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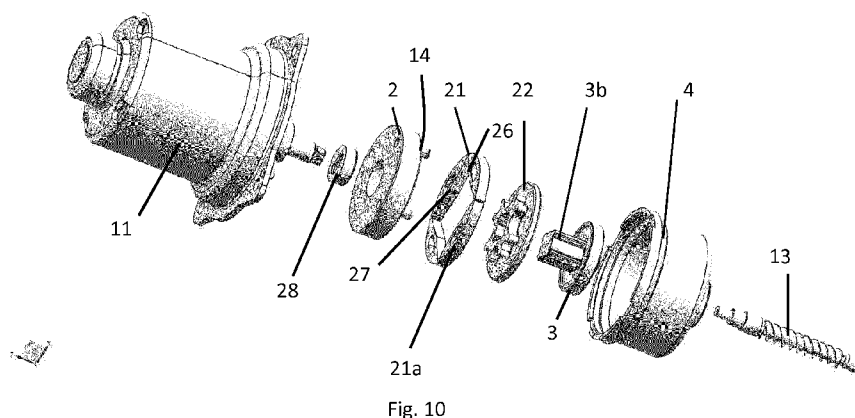
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(54) Title: DEVICE FOR ACTUATING A CLUTCH



(57) Abstract: The proposal is for a device for actuating the clutch in a transmission, wherein the release of the clutch is accom-
plished by means of an actuator (11) and of an output shaft (13), which is provided with an arrangement for self-holding, and
wherein the arrangement for self-holding is a brake (10), which locks the output shaft (13) when the torque of the actuator (11)
ceases.

Device for actuating a clutch

The invention relates to a device for actuating a clutch in a transmission for a motor vehicle, wherein the release of the clutch is accomplished by means of a clutch actuator, which is provided with an arrangement for self-holding.

Prior art

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An example of a device for actuating a transmission for a motor vehicle, which is provided with an automated or partially automated shift, is known from DE19826068 A1. This publication assumes that the clutch and a transmission brake in vehicles with automated or partially automated transmissions are activated by means of an electronic controller during the shift operation in order to make the shift operation take place at synchronous speeds of the shift elements to be connected. For this purpose, the electronic controller intervenes both in the engine control of the engine driving the transmission and in the transmission brake, which is provided to decelerate a shaft of the transmission during the shift operation. The electronic controller furthermore intervenes in the clutch control during the shift operation in order to interrupt torque transmission between the engine and the transmission before the actual shift operation and to reestablish torque transmission after the shift operation.

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During downshifts, transmission synchronization is performed by actively increasing the engine speed, and upshifting is performed centrally for all the gears using a transmission brake, with automated neutral selection and intermediate clutch engagement.

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In this case, the actuating device for the automated dry clutch can be moved either pneumatically or electrically or hydraulically in an accurately positioned manner

under electronic control and transmits the respective position as a feedback signal by means of a displacement sensor. The transmission brake and the clutch actuating unit each have a dedicated control unit, which has solenoid valves for the pneumatic or hydraulic system and a dedicated actuator in the form of a working
5 piston or electric motor.

In order to simplify the design of the actuating devices for the clutch and the transmission brake, the proposal in this publication is that the actuating device act jointly as an actuating device for the clutch actuator and the transmission brake. For this purpose, the actuating device can have a fluid-actuated piston, which
10 serves to reduce the speed of the input shaft on the transmission brake provided as a multi-disk brake and which simultaneously opens the clutch, or, alternatively, can have a two-armed lever, which acts upon the clutch on the input shaft and, by means of an extension, acts upon the transmission brake on the opposite side from the release cylinder.

15 It is the object of the present invention to simplify the device for actuating a clutch and to eliminate the electromagnetic transmission brake.

The object is achieved with a device for actuating the clutch in a transmission, wherein the release of the clutch is accomplished by means of an actuator, which is provided with an arrangement for self-holding, wherein the arrangement for self-
20 holding is a brake, which locks the output shaft when the torque of the actuator ceases.

It is advantageous that the output shaft performs a reverse rotary motion to lock the brake and thus locks the brake automatically.

It is advantageous if the brake is released purely mechanically by means of the
25 actuator by applying a torque.

It is very simple here that the brake can be released in both directions of rotation by applying a torque by means of the actuator.

It is very important that the device is installed precisely in an all-wheel clutch or a transfer gear in order in this way to obtain reliable locking of the actuator shaft in a defined angular position if the control system fails or the actuator is switched off.

It is advantageous that the brake has at least one input plate and one output plate
5 with braking elements clamped between them and is thus of very simple construction.

In this case, the braking elements are supported against a housing or a brake drum or against a cavity at an installation location.

It is advantageous that the braking elements comprise a toothed ring in combination with an element which presses the teeth outward against the housing, or
10 comprise a toothed ring and a cam wheel or comprise a spring element.

It is advantageous if the braking elements are preloaded either by means of a spring or by the inherent spring properties of the material of the braking element.

It is important for the braking that the torque transmission between the input plate
15 and the output plate has a lost motion.

An advantageous embodiment is chosen in such a way that the lost motion can be produced by geometrical configuration of the components of either the input and output plates or of the hole in the input plate.

Description of the invention

20 The invention is described by way of example below with reference to the attached drawing.

Figure 1 to figure 4 show a schematic illustration of the first illustrative embodiment,

Figure 5 to figure 7 show a schematic illustration of the second illustrative embodiment,
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Figure 8 to figure 9 show a schematic illustration of the third illustrative embodiment,

Figure 10 to figure 12 shows a fourth embodiment.

An overall structure can be seen from figure 8. An actuator 11 drives a drive shaft
5 12, which is connected to an input part, in the specific case an input disk 2 of the associated brake 10.

The first example of a transmission brake is shown by figures 1 to 4. At the end,
the brake comprises an input disk 2 and an output part 3, in the specific case an
output disk 3. The two components are shown in figure 4. The input disk 2 has two
10 side walls 2a, which extend perpendicularly to the circular surface of the input disk
2. In their external contour, the side walls 2a follow a cylindrical shape and, in their
internal contour, they follow a trough-shaped structure with two raised portions 2c.
The raised portions 2c have side faces, which serve as a first part of a torque
connection 6b. A cylindrical journal 2b is arranged in the center. The drive shaft 12
15 of the actuator 11 engages in the journal 2b and drives the input disk 2.

The output disk 3 has a circular shape with recesses on the rim, which corre-
sponds approximately to the contour of the side walls 2a of the input disk. The
recesses give rise to surfaces 6a along noses 3c, which serve for torque transmis-
sion.

20 Arranged centrally there is a hollow shaft 3a, which is mounted on the journal 2b of
the input disk. The external contour of the hollow shaft has four receptacles 8,
which cause the hollow shaft to deviate from a cylindrical external contour.

Figure 3 shows how the two disks, the input disk 2 and the output disk 3, are con-
nected to one another. Braking components 1 are installed between the two disks.

25 In this embodiment, the braking components are more easily visible in figure 1.
These are four tetrapod-shaped components, which have a first tongue 1a and a
second tongue 1b and otherwise are supported against a housing 4. The first

tongue 1a projects into the trough-shaped recess in the side wall 2a of the input disk 2, the second tongue is seated in the recess 8 in the hollow shaft of the output disk 3. The four braking components are held and loaded by a frame-type spring 5, which brings the braking components 1 into contact with the brake drum, the housing 4.

There is a torque connection between the input disk 2 and the output disk 3 via the side faces 6a and 6b, wherein a distance between the side faces is provided as a lost motion 7. This lost motion can be formed by additional components or by a suitable geometry of the two parts.

The output disk has receptacles 8 for the braking parts 1 or for the second tongues 1b, which allow pivoting of the braking parts 1 relative to the output disk about a respective pivoting axis A and permit a braking torque on the output disk. If a braking part 1 comes into contact with the brake drum, the output disk is locked in one direction toward the brake drum 4 by the braking part 1. Depending on the arrangement of the braking parts, locking can be accomplished in one direction or in both directions.

