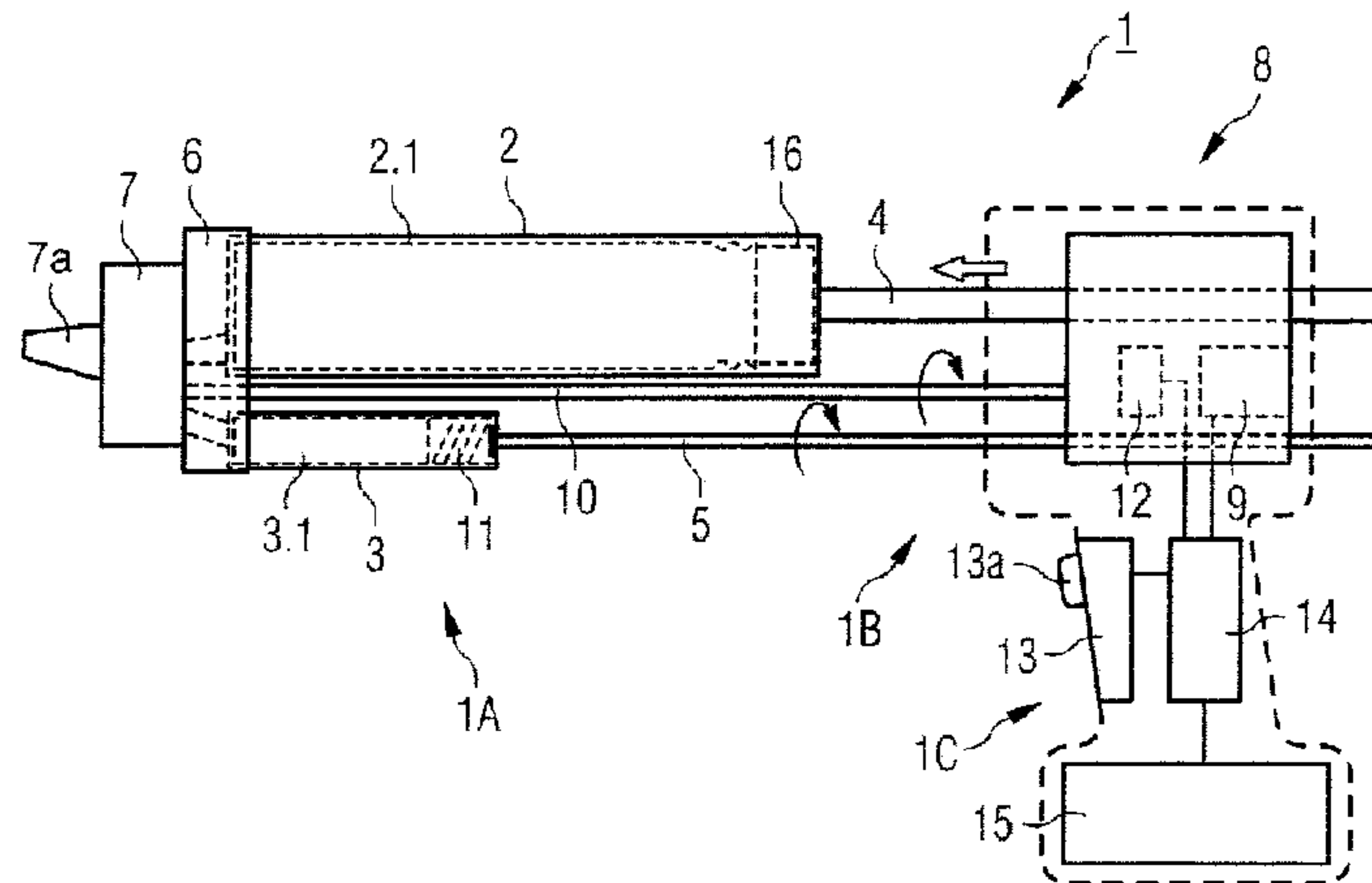




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(54) Titre : DISPOSITIF D'ENTRAINEMENT D'UN DISPOSITIF DE DOSAGE ET DE MELANGE DE SUBSTANCES A PLUSIEURS COMPOSANTS
(54) Title: DRIVING DEVICE OF A METERING AND MIXING APPARATUS



(57) **Abrégé/Abstract:**

A driving device of a metering and mixing apparatus for multi-component substances, which has at least two holders for holding interchangeable cartridges, a discharging apparatus for the simultaneous discharging of the substance components from the cartridges by discharging pistons entering the cartridge holder or cartridges, wherein at least one discharging piston has a thread which, can generate a forward propulsion of said piston, and a mixing apparatus which mixes and discharges the discharged substance components in mixed form, a gear unit for connection of a drive motor and a spindle-like discharging rod of the piston provided with the thread, a rear part of the longitudinal extent of the rod has a spirally toothed, non-self-locking spindle section and, at the front end, an engagement element for engaging in the piston, wherein the gear unit has a driven wheel with an internal spiral toothing matched to the toothing of the spindle section

ABSTRACT

A driving device of a metering and mixing apparatus for multi-component substances, which has at least two holders for holding interchangeable cartridges, a discharging apparatus for the simultaneous discharging of the substance components from the cartridges by discharging pistons entering the cartridge holder or cartridges, wherein at least one discharging piston has a thread which, can generate a forward propulsion of said piston, and a mixing apparatus which mixes and discharges the discharged substance components in mixed form, a gear unit for connection of a drive motor and a spindle-like discharging rod of the piston provided with the thread, a rear part of the longitudinal extent of the rod has a spirally toothed, non-self-locking spindle section and, at the front end, an engagement element for engaging in the piston, wherein the gear unit has a driven wheel with an internal spiral toothing matched to the toothing of the spindle section.

DRIVING DEVICE OF A METERING AND MIXING APPARATUS

DESCRIPTION

5 **Technical Area**

The invention relates to a driving device of a metering and mixing apparatus for multi-component substances, especially multi-component adhesives, which has at least two interconnected cartridge holders for holding replaceable cartridges with individual substance components, a discharge device for simultaneously
10 discharging the substance components from the cartridges through component outlets by means of discharging pistons that enter the cartridge holder or cartridges, wherein at least one discharging piston has a threading which by rotating can create forward propulsion of this discharging piston, and has a mixing
15 apparatus which is connected to the component outlets and mixes the discharged substance components and dispenses them in the mixed state.

Prior Art

20 A metering and mixing apparatus with the above-mentioned structure is the subject of European Patent Application 2468415 of the applicant.

A similar metering and mixing apparatus for mixing a dental impression compound is already known from DE 3 233 366 A1. This device comprises a stirring unit,
25 designed as a disposable part, with a base body that has a mixing chamber with several feed channels opening separately into the mixing chamber for the components of the impression compound and an outlet opening for the mixed impression compound. The stirring unit also has a stirrer, arranged rotatably in the mixing chamber, which is driven by a driving device against which the stirring unit
30 is held removably. The components of the impression compound are held in reservoir cylinders and are forced by pistons into the mixing chamber, and after

mixing are forced out through the outlet opening into the impression tray. The speed of advance of the actuating drives of the pistons can be varied so that both the ratio of the piston advance speed which determines the setting time of the impression compound and the overall advance or the duration of advance and
5 thus the quantity of impression compound can be controlled.

For the prior art, reference is also made to EP 0 057 465 A2, WO 2011/025831 A1, US 2009/039113 A1, WO 2008/076941 A1 and EP 2 279 379 A1.

10 **Presentation of the Invention**

The problem of the invention is to supply a reliably and precisely operating driving device for a metering and mixing apparatus of the above-mentioned type.

15 In some embodiments of the present invention, there is provided a driving device of a metering and mixing apparatus for multi-component substances, especially multi-component adhesive substances, which has at least two cartridge holders for holding replaceable cartridges with individual substance components, a discharging device for simultaneous discharging of the substance components from the cartridges
20 through component outlets with the aid of discharging pistons entering the cartridge holder or cartridges, wherein at least one discharge piston has a threading which can produce forward propulsion of this driving piston by rotation, and a mixing apparatus connected to the component outlets, which mixes the discharged substance components and discharges them in mixed form, with a transmission unit for
25 connection of a drive motor, especially electrical, and a spindle-like discharging rod of the discharging piston provided with the threading, which in a rear part of its longitudinal extent based on the position of use has a spiral-toothed, non-self-locking spindle section and at the front end has an engagement element for engaging in the discharging piston, wherein the transmission unit has a driven wheel which is
30 matched to the spiral toothing of the spindle section.

In some embodiments of the present invention, there can be provided the driving device described herein, wherein the spiral-toothed spindle section has a lead of the spiral toothing between 45° and 65° , especially between 50° and 61° .

- 5 In some embodiments of the present invention, there can be provided the driving device described herein, wherein the spindle-like discharging rod consists substantially of steel and the internally toothed driven wheel consists substantially of plastic.
- 10 In some embodiments of the present invention, there can be provided the driving device described herein, wherein in the front section of the discharging rod outside of the spiral-toothed spindle section a following braking element is provided to guarantee axial movement of the discharging rod even during idling.
- 15 In some embodiments of the present invention, there can be provided the driving device described herein, wherein the following braking element is designed as a following plastic brake.

