-saving manner.

[0018] Furthermore, it is provided that the seat shell, by way of the interconnection via the rear swing arm, is indirectly supported on the leaf spring or leaf springs, and the further spring element or the further spring elements, which together form a spring pack in order to compensate for the body weight of a person seated. On account thereof, the transmission of force is transmitted to the rear swing arm, such that a direct introduction of force into the seat shell is not required.

[0019] It is also provided that the further spring element or the further spring elements is or are, designed as a leaf spring, which is or are disposed next to the adjustable leaf

springs in such a manner, wherein the additional leaf spring or the additional leaf springs, by way of a first end region, is or are likewise fixed to the support, wherein the mechanical functional group comprises stationary bearings for the further spring element or elements. An alignment of this type of the leaf springs and of the further spring elements enables a compact construction, since the rear swing arm may be supported on all springs of the spring pack by way of a cross brace in the case of an H-shaped embodiment.

[0020] It is also provided that one additional leaf spring each is connected to an adjustable leaf spring in the first end regions thereof, and to separate said leaf springs outside the first end region with a slot. On account thereof, it is possible to reduce the number of components while maintaining the function.

[0021] On account of a special embodiment of the mechanical adjustment action, particular free movement is achieved as a consequence of the use of fewer components, such that a setting which is driven by the mechanical weighing action particularly continues without the user becoming aware of the setting operation.

[0022] Finally, a chair which comprises a mechanical functional group according to at least one of the preceding claims according to the invention is provided, comprising a foot element, a back element, and a seat element. A chair of this type offers the advantages which have been stated above for the mechanical functional group.

[0023] In the context of the invention, a seat shell comprises a seat element and a back element. It is provided here both that the seat shell is designed in a unipartite manner, such that the seat element is connected to the back element by way of a connection means, such as in particular at least one articulated connection or at least one elastic connection element, as well as that the seat element and the back element are only indirectly interconnected by way of the mechanical functional group.

[0024] Further details of the invention are described in the drawing by means of schematically illustrated exemplary embodiments.

[0025] In the drawing:

Fig. 1 shows a perspective side view of a chair according to the invention, having a mechanical functional group according to the invention;

Fig. 2 shows a detailed view of Fig. 1;

Fig. 3 shows a side view of Fig. 1;

Fig. 4 shows a detailed view of Fig. 3;

Fig. 5 shows a perspective view of the mechanical functional group of the chair;

Fig. 6 shows the illustration of Fig. 5, with the leaf springs disregarded;

Fig. 7 shows a side view of Fig. 6, corresponding to the arrow direction VII shown therein;

Fig. 8 shows the illustration of Fig. 7, with the leaf springs disregarded;

Fig. 9 shows a sectional side view of the mechanical functional group;
 Fig. 10 shows a further perspective view of the mechanical functional group;
 Fig. 11 shows the illustration of Fig. 10, with the support disregarded and the rear swing arm disregarded;
 Figs. 12 to 14 show sectional side views of the mechanical functional group in the unstressed, lightly stressed, and heavily stressed position of the support;
 Fig. 15 shows a plan view of the mechanical functional group;
 Fig. 16 shows a plan view of the illustration of Fig. 15, with the leaf springs removed;
 Fig. 17 shows a further perspective illustration of the mechanical functional group; and
 Figs. 18 and 19 show the illustration of Fig. 17, with components partially disregarded.

[0026] A chair 1 according to the invention having a mechanical functional group 2 according to the invention is illustrated in Fig. 1 in a perspective side view. Fig. 2 shows the mechanical functional group 2. Fig. 3 shows the chair 1 illustrated in Fig. 1 in a side view from the right, and Fig. 4 shows the mechanical functional group 2 again in an enlarged illustration, but in the side view corresponding to Fig. 3. The mechanical functional group 2 known from Figs. 1 to 4 is illustrated in Figs. 5 to 19 in further views, wherein components have been disregarded to some extent in order to improve the illustration of individual components.

[0027] As is shown in particular in Figs. 1 to 6, a foot element 3, a back element 4, and a seat element 5 are articulatable on the mechanical functional group 2 for the chair 1. Here, the back element 4 and the seat element 5 form a seat shell S. The mechanical functional group 2 comprises a support 6, a front swing arm 7, which is shown only in Figs. 1 to 4, and a rear swing arm 8 which, commencing from Fig. 5, is illustrated at best in a cut-off manner.

[0028] The front swing arm 7 is articulated on the support 6 so as to be pivotable about a rotation axis D67 and is connected to the seat element 5 so as to be pivotable about a rotation axis D65, wherein axle journals 9, 10 are formed on the support 6, on a right side wall SFR6 of the support 6 and on a left side wall SFL6 of the support 6 to this end, into which axle journals 9, 10 the front swing arm 7 is dropped (cf. Figs. 1 to 4, for example). The front swing arm 7 is configured as an H-type bracket 11 (see in particular Fig. 2) which comprises four legs 12, 13, 14, and 15 and a cross brace 16. The first and the second leg 12, 13 are connected to the support 6 here, and the legs 14, 15 are connected to the seat element 5.

[0029] The rear swing arm 8 (see in particular Fig. 2) is articulated on the support 6 so as to be pivotable about a rotation axis D68 and connected to the seat shell S, wherein the

support 6 is connected to the seat element 5 so as to be pivotable about a rotation axis D56. To this end, axle journals 17, 18 are formed on the support 6, on the right side wall SFR6 of the support 5 and on the left side wall SFL6 of the support 6 (see Fig. 6), into which axle journals 17, 18 the rear swing arm 8 is dropped. The rear swing arm 8, like the front swing arm 7, is designed as an H-type bracket 19 (see Figs. 2 and 5), which comprise four legs 20, 21, 22, and 23, a cross brace 24, and an appendage 25 (see Fig. 3). The first and the second leg 20, 21 are connected to the support 6 here, the legs 22, 23 are connected to the seat element 5, and the appendage 25 is connected to the back element 4, such that the rear swing arm 8 is connected to both the seat element 5 and the back element 4.

[0030] In order for a body weight G of a person (not illustrated) seated on the chair 1 to be compensated for, the mechanical functional group 2 comprises four leaf springs 26, 27, 28, and 29. Here, the internal leaf springs 26 and 28, which are close to a central longitudinal axis ML, are designed as wide leaf springs, and the leaf springs 27 and 29 which are remote from the central longitudinal axis ML are configured as narrow leaf springs (see Fig. 5). It can be seen from Fig. 6 that one bearing each 31, 32 is assigned to the narrow leaf springs 27 and 29 on a base 30 of the support 6, which is formed in said support 6. On account thereof, the restoring force of the narrow leaf springs 27 and 29 is defined to a fixed value.

[0031] The mechanical functional group 2 comprises two adjustable bearings 33, 34, an adjustment mechanism 35 for the bearings 33, 34, and tracks 36, 37 for the bearings 33, 34 (see in particular Fig. 18).

[0032] The internal leaf springs 26, 28 as well as the external leaf springs 27, 29 (see Fig. 5) are fixed by way of a first end region 26a, 27a, 28a, 29a to the support 6 in a receptacle 39 in a bulkhead 38 which is disposed between the axle journals 9, 10.

[0033] Outside their end regions 26a, 27a, 28a, 29a the leaf springs 26, 27, 28, and 29 each bear, with a lower side 26b, 27b, 28b, 29b on the respective bearings 33, 31, 34, 32 assigned to them, and indirectly support, by way of opposite end regions 26c, 27c, 28c, 29c, the seat shell S or directly support the rear swing arm 8 on the cross brace 24 thereof (see Fig. 5).

[0034] The external leaf springs 27, 29 of the mechanical functional group 2 form further spring elements 40, 41. The elastic restoring force R40, R41 of the two further spring elements 40, 41, and the elastic restoring force R26, R28 of the two internal leaf springs 26, 28 here add up to a total restoring force RG which supports the seat shell S by way of the swing arm 8.

[0035] The two internal leaf springs 26, 28 of the mechanical functional group 2 are assigned to the displaceable bearings 33, 34, wherein each bearing 33, 34 is assigned to one of the leaf springs 26, 28, and wherein the bearings 33, 34 are displaceable below the

leaf springs 26, 38 by the adjustment mechanism 35, and are displaceable on their tracks 36, 37 by variable paths W33, W34 (see Fig. 6).

[0036] The support 6 is indirectly connected to the foot element 3, wherein the mechanical functional group 2 further comprises a flange 42 in addition to the support 6 (see Fig. 18), an articulation means 43 (see Fig. 9), and a weighing means 44 (see Fig. 19). The flange 42 is connected to the foot element 3 here. The support 6 is articulated on the flange 42 here by way of the articulation means 43, and the support 6 is supported on the flange 42 by way of the weighing means 44 (see Fig. 9).

[0037] The adjustment mechanism 35 comprises a mechanical weighing action 45 and a mechanical adjustment action 46, wherein the mechanical weighing action 45 drives the mechanical adjustment action 46 depending on the body weight G of a person seated on the seat element 5, and the displaceable bearings 33, 34, depending on the body weight G of the person seated, are simultaneously displaced by the mechanical adjustment action 46 by variable paths W33, W34 along their tracks 36, 37 in such a manner that the seat shell S is supported by way of the rear swing arm 8 on the support 6 to a degree so as to correspond to the body weight G of the person (see in particular also Fig. 18). To this end, the mechanical adjustment action 46 which is driven by the mechanical weighing action 45, comprises a first transmission 47 with a first reduction gearing, and a second transmission 48 with a second reduction gearing, which deviates from the first reduction gearing. According to a variant of an embodiment not illustrated, first and second transmissions with identical reduction gearing are also provided in a particular construction design. To this end, reference is made in particular to Fig. 18 and Figs. 12 and 14 which show various positions.

[0038] With respect to the fundamental function of a weighing mechanism, in which an adjustment of the restoring force by which the chair counteracts the movements of the person – such as a leaning back of the person, for example - is performed by way of the body weight of a person seated on the chair, we refer in principle to WO 2007/110732 A2, which has already been referred to in the introduction to the description.

[0039] Fig. 12 shows a longitudinal section through the mechanical functional group 2, wherein the flange 42 which is fixed onto the foot element 3 is identifiable. By way of the weighing means 44, which is visible in Figs. 9 and 19, and which is designed as two further leaf springs 49a, 49b, the support 6, by which the seat shell S (not illustrated here) is supported, is held in the unstressed position S6-1 shown in Fig. 12. A gear wheel 50 of the mechanical adjustment action 46, which is rotatably mounted on the support 6, meshes with a rack 51 formed on the flange 42 here. In the event of light stress acting on the seat element 5 or the seat shell S, the support 6, counter to the spring force of the leaf springs 49a, 49b, is lowered in relation to the flange 42 into the position S6-1 shown in

Fig. 13. During lowering, the gear wheel 50 is driven by the rack 51 and rotates in an anticlockwise manner from a first rotary position S50-1 (see Fig. 12) to a second rotary position S50-2 (see Fig. 13). By way of an articulated lever 52, the first leg 52a of which is rigidly connected to the gear wheel 50, and the second leg 52b of which is connected in a rotating articulated manner to the first leg 52a, and the second leg 52b of which at its free end rotatably supports a further gear wheel 53, the left-hand rotation of the first gear wheel 50 forces the articulated lever 52 to slightly buckle. As this buckling takes place, the second gear wheel 53, which runs between a further rack 54 which is configured on the support 6 and a rack 55 which is configured on the displaceable bearing 34, rolls off the lower rack 54. On account of its right-hand rotation and its change of position, the second gear wheel 53 moves the third rack 55 and thus the bearing 34 to the right in the direction of the flange 42 here, such that the leaf spring 28 assigned to the bearing 34 is subject to increasing support and, on account thereof, exerts a greater restoring force on the rear swing arm 8. In Fig. 14, the body weight acting on the seat element 5 or the seat shell S is even greater, and the support in relation to the flange 42 is lowered to the position S6-3, such that the bearing 34 is moved farther in the direction of the flange 42.

