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(54) Benævnelse: **ENHED TIL ET DOSERINGSSYSTEM FOR EN SPREDEMASKINE TIL DISTRIBUTION AF ET GRANULÆRT MATERIALE ELLER LIGNENDE, DOSERINGSSYSTEM OG SPREDEMASKINE**

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DESCRIPTION

[0001] The present disclosure refers to an assembly for a dosing system of a spreader machine for distributing a granular material or the like, a dosing system, and a spreader machine, specifically an agricultural spreader machine.

Background

[0002] Spreader or distributing machines are used for distributing a granular material or the like. In case of an agricultural spreader machine a fertilizer may be distributed. Document EP 0 511 714 A2 refers to a spreader machine which is provided with an arrangement comprising to spreader disk. The granular material to be distributed by the spreader machine is received in a storage container or tank. From the storage container the granular material is provided to the spreader disks. On its way from the storage container to the spreader disk the granular material is dosed by a dosing system, thereby, controlling the amount of granular material distributed per time.

[0003] In the document DE 10 2007 045 905 A1, a dosing device for a spreading unit of a centrifugal spreader comprising at least one rotatingly driven throwing disk equipped with throwing vanes is disclosed. The dosing device comprises at least one flow opening which can be adjusted in terms of its opening width and position with respect to the centrifugal disk and which has at least one opening contour. Via the flow opening, the granular material to be discharged, which is located in the storage container assigned to the dosing device can be supplied to the throwing disk in adjustable amounts. Different opening contours for the flow opening are provided. A further dosing assembly is disclosed in US 8 657 208 B2.

Summary

[0004] It is an object of the present disclosure to provide an assembly for a dosing system of a spreader machine for distributing a granular material or the like, a dosing system, and a spreader machine which allow for improved dosing of the material to be distributed.

[0005] For solving the problem, an assembly for a dosing system of a spreader machine for distributing a granular material according to the independent claim 1 is provided. Further, a dosing system for a spreader machine and a spreader machine according to the claims 10 and 11, respectively, are provided. Further embodiments are disclosed in the dependent claims.

[0006] According to the invention, an assembly for a dosing system of a spreader machine for distributing a granular material or the like is provided. The assembly comprises: a first member provided with a first opening; a second member provided with a second opening; and an

actuator connected to at least one of the first and second members and configured to provide a driving force for relative movement between the first and second members, thereby, adjusting an opening size of a dosing opening provided by an overlapping area in which the first and second openings are overlapping. The first and second members are moveable by the relative movement into a first position providing the dosing opening with a first opening size and a second position different from the first position and providing the dosing opening with a second opening size different from the first opening size, wherein a center portion of the dosing opening being locally fixed when the first and second members are moved between first and second positions.

[0007] According to a further aspect, a dosing system for a spreader machine for distributing a granular material or the like is provided, the dosing system comprising the assembly.

[0008] According to still a further aspect, a spreader machine for distributing a granular material or the like is provided, the spreader machine comprising: a storage container for receiving a granular material to be distributed, a spreading device configured for distributing the granular material, and a dosing system configured for dosing the granular material received from the storage container to the spreading device.

[0009] The relative movement provided for the first and second members allows for fine adjustment (fine-tuning) of the size of the dosing opening which is defined by the overlapping area for the first and second openings, the overlapping area being adjusted according to the relative position between the first and second members. Linear movement can be applied in small steps supporting exact dosing of the granular material.

[0010] If the first and the second members are provided in a first relative position or orientation to each other, the opening size of the dosing opening is provided with a first size. Changing the relative position or orientation of the first and second members to each other will provide them in a second relative position, thereby, establishing a second opening size of the dosing opening different from the first opening size. For amending or adjusting the size the overlapping area in which the first and second openings are overlapping is adjusted. A closed position may be provided for the dosing opening if there is no overlapping between the first and second openings.

[0011] The center (portion, spot or area) of the dosing opening is kept in a non-moved or non-relocated position. If a spreading device located underneath of the assembly does not change its relative position to the assembly, such fixing of the center portion of the dosing opening may ensure keeping a center of the discharging of the granular material to the spreading device while the opening size of the dosing opening is adjusted by relative movement between the first and second members.

[0012] With regard to a throughput of the granular material through the dosing opening, a throughput of at least about 300 kg / min may be provided in operation.

[0013] The assembly may comprise a guiding mechanism configured for linearly guiding at least one of the first and second members for the linear movement. The guiding mechanism provided for guidance while the at least one of the members is moved may comprise one or more guiding slots provided, for example, in at least one of the first and second members. Within such guiding slot a pin or projection may be received and guided while the linear movement or motion is conducted.

[0014] The assembly may further comprise a first hinge connecting the actuator to the first member. The first hinge may comprise one or more lever arms for connecting the actuator to the first member. In an example an extracting and retracting actuator element of the actuator may be connecting to the first hinge, and, thereby, functioning together with the first hinge for driving linear movement or motion.