- In some embodiments of the present invention, there can be provided the driving
20 device described herein, wherein the following braking element is designed as a following wrap spring housing.

- In some embodiments of the present invention, there can be provided the driving
device described herein, wherein on the spindle-like discharging rod a position
25 marking element is provided for especially optical detection of the axial position of the discharging rod and thus indirectly of the discharging piston which is engaged with it.

- In some embodiments of the present invention, there can be provided the driving
device described herein, wherein the position marking element is formed by or
30 attached to the following braking element.

In some embodiments of the present invention, there can be provided the driving device described herein, wherein the engaging element is formed at the end of the drive rod as a polygonal element, Torx or claw element.

- 5 In some embodiments of the present invention, there can be provided the driving device described herein, wherein the engaging element corresponding to an engagement element on the discharge piston is designed to be self-locating.

10 In some embodiments of the present invention, there can be provided the driving device described herein, wherein the transmission unit comprises a planetary transmission unit of the driving motor with a primary driven wheel and a switchable coupling device comprises a first coupling element with a drive pinion engaging with the primary driven wheel and a second coupling element which is designed as the internally toothed driven wheel of the transmission unit.

15

In some embodiments of the present invention, there can be provided the driving device described herein, wherein the switchable coupling device is designed as a claw coupling.

- 20 In some embodiments of the present invention, there can be provided the driving device described herein, wherein the transmission unit is designed for driving the discharging piston having the threading and at least one additional discharging piston for another component, driven over a gear rack, and has an axially movable assembly under reaction pressure when discharging the other component and the
25 second coupling element of the switchable coupling device is positioned essentially fixed in the axial direction relative to the movable assembly, in such a manner that under the reaction pressure, during discharge of the other component, it moves with the assembly and consequently engages with the first coupling element.

- 30 In some embodiments of the present invention, there is provided an application device for multi-component substances, especially multi-component adhesives, with

a driving device described herein, with an integrated electric driving motor and battery power supply for this as well as an operating and control unit.

In some embodiments of the present invention, there is provided a driving device of a metering and mixing apparatus for multi-component substances, which has at least two cartridge holders for holding replaceable cartridges with individual substance components, a discharging device for simultaneous discharging of the substance components from the cartridges through component outlets with the aid of discharging pistons entering the cartridge holder or cartridges, wherein at least one discharge piston has a threading which can produce forward propulsion of the at least one discharge piston by rotation, and a mixing apparatus connected to the component outlets, which mixes the discharged substance components and discharges them in mixed form, the driving device comprising:

a transmission unit for connection of a drive motor; and
a spindle-like discharging rod of the at least one discharging piston provided with the threading, which in a rear part of its longitudinal extent based on a position of use has a spiral-toothed, non-self-locking spindle section and at a front end of the discharging rod has an engagement element for engaging in the at least one discharging piston,

wherein the transmission unit has a driven wheel which is matched to the spiral toothing of the spindle section.

In some embodiments of the present invention, there is provided an application device for multi-component substances with a driving device as described herein, with an integrated electric driving motor, battery power supply for the integrated electric driving motor, and an operating and control unit.

The invention includes the consideration of ensuring, in the propulsion of a metering and mixing apparatus using a self-cutting drive piston, that this piston is continuously in positive force-transferring connection with a drive motor. It also includes the consideration of realizing this by means of a spiral-toothed,

non-self-locking spindle drive. The invention also includes the concept of providing a transmission unit, the driven wheel of which has teeth matched to the teeth of the discharging rod with spindle section. In addition, the invention includes the concept of providing an engagement element at the front end (in the position of use) of the said discharging rod for engaging in the discharging piston. With the suggested solution it is especially achieved that a drive force is coupled independently into a piston (especially a self-cutting piston) that generates a forward drive independently. This is accomplished specifically and advantageously only if in the case of parallel discharging of (at least) one other

component, which takes place via a conventional discharge piston, a predetermined (counter)pressure threshold is exceeded. According to the requirements of many types of use, in this way the discharge of the components that are discharged with the self-cutting piston is suppressed when and for as long
5 as another component to be mixed with the first-mentioned one is not being discharged simultaneously. In addition, when reloading the metering and mixing apparatus, the discharging rod of the self-cutting piston is brought back into its starting position again simply by pushing back (without appreciable resistance and without additional manipulations).

10

The drive suggested here in particular takes into consideration the fact that in a metering and mixing apparatus of the type under discussion, with (at least) one discharging piston automatically generating forward propulsion by rotation, no appreciable axial force need be supplied for this, but merely a sufficient rotational
15 momentum. In principle, the axial force need only be large enough so that the discharging rod does not lose contact with the discharging piston.

In view of the aforementioned considerations and advantageous effects, an execution appears advantageous in which the spirally-toothed spindle section
20 exhibits a high lead of the spiral toothing of between 45° and 65° , especially between 50° and 61° .

In additional advantageous embodiments the engagement element at the end of the discharging rod is designed as a polygonal element, Torx or claw element.

25 Naturally it is necessary to guarantee that the shape of the engagement element corresponds to the shape of a corresponding projection or inset molding on the back side (in the position of use) of the driving piston at least insofar as is necessary for transferring the torque levels required in the instance of use. For this purpose, the geometric shape of the engagement element and the
30 engagement opening need not necessarily be identical. In an advantageous embodiment, the engagement element corresponding to an engagement fitting on

the discharging piston is designed to be self-locating. In this way, "idling" phases of the drive and damage to the engagement area of the discharging piston can be largely avoided.

5 In a cost-advantageous and also functionally advantageous embodiment, the spindle-like discharging rod is made substantially of steel and the engagement area of the discharging piston is made substantially of plastic. However, other material pairs are also possible, and may be reasonable for special applications; for example, the spindle can also consist, as a whole or in part, of a nonferrous alloy, such as
10 brass or bronze or an aluminum alloy, and in the usual discharging pistons as well, usually made substantially of plastic, a counter-piece also made of metal may optionally be used for the spindle engagement element.

Similarly in an additional embodiment it is provided that the spindle-like discharging
15 rod is made substantially of steel and the inner, toothed driven wheel is made substantially of plastic. Here also other material pairings, for example according to the above-mentioned examples, are possible and may be expedient.

In an additional advantageous embodiment it is provided that in the front end of
20 the discharging rod, outside of the spiral-toothed spindle section. The special features of the metering and mixing device for which the suggested driving device is intended, to be sure, ensure the supplying of an axial force (discharging force) under a load, thus in the coupled-in state of the discharge spindle in the discharge piston. However, additional means are to be provided in order to generate an axial
25 motion in the idle state as well, which ultimately also means that the discharging rod will locate the discharge piston at all. The braking element mentioned ensures this.

In a first embodiment, the moving braking element is designed as a moving plastic
30 brake. An additional embodiment is characterized in that the moving braking element is designed as a following wrap spring housing.

Since in practical operation of the metering and mixing device it should be possible to determine whether the discharge piston provided with the thread is operating correctly, thus is actually being moved forward and as a result, discharging the appropriate component, an additional embodiment has on the
5 discharging rod of the discharge piston provided with the thread a position marking element for, especially optical detection of the axial position of the discharging rod and thus indirectly of the discharging piston. In a variant expeditiously combining the above-mentioned aspects of execution. it is provided that the position marking element is formed by the carrying along of the braking
10 element or is attached to it.

In an additional embodiment of the invention, the transmission unit is designed as a planetary transmission unit (of the driving motor), which has a primary drive wheel. Also preferably, a switchable coupling apparatus is provided, which then
15 advantageously comprises a coupling element with a driving pinion gear engaging with the primary driven wheel, and comprises an additional coupling element that is designed as an internal spiral toothing for the transmission unit.

The above-mentioned desirable connection of the discharge of the component
20 discharged with the self-cutting discharging piston to the simultaneous discharging of (at least) one additional component is accomplished with particular reliability in a further embodiment of the invention. In this, the transmission unit is structured for driving the discharging piston provided with the threading and at least one additional discharging piston for another component, driven over a gear
25 rack, and it has an axially movable gear assembly that is movable axially under counter-pressure during discharging of the other component. In this connection, the one coupling element of the switchable coupling device is positioned substantially fixedly in the axial direction relative to the movable assembly, such that it moves with this assembly under the counter-pressure during discharging of the
30 other component. As a result, the first coupling element engages with the other

coupling element, fixedly disposed relative to the apparatus housing.

Finally, the framework of the present invention also includes an application apparatus for multi-component substances, especially multi-component adhesives, with a driving device described herein, with an integrated electric driving motor and battery power supply for this as well as an operating and control unit.

Brief Description of the Invention

10

In the following, the invention will be described in greater detail based on the preferred exemplary embodiments with the aid of the figures, wherein only the features necessary for understanding the invention are shown. Naturally the invention is not limited to the exemplary embodiments shown and described.

