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(54) **Electromechanical control device for rototranslating doors**

(57) Electromechanical control device for rototranslating doors, comprising a base plate (13b), a motor unit (15) arranged to pass from an engaged position to a disengaged position and vice versa, a clutch unit (17), a reduction unit (19) and a control unit (21), said motor unit being associated with a tilting plate connected to a control

lever associated with at least one emergency handle, the operation of the emergency handle being capable of causing the disengagement of said motor unit, wherein the motor unit (15) and the clutch unit (17) are associated with the base plate (13b) on the opposite side with respect to the reduction unit (19) and the control unit (21).

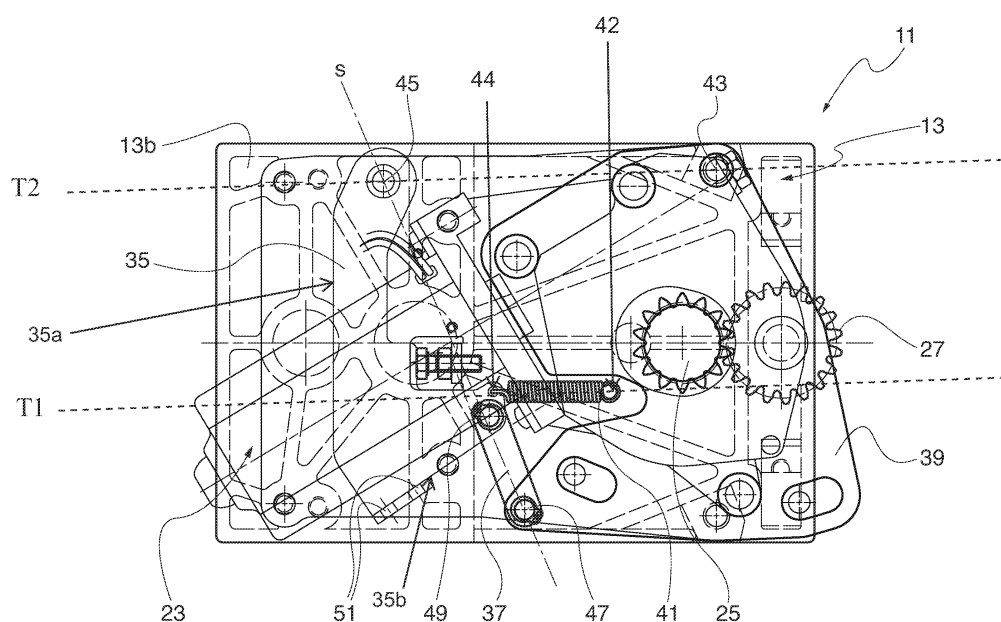


Fig. 2

Description

Technical field

[0001] The invention relates to an electromechanical control device for rototranslating doors.

[0002] More precisely, the invention relates to an electromechanical control device for rototranslating doors of vehicles, such as buses, people carriers and the like.

Prior art

[0003] Electromechanical control devices for rototranslating doors of passenger vehicles, such as buses and people carriers, are known in the art.

[0004] Such devices are generally equipped with an electric motor, a gear reduction unit for obtaining the desired transmission ratio, and a control unit for controlling the opening and closing of the door by means of a rod and a pair of arms associated with the rod.

[0005] An example of a device of the above kind is disclosed in ES 2070706.

[0006] For safety reasons, it is required that the doors of the above kind can be opened also in case of failure of the control device. For that reason, the control devices presently employed are equipped with a release system disengaging the electric motor from the reduction unit.

[0007] An example of such emergency release systems is disclosed in EP 1072749.

[0008] Generally, such release systems can be operated by means of a pair of safety handles, one of which is located inside the vehicle and the other outside the vehicle.

[0009] One of the drawbacks of the prior art devices is related with the need to exert a considerable effort in case of emergency, when the device has to be disengaged in order to allow the manual opening of the door.

[0010] This drawback is particularly severe if one considers that it is necessary that the door can be easily opened in case of emergency even by a child or an aged person.

[0011] Another drawback of the prior art is related with the complexity of the solutions adopted until now, which consequently demand frequent maintenance and entail high manufacture costs.

[0012] A further, but not the last, drawback of the prior art devices is related with the need to obtain a sufficient reduction ratio to allow using reduced power motors or, in any case, to avoid overloads on the motor and to lengthen its useful life. Obtaining an adequate reduction ratio entails however providing a gear chain which is the more cumbersome the higher the reduction ratio, and this leads either to the impossibility of obtaining adequate reduction ratios when it is desired to keep the device compact, or to the need to increase the size of the housing of the device.

[0013] The invention aims at solving the drawbacks mentioned above by providing an electromechanical

control device for rototranslating doors, which device can be disengaged easily and with a minimum effort and can be industrially manufactured at advantageous costs.