[0040] The second transmission 48 mentioned thus comprises the articulated lever 52, the second gear wheel 53, and the racks 54 and 55. As can be seen from Fig. 50, the first gear wheel 50 drives the articulated levers of both transmissions and is thus a component part of both transmissions. Different reduction gearings of the transmissions are thus implemented by differently conceived articulated levers or by different toothings of the second and third racks and of the second gear wheel.

[0041] The first transmission 47 (not illustrated in more detail here) again comprises all the components mentioned, such that the other bearing 33 is also movable depending on the movement of the rack 51 formed on the flange 42 and on the thus caused rotation movement of the gear wheel 50. The first transmission which moves the bearing 33, and the second transmission which moves the bearing 34, have different reduction gearings and, on account thereof, move the bearings 33, 34 in a synchronous manner, or by variable paths W33, W34 in the same periods of time.

[0042] As has been mentioned, in Fig. 14 the support 6 is shown in the heavily stressed position S6-3, in which the gear wheel 50 is in a rotary position S50-3. Accordingly, in this rotary position S50-3, the bearing 34 is then also displaced even farther towards the right in the direction of the flange 42, such that the leaf spring 28 exerts an even higher restoring force on the rear swing arm 8. The support 6 is guided on the flange 42 by way of the articulation means 43, these being implemented as two levers 43a, 43b which operate in parallel.

[0043] It can be seen from Fig. 17, for example, that the wide leaf spring 26 and the narrow leaf spring 27 as well as the wide leaf spring 28 and the narrow leaf spring 29,

that is to say an additional leaf spring each with an adjustable leaf spring in their respective first end regions 26a, 27a, and 28a, 29a, are each interconnected to form finger springs 56, 57, and outside their first end region 26a, 27a, and 28a, 29a, namely in a central region 26d, 27d, and 28d, 29d, and an opposite end region 26c, 27c, and 28c, 29c, are each separated by a slot 56a, and 57a.

List of reference numbers:

1	Chair
2	Mechanical functional group
3	Foot element
4	Back element
5	Seat element
6	Support
7	Front swing arm
8	Rear swing arm
9, 10	Axle journal on 6
11	H-type bracket formed by 7
12 – 15	Leg of 11
16	Cross brace of 11
17, 18	Axle journal on 6
19	H-type bracket formed by 8
20 – 23	Leg of 19
24	Cross brace of 19
25	Appendage of 19
26	Wide internal leaf spring
27	Narrow external leaf spring
28	Wide internal leaf spring
29	Narrow external leaf spring
30	Base of 6
26a – 29a	First end region of 26 – 29
26b – 29b	Lower side of 26 – 29
26c – 29c	Second end region of 26 – 29
31, 32	Bearing for 27, 29 on 6
33, 34	Displaceable bearing
35	Adjustment mechanism
36, 37	Track for bearing 33 and 34, respectively
38	Bulkhead of 6
39	Receptacle on 6 for 26 to 29
40	Further spring element, formed by 27
41	Further spring element, formed by 29
42	Flange
43	Articulation means
43a, 43b	First, second lever
44	Weighing means

45	Mechanical weighing action of 35
46	Mechanical adjustment action of 35
47	First transmission with first reduction gearing
48	Second transmission with second reduction gearing
49a, 49b	Leaf spring forming weighing means 44
50	Gear wheel of 46, bearing on 50
51	Rack on 42
52	Articulated lever
52a, 52b	First, second leg
53	Second gear wheel on 52b
54	Rack on 6
55	Rack on 34
56	Finger spring of 26, 27
56a	Slot of 56
57	Finger spring of 28, 29
57a	Slot of 57
D67	Pivot axis of 6, 7
D65	First pivot axis of 6, 5
D68	Pivot axis of 6, 8
D56	Second pivot axis of 6, 5
SFR6	Right side wall of the support
SFL6	Left side wall of the support
G	Body weight of a person
S	Seat shell
R26, R28	Restoring force of 26, 28
R40, R41	Restoring force of 40, 41
RG	Total restoring force
W33	Path of 33
W34	Path of 34
S6-1	Unstressed position of 6
S6-2	Lightly stressed position of 6
S6-3	More heavily stressed position
S50-1	First rotary position of 50
S50-2	Second rotary position of 50
S50-3	Third rotary position of 50
ML	Central longitudinal axis
SE	Mirror plane

Claims:

1. A mechanical functional group (2) for a chair (1),
 - wherein a foot element (3), a back element (4), and a seat element (5) are articulatable on the mechanical functional group (2);
 - wherein the back element (4) and the seat element (5) form a seat shell (S);
 - wherein the mechanical functional group (2) comprises a support (6), a front swing arm (7), and a rear swing arm (8);
 - wherein the front swing arm (7) is pivotably articulated on the support (6) and connected to the seat element ();
 - wherein the rear swing arm (8) is pivotably articulated on the support (6) and connected to the seat shell (S);
 - wherein the mechanical functional group (2), in order to compensate for a body weight of a person seated, comprises at least one leaf spring;
 - wherein the mechanical functional group (2) furthermore comprises at least one adjustable bearing (33, 34), an adjustment mechanism (35) for the bearing (33, 34) or the bearings (33, 34), and at least one track (36, 37) for the bearing or bearings (33, 34);
 - wherein the leaf spring (26, 28) or the leaf springs (26, 28), by way of a first end region (26a, 28a), is or are fixed to the support (6), each bears on the bearing (33, 34) or bear on the bearings (33, 34) outside the end region (26a, 28a), and in each case supports or support the seat shell (S) outside the end region (26a, 28a);characterized in that
 - the mechanical functional group (2) comprises at least one further spring element (27, 29), wherein the elastic restoring force (R27, R29) of the at least one further spring element (27, 29) and the elastic restoring force (R26, R28) of the leaf spring (26, 28) or the leaf springs (26, 28) supports the seat shell (S) by way of a total restoring force (RG); and/or
 - the mechanical functional group (2) comprises at least two of the leaf springs (26, 28) and at least two of the bearings (33, 34), wherein each bearing (33, 34) is assigned to one of the leaf springs (26, 28), wherein at least two of the bearings (33, 34) are displaceable below the leaf springs (26, 28) by the adjustment mechanism (35) and are displaceable on the track or tracks (36, 37) by variable paths (W33, W34).
2. The mechanical functional group according to claim 1, characterized in that the front swing arm is designed as an H-shaped bracket with four legs, wherein the

bracket on the first and the second leg is fastened to the support so as to be pivotable about a common rotation axis, and wherein the seat element is articulated on the third and the fourth leg so as to be pivotable about a common rotation axis.

3. The mechanical functional group according to claim 1, characterized in that the rear swing arm is configured as an H-shaped bracket with four legs, wherein the bracket on the first and the second leg is fastened to the support so as to be pivotable about a common rotation axis, wherein the seat element is articulated on the third and the fourth leg so as to be pivotable about a common rotation axis, and wherein an appendage of the third and fourth leg is connected to the back element and supports the latter.
4. The mechanical functional group according to at least one of the preceding claims, characterized in that the support is directly connected to the foot element.
5. The mechanical functional group according to claim 4, characterized in that the adjustment mechanism comprises a drive, which in particular is configured as a manual drive or as an electric drive, a first transmission with a first reduction gearing and a second transmission with a second reduction gearing, which is different from the first reduction gearing, wherein both transmissions are drivable by the drive, and wherein the first bearing is drivable by the first transmission and the second bearing is drivable by the second transmission.
6. The mechanical functional group according to claim 4, characterized in that the adjustment mechanism comprises a first drive, which in particular is configured as a manual drive or as an electric drive, a second manual drive, which in particular is configured as a manual drive or as an electric drive, a first transmission and a second transmission, wherein the first transmission is drivable by the first drive, and wherein the second transmission is drivable by the second drive.
7. The mechanical functional group according to claim 4, characterized in that the adjustment mechanism comprises a drive, which in particular is configured as a manual drive or as an electric drive, and equipped with a clutch and a transmission, wherein the transmission is drivable by the drive, and wherein the first bearing in a first clutch position of the clutch is drivable by the transmission, and wherein the second bearing in a second clutch position of the clutch is drivable by the transmission.

8. The mechanical functional group according to at least one of the claims 1 to 3, characterized in that the support is indirectly connected to the foot element, wherein the mechanical functional group further comprises, in addition to the support, a flange, an articulation means, and a weighing means, wherein the flange is connected to the foot element, wherein the support by way of the articulation means is articulated on the flange, and wherein the support by way of the weighing means is supported on the flange.
9. The mechanical functional group according to claim 8, characterized in that the adjustment mechanism comprises a mechanical weighing action and a mechanical adjustment action, wherein the mechanical weighing action drives the mechanical adjustment action depending on the body weight of a person seated on the seat element 5, and the bearings, depending on the body weight of the person seated, are simultaneously displaced by the mechanical adjustment action by variable paths along their track in such a manner that the seat shell is supported on the support to a degree so as to correspond to the body weight of the person seated.
10. The mechanical functional group according to claim 8, characterized in that the weighing means comprises at least one leaf spring.
11. The mechanical functional group according to claim 8, characterized in that the articulation means comprises two levers, which are guided in parallel and which are in each case connected to the flange and the support so as to be rotatable about a total of four parallel articulation axes.
12. The mechanical functional group according to at least one of the preceding claims, characterized in that the seat shell, by way of the interconnection via the rear swing arm, is indirectly supported on the leaf spring or leaf springs, and the further spring element or the further spring elements, which together form a spring pack in order to compensate for the body weight of a person seated (the rear swing arm is supported on all springs of the spring pack, the seat shell is supported on the rear swing arm).
13. The mechanical functional group according to at least one of the preceding claims, characterized in that the further spring element or the further spring elements is or are designed as a leaf spring, which is or are disposed next to the adjustable leaf springs in such a manner that the additional leaf spring or the additional leaf

springs, by way of a first end region, is or are likewise fixed to the support, wherein the mechanical functional group comprises stationary bearings for the further spring element or elements.

14. The mechanical functional group according to claim 13, characterized in that one additional leaf spring each is connected to an adjustable leaf spring in the first end region, and outside the first end region said leaf springs are separated by a slot.

15. A mechanical functional group (2) for a chair (1),

- wherein a foot element (3), a back element (4), and a seat element (5) are articulatable on the mechanical functional group (2);
- wherein the back element (4) and the seat element (5) form a seat shell ();
- wherein the mechanical functional group (2) comprises a support (6), a front swing arm (7), and a rear swing arm (8);
- wherein the front swing arm (7) is pivotably articulated on the support (6) and connected to the seat element (5);
- wherein the rear swing arm (8) is pivotably articulated on the support (6) and connected to the seat shell ();
- wherein the mechanical functional group (2), in order to compensate for a body weight of a person seated, comprises at least one leaf spring;
- wherein the mechanical functional group (2) furthermore comprises at least one adjustable bearing (), an adjustment mechanism () for the bearing () or the bearings (), and at least one track () for the bearing or bearings ();
- wherein the leaf spring () or the leaf springs (), by way of a first end region () is or are fixed to the support (6), each bears on the bearing () or bear on the bearings () outside the end region (), and in each case supports or support the seat shell () outside the end region ();

characterized in that

- the support is indirectly connected to the foot element, wherein the mechanical functional group further comprises, in addition to the support, a flange, an articulation means, and a weighing means, wherein the flange is connected to the foot element, wherein the support by way of the articulation means is articulated on the flange, and wherein the support by way of the weighing means is supported on the flange;
- the adjustment mechanism comprises a mechanical weighing action and mechanical adjustment action, wherein the mechanical weighing action drives the mechanical adjustment action depending on the body weight of a person seated on the seat element 5, and the bearings, depending on the body weight

of the person seated, are simultaneously displaced by the mechanical adjustment action by variable paths along their track in such a manner that the seat shell is supported on the support to a degree so as to correspond to the body weight of the person seated;

- the flange comprises a rack, wherein the rack drives a first transmission (47), which acts on the first displaceable bearing 33, and a second transmission (48), which acts on the second displaceable bearing (34); and
- each transmission (47, 48) comprises an articulated lever, wherein the articulated lever comprises a first leg and a second leg, wherein the two legs are connected in an articulated manner, wherein the first articulated lever at its free end is pivoted and the second articulated lever at its free end rotatably holds a gear wheel which is positioned in such a manner between a rack which is connected to the support and a rack which is disposed on the bearing that rolling of the gear wheel on the rack which is implemented on the support leads to a relative movement between the gear wheel and the bearing in that the bearing is conveyed by the rotation and the linear movement of the gear wheel.