15

Specifically the drawings show the following:

- Fig. 1 a side view of an application device according to the invention for a 2-component adhesive;
- 20 Fig. 2 a representation of the structure of the transmission unit 8 of the application device according to Fig. 1,
- Fig. 3A and 3B perspective view of an embodiment of the gear component serving to drive the gear rack 4,
- 25 Fig. 4 a schematic diagram (perspective view) for explaining an additional variant of the drive of the gear rack 4,
- 30 Fig. 5 a perspective view of an embodiment of the second discharging rod 5 of the application device according to Fig. 1,

Fig. 6 a cutaway view of an embodiment of the transmission unit 8 of the application device according to Fig. 1,

5 Fig. 7A and 7B schematic diagrams (perspective views) of a detail of the second discharging rod according to Fig. 5,

Fig. 8 a block diagram of an embodiment of a sensor that forms part of the drive device 1B of the application apparatus according to Fig. 1
10 and

Fig. 9A and 9B motor current-time diagram for explaining two embodiments of a control sequence of the drive control.

15 **Method of Executing the Invention**

Fig. 1 shows a side view (schematic representation) of an application device 1 according to the invention, wherein a metering and mixing apparatus 1A and a corresponding drive device 1B and finally an apparatus body 1C are separately
20 designated as components.

The metering and mixing apparatus 1A comprises, shown as examples, two cartridge holders 2 and 3 with different diameters and different lengths for a tubular sack 2.1 and a solid cartridge 3.1. The larger cartridge holder 2 is actuated
25 with an axially movable first drive piston ("linear piston") 16 that is connected to a first discharging rod (gear rack) 4 and is advanced by this in a linear fashion into the cartridge holder 2. The cartridge holder 3, which has a substantially smaller diameter and also is substantially shorter than the cartridge holder 2, according to the invention is actuated by a second drive piston ("rotary piston"), which on its
30 outside has a threading that engages with the inner wall of the cartridge holder 3 or a cartridge 3.1 inserted therein and generates forward drive by rotation.

The drive unit 1B comprises a transmission unit 8 which has a single drive inlet side and three different drive outlet sides. These are on one hand an outlet for the linearly advanced gear rack 4, on the other hand an outlet for a second
 5 discharging rod 5 and finally an outlet for a likewise rotating drive shaft 10, which operates a rotary mixer 7. The two cartridge holders 2 and 3 on the discharge side are connected with a cartridge coupling 6, through which the substance also present in the cartridge holders 2 and 3 is delivered from the component outlets to the rotary mixer 7, which is likewise connected to the cartridge coupling 6. The
 10 design of such a rotary mixer is known. It has a drive tip 7a attached at the front, through which the mixed substance is ultimately discharged.

The transmission unit 8 in the embodiment of the metering and mixing apparatus 1 shown here is driven with the aid of an electric motor 9. In this as well a
 15 microswitch 12 is provided, the function of which will be described further below.

The device body 1C comprises an operating unit 13 with a manually actuatable on and off switch 13a, a drive control unit 14 and a battery pack 15.

Fig. 2 shows the structure of an embodiment of the transmission unit 8 in
 20 somewhat greater detail; for this purpose also reference is made to Fig. 6 and the further embodiments. It is to be noted that the method of presentation of Fig. 2 and additional figures differs from that in Fig. 1 in that in Fig. 2 the gear components forming part of the gear rack 4 are at the bottom and the components belonging to the second discharging rod 5 are located at the top.

25 The transmission unit 8 comprises a first assembly 18 fixed in place relative to a wall of an apparatus housing 17 of the application device and a second assembly 19 carried movably in the apparatus housing. The two gear assemblies 18 and 19 are clamped elastically together by means of a counter-pressure spring 20 (shown
 30 here symbolically) and the movable assembly 19 is elastically supported against the apparatus housing 17 with an additional spring element 21, which is also

designated as a pressure spring element in the remainder of the document. The first assembly 18 comprises a planetary gear 22, which is in contact with a drive pinion of the drive motor, and the output 23 for driving the spindle-like second drive rod (likewise not shown here) and driven gears for the first discharging rod (gear rack) and the drive shaft of the mixer, which are likewise not labeled or shown separately here.

At the output for the second discharging rod, a switchable coupling (claw coupling) 24 is provided, which comprises a first coupling element 24a fixed in place relative to the first assembly 28 and a second coupling element 24b fixed in place relative to the second assembly 19. A gear component 25 placed in the second assembly 19 for driving the first discharging rod (gear rack) will be described below.

The microswitch 12 is fixed on the first assembly 18; this is designed and positioned such that it is actuated in a preset movement position of the second assembly 19.

The functioning of the two-part design of the transmission unit 8 with the spring supports mentioned and the microswitch is as follows in a simplified description:

In the switched-off state of the application device, the second assembly 19 has advanced forward relative to the first assembly 18 of the transmission unit 8 due to the force of the counter-pressure spring 20 that the first and second coupling elements 24a, 24b of the switchable coupling 24 are not connected and the second assembly also does not touch the microswitch 12. The exact resting position of the second assembly 19 is adjusted by suitable selection of the back-pressure spring 20 and the forward-pressure spring 21, adapted to one another, and the response behavior of the mounting of the second assembly on startup of the apparatus.

On startup the drive force proceeds from the drive motor over the planetary gear

22 and the gear component 25 to the gear rack 4 and causes it to move in the drive direction of the metering and mixing apparatus (to the left in Fig. 1 and Fig. 2). As soon as the first discharging piston 16 encounters the end of the filled cartridge 2.1 facing it, a reactive pressure builds up, because of the viscosity of the substance component contained therein and is transmitted over the gear rack 4 to its drive pinion (see Fig. 3A) and is transmitted over its mounting to the second component 19. It causes movement of the second assembly 19 relative to the first assembly 18 against the spring force of the counter-pressure spring 20. As soon as a certain shift amount is reached, the coupling elements 24a, 24b engage, and the flow of force from the drive motor also reaches the spindle-like second discharging rod 5, setting this into rotation and driving the self-cutting piston. At the same time the microswitch 12 is actuated by the movement of the second assembly 19; for the function connected with this process, see below.

As a result of this design and the resulting sequence it is ensured that discharge of the component B contained in cartridge 3.1 takes place only if the component A of the multi-component system contained in cartridge 2.1 is also discharged. This is also true if a partially emptied cartridge with component A is placed in the device at point 1 and the operation is started in the fully retracted initial position of the gear rack 4. Specifically this then moves forward in idle mode, and the second gear assembly 19 remains in the outlet state shifted relative to the first assembly 18, until the first discharging piston 16 encounters the end of the partially filled cartridge. Only at this time is a reaction force built up there which presses the second assembly 19 against the first assembly 18 and thus closes the switchable coupling 24, so that the drive force is also introduced into the second discharging rod (spindle) 5. In this application as well, therefore, component B is only discharged at the correct time.

Figs. 3A and 3B show, as an embodiment of the gear component serving to drive the first discharging rod (gear rack 4), a coupling-capable screw drive 25 in the coupled-in (Fig. 3A) and uncoupled (Fig. 3B) states. The screw drive comprises a

screw 25a with a spline shaft which is supported in an axial bearing 25b and is driven over a drive gear (not shown here) of the planetary gear. Two worm gears 25c with helical teeth are engaged with the screw 25a, with a claw coupling 25d assigned to each of them. With the displaceable coupling element of this coupling 25d in each case a straight-toothed drive pinion 25e is fixed on, which in the engaged state of the coupling 25d moves along with the worm gear 25c and transmits the drive force to the gear rack (no. 4 in Fig. 1), not shown here, with which it meshes. In the disengaged state shown in Fig. 3B the pinions 25e rotate freely, so that the gear rack supported between them and engaging with them can be moved axially practically without resistance. This makes it possible to easily draw back to reload the application device with a full cartridge 2.1 (Fig. 1).

Fig. 4 shows an alternative version of this, specifically picking up the mode of drawing shown in Fig. 1. Here the gear rack 4 is driven over a spur gear 26 and two screws 27, which are pivotably supported in a guide bar 28. By pivoting this screw 27 by means of an actuating lever (not shown) its engagement with the gear rack 4 can be undone, so that it is once again made possible to withdraw the gear rack almost without resistance. In a further modification of the design of this gear part it may also be provided that the gear rack 4 can be driven over two pinions directly meshing in the flanks thereof, with their rotational axes perpendicular to the length of the gear rack. This drive concept is familiar to the person skilled in the art and therefore will not be illustrated or described in greater detail.

Fig. 5 shows a perspective view of an exemplary embodiment of the second discharging rod 5. At its end (on the left in the figure) this has an engaging element 5a, which is designed here as a polygon for engaging in a correspondingly-shaped engagement device on the discharging rod piston 11 (Fig. 1), which represents a separate part from the discharging rod and for example can be part of the cartridge 3.1 and can be delivered with it. The opposite end section

5b of the discharging rod 5 has a spiral toothed system with a high lead, resulting in non-self-locking behavior. In this terminal section 5b the spindle-like discharging rod engages with an inner-toothed drive gear 29 of the transmission unit corresponding to the exterior threading of section 5b, which is fixed to or
 5 made in one piece with the second coupling element 24b of the switchable coupling 24 shown in Figure 2 as described in the preceding.