Description of the invention

[0014] Advantageously, thanks to the fact that the movable clutch unit comprises a control lever and a tilting plate on which the motor is mounted, which lever and plate are mutually articulated by means of a return arm, and that a resilient element arranged to keep the control lever in the arrangement corresponding to the engaged condition of the motor unit is arranged between the control lever and the device base, in such a way that it is necessary to overcome the resistance of said resilient element to obtain the passage to the disengaged condition, the effort demanded for manually disengaging the motor unit from the clutch unit is reduced with respect to the prior art devices.

[0015] A further advantage of the invention is related with the separate arrangement of the motor and clutch units on the one hand, and the reduction unit on the other hand, with respect to the base plate of the device. More particularly, such an arrangement allows obtaining a further reduction torque between the motor unit and the reduction unit, with the advantage that the size of the gears in the reduction unit can be reduced for a given desired reduction ratio.

[0016] Moreover, thanks to the arrangement of the motor unit and the clutch unit outside the housing of the device, the considerable advantage is obtained that a quick replacement of the pinion of the motor-reducer and of the gear wheel of the reduction unit is possible, with the consequent possibility of easily and economically varying the reduction ratio depending on the intended use of the device and on the motor employed.

Brief Description of the Figures

[0017]

- Fig. 1 is a diagrammatical overall view of the control device according to the invention, associated with an emergency handle;
- Fig. 2 is a top view, in transparency, of the device shown in Fig. 1, in engaged condition;
- Fig. 3 is a top view, in transparency, of the device shown in Fig. 1, in disengaged condition;
- Fig. 4 is a top view of the device shown in Fig. 1, in engaged condition;
- Fig. 5 is a top view of the device shown in Fig. 1, in disengaged condition;
- Fig. 6 is a sectional side view of the device shown in Fig. 1, in engaged condition.

Description of a Preferred Embodiment

[0018] With reference to the accompanying drawings,

the control device according to the invention, which is generally denoted by reference numeral 11, includes a base plate 13b, a motor unit 15, a clutch unit 17, a reduction unit 19 and a control unit 21.

[0019] The device further includes a housing 13, substantially made as a parallelepiped box in which flanks 13a, base plate 13b and a removable cover 13c for accessing the elements housed within the box are defined. Housing 13 is preferably made of metal, e.g. steel or aluminium.

[0020] Motor unit 15 comprises an electric motor-reducer 23 having a drive pinion 25.

[0021] In accordance with the invention, motor unit 15 is associated with a clutch unit 17 by means of which pinion 25 can be brought into engagement with or disengaged from a corresponding input gear wheel 27 of reduction unit 19.

[0022] Always in accordance with the invention, said motor unit 15 and said clutch unit 17 are associated with base plate 13b on the opposite side with respect to the reduction unit and the control unit and to the housing in which the latter two units are preferably housed, and therefore the motor and clutch units can be easily accessed and inspected.

[0023] Reduction unit 19 comprises cascaded gears 29a, 29b, 29c, 29d arranged to provide the desired reduction ratio between said motor-reducer 23 and control unit 21. Reduction unit 19 is housed within housing 13, on the opposite side of base 13b with respect to clutch unit 17, which, on the contrary, is preferably housed outside said housing 13 and is protected by a suitable casing.

[0024] Control unit 21 includes a control shaft 31, integral with gear 29d and having associated therewith a grooved stud 33 of a ball screw or the like, which controls, in conventional manner, the opening and closing of a vehicle door (not shown).

[0025] Always in accordance with the invention, clutch unit 17 comprises a control lever 35, a return arm 37, a tilting plate 39 on which motor-reducer 23 is secured, and a resilient element 41.

[0026] Said control lever 35, said return arm 37 and said tilting plate 39 are so arranged that, when drive pinion 25 is meshing with gear wheel 27 (Figs. 2 and 6), tilting plate 39 can be rotated about hinge pin 43 relative to base 13b in order to bring pinion 25 into disengaged condition (Fig. 3) with a minimum effort. Such an arrangement is achieved since hinge pins 47, 49 of return arm 37, which is approximately rectilinear, are substantially aligned along axis "S" passing through hinge pin 45 pivotally connecting control lever 35 to base plate 13b. More precisely, said arrangement is such that, in said engaged condition, hinge pin 49 pivotally connecting return arm 37 to control lever 35 is slightly offset towards tilting plate 39 with respect to axis "S".

[0027] Said control lever 35 has a fastening zone 51, defined for instance by a pair of corresponding holes for fastening the ends of respective control cables 53 asso-

ciated with respective emergency handles 55 (one of which is shown in Fig. 1), one of such handles being generally located inside the vehicle and the other outside the vehicle.

[0028] In accordance with the invention, control lever 35 is L-shaped and leg 35a and foot 35b of the "L" are mutually inclined so as to form an acute angle directed towards tilting plate 39. Moreover, the upper end of leg 35a is pivotally connected at 45 to base 13b and the end of foot 35b is pivotally connected at 49 to return arm 37. Furthermore, said fastening zone 51 is formed in correspondence of the portion connecting leg 35a and foot 35b of the "L", so that said fastening zone 51 is substantially laterally spaced apart with respect to the other parts of the device, and in particular with respect to return arm 37, thereby reducing the risks of interference among the moving parts.