[0015] The assembly may comprise a second hinge connecting the actuator to the second member. The embodiments or design options outlined for the first hinge above may apply to the second hinge *mutatis mutandis.*

[0016] The second member may be forced movable (forced movement) in response to movement of the first member, the movement driven by the actuator. If the first member is driven to be moved, such motion of the first member will forcibly cause movement of the second member. In this case relative movement between the first and second members comprises moving both the first and second members. It may be similarly foreseen that the first member is forced to move in case the second member is driven for movement. Thus, synchronized movement or motion of the first and the second members may be applied.

[0017] At least one of the first and the second openings may be a square opening. At least one of the first and the second openings may be provided with a square opening having the same length on all sides of the opening, for example, on all four sides of the square opening.

[0018] The dosing opening may be a square opening. By the relative movement between the first and second members corner sections of the first and second openings provided opposite to each other may be moved in a closer or more distant position. The dosing opening may be provided with a quadratic opening shape (quadratic opening or hole).

[0019] A first type of shape of the dosing opening provided in the first position may be equal to a second type of shape of the dosing opening provided in the second position. In this embodiment, a first type of shape of the dosing opening, if the first and second openings are in a first overlapping position, is equal to a second type of shape of the dosing opening after the first and second openings moved to a second overlapping position different from the first overlapping position. In this case, by the relative movement between the first and second members (causing relative movement between the first and second openings) the type of shape of the opening does not change. For example, in the different relative positions between the first and second members the dosing opening may be provided with a square opening (shape). Still, depending on the relative position of the first and second members the dosing

opening is provided with different opening size. Depending on the size of the dosing opening more or less granular material can pass through the doping dosing opening.

[0020] The first and second members are configured to synchronously move while conducting the relative movement. With regard to such example or other embodiments, there may be a single actuator for moving both the first and the second members for relative movement. Alternatively, each of the first and second members may be assigned an individual actuator. The actuators may be controlled by a controller device, thereby, also allowing synchronized movement of the first and the second members.

[0021] According to an example not being part of the scope of the invention, the first and second members may be moved non-synchronously. For adjusting the size of the dosing opening, first the first member may be moved followed by movement of the second member for finally adjusting the dosing opening.

[0022] In the different embodiments, adjustment of the size of the dosing opening may be conducted by moving both the first and the second member.

[0023] The relative movement is conducted by linear movement of at least one of the first and second members. The linear movement or motion is provided by a one-dimensional motion or movement along a straight line. Being not part of the scope of the invention is the relative movement being conducted by applying rotational movement.

[0024] For providing the driving force for the relative movement between the first and second members, at least one of a cylinder extractable and retractable, and a toothed-wheel-rack mechanism may be provided. The cylinder may be provided with a hydraulic or a pneumatic cylinder. For the cylinder, a piston may be provided in chamber, the piston being connected to a piston rod which in operation can be extracted and retracted. With regard to the toothed-wheel-rack mechanism, the toothed-wheel may be driven by an electric motor. Two racks may be provided on opposite sides of the toothed-wheel, thereby, driving or moving both racks by rotating the toothed-wheel. The two racks may be connected to the first and the second members, thereby, causing relative movement between the first and second members if the toothed-wheel is driven.

[0025] At least one of the first member and the second member may be provided with a plate member. For this or other examples, the first and second members may be located above each other in a vertical direction. Plate members provided for both the and second members may be provided in a parallel position. It may be provided that the first and second members are sliding on each other in case of relative movement between the first and second members. With regard to the plate members or other embodiments, the first and second openings may be provided in a center area of the first and the second member, respectively.

[0026] The embodiments outlined above may apply to at least one of the dosing system and the spreader machine *mutatis mutandis.* The spreader machine may be an agricultural

spreader machine for distributing, for example, a fertilizer.

Description of further embodiments

[0027] Following, further embodiments are described in further detail by referring to figures. In the figures show:

Fig. 1
a schematic representation of an arrangement of elements for a spreader machine for distributing a granular material or the like;

Fig. 2
a schematic perspective view of an assembly for a dosing system of a spreader machine for distributing a granular material or the like;

Fig. 3
a top view of the assembly in Fig. 2,

Fig. 4
a perspective view from the bottom of the assembly in Fig. 2;

Fig. 5
a bottom view of the assembly in Fig. 2;

Fig. 6
a schematic top view of another assembly for a dosing system of a spreader machine for distributing a granular material or the like; and

Fig. 7
a schematic bottom view of the further assembly from Fig. 6.

[0028] Fig. 1 shows a schematic representation of an arrangement for a spreader or distributor machine such as an agricultural spreader machine, for example, for distributing a fertilizer material. Granular material to be distributed is received in a storage container or tank 1 which may be carried, for example, by a tractor or may be provided on an implement. For spreading or distributing the granular material it is provided to a spreading device 2 comprising, for example, one or two spreader disks as it is known as such for different types of spreader devices. For having the granular material provided from the storage container 1 to the spreading device 2 depending on the work situation, a dosing system 3 is provided between the storage container 1 and the spreader device 2. The granular material to be distributed is provided from the storage container 1 to the dosing system 3 which will dose the granular material to the spreader device 2. This is schematically shown in Fig. 1 by an arrow 4.

[0029] Following, with reference to Fig. 2 to 7 embodiments for an assembly for a dosing system for a spreader machine for distributing a granular material or the like are described. For example, the assembly may be applied in the arrangement depicted in Fig. 1.