16. The mechanical functional group according to claim 15, characterized in that the first and the second transmission have identical reduction gearings or different reduction gearings.
17. A chair, characterized in that the chair comprises a mechanical functional group according to at least one of the preceding claims, a foot element, a back element, and a seat element.

ABSTRACT

The invention relates to a mechanical functional group, wherein the mechanical functional group comprises at least one further spring element, wherein the elastic restoring force of the at least one further spring element and the elastic restoring force of the leaf spring or of the leaf springs supports the seat shell by way of a total restoring force, and/or wherein the mechanical functional group comprises at least two of the leaf springs and at least two of the bearings, wherein each bearing is assigned to one of the leaf springs, wherein at least two of the bearings are displaceable below the leaf springs by the adjustment mechanism and are displaceable on the track or tracks by variable paths. (Fig. 4)

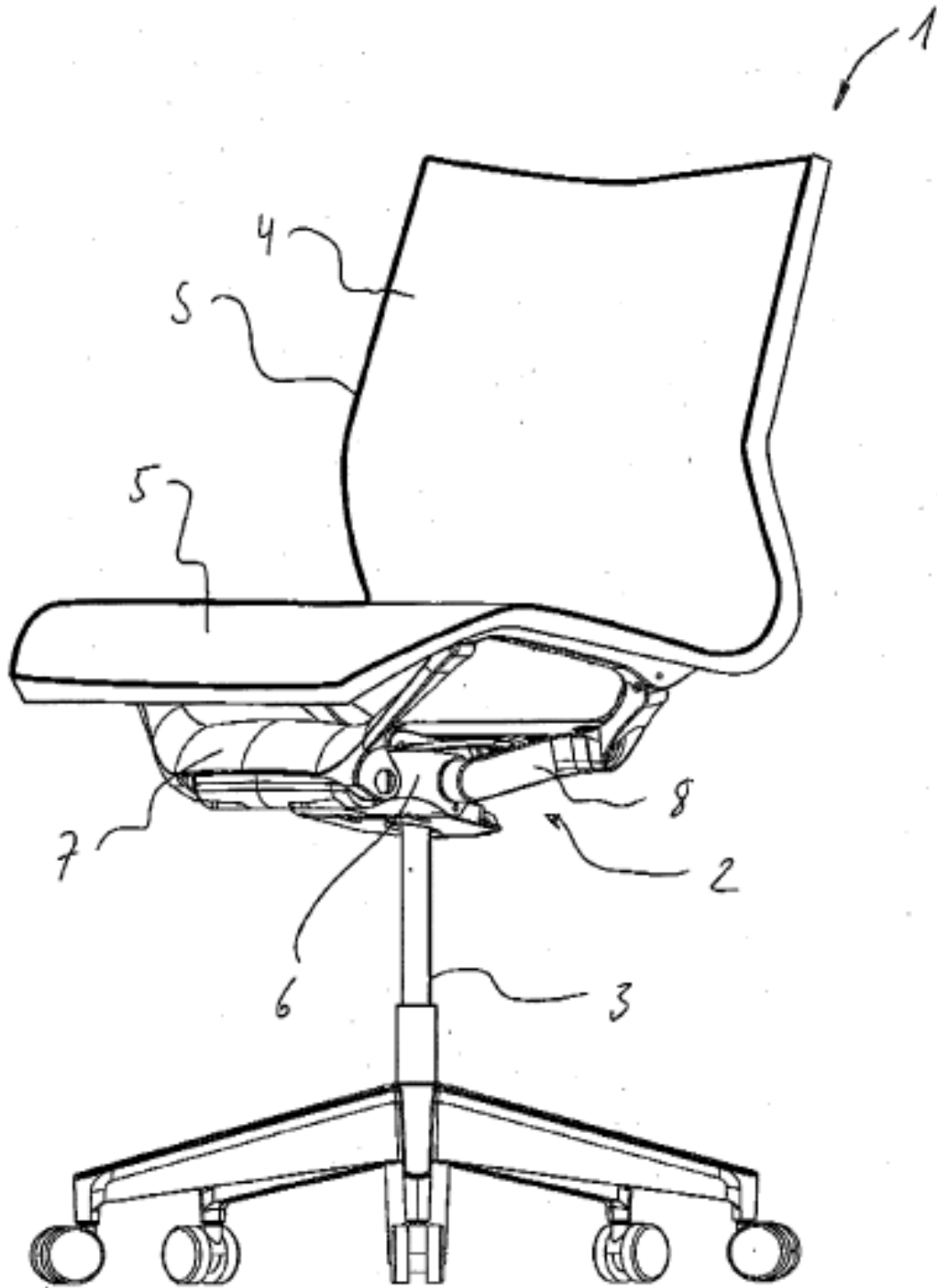


Fig. 1

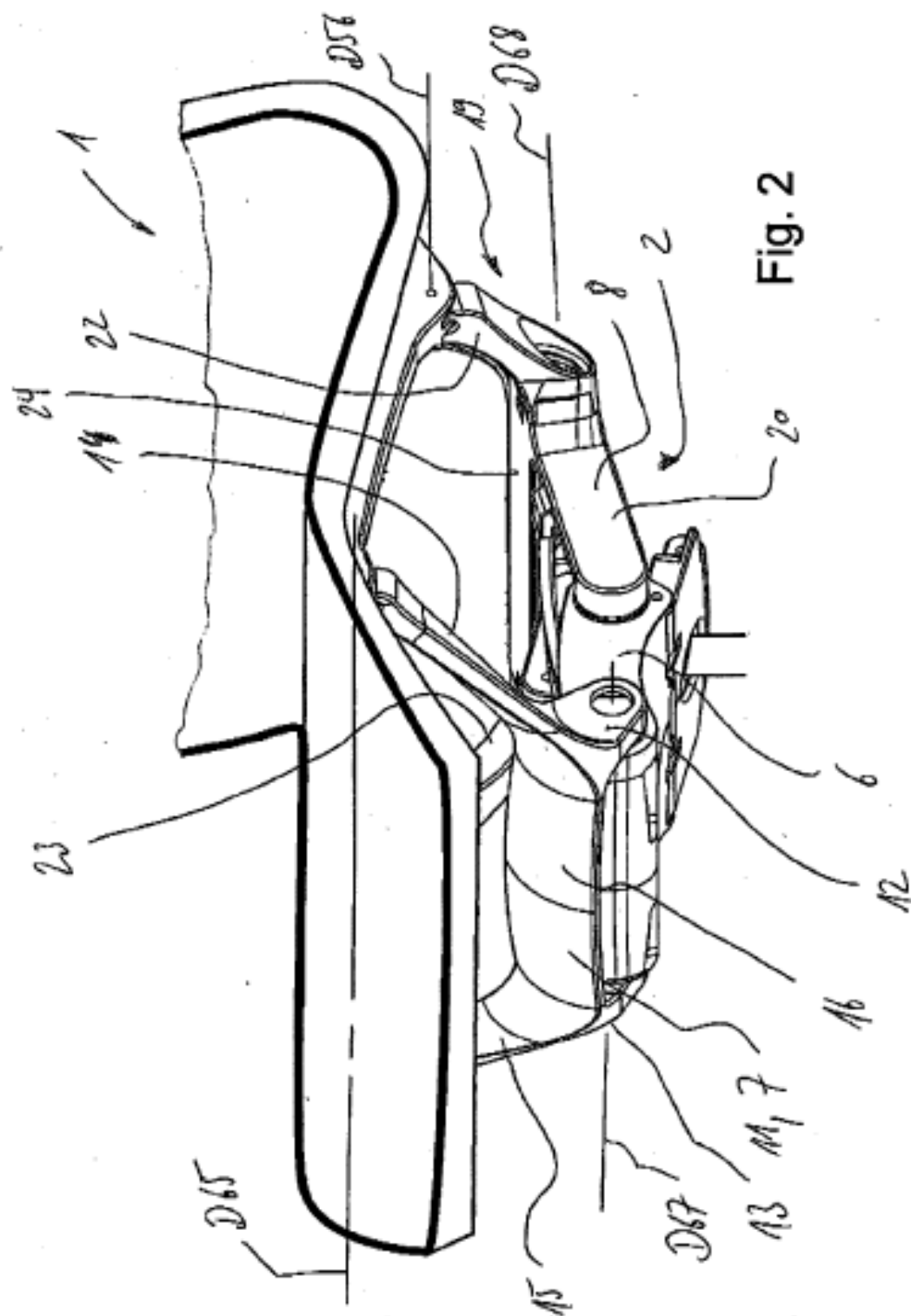


Fig. 2

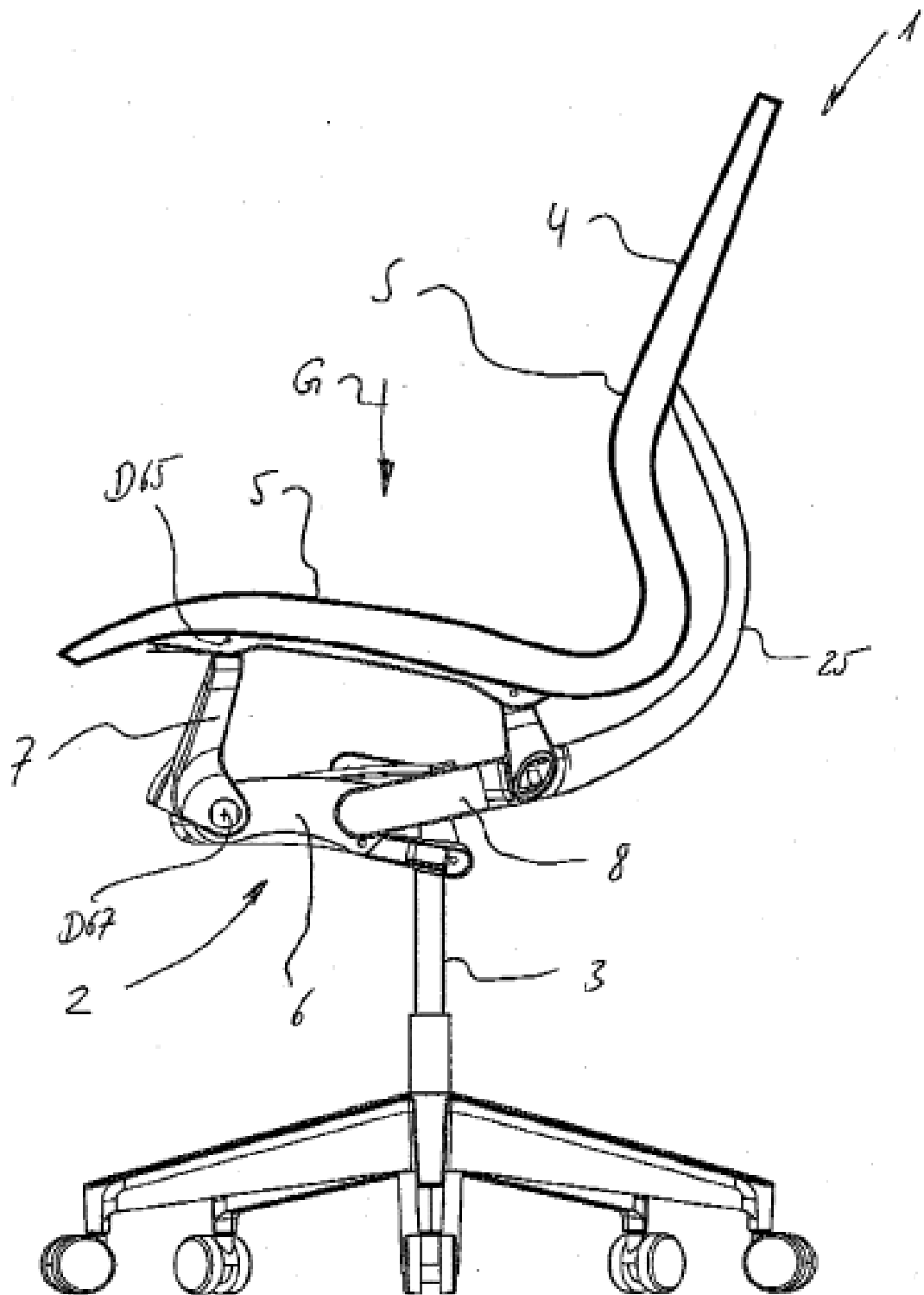


Fig. 3

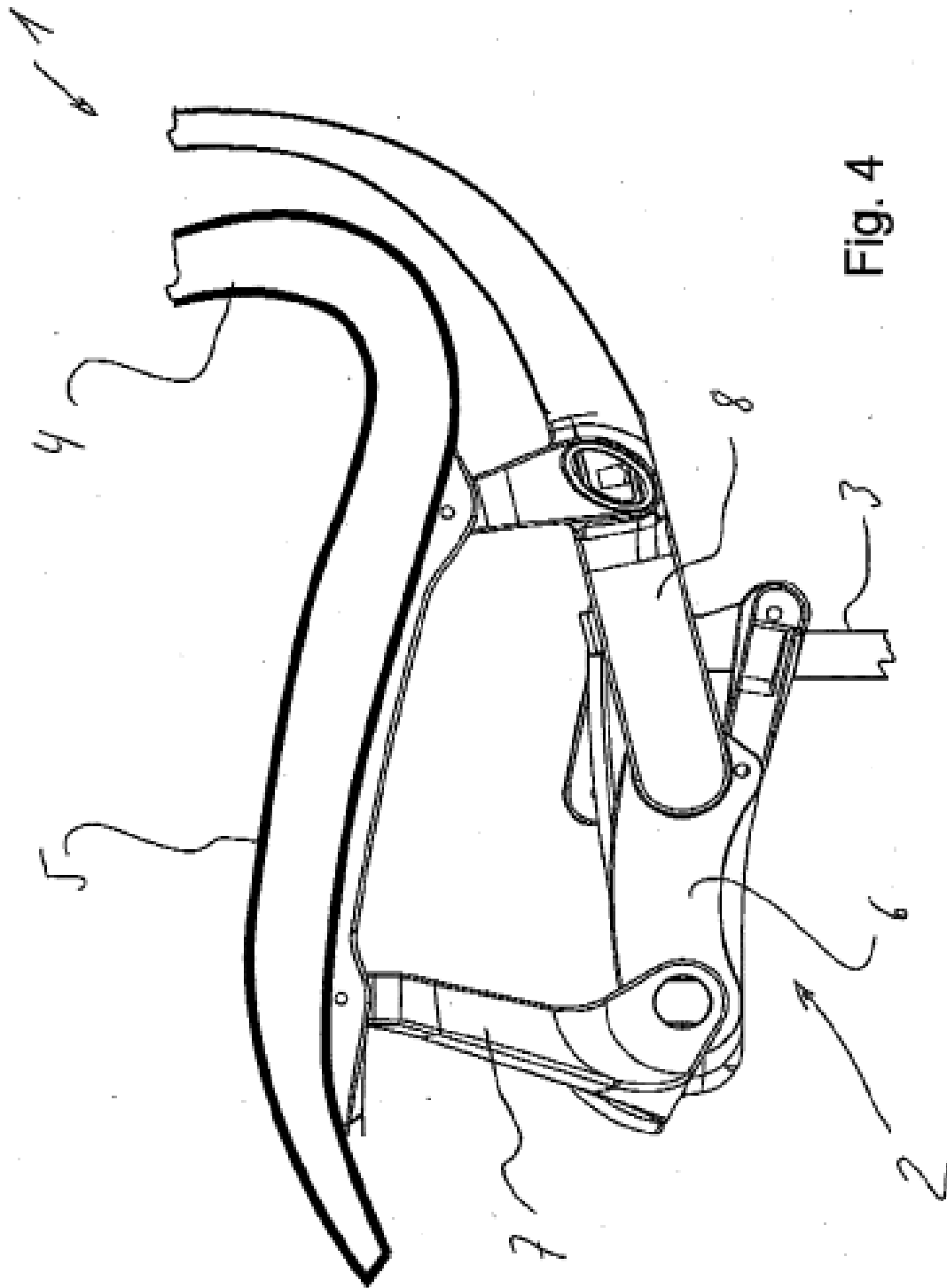
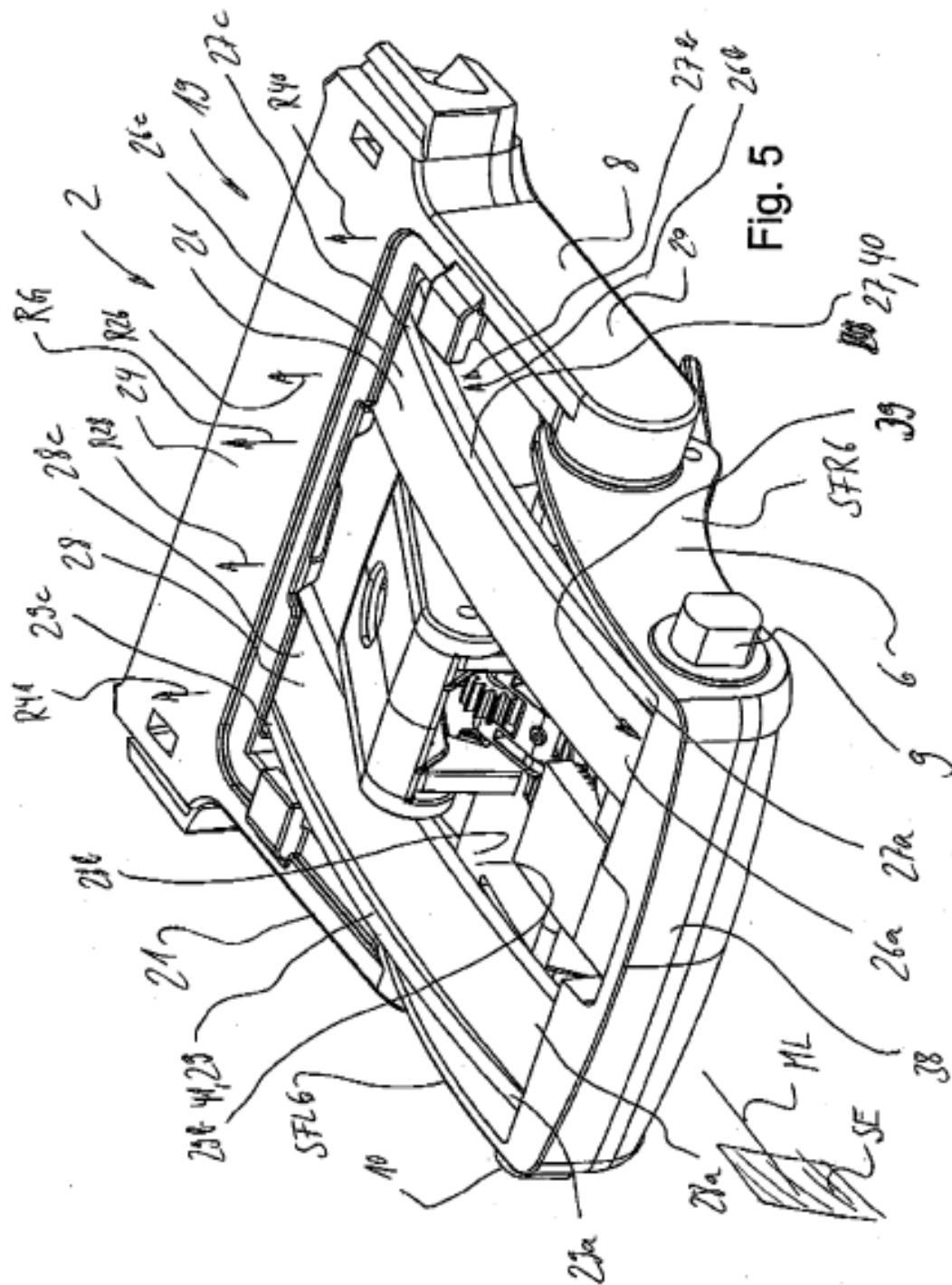
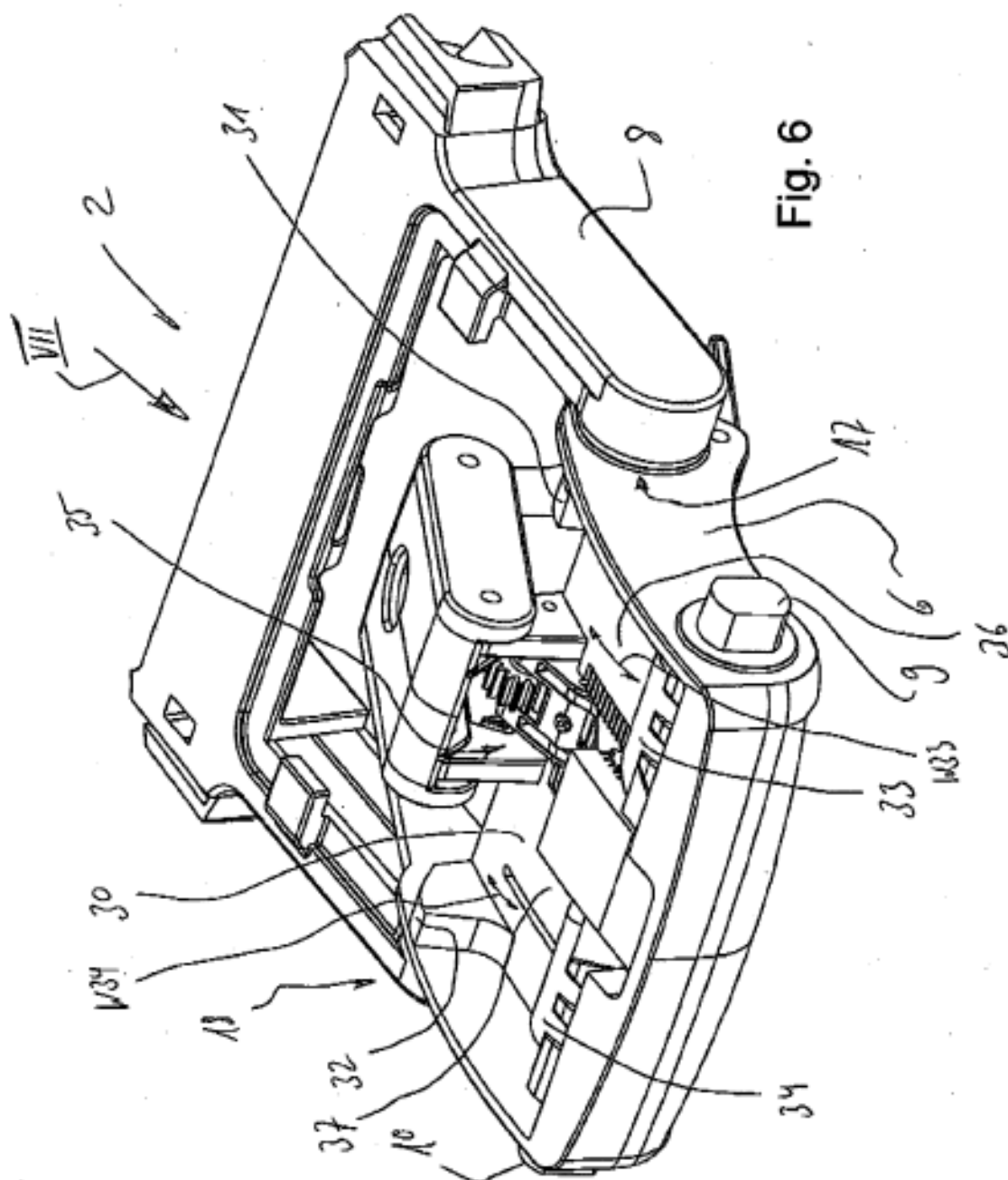