[0029] In accordance with the invention, resilient element 41 is aimed at keeping control lever 35 in the position corresponding to the engaged condition of pinion 25 and is preferably arranged between control lever 35 and base plate 13b. More precisely, according to a preferred embodiment, said resilient element 41 comprises a coil spring or similar device, having a first end fastened to base 13b at 42 and the opposite end fastened to control lever 35 at 44. Advantageously, said fastening point 44 provided for fastening one end of resilient element 41 to control lever 35 is located near or at hinge pin 49 pivotally connecting return arm 37 to control lever 35. Preferably, said fastening point 44 coincides with hinge pin 49 or is located at most at a very small distance from said pin, preferably 5 to 10 mm, sufficient to avoid interference between return arm 37 and resilient element 41 during operation of control lever 35 and the consequent rotation of tilting plate 39. Moreover, always in accordance with the invention, said fastening points 42 and 44 of resilient element 41 are aligned along an axis "T1" that is substantially parallel with axis "T2" passing through hinge pins 43 and 45 of tilting plate 39 and control lever 35, respectively, when pinion 25 is in engaged condition, said axes defining an angle of a few degrees, preferably an angle smaller than 30°, when said pinion is in disengaged condition.

[0030] Advantageously, thanks to the association of motor unit 15 with a movable clutch unit 17 having the described arrangement, it is possible to disengage pinion 25 of motor-reducer 23 from reduction unit 19 by acting on emergency handles 55 and, consequently, to allow the manual opening of the door, with a minimum effort.

[0031] As known, when the door is closed, the locking torque exerted by the motor-reducer in correspondence of pinion 25 and gear wheel 27 is particularly high and, in any case, is such that the mutual disengagement of said pinion 25 and gear wheel 27 would require a considerable effort. Notwithstanding this, thanks to the described arrangement, pinion 25 can be easily moved away from gear wheel 27 by exerting a force sufficient to overcome the resistance of spring 41 and to bring hinge

pin 49 of return arm 37 on the opposite side of axis "S" with respect to the position taken when pinion 25 is meshing with gear wheel 27.

[0032] It is clear that the above description has been given only by way of non limiting example and that changes and modifications to the described embodiment, in particular in respect of shape, size, materials, types of components etc. are possible without departing from the scope of the invention. Further applications, besides those mentioned above, are possible as well.

Claims

1. Electromechanical control device (11) for rototranslating doors, comprising a base plate (13b), a motor unit (15) arranged to pass from an engaged position to a disengaged position and vice versa, a clutch unit (17), a reduction unit (19) and a control unit (21), wherein said clutch unit comprises a tilting plate (39) and a control lever (35) pivotally connected to the base plate at respective first hinge pins (43, 45) and mutually articulated by means of a return arm (37) in turn pivotally connected to said tilting plate and said control lever at respective second hinge pins (49, 47), said motor unit being associated with said tilting plate and said control lever being associated with at least one emergency handle, the operation of the emergency handle being capable of causing the rotation of said control lever and said tilting plate by means of said return arm, **characterised in that** said motor unit (15) and said clutch unit (17) are associated with the base plate (13b) on the opposite side with respect to the reduction unit (19) and the control unit (21).
2. Device according to claim 1, comprising a resilient element (41) fastened to the control lever (35) and to the base plate and aimed at keeping the control lever (35) in the position corresponding to the engaged position of the motor unit (15), in such a way that it is necessary to overcome the resistance of said resilient element in order to make the motor unit pass from the engaged position to the disengaged position.
3. Device according to claim 2, wherein one end of the resilient element (41) is fastened to the control lever (35) near or at the hinge pin (49) pivotally connecting the return arm (37) to the control lever (35).
4. Device according to claim 3, wherein the fastening points (42, 44) at which the resilient element (41) is fastened to the control lever and to the base plate (13b) are aligned along an axis (T1) that is substantially parallel with the axis (T2) passing through the hinge pins (43, 45) pivotally connecting the tilting plate (39) and the control lever (35) to said base
5. Device according to claim 1, wherein the control lever (35) has a zone (51) for fastening the end of at least one control cable (53) associated with an emergency handle (55), and wherein said lever (35) is L-shaped and has a respective leg (35a) and foot (35b) mutually inclined so as to define an acute angle directed towards the tilting plate (39).
6. Device according to claim 5, wherein said zone for fastening the control cable is provided with a pair of holes (51) for fastening the ends of respective control cables (53) associable with respective emergency handles (55).
7. Device according to claim 5, wherein the control lever (35) is pivotally connected to the base (13b) at the upper end of the leg (35a) and wherein the return arm (37) is pivotally connected to the control lever (35) at the free end of the foot (35b).
8. Device according to claim 7, wherein said zone (51) for fastening the control cable is provided in correspondence of the portion connecting the leg (35a) and the foot (35b) of the L-shaped lever, so that said fastening zone (51) is substantially laterally spaced apart with respect to the other parts of the device, and in particular with respect to the return arm (37), thereby reducing the risks of interference among the moving parts.
9. Control device according to claim 1, including a housing (13) substantially made as a parallelepiped box having flanks (13a), a base (13b) and a removable cover (13c) for accessing the elements housed within the box.
10. Control device according to any preceding claim, wherein said reduction unit (19) comprises cascaded gears (29a, 29b, 29c, 29d) arranged to provide the desired reduction ratio between the motor unit (15) and the control unit (21).
11. Control device according to claims 9 and 10, wherein said reduction unit (19) is housed within the housing (13) at the opposite side of the base (13b) with respect to the clutch unit (17), which in turn is housed outside said housing (13).