The drive rod or spindle 5 is supported at the bearing points 30. Between the end provided with the engaging element 5a and the spiral-toothed end section 5b it is
 10 designed as a cylindrical axis and in this area has a following braking device 31 for generating a minimal braking torque (in the range of 0.5 to 1.0 Nm), which also generates an axial advance when idling, i.e., in the non-engaged state of the discharging rod with the corresponding discharging piston. The braking element
 15 31 can also serve as a position marker for labeling the axial position of the discharging rod in the field of view of an operator or for an optical detection device or can bear such a marking element. In this way it is possible to detect whether the second discharging rod (like the first discharging rod) is moving forward, and thus whether correct discharging of component B is taking place. Thus failure
 20 (caused for example by lack of correct engagement between the discharging rod and the separate discharging piston) can be recognized immediately and the occurrence of incorrect adhesion points can be suppressed.

Fig. 6 shows a sectional view of additional parts of the transmission unit 8 with the discharging rods 4 and 5 in place to make their position assignment clear. With
 25 regard to the screw drive 25' for driving the first discharging rod 4, the construction is somewhat modified versus the gear component 25 sketched in Fig. 2 as well as Fig. 3A and 3B; however, this is of minor importance for understanding this aspect of construction of the drive device.

30 Figs. 7A and 7B on one hand show in somewhat further detail the braking element 31 already illustrated in Fig. 5, which is designed here as a following wrap spring

housing, and the wrap spring 31a is also visible. Fig. 7B shows an embodiment of the braking element as a following plastic brake 31'. Both brake element designs are already known to the person skilled in the art and therefore will not be explained further.

5

Fig. 8 shows schematically on a block diagram the structure of a sensor system and the associated control means of the proposed drive device. The sensor system, in addition to the previously-mentioned microswitch 12, comprises on the on/off switch ("trigger") 13a, naturally serving as the primary operating element --
 10 or in addition to this or as a sensory replacement for it -- a current detection unit 32 for detecting the motor current of the drive motor 9, which is supplied to this over a motor control 33. The drive control unit 14 comprises a sensor signal processing step 14a, a delay element 14b and a control signal outlet step 14c.

15 Through a processing algorithm implemented in the sensor signal processing unit 14a, the signals from the microswitch 12, which ultimately contain information on the discharge of component A, are placed in an appropriate relationship to data originating from the on/off switch 13a or the current detection unit 32 and ultimately provide information on the operating state of the motor. The processing
 20 result is also subjected to an appropriate chronological evaluation (likewise on the basis of stored algorithms) in the delay element 14b, and as a result, a suitable motor control signal is emitted in all operating situations of the application device by the control signal output unit 14c.

25 Figs. 9A and 9B for example show time sequences based on motor current-time diagrams, which each start at a point A with an increase in the detected motor current I based on a turning-on action of the on/off switch 13a. At point B in Fig. 9A an on/off switch is slowly released; at point C the flow detection unit 32 detects a motor current value of 0, after which, during a brief phase D, the sensor signal
 30 processing unit 14a tests whether the motor current remains at the value of 0 to determine whether the on/off switch was released deliberately or accidentally. If

the former is the case, then at point E the signal from the still-depressed microswitch 12 can be processed, such that control signal output unit 14c ultimately emits a signal that causes a return stroke of the motor 9.

- 5 Fig. 9B shows an alternative version of a comparable control sequence. Here in the sensor signal processing unit 14a before time B (release of the on/off switch) in a phase AB* the motor current value is detected and stored and used for comparison with the current value measured at time point C. Here the processing unit recognizes, based on the comparison result, whether the on/off switch was
10 deliberately released, and as long as a corresponding signal is available from the microswitch 12, starts the motor return stroke at practically the same time.

- With the procedure described in both variants, an unnecessary return stroke of the motor in case of accidental or very brief release of the trigger can be
15 prevented, but at the same time a return stroke that is appropriate because of deliberate termination of the drive process can be initiated, so that an “overshooting” discharge of multi-component substances, especially component A (which would still be under drive pressure if the motor were simply turned off) can be suppressed. At the same time, with the (slight) return stroke and with the end
20 of effect of the reaction force coming from component A the second gear assembly 19 is made to return to its initial position at a maximum distance from the first assembly 18, thus releasing the coupling 24 and the microswitch 12. This is a suitable shutoff and non-use state of the application device.

- 25 The execution of the invention is not limited to the examples, but a large number of modifications are also possible, falling within the framework of commercial utilization.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A driving device of a metering and mixing apparatus for multi-component substances, which has at least two cartridge holders for holding replaceable cartridges with individual substance components, a discharging device for simultaneous discharging of the substance components from the cartridges through component outlets with the aid of discharging pistons entering the cartridge holder or cartridges, wherein at least one discharge piston has a threading which can produce forward propulsion of the at least one discharge piston by rotation, and a mixing apparatus connected to the component outlets, which mixes the discharged substance components and discharges them in mixed form, the driving device comprising:

a transmission unit for connection of a drive motor; and

a spindle-like discharging rod of the at least one discharging piston provided with the threading, which in a rear part of its longitudinal extent based on a position of use has a spiral-toothed, non-self-locking spindle section and at a front end of the discharging rod has an engagement element for engaging in the at least one discharging piston,

wherein the transmission unit has a driven wheel which is matched to the spiral toothing of the spindle section.

2. The driving device according to claim 1, wherein the multi-component substances comprise individual substance components.

3. The driving device according to claim 1 or 2, wherein the drive motor is electrical.

4. The driving device according to any one of claims 1 to 3, wherein the spiral-toothed spindle section has a lead of the spiral toothing between 45° and 65°.

5. The driving device according to claim 4, wherein the lead of the spiral toothing is between 50° and 61°.
6. The driving device according to any one of claims 1 to 5, wherein the spindle-like discharging rod is made substantially of steel and the driven wheel, which is internally toothed, is made substantially of plastic.
7. The driving device according to any one of claims 1 to 6, wherein in a front section of the discharging rod outside of the spiral-toothed spindle section a following braking element is provided to guarantee axial movement of the discharging rod even during idling.
8. The driving device according to claim 7, wherein the following braking element is designed as a following plastic brake.
9. The driving device according to claim 7, wherein the following braking element is designed as a following wrap spring housing.
10. The driving device according to any one of claims 1 to 9, wherein on the spindle-like discharging rod a position marking element is provided for optical detection of an axial position of the discharging rod and thus indirectly of the at least one discharging piston which is engaged with the position marking element.
11. The driving device according to any one of claims 7 to 9, wherein on the spindle-like discharging rod a position marking element is provided for optical detection of an axial position of the discharging rod and thus indirectly of the at least one discharging piston which is engaged with the position marking element, and wherein the position marking element is formed by or attached to the following braking element.

12. The driving device according to any one of claims 1 to 11, wherein the engaging element is formed at an end of the drive rod as a polygonal element, Torx or claw element.
13. The driving device according to claim 12, wherein the engaging element corresponding to an engagement element on the discharge piston is designed to be self-locating.
14. The driving device according to any one of claims 1 to 13, wherein the transmission unit comprises a planetary transmission unit of the driving motor with a primary driven wheel and a switchable coupling device, the switchable coupling device comprising a first coupling element with a drive pinion engaging with the primary driven wheel and a second coupling element which is designed as the internally toothed driven wheel of the transmission unit.
15. The driving device according to claim 14, wherein the switchable coupling device is designed as a claw coupling.
16. The driving device according to claim 14 or 15, wherein the transmission unit is designed for driving the at least one discharge piston having the threading and at least one additional discharging piston for another component, driven over a gear rack, and has an axially movable assembly under reaction pressure when discharging the another component and the second coupling element of the switchable coupling device is positioned substantially fixed in the axial direction relative to the movable assembly, in such a manner that under reaction pressure, during discharge of the another component, the second coupling element moves with the assembly and consequently engages with the first coupling element.
17. An application device for multi-component substances with a driving device as defined in any one of claims 1 to 16, with an integrated electric driving

motor, battery power supply for the integrated electric driving motor, and an operating and control unit.