[0030] Fig. 2 to 5 show an assembly 10 for a dosing system of a spreader machine. A first member 11 and a second member 12 are provided above each other. In the example shown in Fig. 1 the first and the second member 11, 12 are provided with a plate member 11a, 12a. The first and the second members 11, 12 are movable relative to each other. In case of movement there is a guiding mechanism 13 provided with guiding slots 14 and guiding pins 15 for guiding or supporting linear movement.

[0031] By the linear movement an overlapping area 16 in which a first opening 17 provided in the first member 11 and a second opening 18 provided in the second member 12 are overlapping, thereby, providing a dosing opening 19. Through the dosing opening 19 the granular material to be distributed or spread can pass on its way from the storage container 1 to the spreading device 2 (see Fig. 1). By adjusting the overlapping area 16 regarding its size the dosing of the granular material can be controlled.

[0032] In the example shown both the first and the second openings 17, 18 are provided with a square opening shape. Also, the dosing opening 19 does have a square shape which is kept in the different relative positions between the first and the second member 11, 12.

[0033] A center portion or area 19a of the dosing opening is kept in a fixed location if the first and second members 11, 12 are moved relative to each other by synchronous movement.

[0034] For causing relative linear movement between the first and the second members 11, 12 there is an actuator 20 coupling to both the first and the second members 11, 12. There are hinges 21, 22 connecting to a lever arm 23 (see Fig. 4 and 5). Consequently, if a rod element 24 of the actuator 20 is extracted or retracted both the first and the second member 11, 12 will be forced to linearly move, thereby, adjusting the size of the dosing opening 19. A center portion of the dosing opening 19 will be kept in the same position (not moving).

[0035] Referring to Fig. 6 and 7, another assembly for a dosing system of the spreader machine is depicted. In Fig. 6 and 7 the same reference numeral are applied to the same features like in Fig. 2 to 5. In step of the combination of the hinges 21, 22 and the lever arm 23 there is a toothed-wheel 31 interacting with two racks 32, 33 provided on opposite sides of the toothed-wheel 31. Again, if the actuator provides a driving force, both the first and the second members 11, 12 are linearly moved relative to each other.

REFERENCES CITED IN THE DESCRIPTION

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- EP0511714A2 **[0002]**
- DE102007045905A1 **[0003]**
- US8657208B2 **[0003]**

ENHED TIL ET DOSERINGSSYSTEM FOR EN SPREDEMASKINE TIL DISTRIBUTION AF ET GRANULÆRT MATERIALE ELLER LIGNENDE, DOSERINGSSYSTEM OG SPREDEMASKINE

Patentkrav

1. Enhed til et doseringssystem (3) for en spredemaskine til distribution af et granulært materiale, der omfatter
   - et første element (11) forsynet med en første åbning (17);
   - et andet element (12) forsynet med en anden åbning (18); og
   - en aktuator (20), der er forbundet til mindst et af det første og andet element (11, 12) og konfigureret til at tilvejebringe en drivkraft til relativ bevægelse udført ved lineær bevægelse mellem det første og andet element (11, 12), hvorved der justeres en åbningsstørrelse af en doseringsåbning (19) tilvejebragt af et overlappende område (16), i hvilket den første og den anden åbning (17, 18) overlapper, hvor det første og det andet element (11, 12) er konfigureret til at bevæge sig synkront, mens den relative bevægelse udføres;

   hvor det første og det andet element (11, 12) er konfigureret til at bevæges af den relative bevægelse til en første position, der tilvejebringer doseringsåbningen (19) med en første åbningsstørrelse, og en anden position, der er forskellig fra den første position og tilvejebringer doseringsåbningen (19) med en anden åbningsstørrelse, der er forskellig fra den første åbningsstørrelse, hvor en midterdel (19a) af doseringsåbningen (19) er fastgjort lokalt, når det første og det andet element (11, 12) bevæges mellem første og anden position.

2. Enheden ifølge krav 1, der yderligere omfatter en styremekanisme (13), der er konfigureret til lineær styring af mindst et af det første og andet element (11, 12) til den lineære bevægelse.

3. Enheden ifølge mindst et af de foregående krav, der yderligere omfatter et første hængsel (21), der forbinder aktuatoren (20) med det første element (11).

4. Enheden ifølge krav 3, der yderligere omfatter et andet hængsel (22), der forbinder aktuatoren (20) med det andet element (12).

5. Enheden ifølge mindst et af de foregående krav, hvor det andet element (12) er tvunget til at bevæge sig som reaktion på bevægelse af det første element (11), idet bevægelsen er drevet af aktuatoren (20).

6. Enheden ifølge mindst et af de foregående krav, hvor mindst en af den første og anden åbning (17, 18) er tilvejebragt med en firkantet åbningsform.

7. Enheden ifølge mindst et af de foregående krav, hvor en første form af doseringsåbningen (19), der er tilvejebragt i den første position, er lig med en anden form for doseringsåbningen (19), der er tilvejebragt i den anden position.