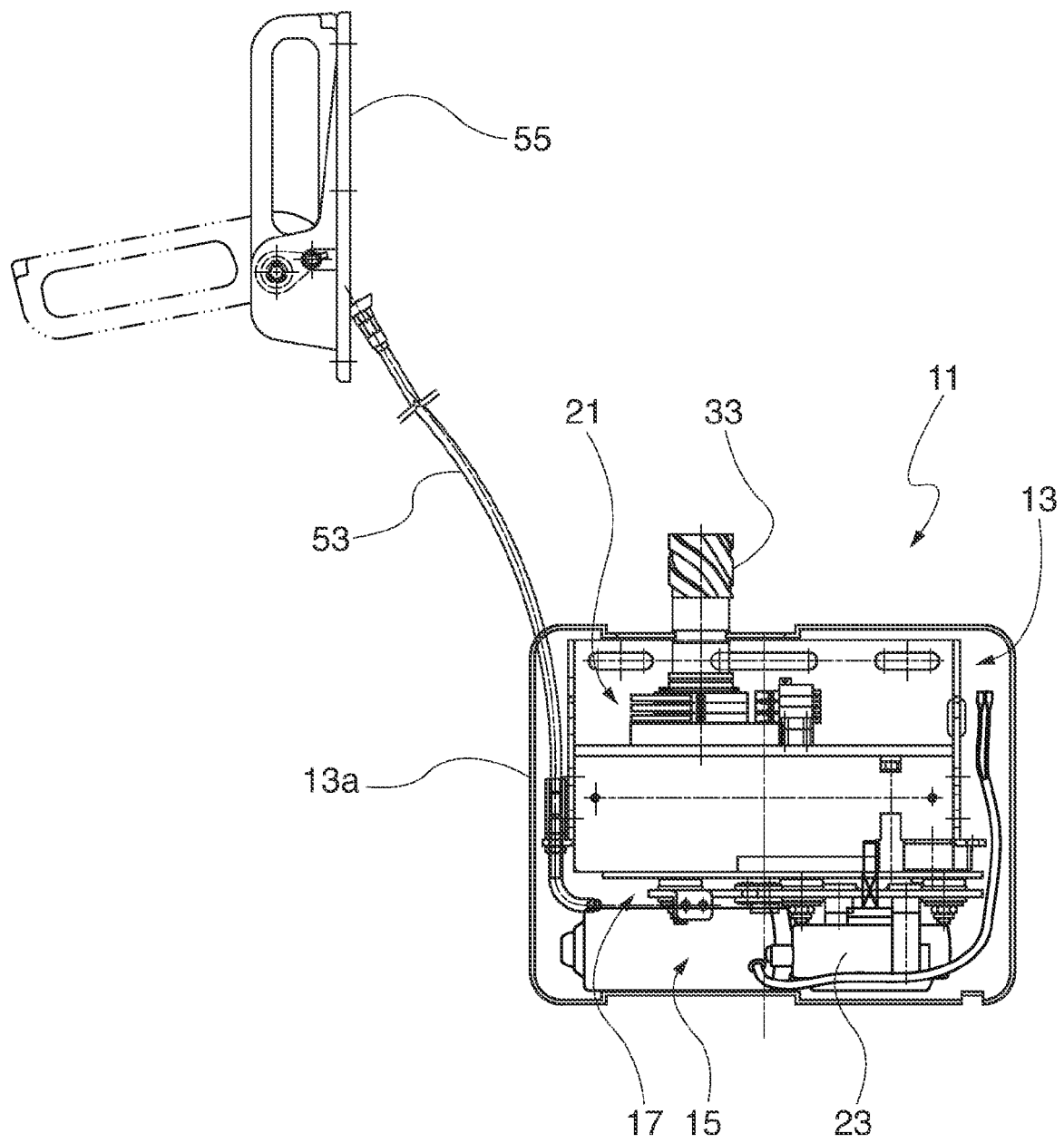


Fig. 1