18. The application device of claim 17, wherein the multi-component substances comprise multi-component adhesives.

FIG 1

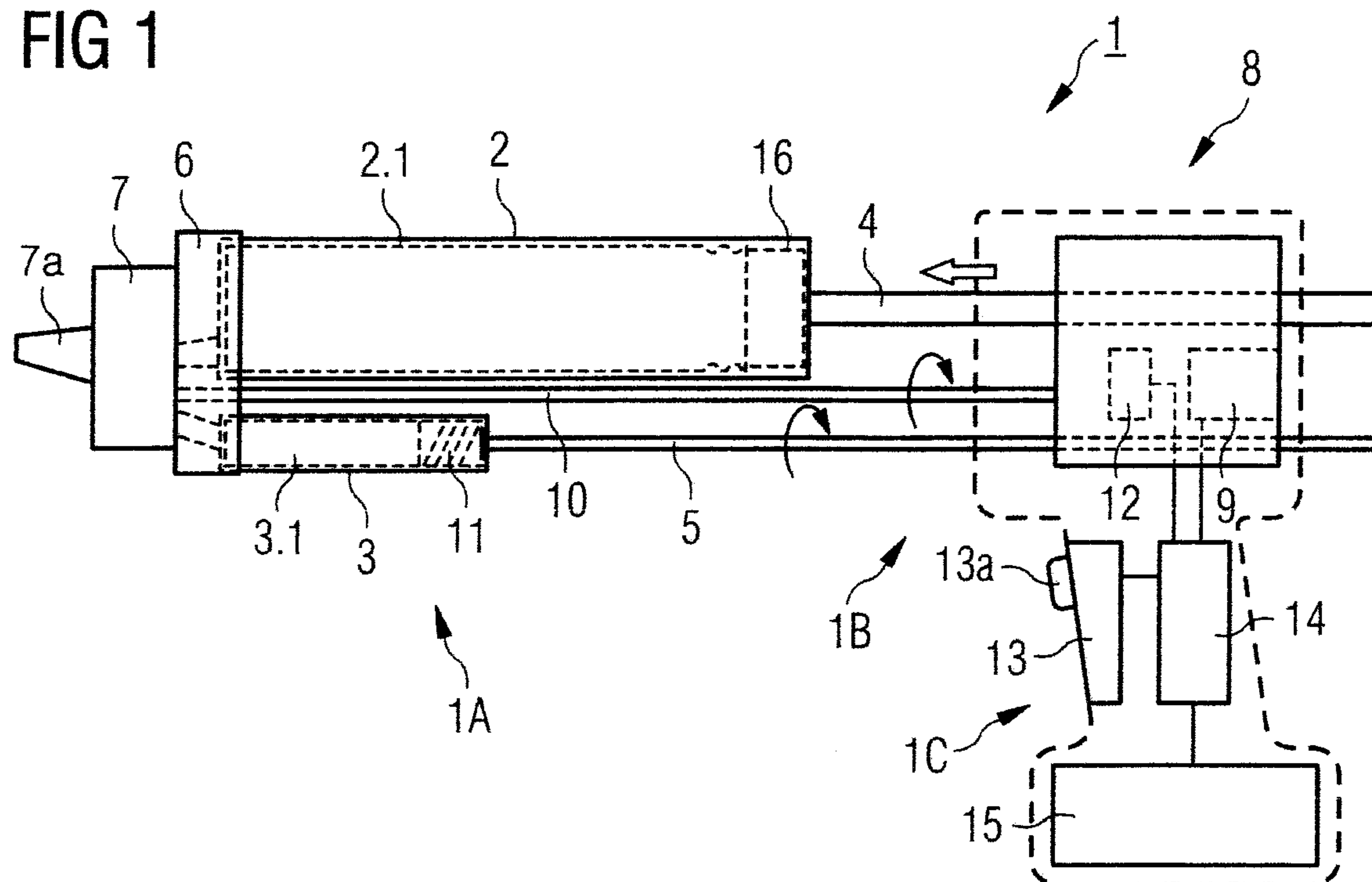
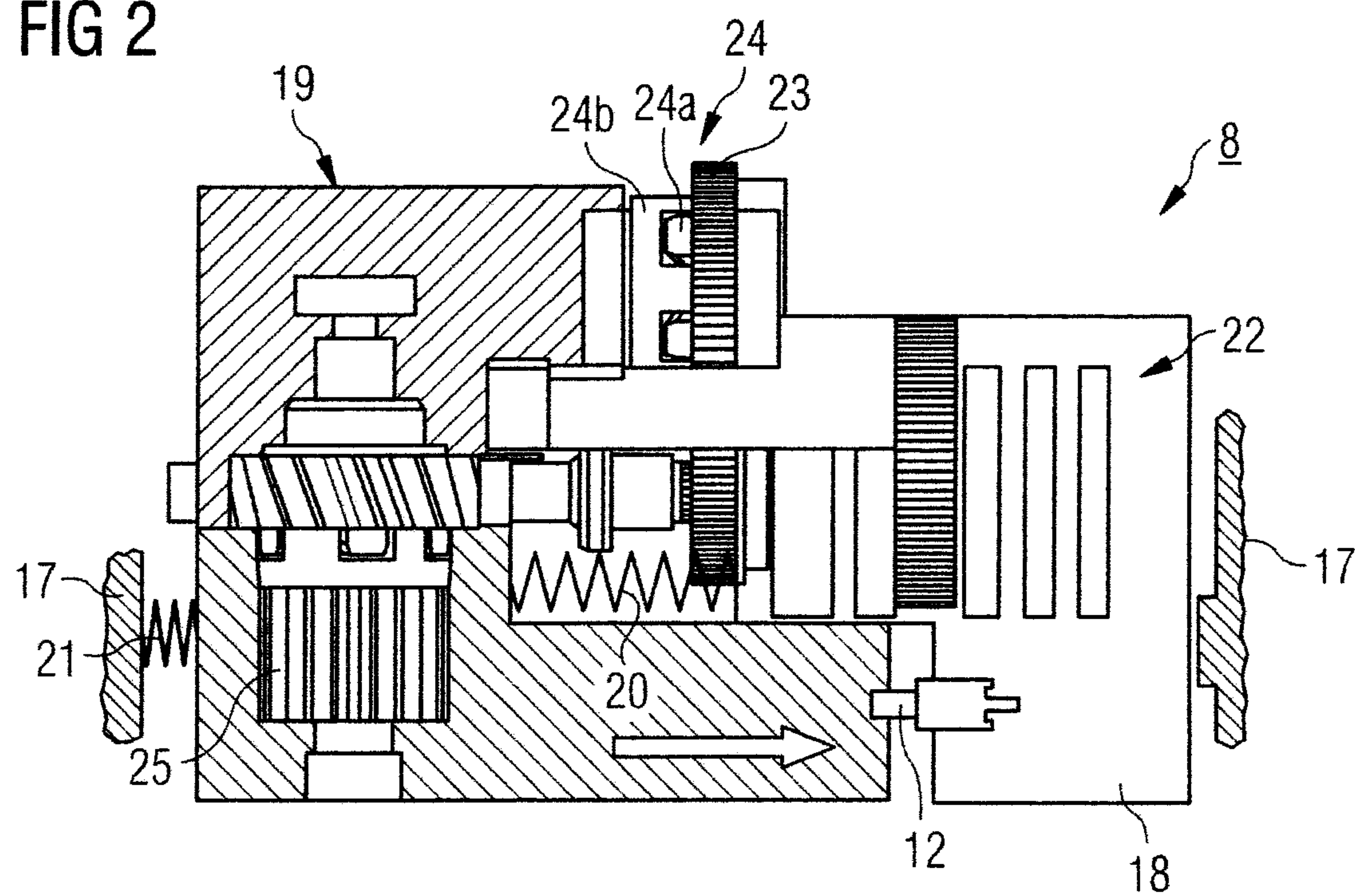