8. Enheden ifølge mindst et af de foregående krav, hvor aktuatoren (20) (20) til tilvejebringelse af drivkraften til den relative bevægelse mellem det første og det andet element (11, 12) omfatter mindst en af
   - en cylinder, der kan udtrækkes og trækkes tilbage; og
   - en tandhjulsmekanisme.

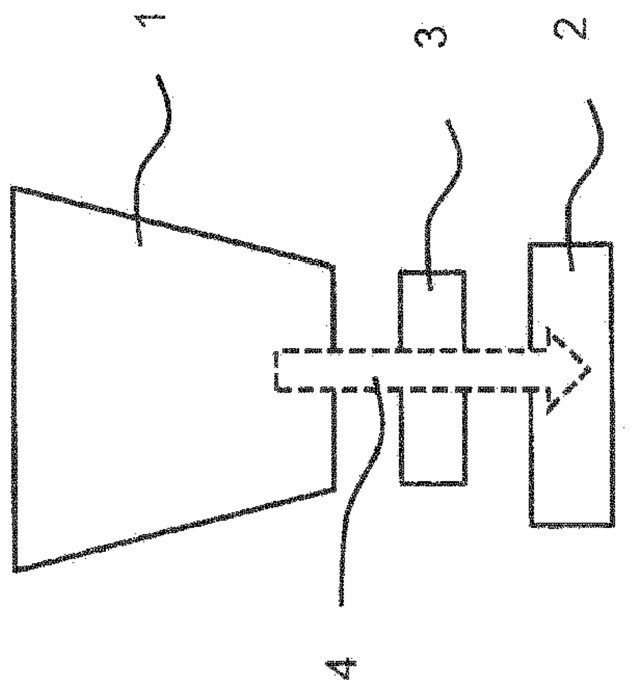
9. Enheden ifølge mindst et af de foregående krav, hvor mindst et af det første og det andet element (11, 12) er forsynet med pladeelement.

10. Doseringssystem (3) til en spredemaskine til distribution af et granulært materiale, der omfatter en enhed ifølge mindst et af de foregående krav.

11. Spredemaskine til distribution af et granulært materiale, der omfatter
    - en opbevaringsbeholder (1) til modtagelse af et granulært materiale, der skal distribueres;
    - en spredeanordning (2), der er konfigureret til distribution af det granulære materiale, og
    - et doseringssystem (3) ifølge krav 10, der er konfigureret til dosering af det granulære materiale, der modtages fra opbevaringsbeholderen (1), til spredeanordningen (2).