The braking parts 1 serve as a rollback lock as soon as the driving torque on the input disk 2 is lower than the opposing return torque on the output disk 3. If there is no torque on the output disk 2, the output disk 3 is locked. The locking is canceled by subjecting the input disk 2 to a torque which is higher than the opposing torque on the output disk or is sufficiently high to pivot the braking parts 1 back, wherein the direction of the torque on the input disk 2 is the same as that of the torque on the output disk 3.

A second embodiment is described in figures 5 to 7. An input disk 2 has two driver pins 14, which are seated on a circular plate. Attached to the rear side of the plate is a shaft segment 14a, which is connected to the input shaft 12.

The output plate 3 has a t-shaped design with two guide slots 15 in the base of the T. A shaft 16 forms the connection to the output shaft or acts as an output shaft.

A metal spring 5 with two bends is inserted by one of its ends into the guide slots 15 and then fits around the transverse structure of the T. The spring provides the loading and produces a braking effect with its contact 1c when it is resting on the housing 4. Torque transmission takes place between the surface of the transverse structure 6a and the spring-assisted contact on the pin 14.

The input disk 2 can pivot the braking parts back by means of the brake release device 9, e.g. can pivot the driver pins 14 back out of the locking position counter to the resilient part and thus cancel the locking. This takes place within the lost motion 7 of the input and output disks.

10 If the system is designed for a locking function in both directions, simultaneous disengagement of all the braking parts can be provided in a central position through appropriate adaptation of the braking parts and of the brake release devices.

Figures 8 and 9 show a third illustrative embodiment. An actuator 11 is connected 15 to an input disk 2 on the input side via a disk 23. Disk 23 is fixed to input disk 2 via fasteners. The output disk 3 has a shaft 3b, which extends in the direction of the input disk 2.

Seated on this shaft 3a is a brake ring 21, in which a cam ring 22 is arranged. The break ring 21 comprises five brake components 21a, which each have contours 20 and teeth on the inside and the outside.

When the actuator is deenergized and there is no reverse torque from the side of the output shaft 13, neither the brake ring 21 nor the cam ring 22 are locked. If the output shaft 13 rotates, the cam ring 22 likewise rotates, but since the shape of the hole in the input disk 2 is not circular but oval with two constrictions, the input plate 25 does not immediately corotate.

Through this movement owing to the lost motion, the cam ring rotates into a position in which the tips of the cams reach the toothed ring in the ramp structures. As

a result, the ramps are pushed outward and the brake ring is pressed by means of its outside against the housing 4 without the input plate 2 rotating. The brake ring with the cam ring is then locked against the housing. Since the shaft 3b is resting against the input plate 2 by means of the cam ring, the input plate is likewise

5 locked with the locking of the cam ring.

It is possible to latch the arrangement in two ways. On the one hand in one direction of rotation of the actuator and, on the other, in the opposite direction. For both latching options, there are two approaches to releasing the locking, on the one hand in and, on the other hand, against the latching direction. Here, two of the four

10 variants of the solution are equal and one variant is unrealistic.

The brake is released when the input disk 2 rotates and the spokes 24 on the plate come into contact with a tooth 25 on the brake ring 21. As a result, the guiding edge of the toothed ring is pressed against the center of the arrangement and thus rises from the braking housing 4. Owing to the lost motion aperture 2d in the input

15 plate 2, the rotation of the input plate does not cause any rotation of the cam ring until the teeth of the toothed ring are no longer in engagement.

Figures 10 and 11 show a fourth embodiment. An input disk 2 has driver pins.

These driver pins engage in apertures 26 in a toothed ring 21. The apertures 26 are elongate holes which extend tangentially with respect to the circular shape of the toothed ring. An output disk 3 has a shaft 3b, which has an almost rectangular cross section. This shaft 3b carries a cam ring 22 with four cams arranged in pairs, which engage in the brake ring 21.

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The input disk 2 is connected to the electric actuator via a coupling ring 28. The driver pins engage in the apertures 26 in the brake ring. The rotation of the actuator also rotates the input plate 2 but the shape of the central hole allows rotation without immediate corotation of the cam ring. Owing to the movement of the driver pins 14 in the elongate holes of the apertures 26, a force acting in the direction of the central axis on the control edge 27 of the brake ring 21 is produced. As a re-

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sult, the external contour of the brake ring is raised from the housing 4, and the mechanism can rotate freely.

If there is no torque applied on the input side and the output side, the arrangement does not lock. When the output shaft rotates, the cam ring 22 also rotates but, owing to a flank in the hole in the input plate, the input plate is not moved. During the movement along the flank, the cam ring rotates into a position in which the cams of the cam ring 22 make contact with the ramps 27 of the bracket ring 21 and press the brake components 21a by means of its external contour against the housing. During this process, the input plate is not moved because the output shaft engages by means of the cam ring on the input plate and locking of the cam ring also includes fixing of the input plate.

The brake can be released when the input plate and the driver pins 14 are pushed toward the end of the elongate hole of the aperture 26 and cause the toothed ring to perform a movement toward the center. As a result, the external contour of the brake ring 21 rises from the housing 4.

Owing to the shape of the hole in the input plate, the cam ring is not moved until the toothed ring ends the locking.

In all the embodiments, it is also possible to install the brake in cartridge form directly in the housing of a clutch arrangement, eliminating the housing as a component and ensuring that the brake operates against a cavity.

Since the brake is designed as a passive component, it can save space and is particularly suitable for installation in clutch actuation systems of transfer gearboxes or all-wheel clutch solutions.

List of reference signs

1 braking components	12 input shaft
1 a, 1 b tongues	13 output shaft
1c contact	14 driver pin
2 input disk/input part	14a shaft segment
2a side wall	15 guide slot
2 b journal	16 shaft
2 c raised portions	21 brake ring
2d aperture	21a brake component
3 output disk/output part	22 cam ring
3a hollow shaft	23 disk
3b shaft	23a non circular drive aperture
3c nose	24 spokes
4 brake drum/housing	25 tooth
5 spring element	26 aperture
6a, 6b torque connection	27 control edge
7 lost motion	28 coupling ring
8 receptacles	A pivoting axis
9 brake release device	
10 brake	
11 actuator	

Claims

1. A device for actuating the clutch in a transmission, wherein the actuation of the clutch is accomplished by means of an actuator (11) and of an output shaft (13), which is provided with an arrangement for self-holding, characterized in that the arrangement for self-holding is a brake (10), which locks the output shaft (13) when the torque of the actuator (11) ceases.
2. The device as claimed in claim 1, characterized in that the output shaft (13) performs a reverse rotary motion to lock the brake (10).
3. The device as claimed in claim 1 or 2, characterized in that the brake (10) can be released by applying a torque by means of the actuator (11).
4. The device as claimed in claim 3, characterized in that the brake can be released in both directions of rotation by applying a torque by means of the actuator (11).
5. The device as claimed in one of the preceding claims, characterized in that the clutch is installed in an all-wheel clutch or a transfer gearbox.
6. The device as claimed in one of the preceding claims, characterized in that the brake has at least one input part (2) and one output part (3) with braking elements (1) clamped between them.
7. The device as claimed in one of the preceding claims, characterized in that the braking elements (1, 21) are supported against a housing (4) or a brake drum or against a cavity at an installation location or are supported in on a shaft.
8. The device as claimed in one of the preceding claims, characterized in that the driven part pivots the braking parts back out of the locking position by means of a brake release device (9), counter to the resilient part, and thus cancels the locking.

9. The device as claimed in one of the preceding claims, characterized in that the braking elements comprise a toothed ring (1, 21) in combination with an element which presses the teeth outward against the housing.

10. The device as claimed in one of the preceding claims, characterized in that the braking elements comprise a toothed ring (21) and a cam wheel (22).

11. The device as claimed in one of the preceding claims, characterized in that the braking elements comprise a spring element (5).