FIG 2



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FIG 3A

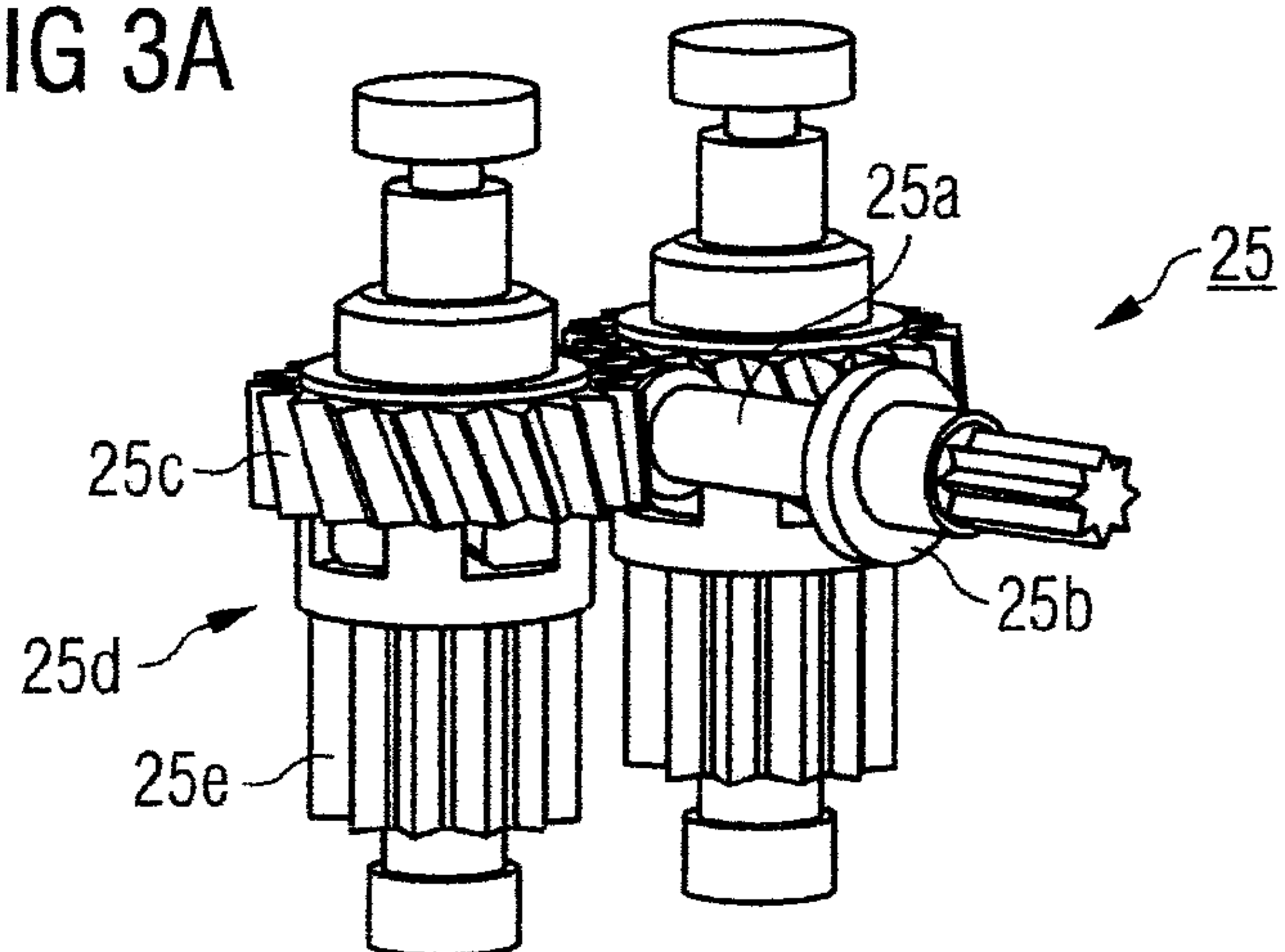


FIG 3B

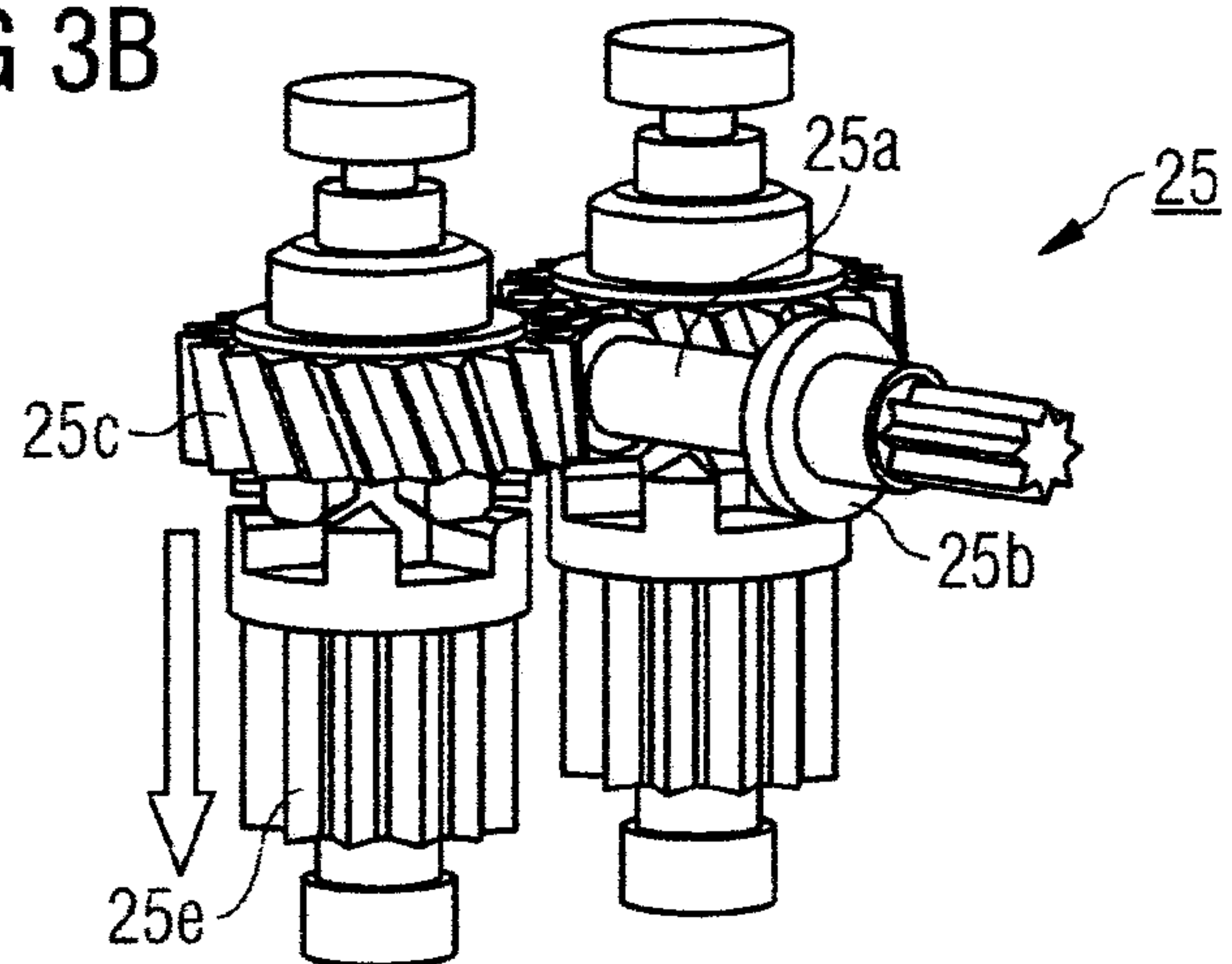
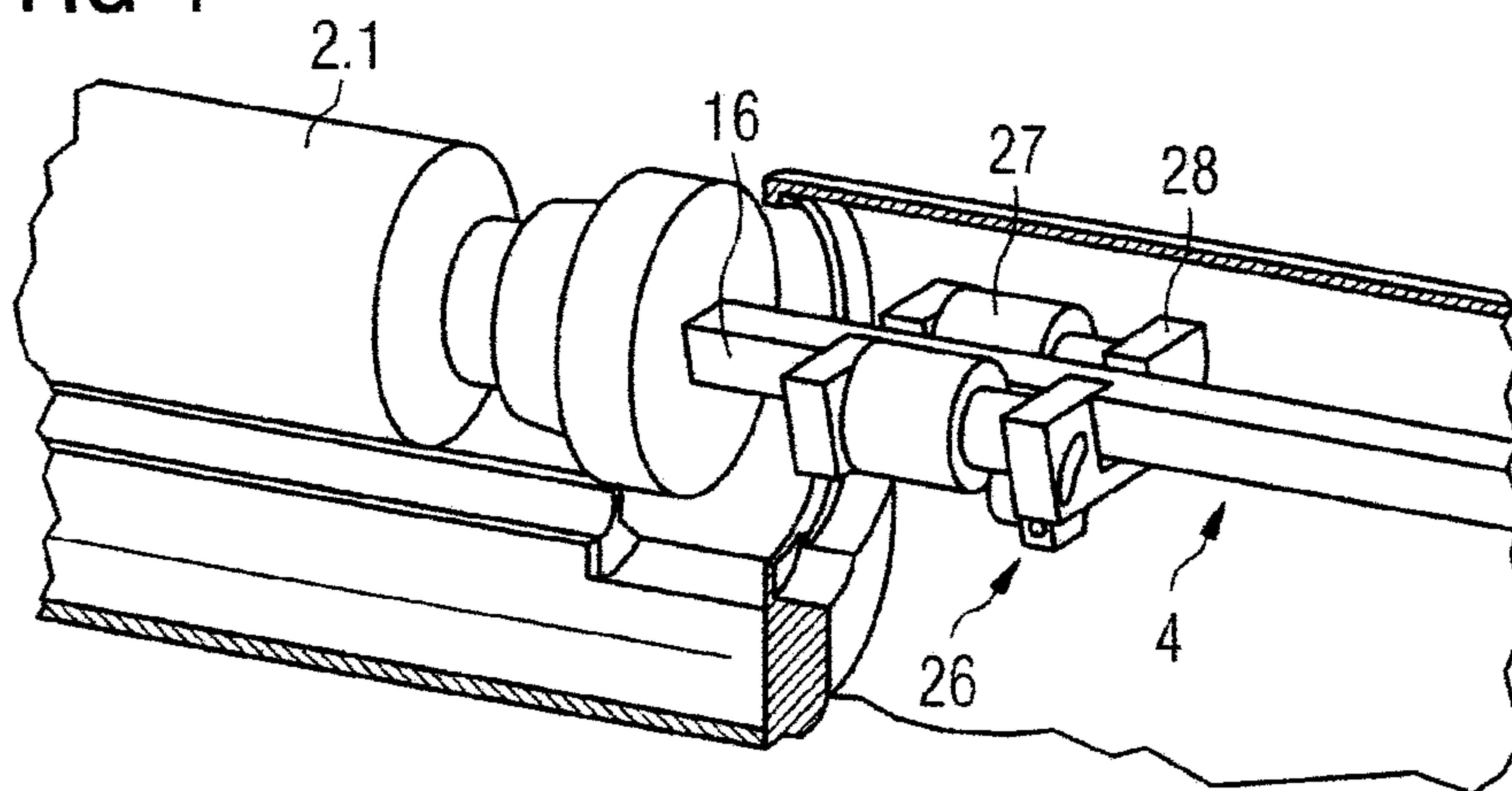
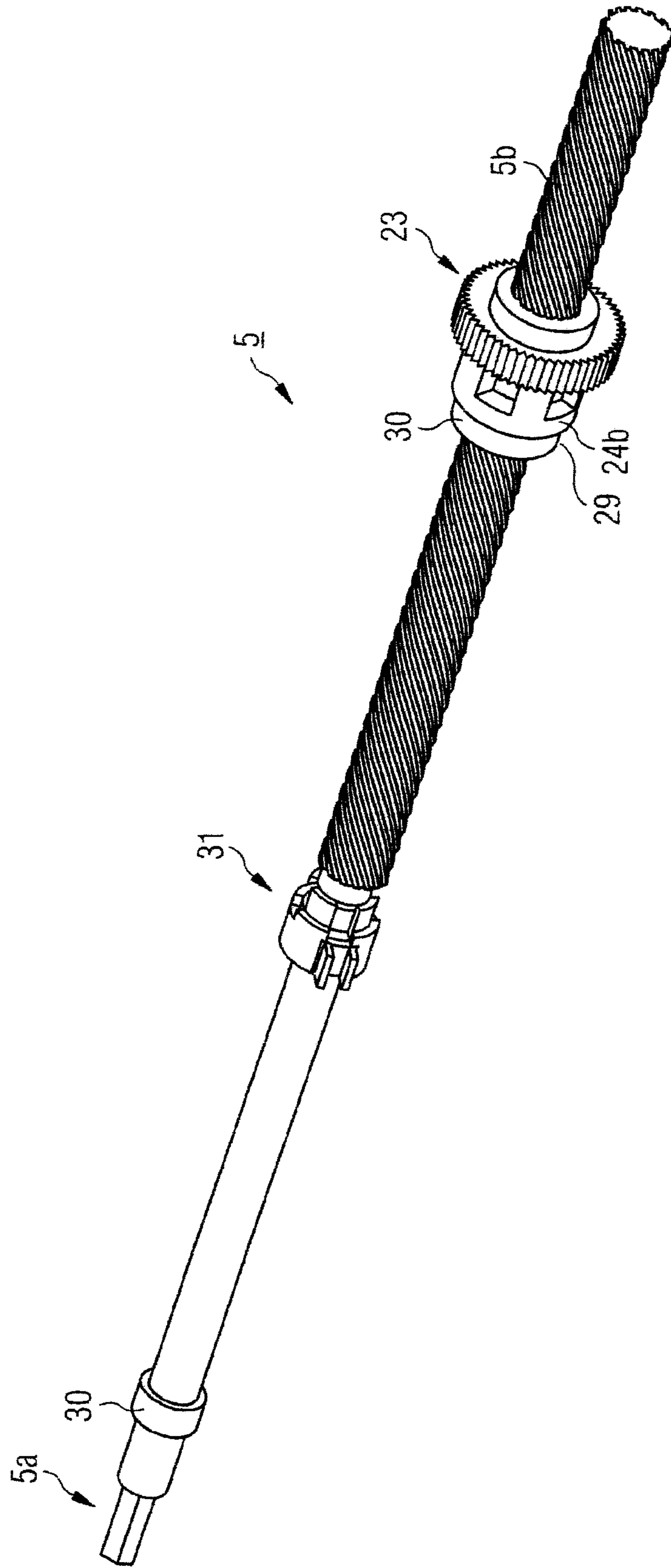