DRAWINGS

Fig. 1



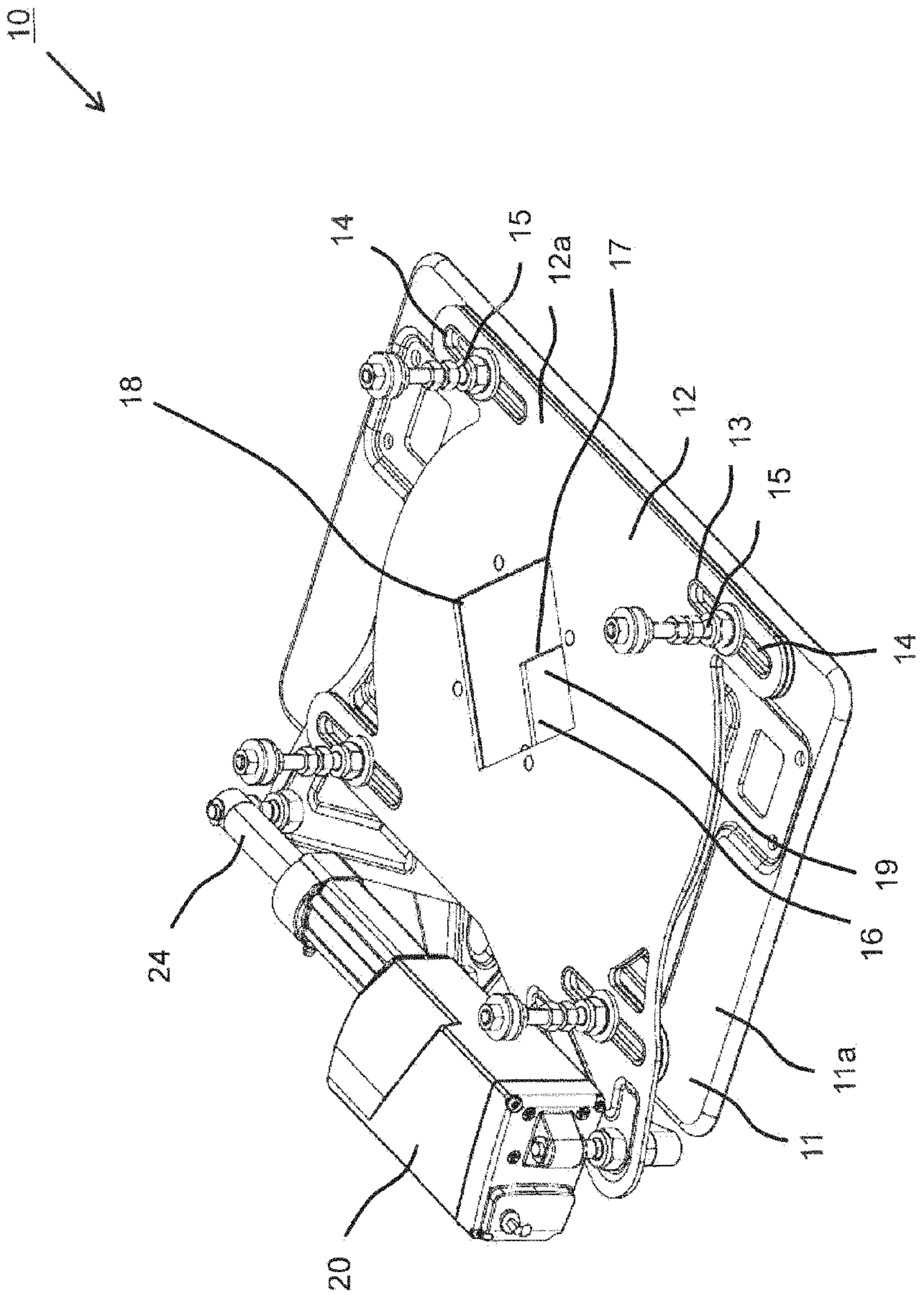


Fig. 2