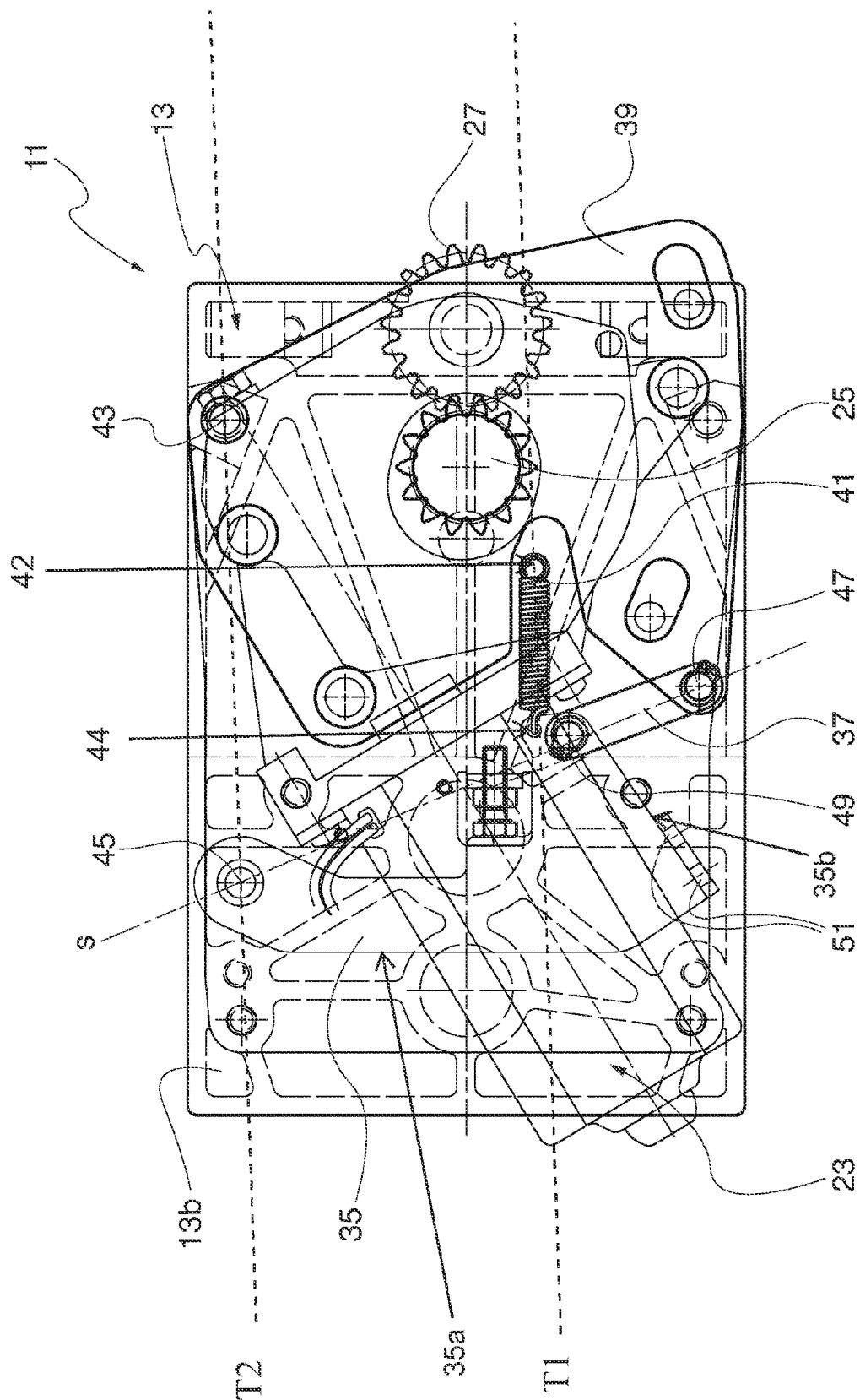


Fig. 2