12. The device as claimed in one of the preceding claims, characterized in that the braking elements are preloaded either by means of a spring (5) or by the inherent spring properties of the material of the braking element (21).

13. The device as claimed in one of the preceding claims, characterized in that the torque transmission between the input part (2) and the output part (3) has a lost motion.

14. The device as claimed in claim 13, characterized in that the lost motion can be produced by geometrical configuration of the components of either the input and output parts or of the hole in the input plate.

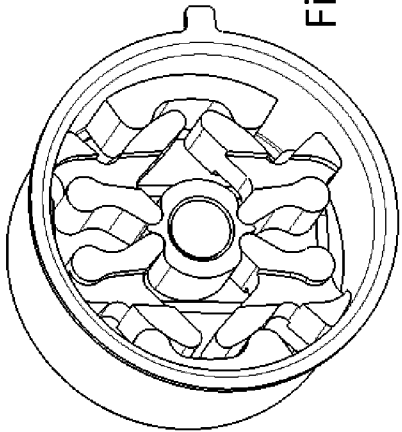
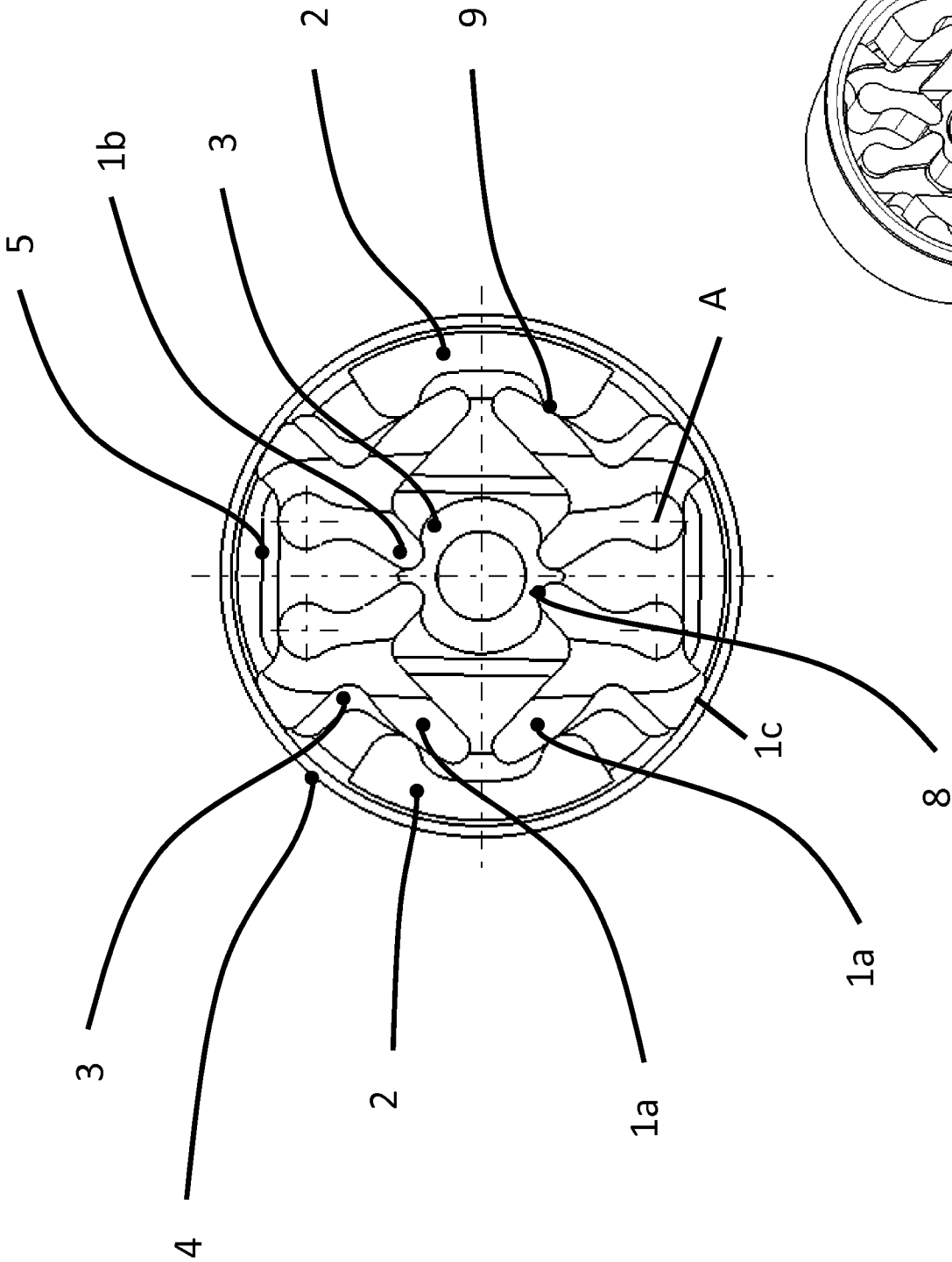