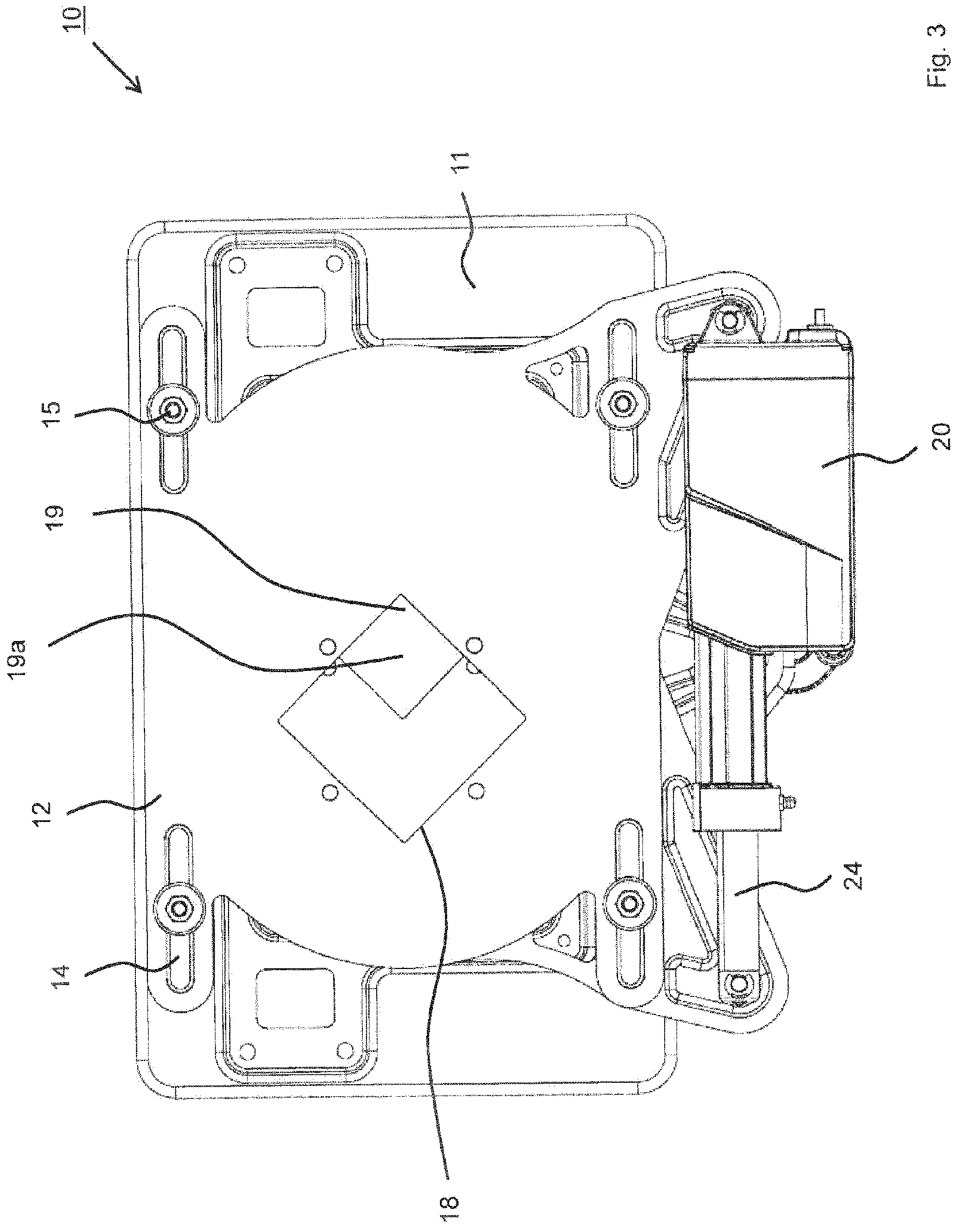


Fig. 3