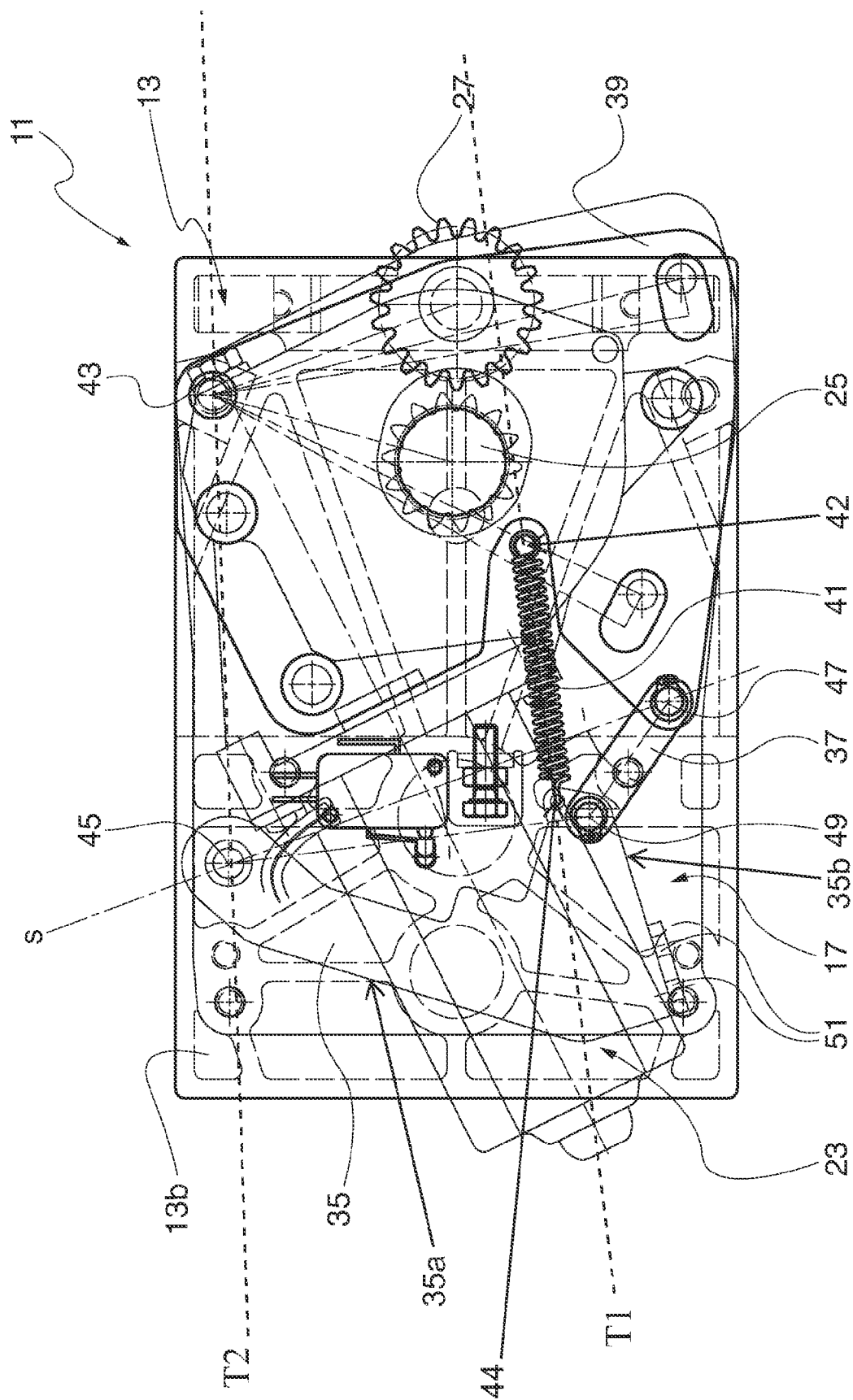


Fig. 3

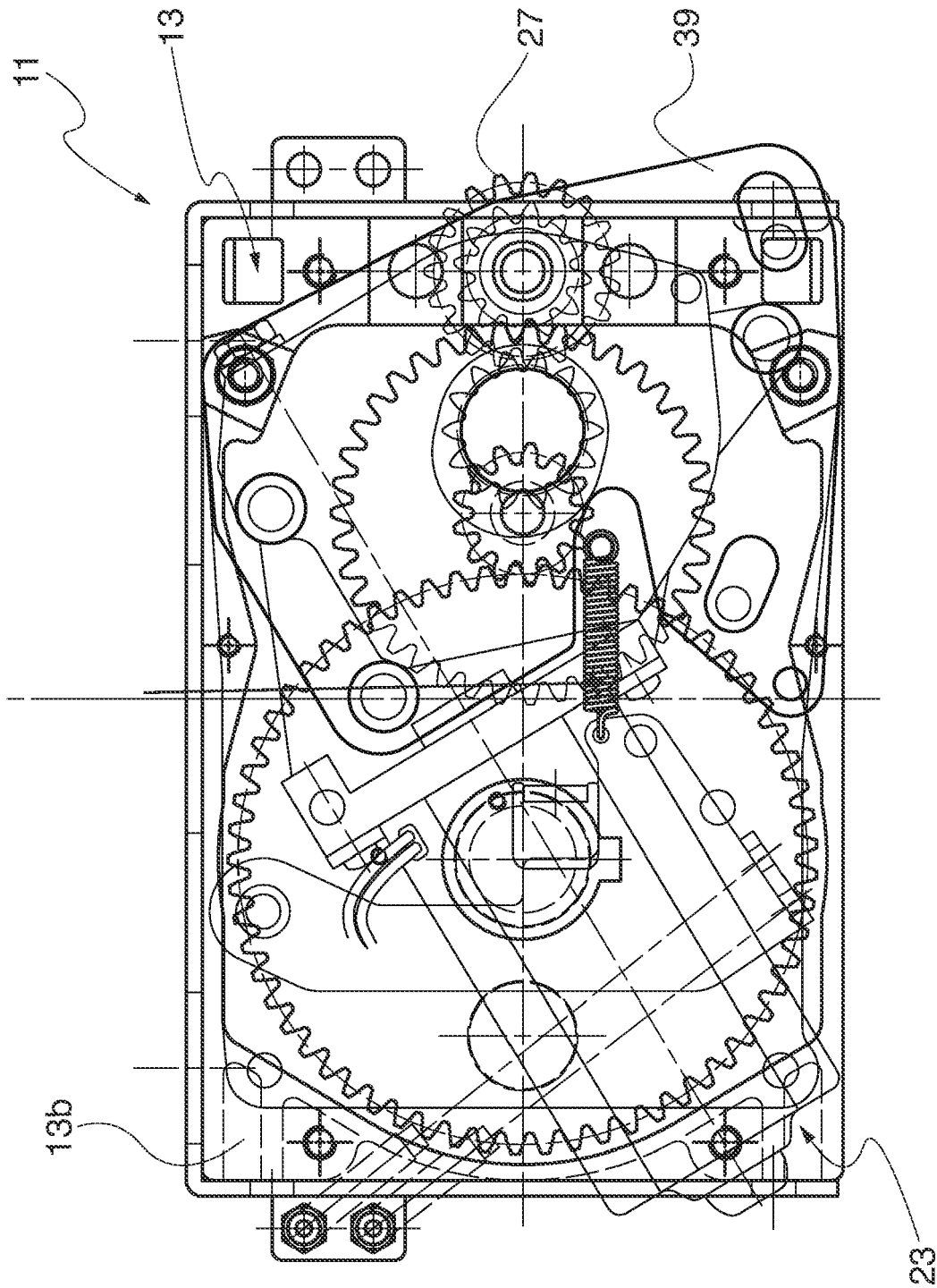