FIG 4



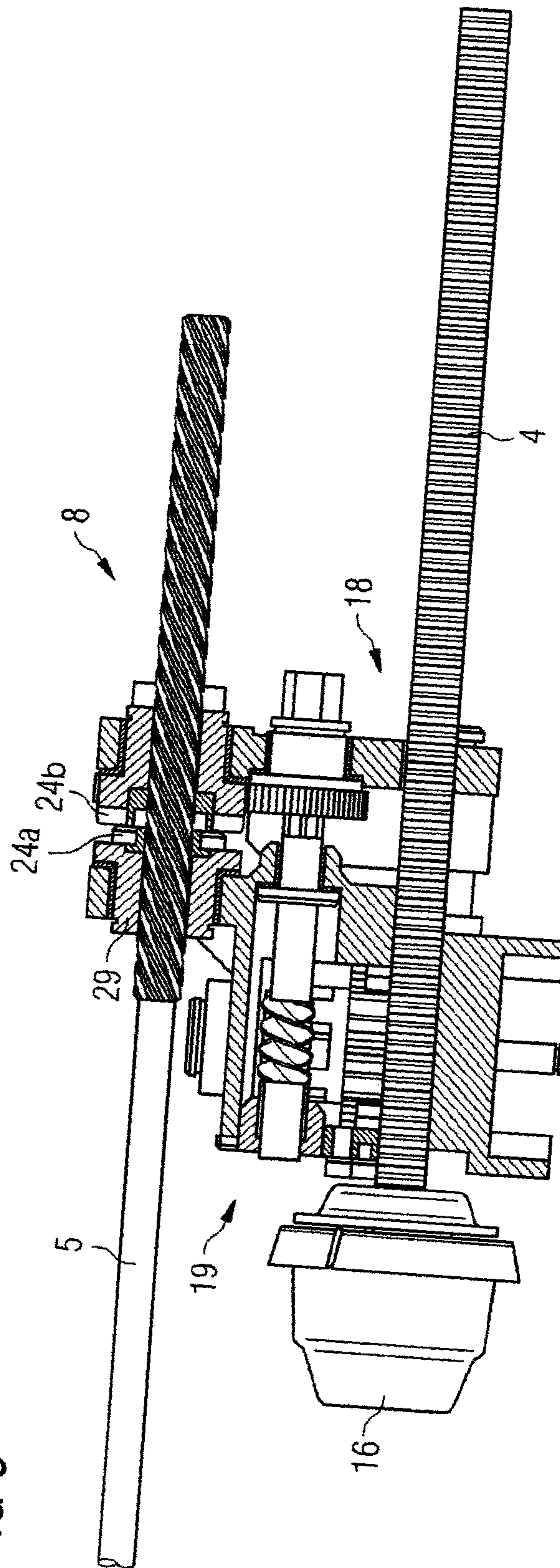
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FIG 5