Fig. 1a

Fig. 1b

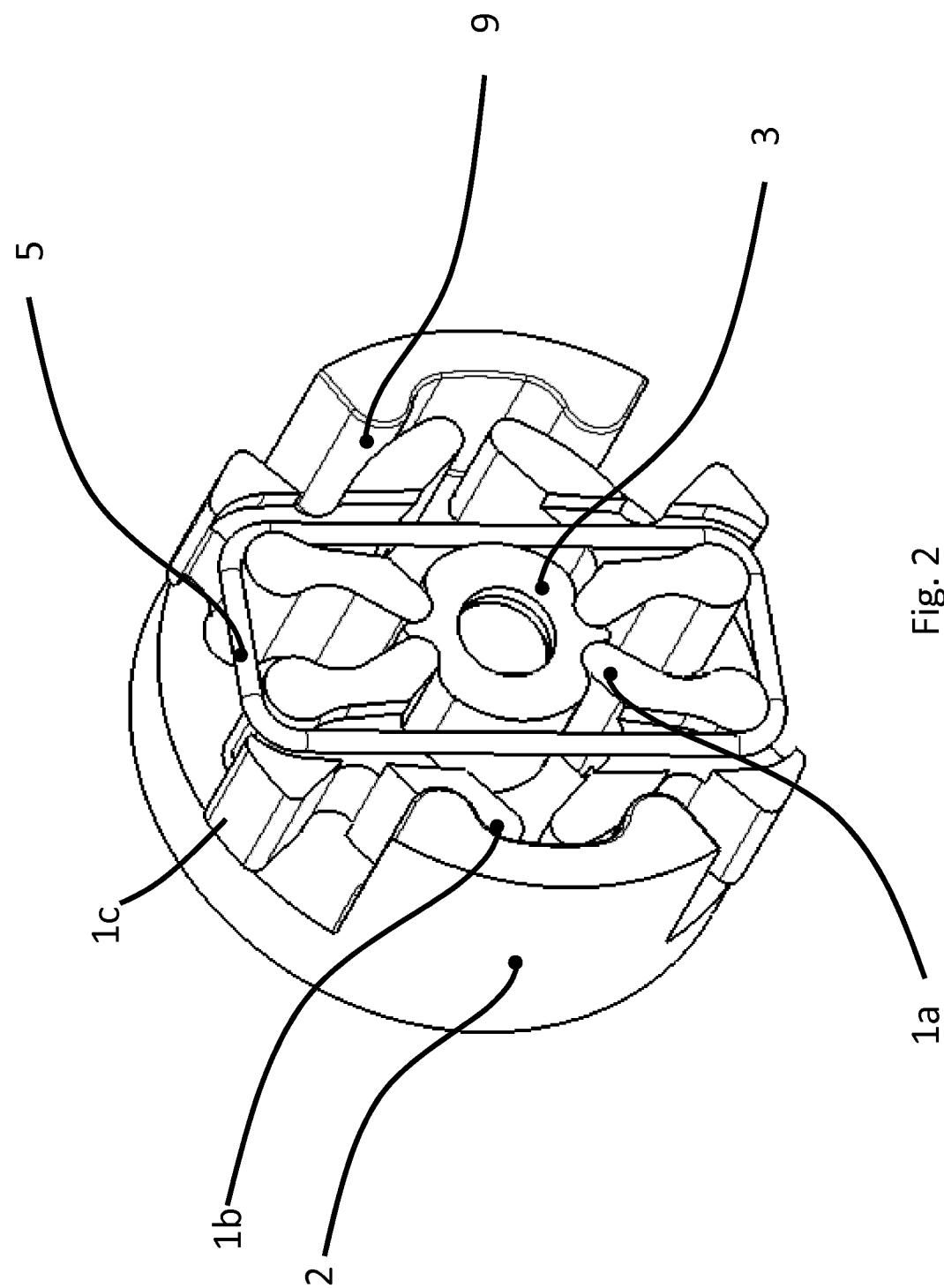


Fig. 2