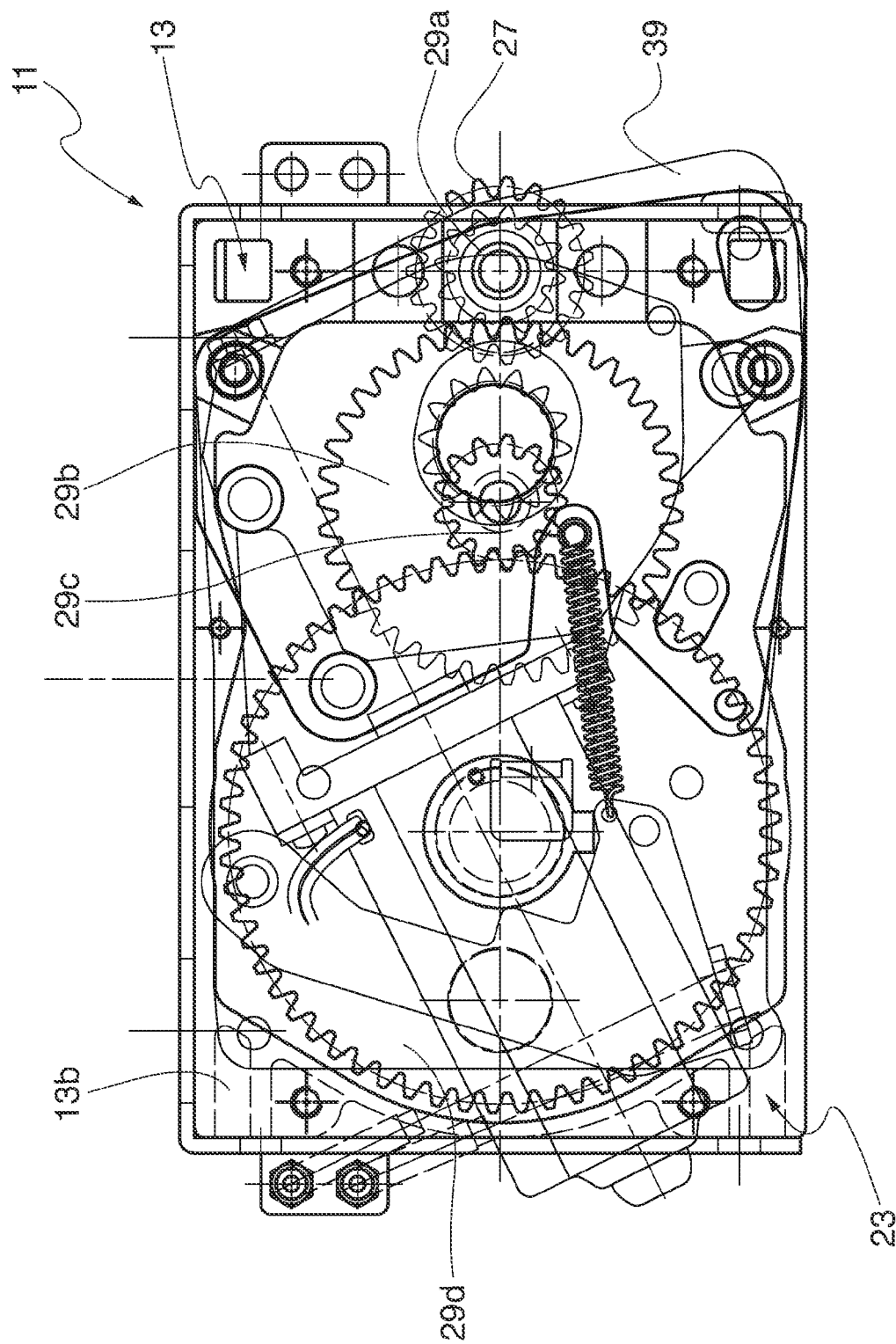