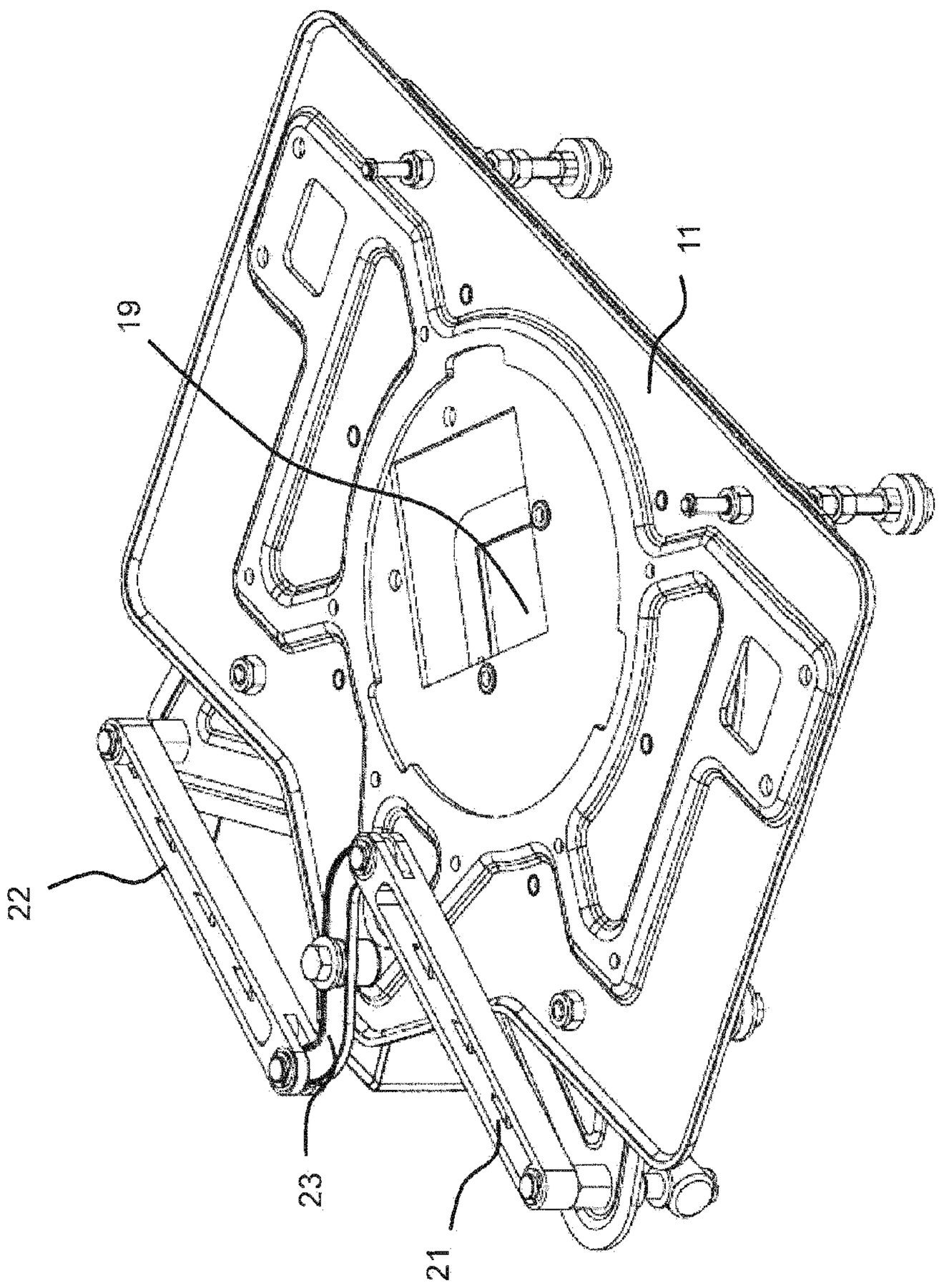
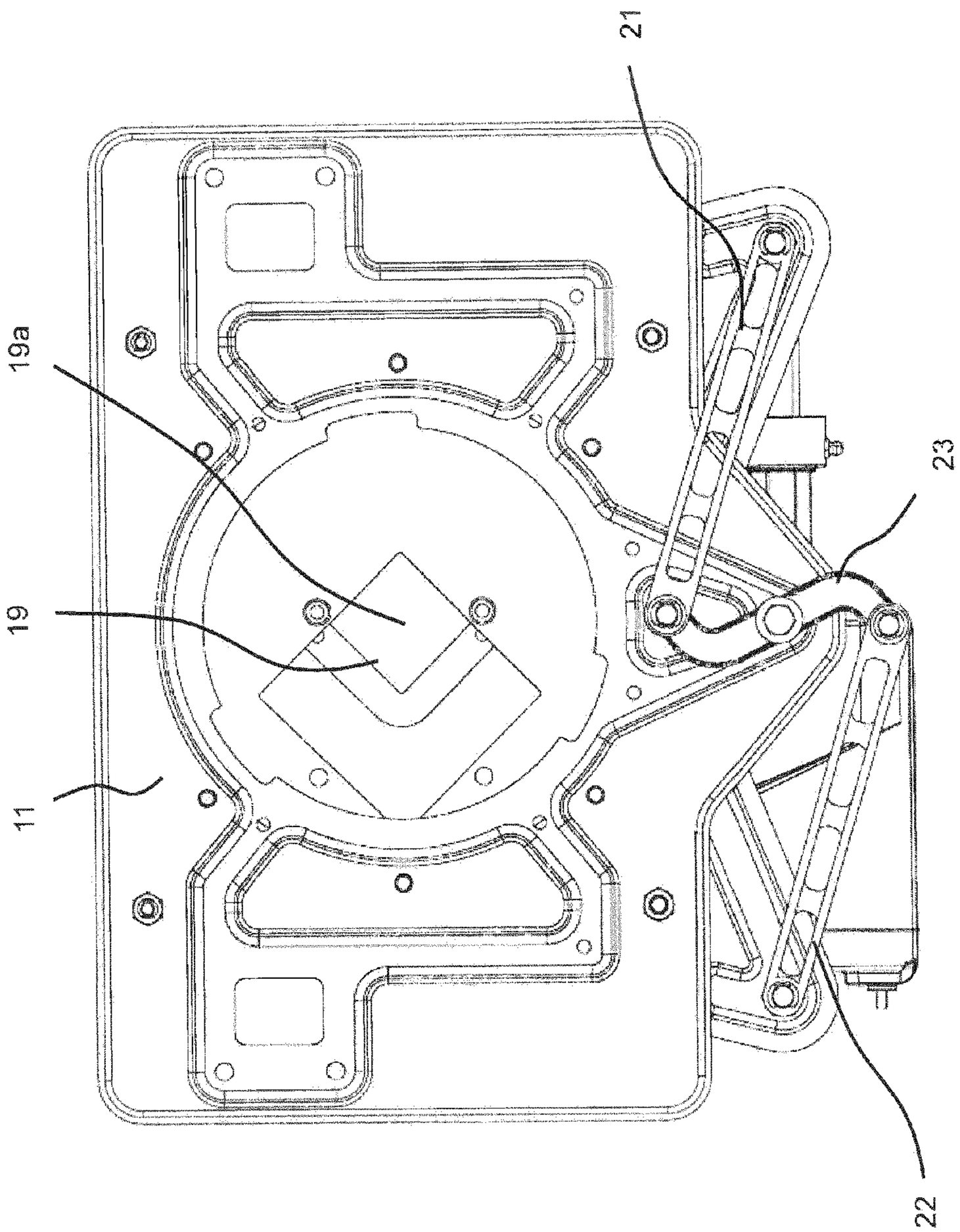