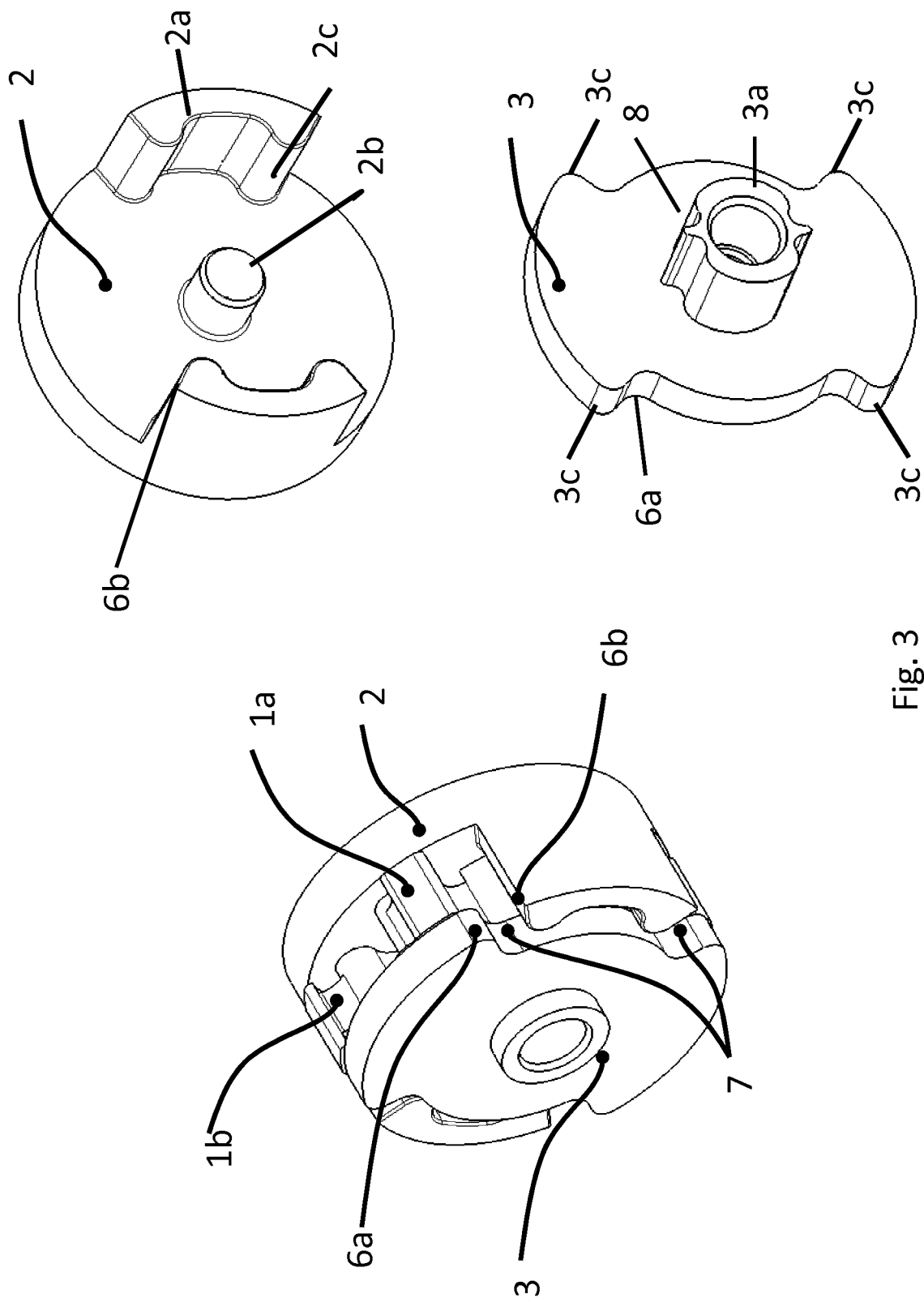
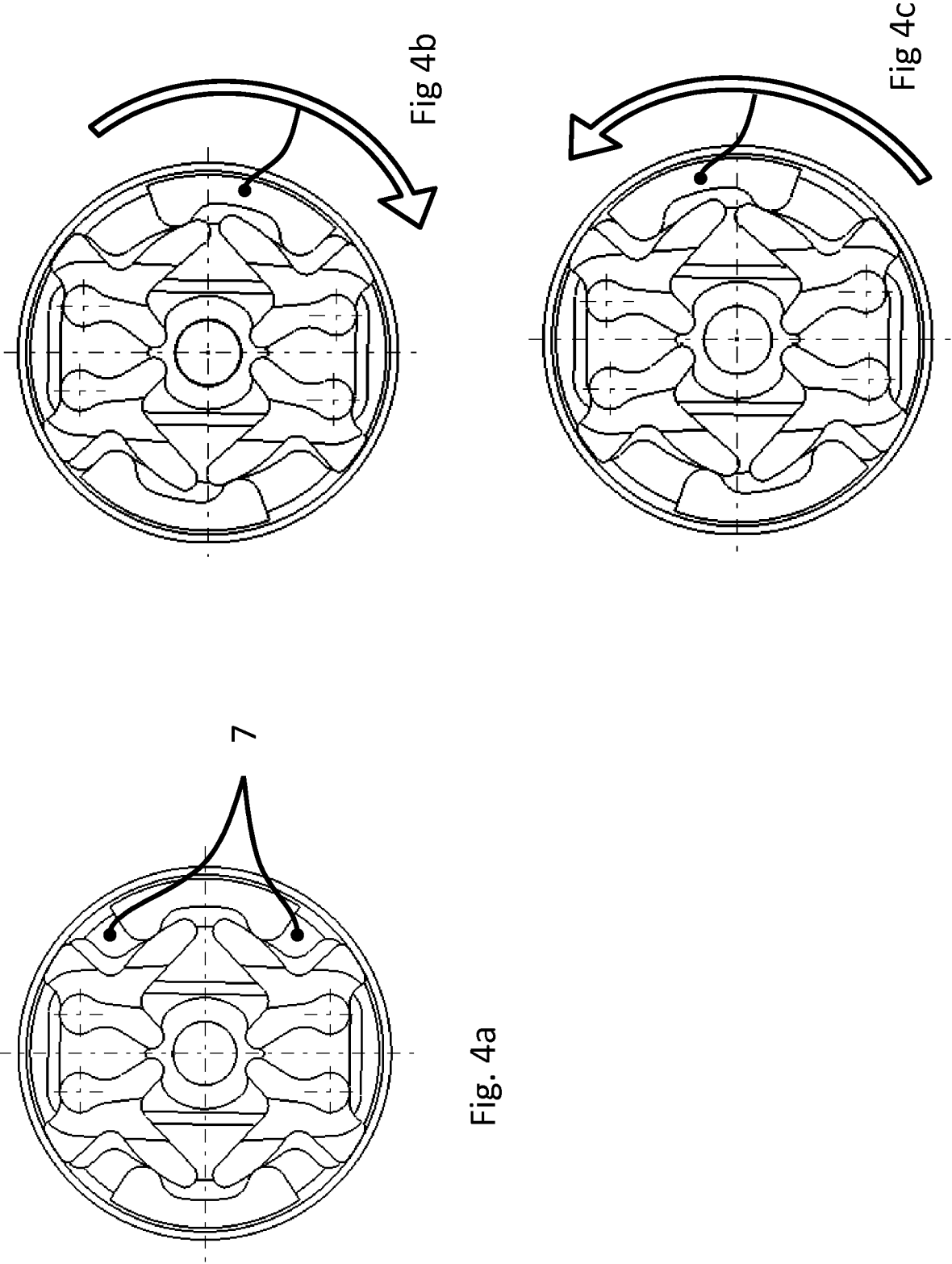