Fig. 4





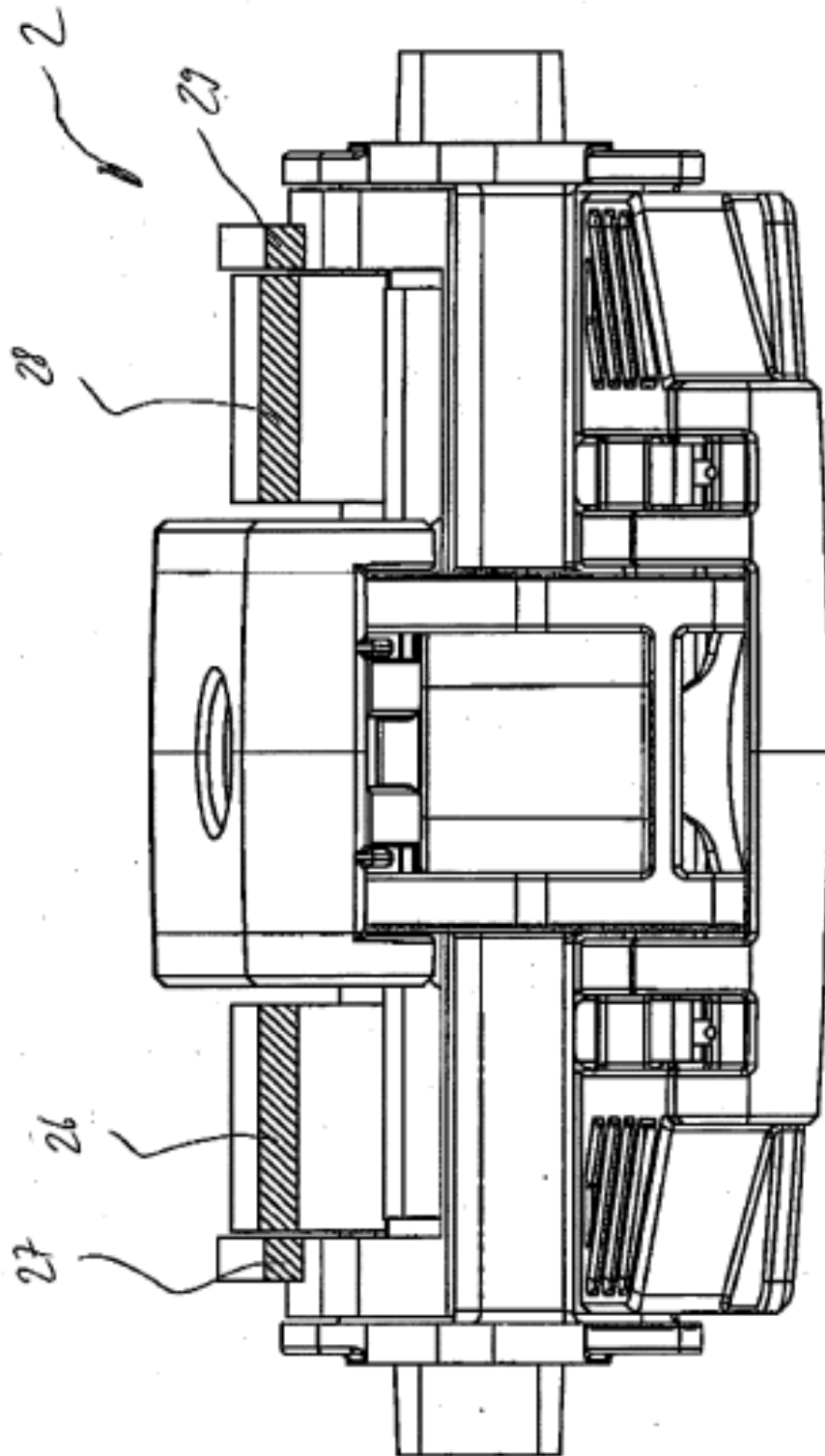


Fig. 7

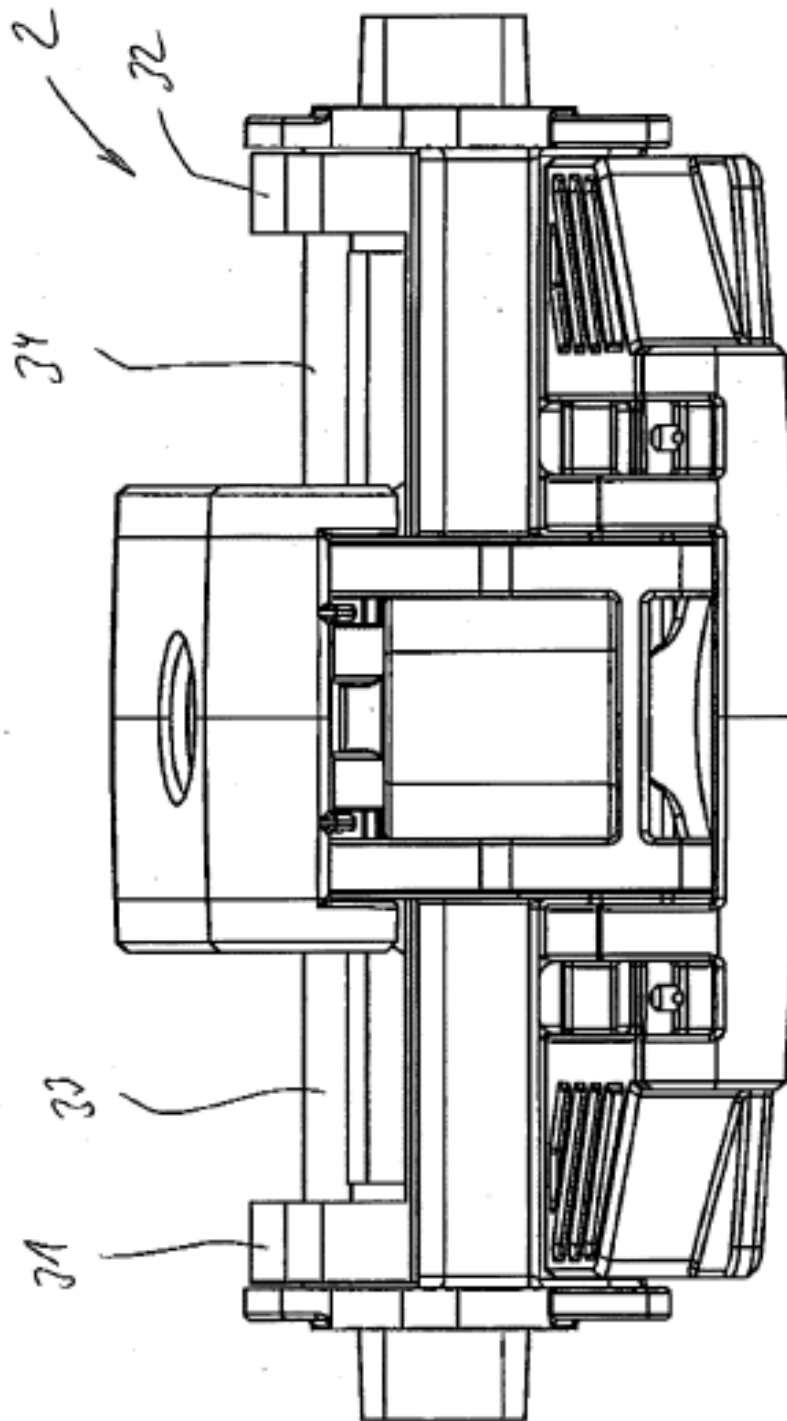


Fig. 8

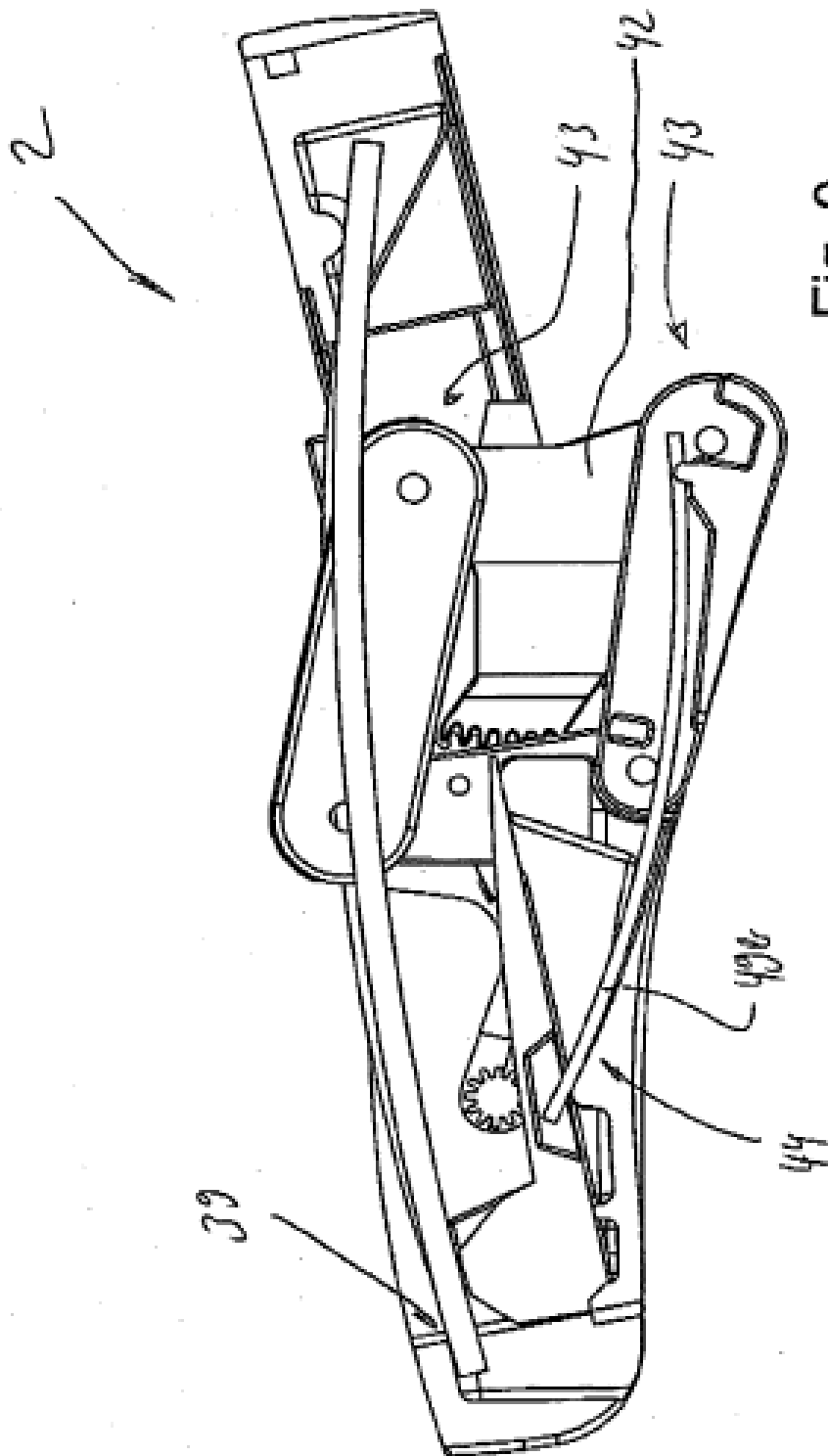


Fig. 9

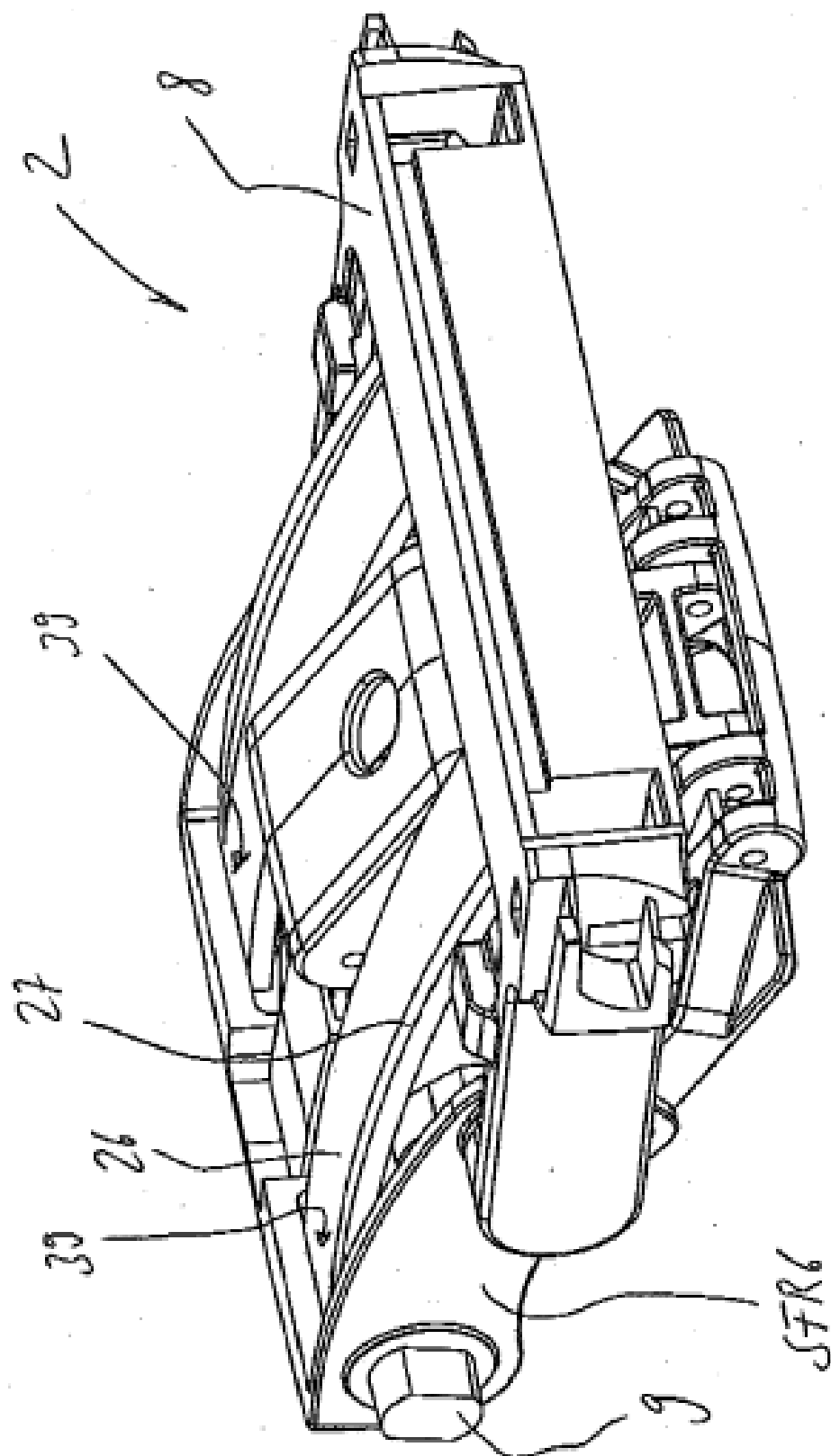


Fig. 10

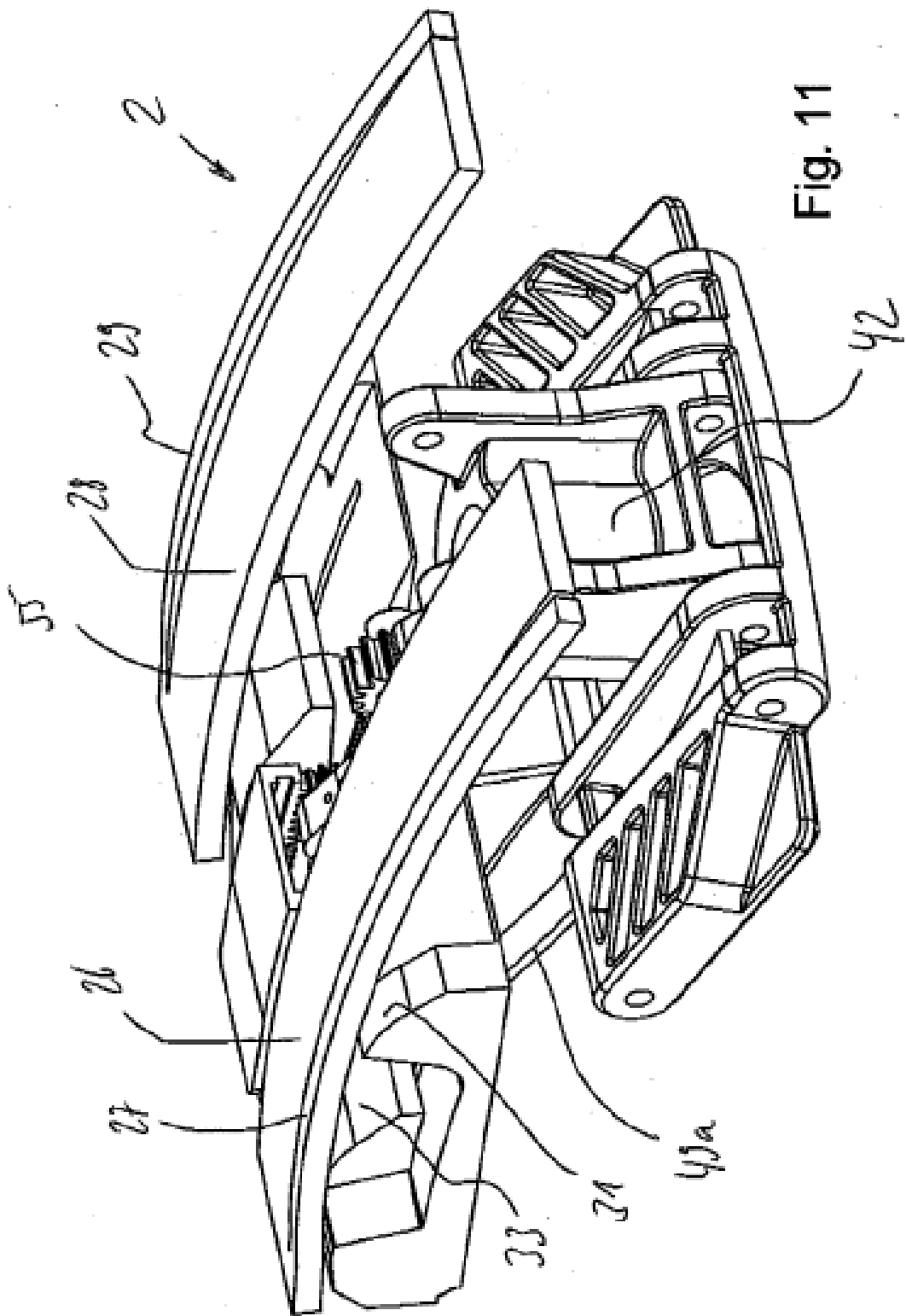


Fig. 11

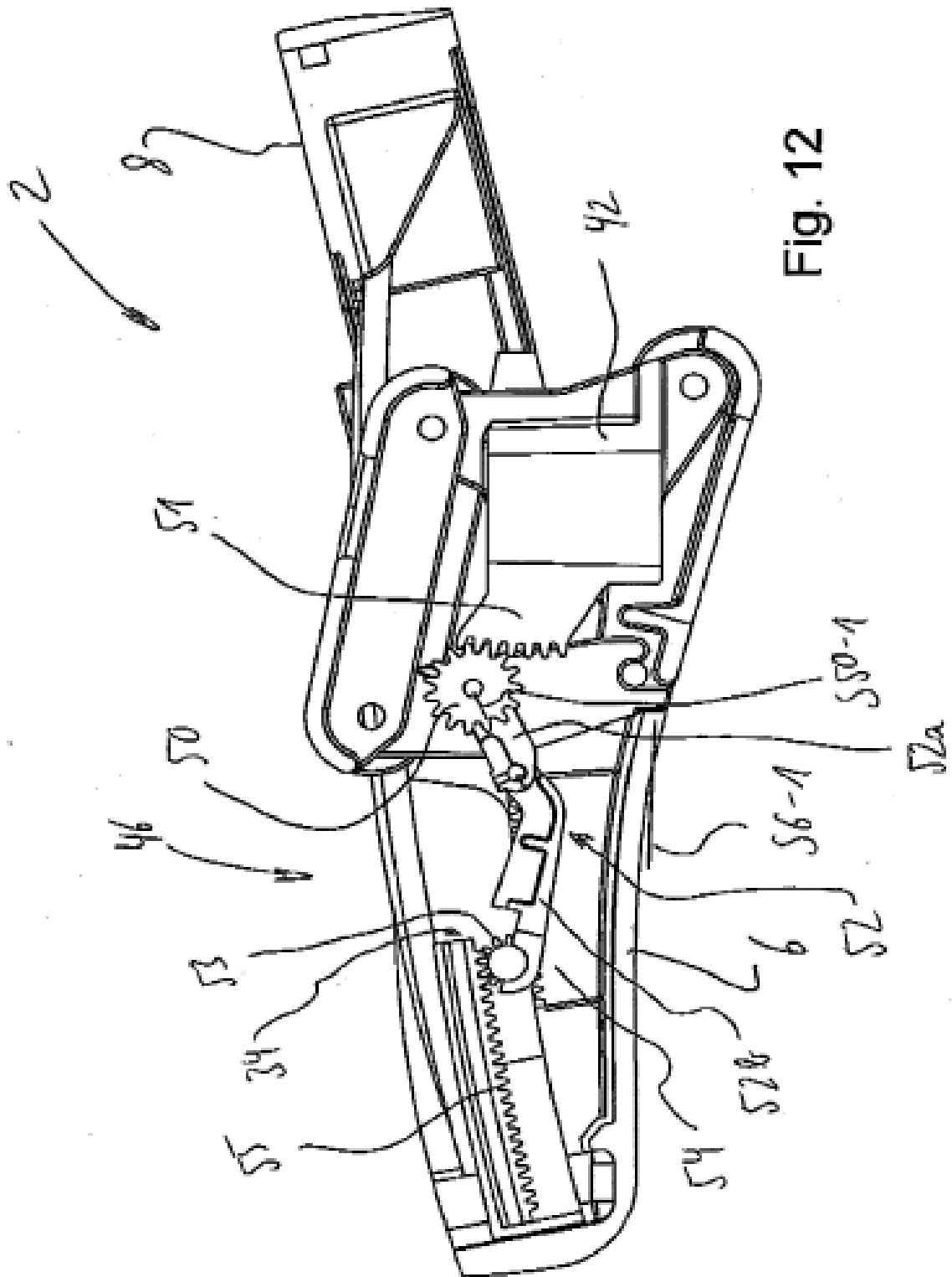


Fig. 12

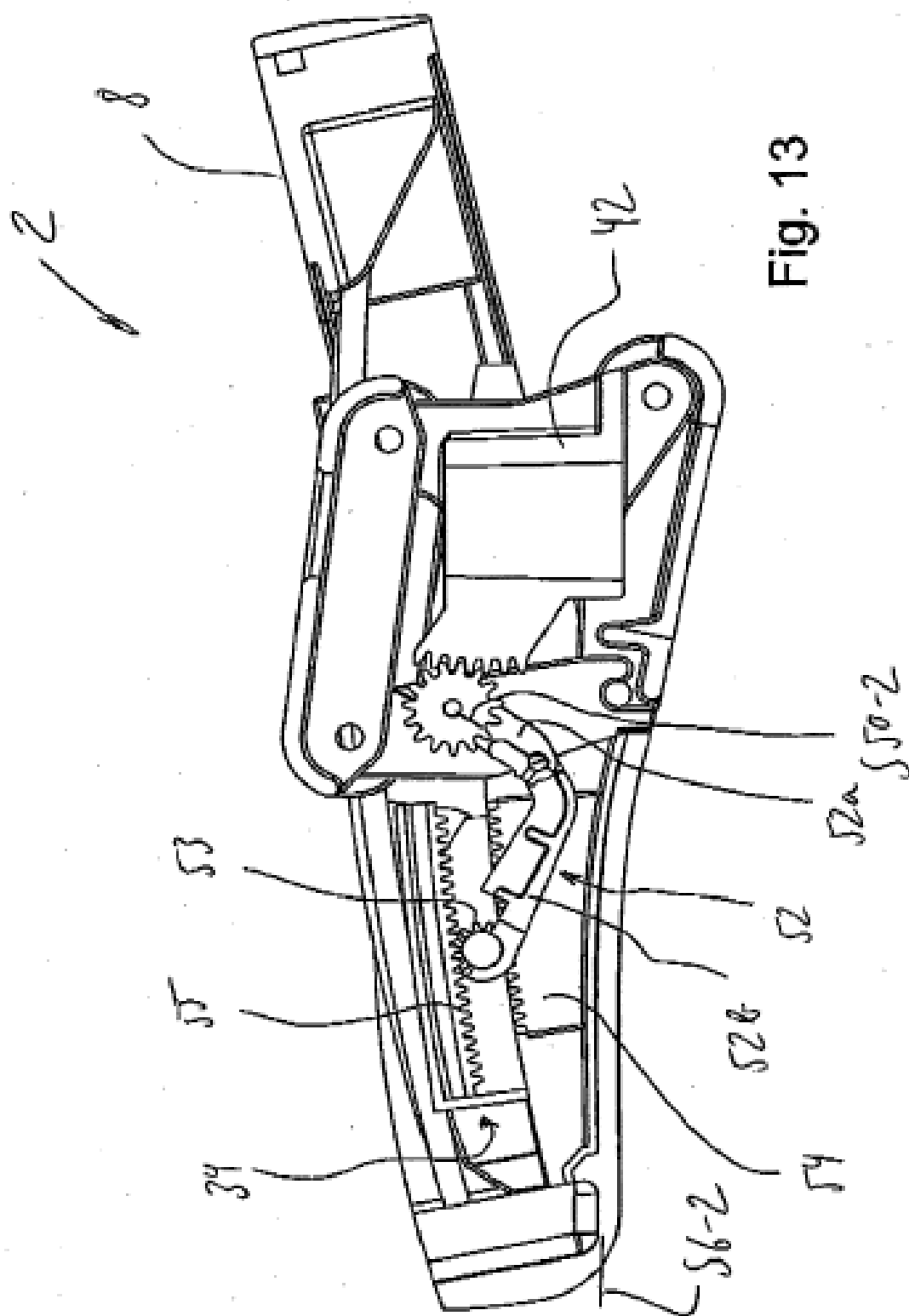