Fig. 4

Fig. 5



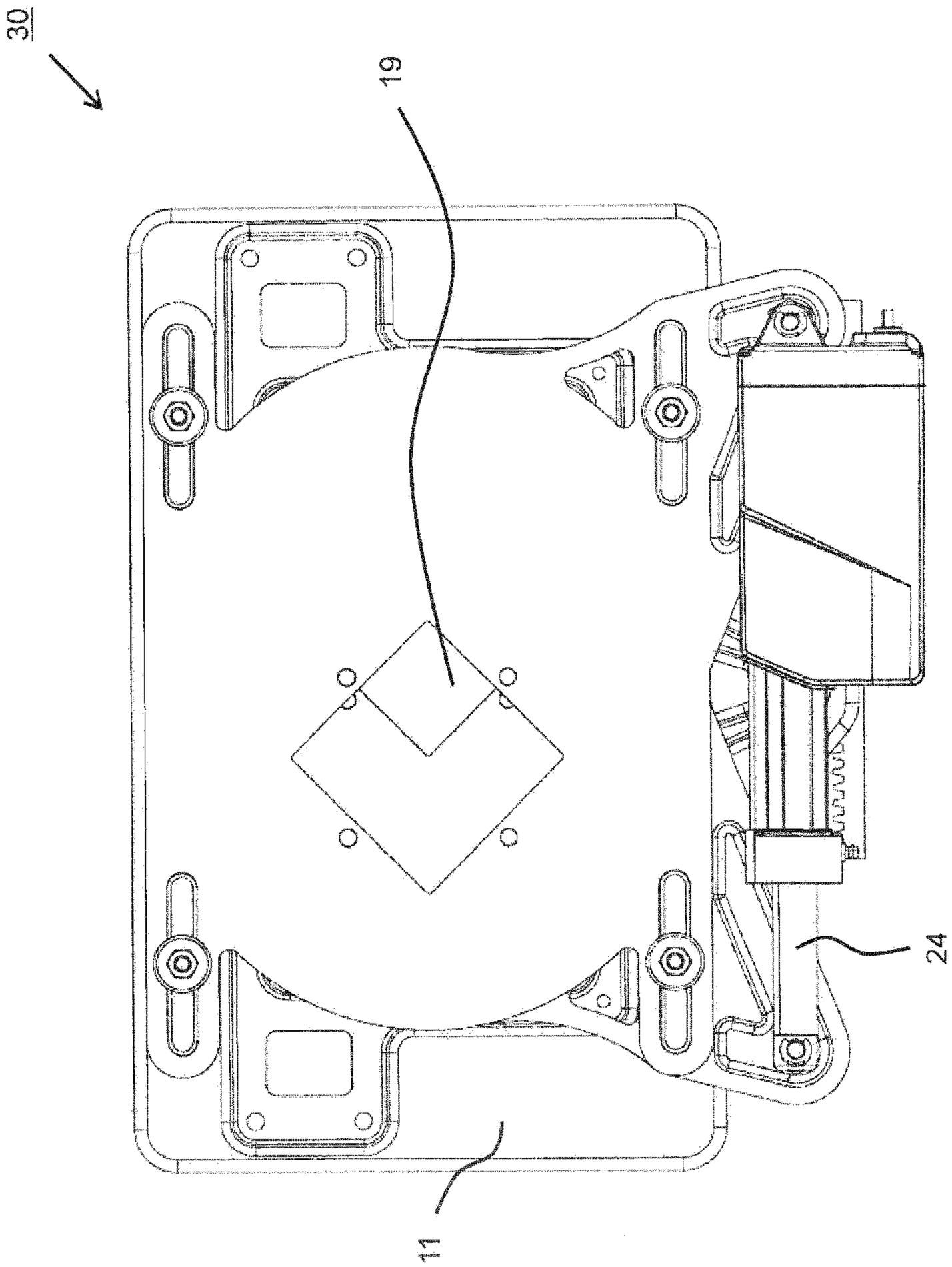


Fig. 6

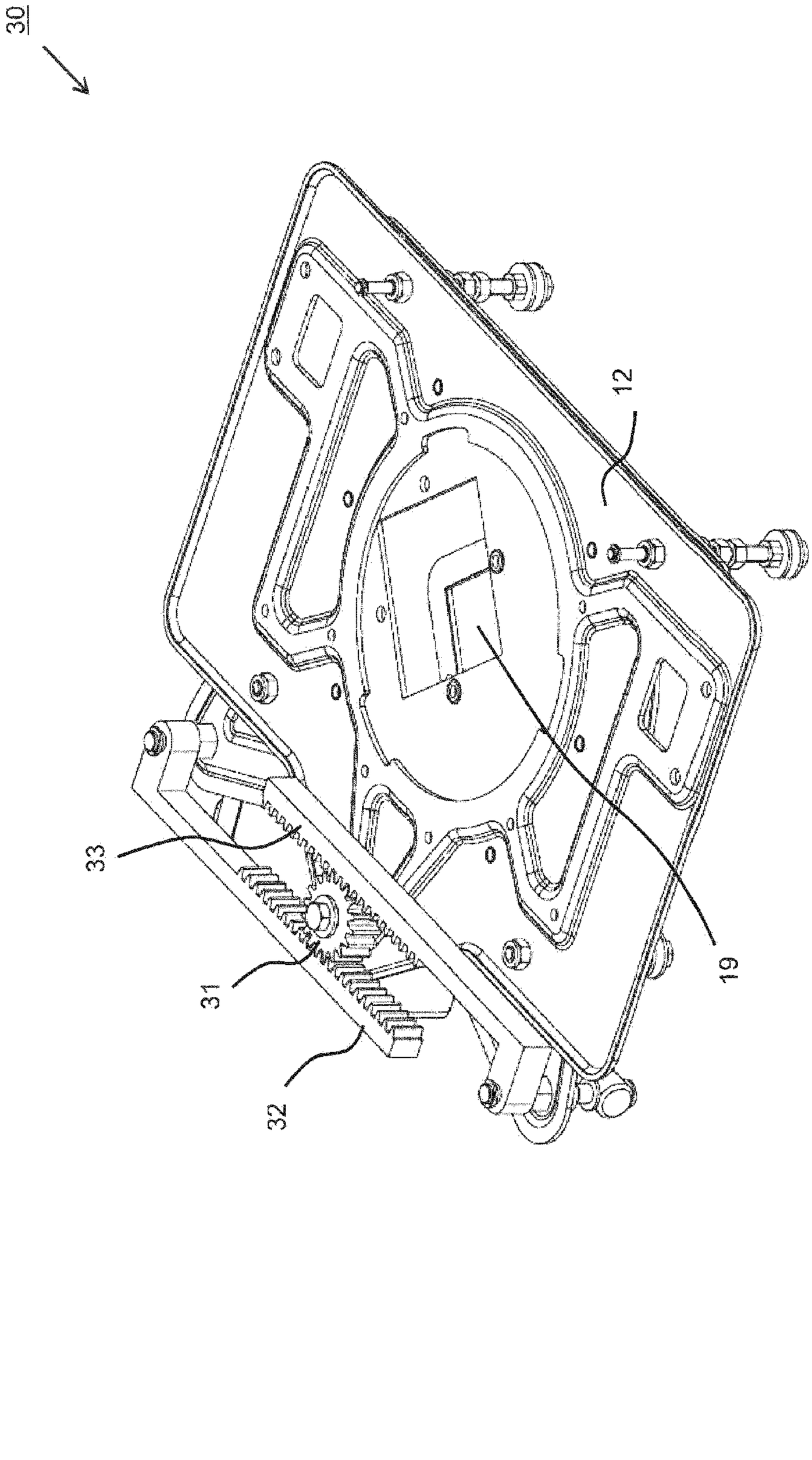


Fig. 7