Fig. 3



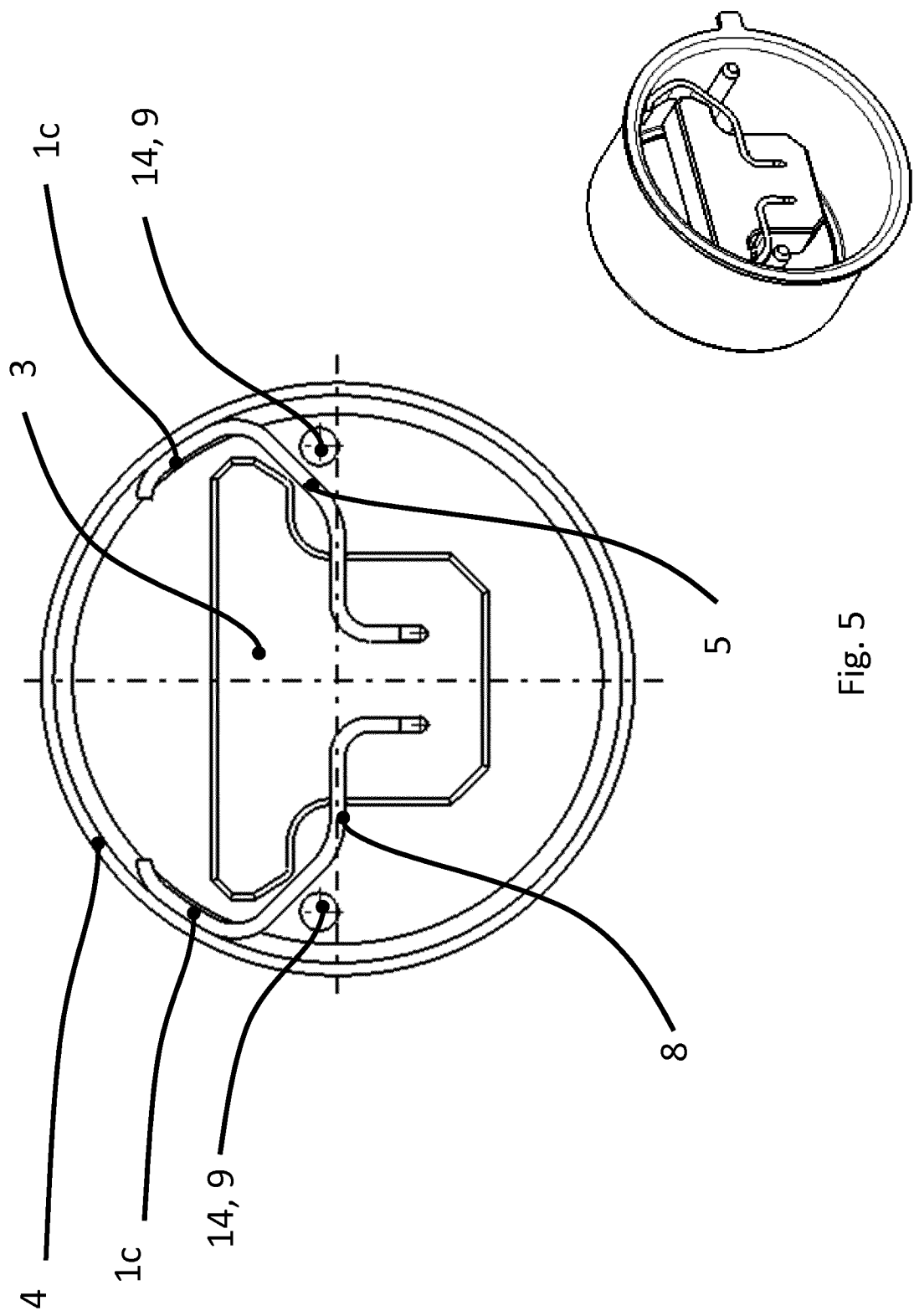


Fig. 5

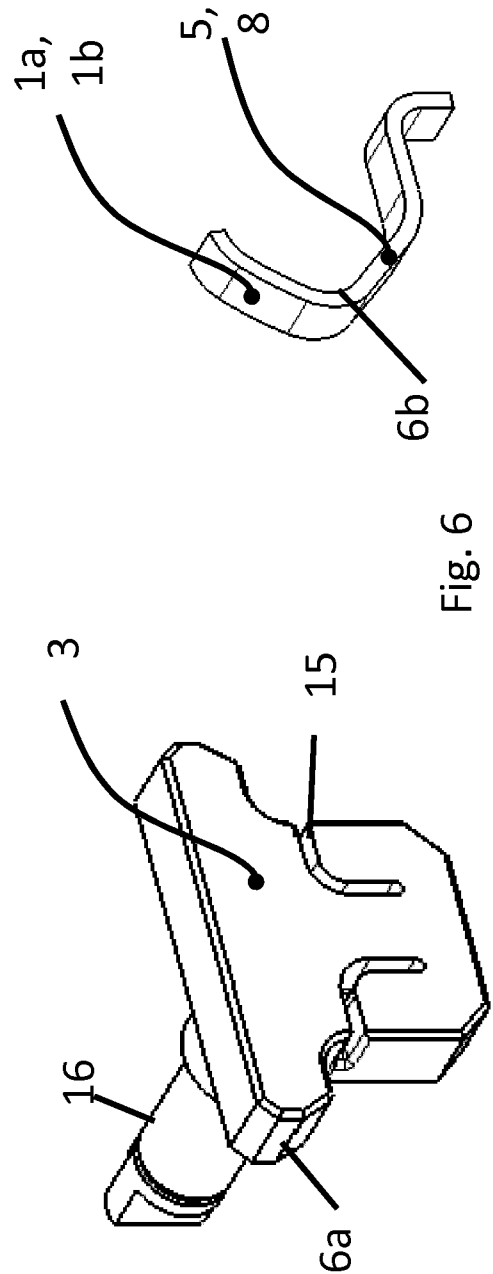
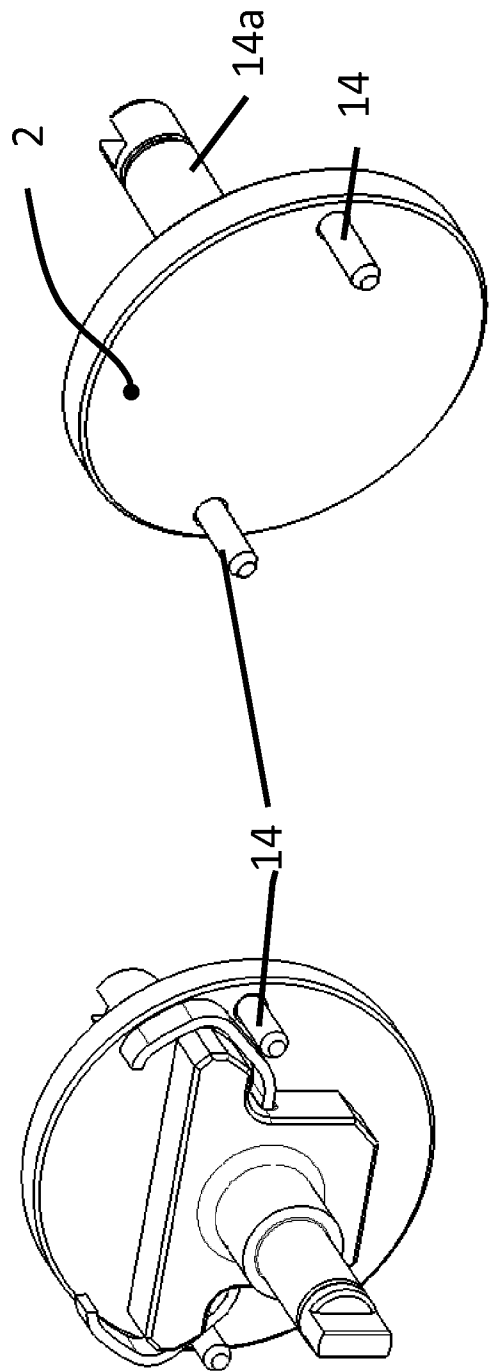