Fig. 13

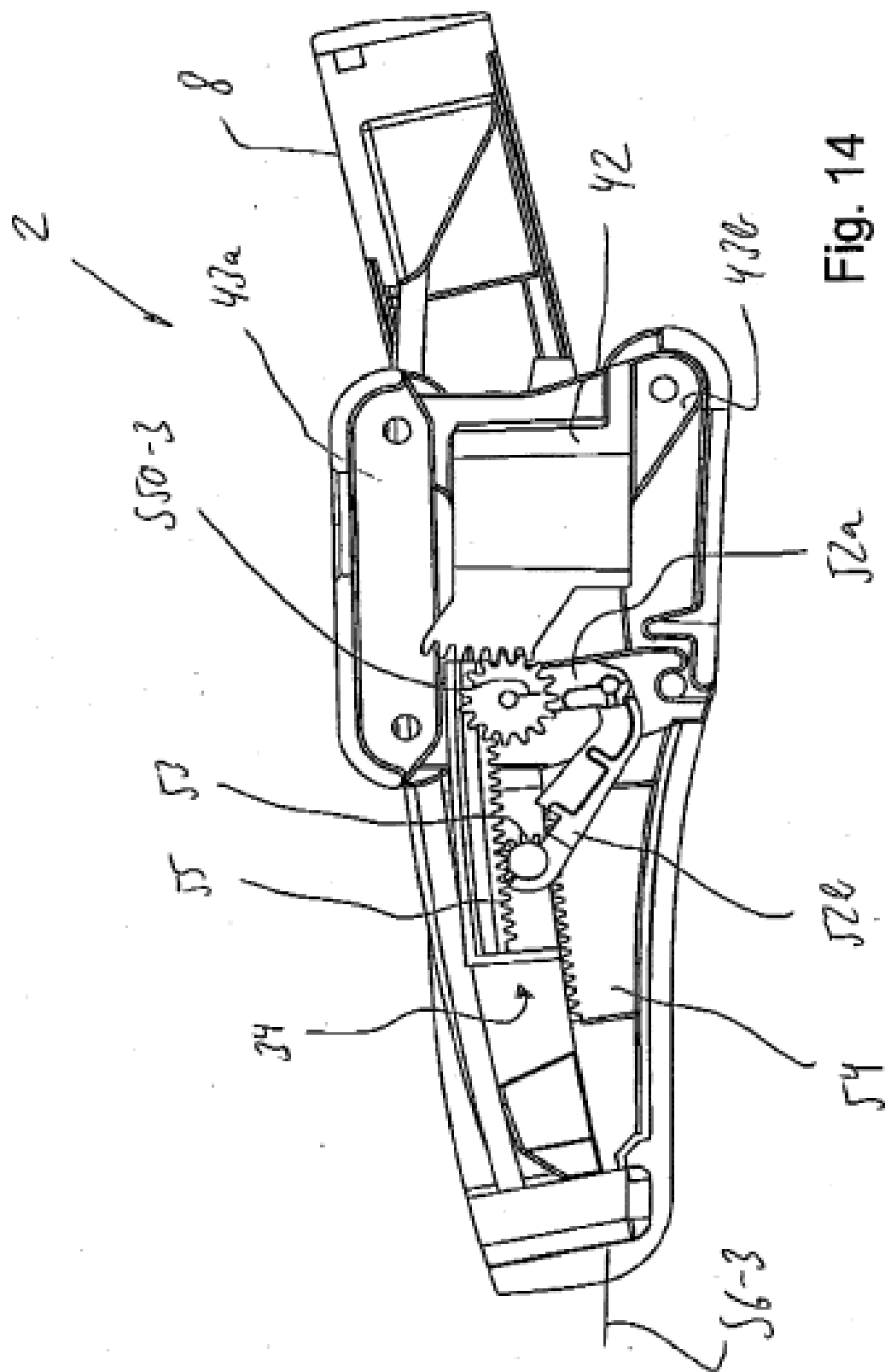


Fig. 14

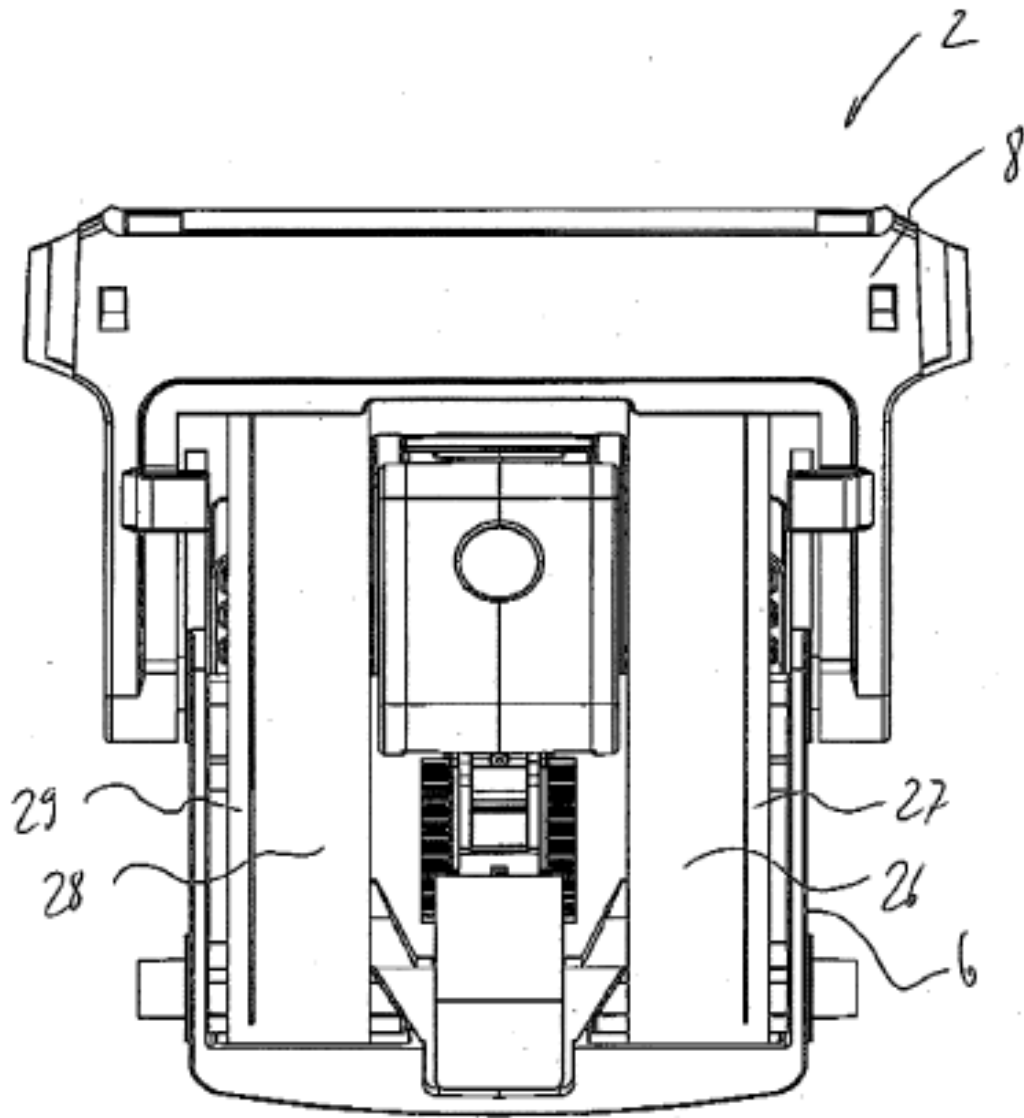


Fig. 15

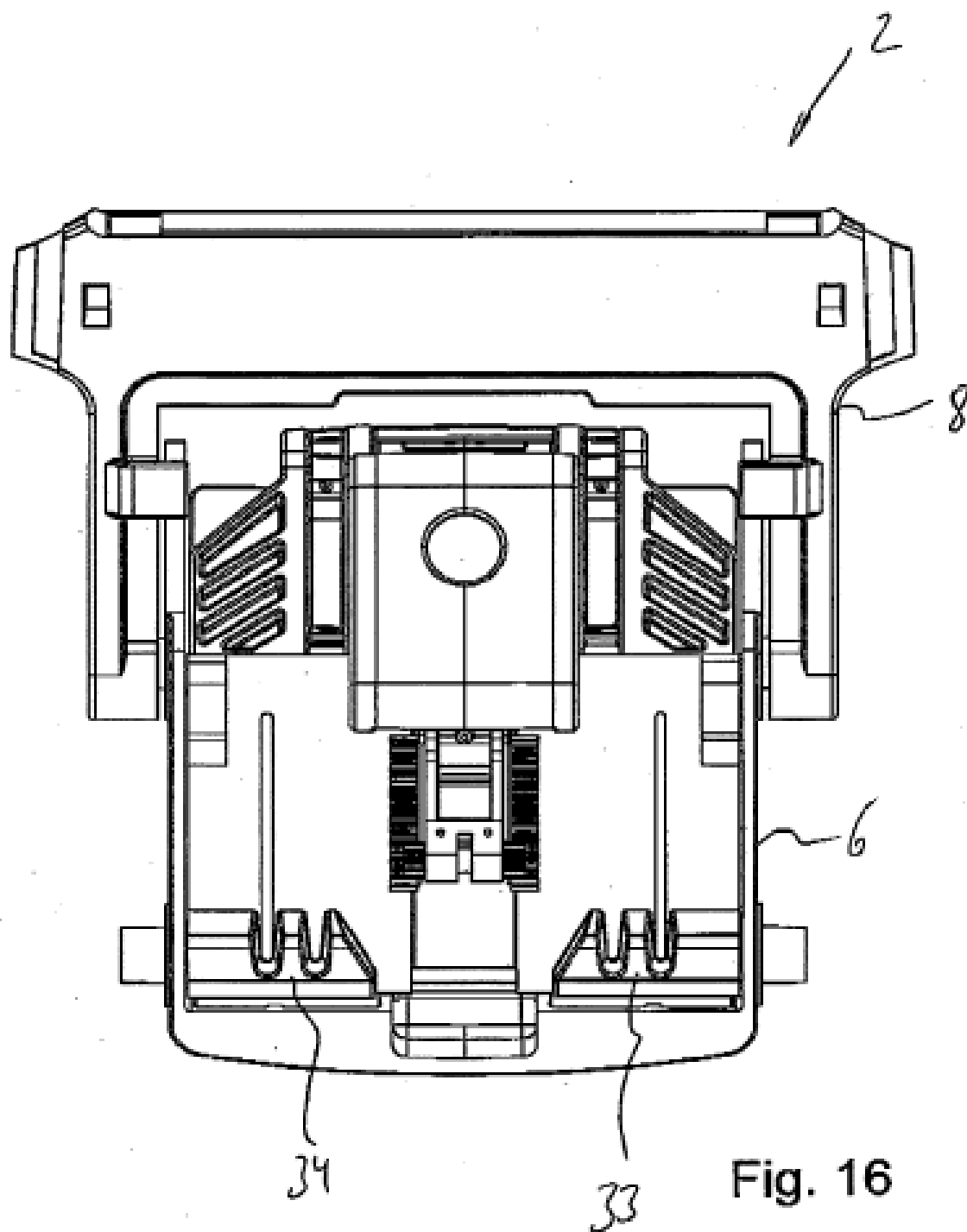


Fig. 16

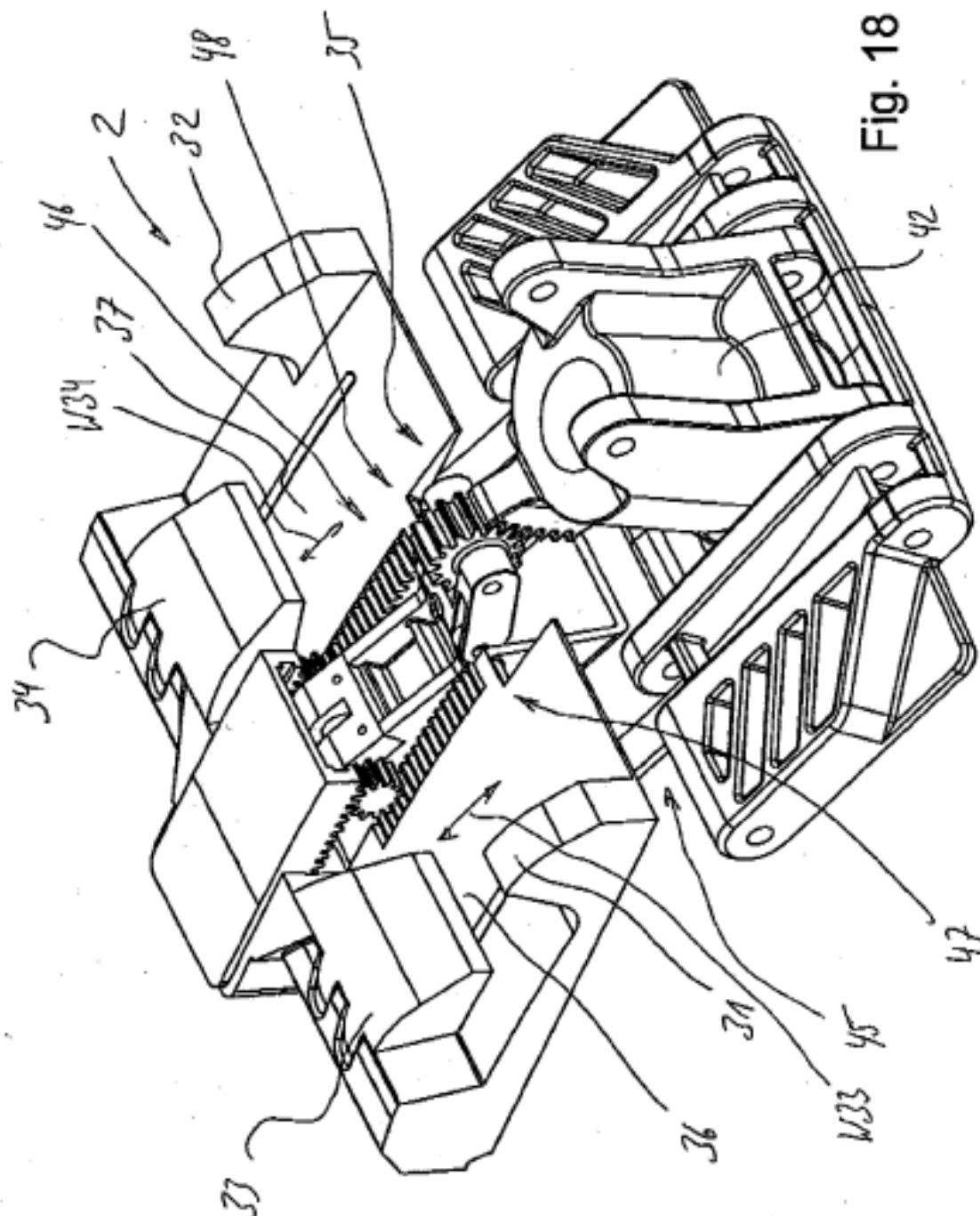


Fig. 18

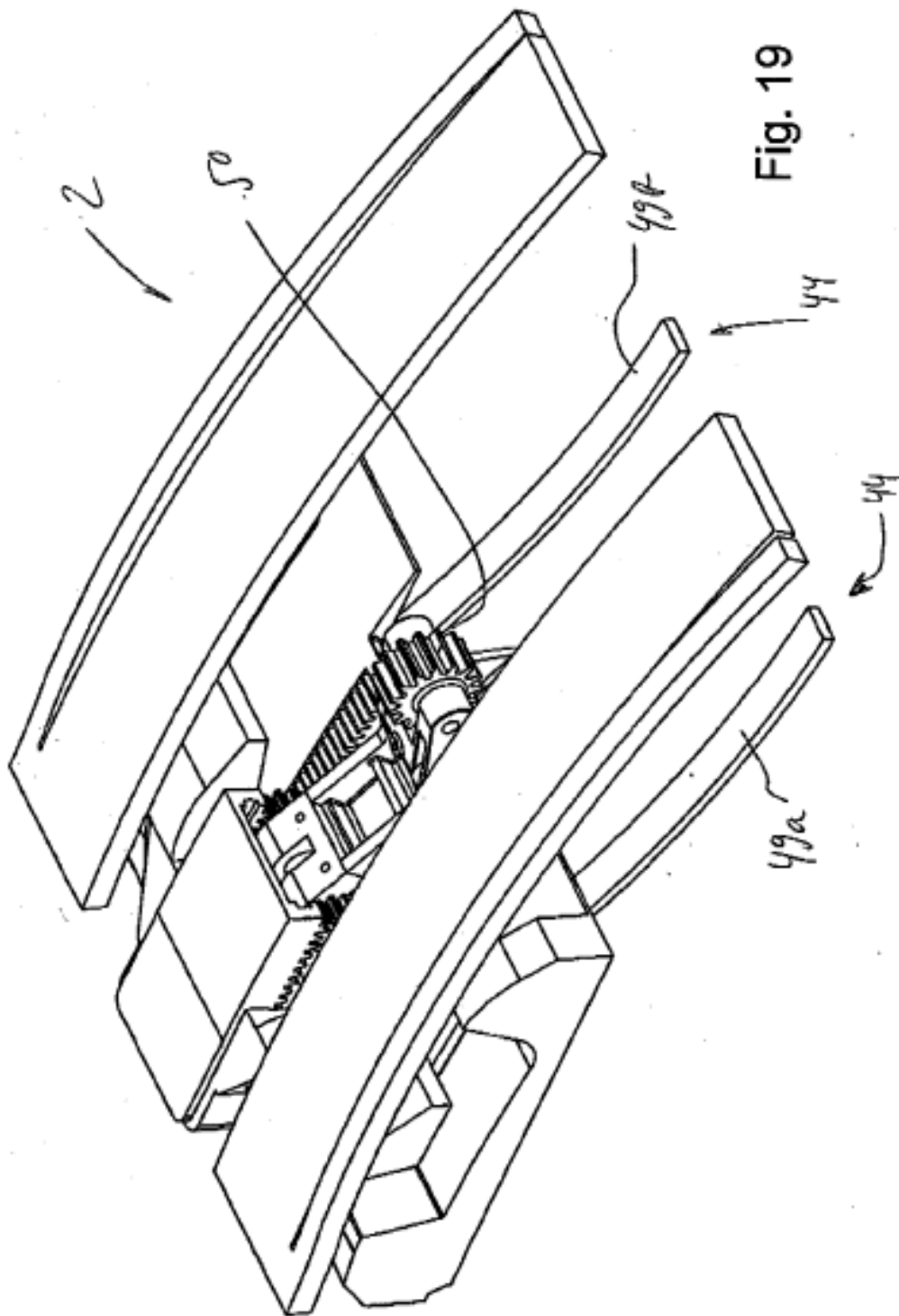


Fig. 19

VERIFIED STATEMENT OF TRANSLATION

I, Sabine Mepstead, being fluent in both the German and English languages, hereby certify under penalty of perjury under the laws of the United States, and in particular 37 CFR 1.68, that the attached English language translation of German Patent Application No. DE 10 2015 003 156.2 is accurate to the best of my knowledge and belief, understanding that willful false statements and the like are punishable by fine or imprisonment, or both under 18 U.S.C. § 1001.

I hereby certify under penalty of perjury that the foregoing is true and correct.

Sabine Mepstead

Name of Translator

A handwritten signature in cursive script, appearing to read 'Mepstead', written in dark ink.

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March 21, 2022