Fig. 4



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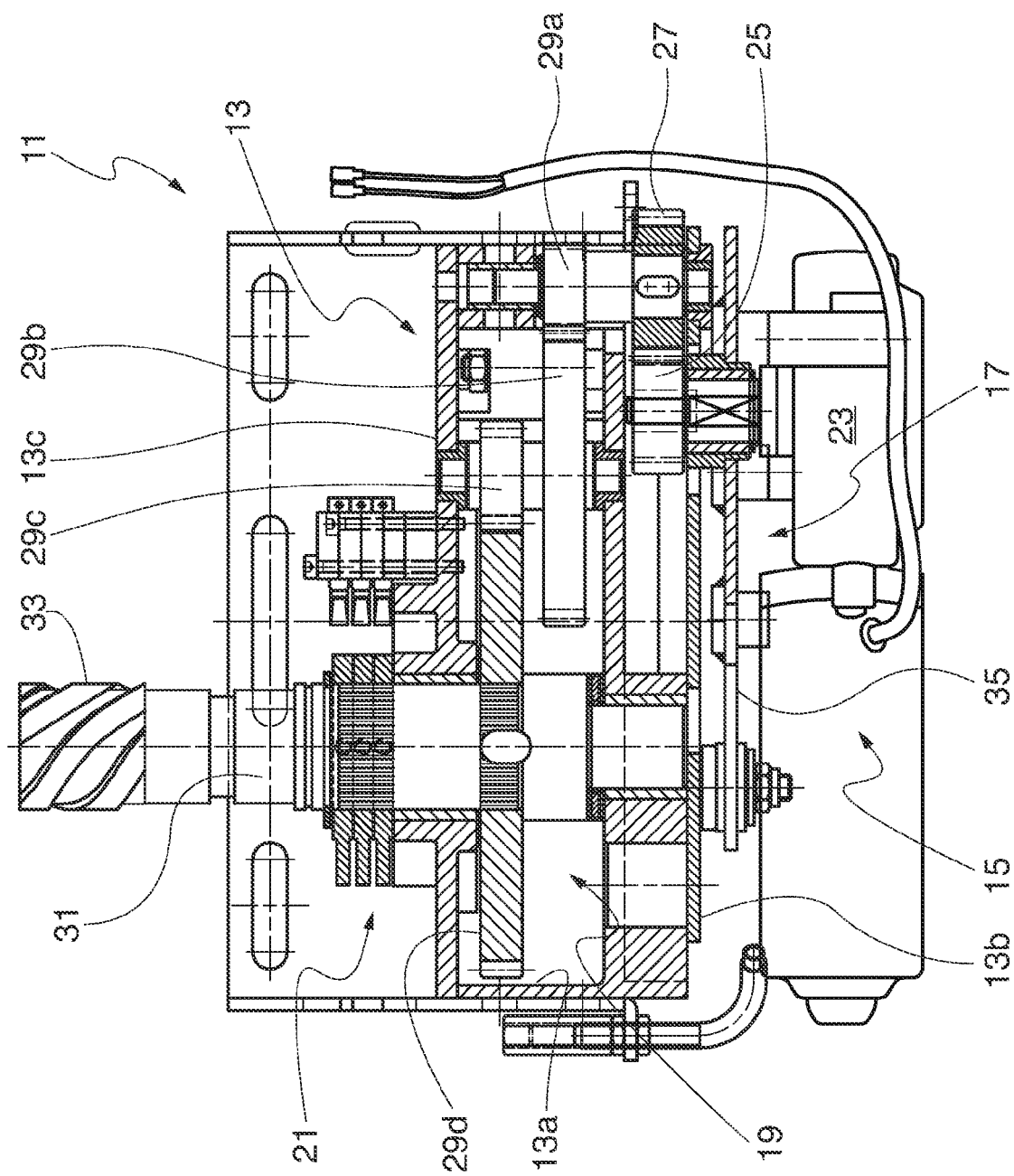


Fig. 6

REFERENCES CITED IN THE DESCRIPTION

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