Fig. 6

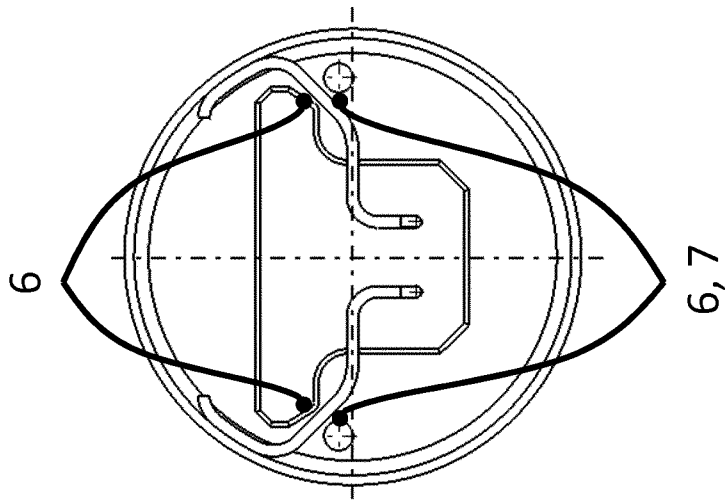


Fig. 7a

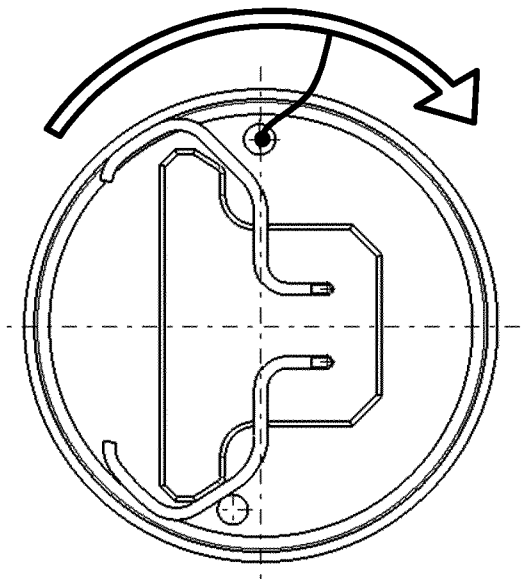


Fig. 7b

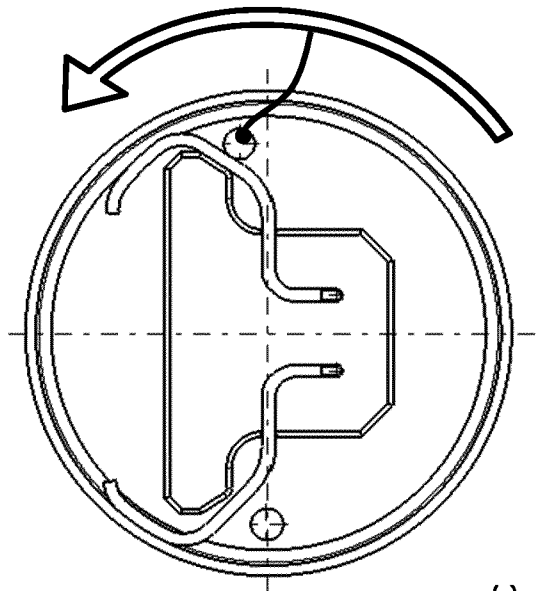


Fig. 7c

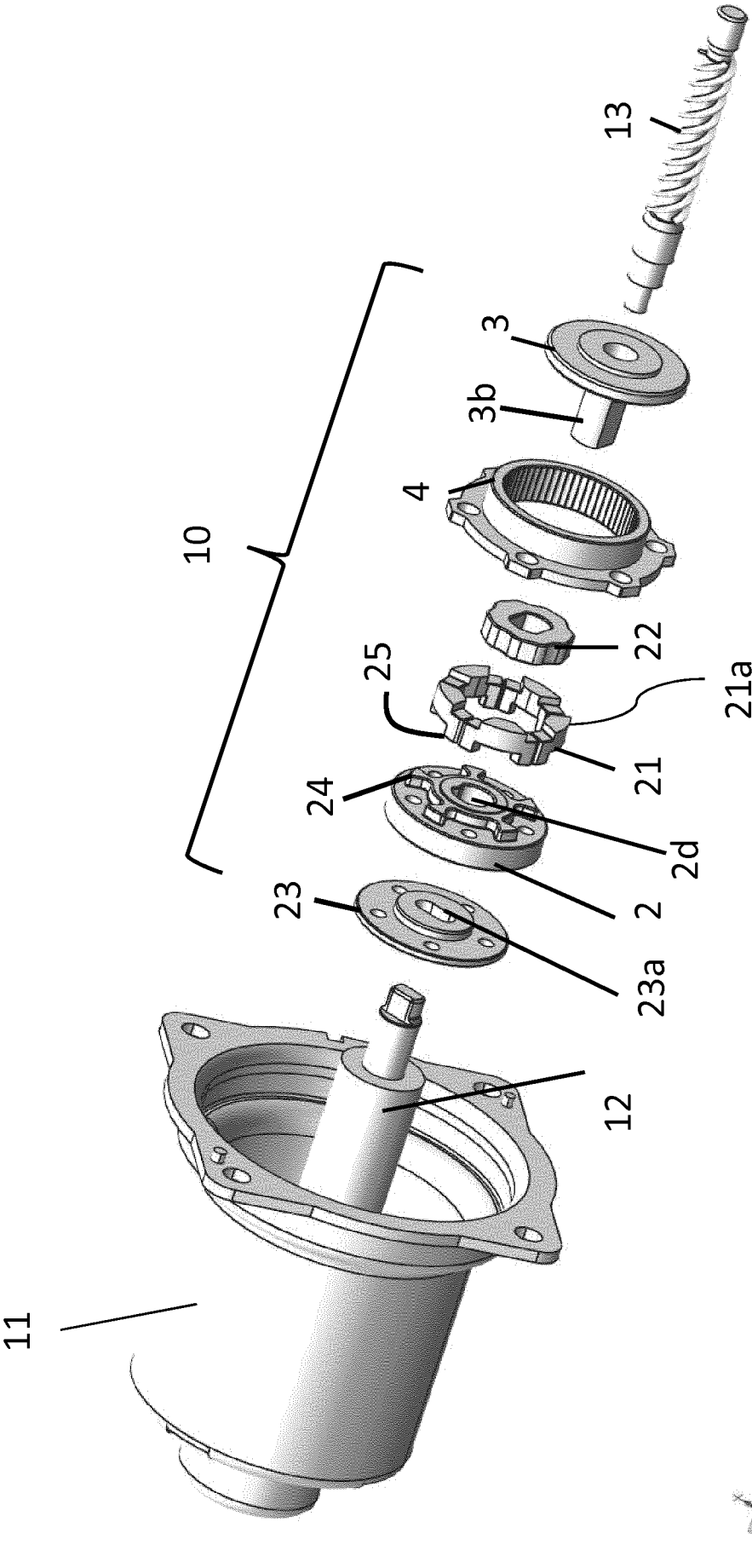


Fig.8

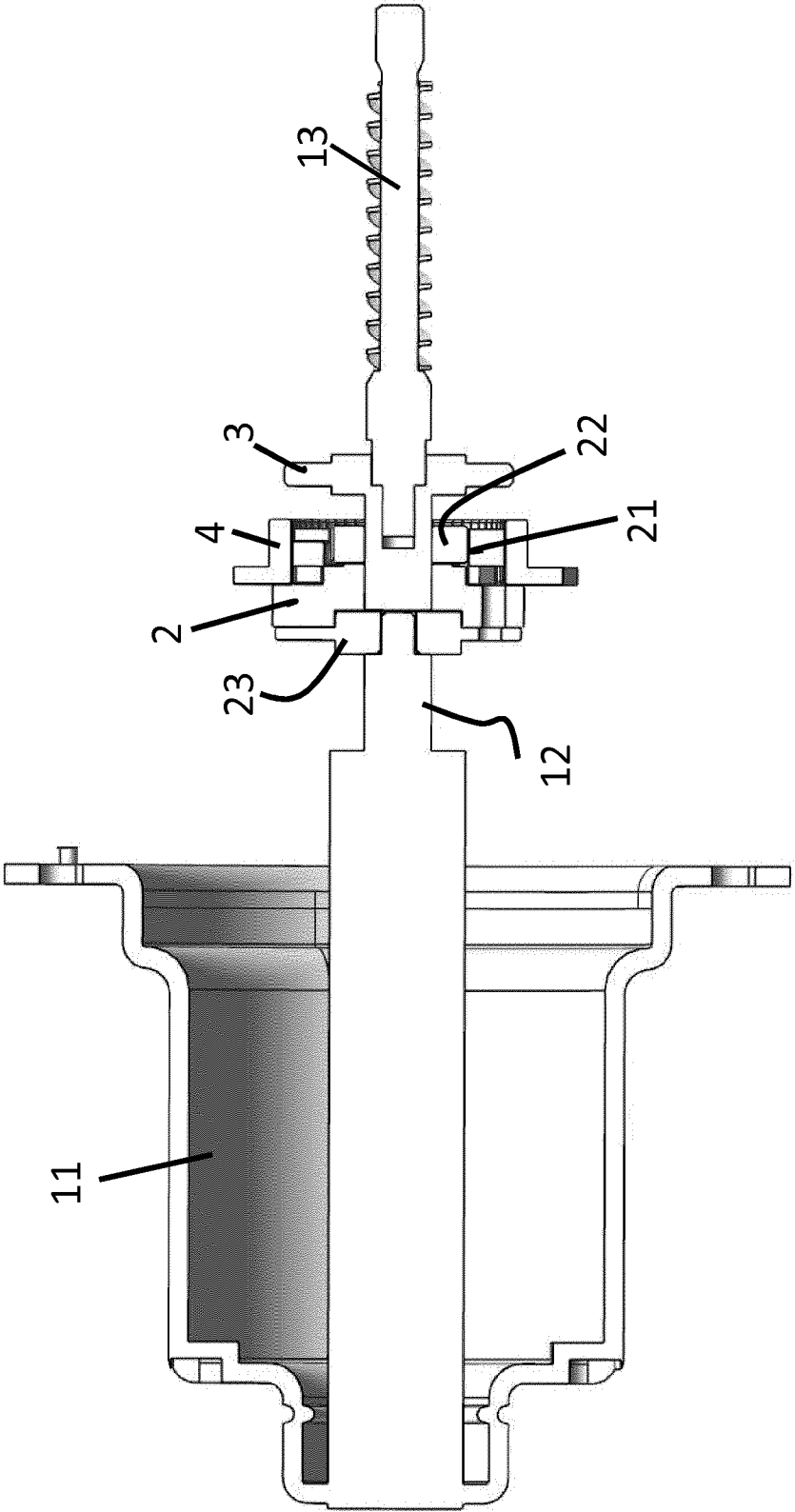
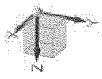


Fig.9



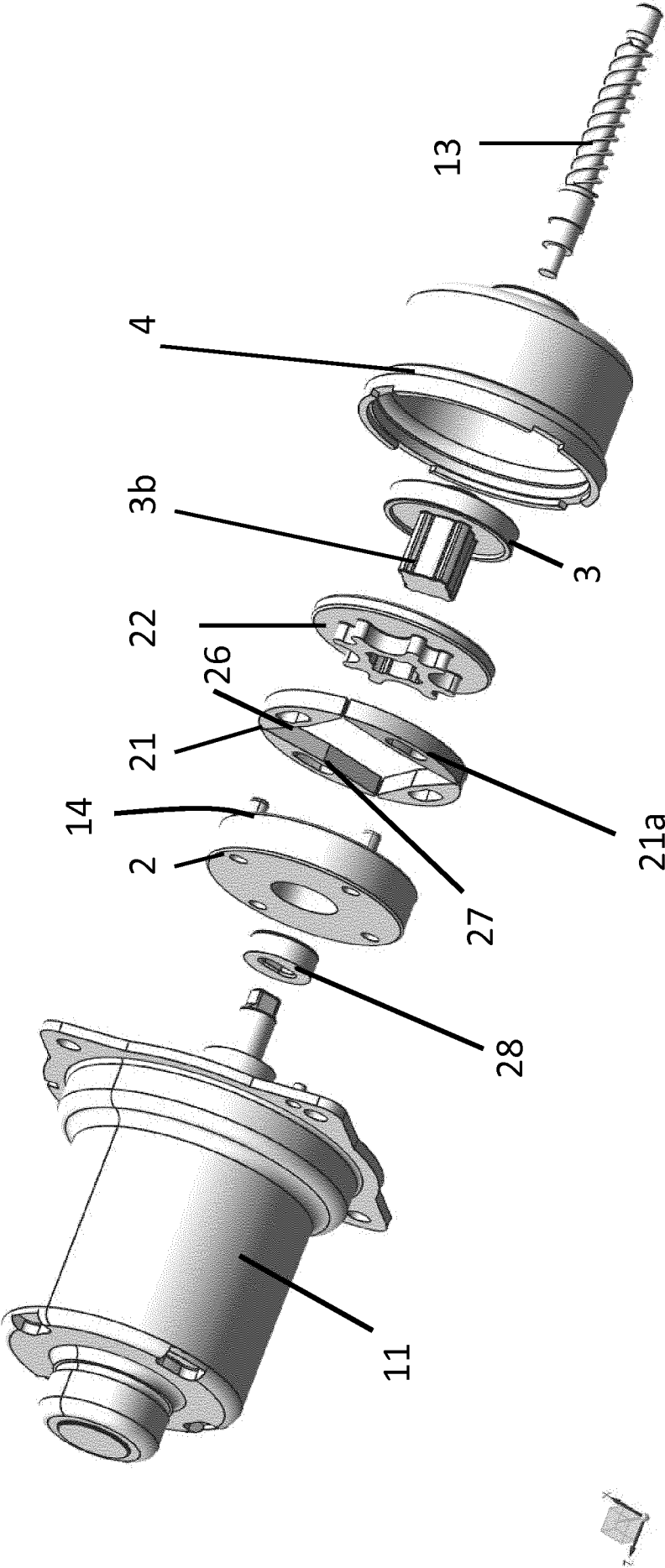


Fig. 10

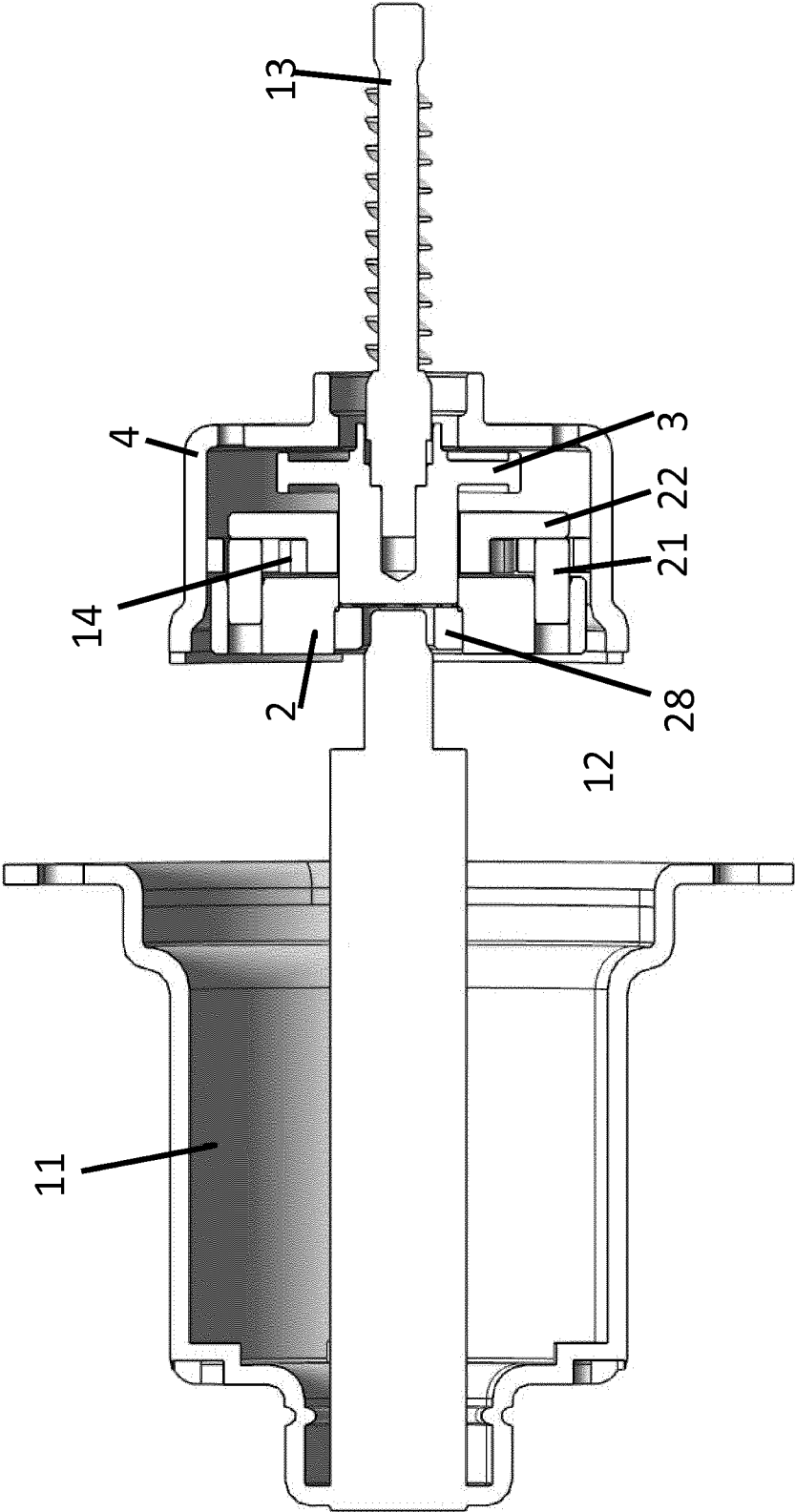


Fig. 11

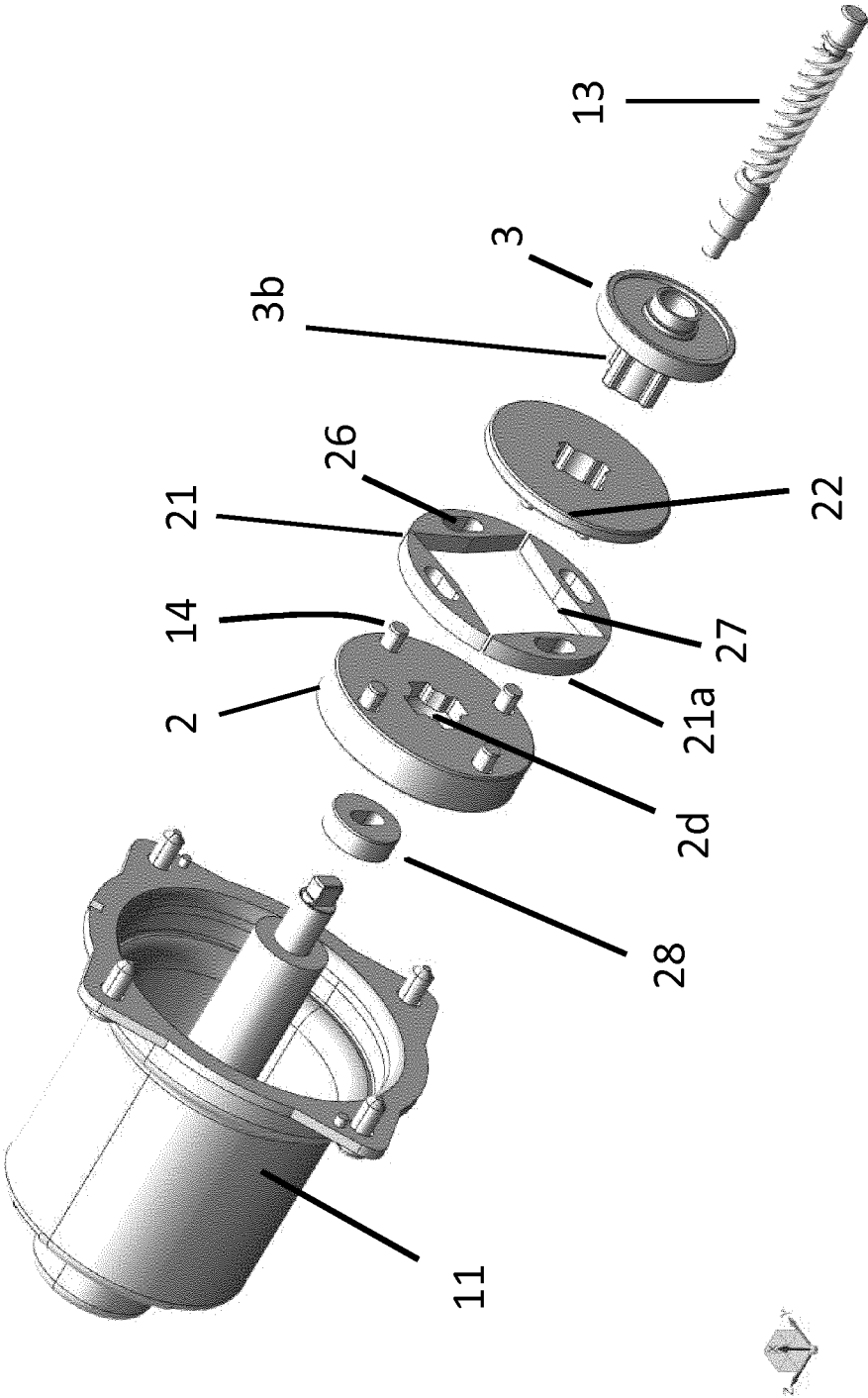


Fig. 12

INTERNATIONAL SEARCH REPORT

International application No

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A. CLASSIFICATION OF SUBJECT MATTER

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ADD. F16H3/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F16D F16H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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X	DE 10 2011 108977 A1 (KEIPER GMBH & CO KG [DE]) 16 February 2012 (2012-02-16) figure 13 -----	1-14



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

26 April 2016

Date of mailing of the international search report

04/05/2016

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Pecquet, Gabriel

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2015/067157

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