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FIG 6



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FIG 7A

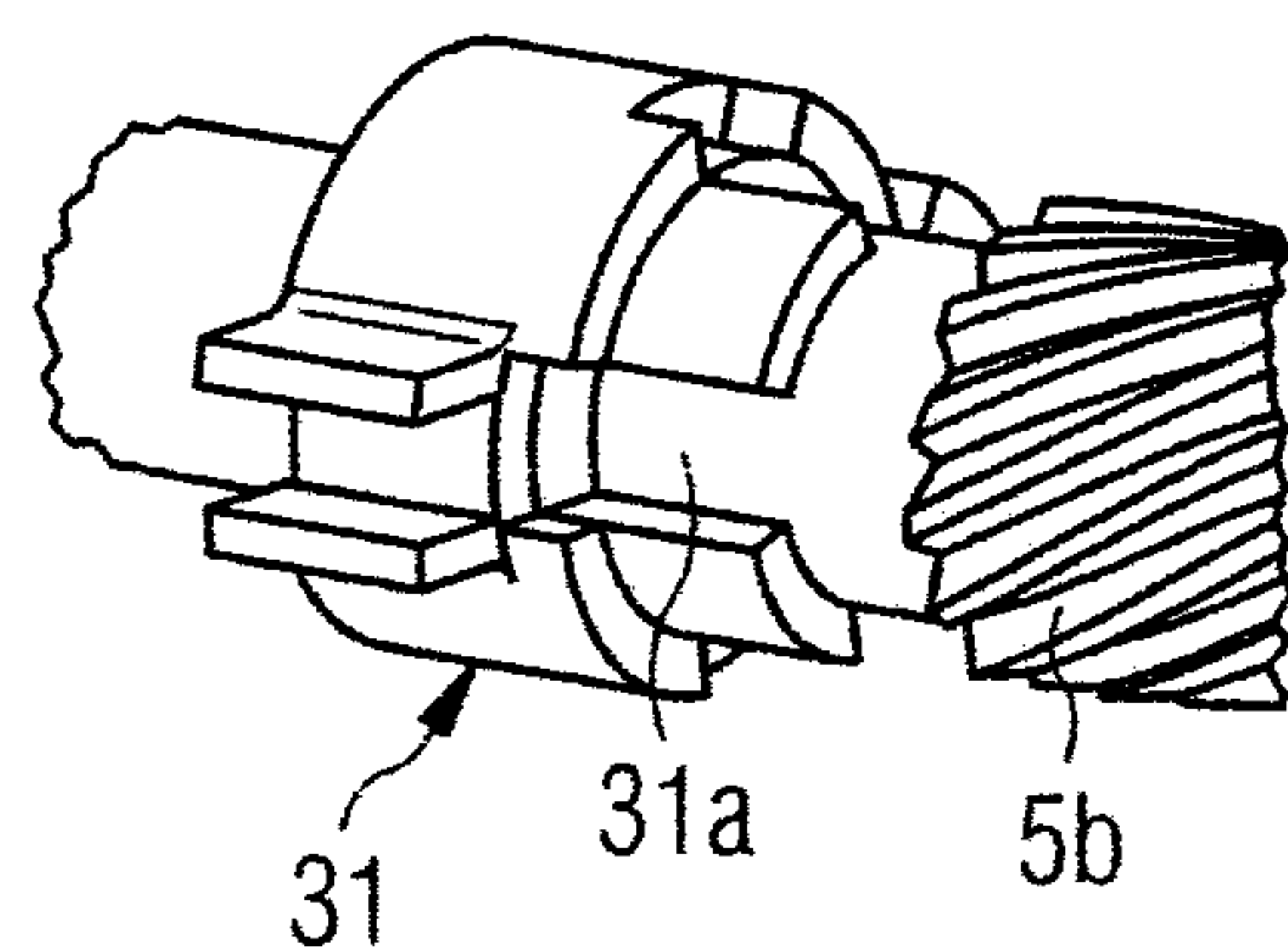


FIG 7B

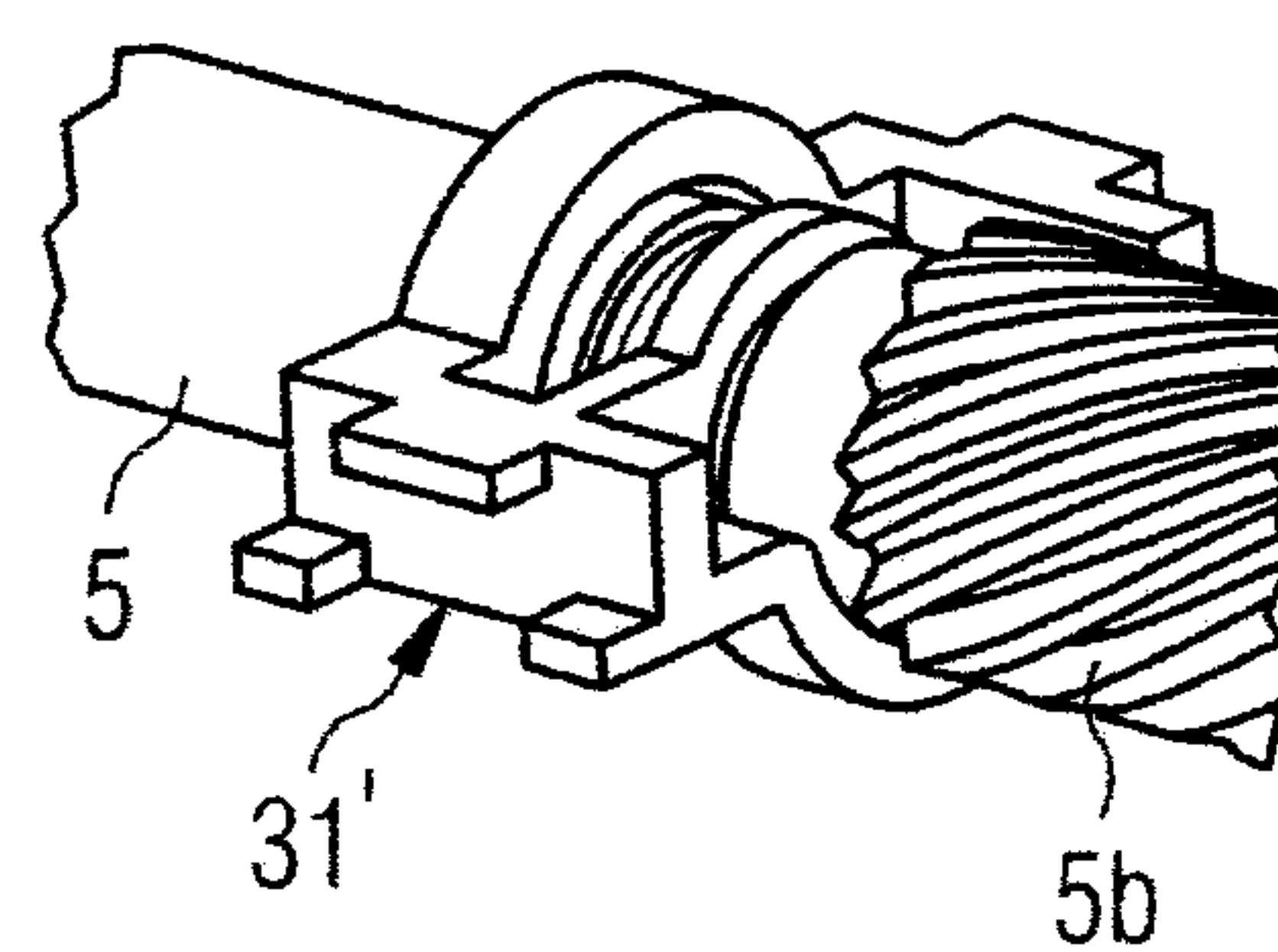


FIG 8

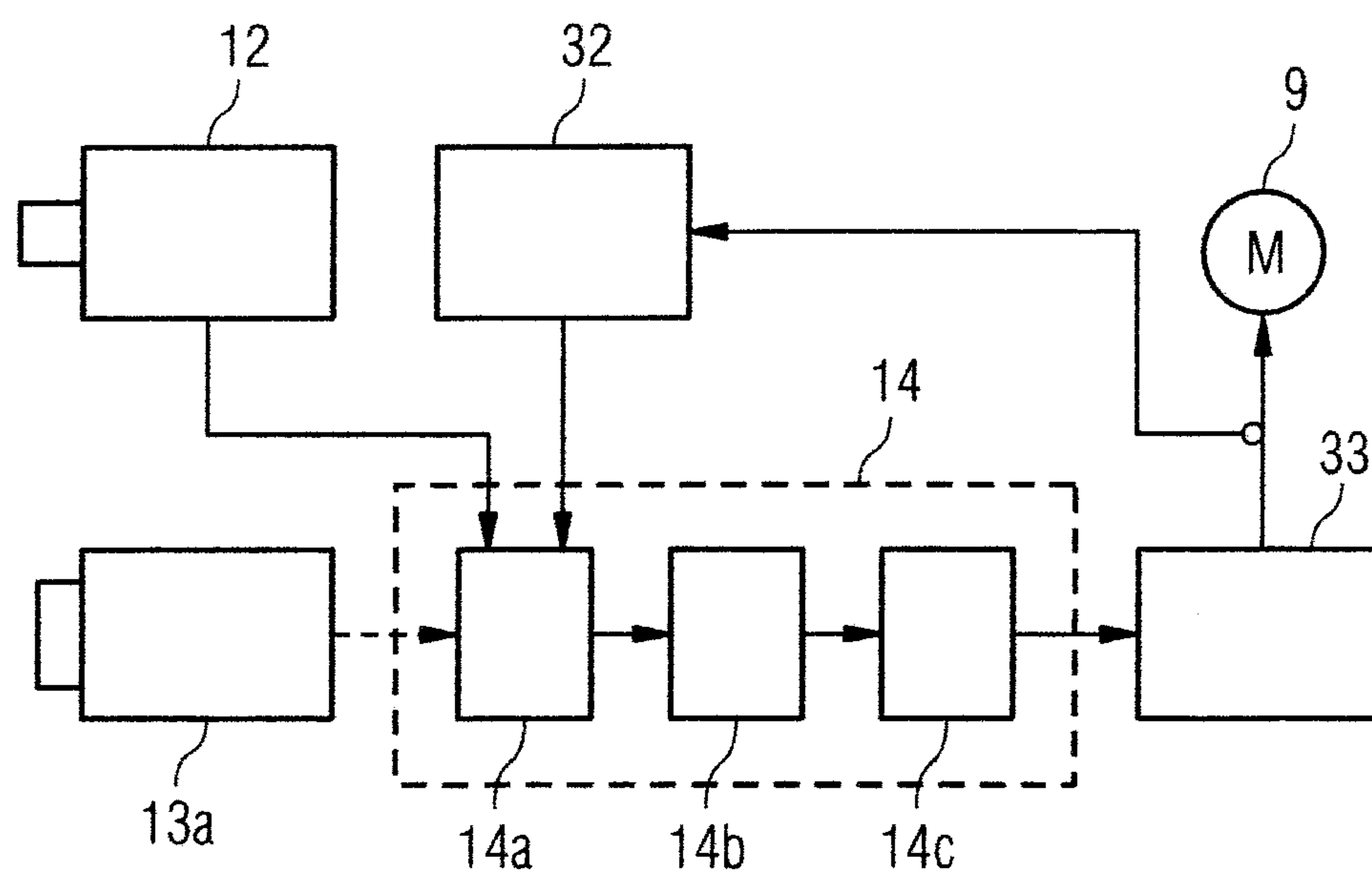


FIG 9A

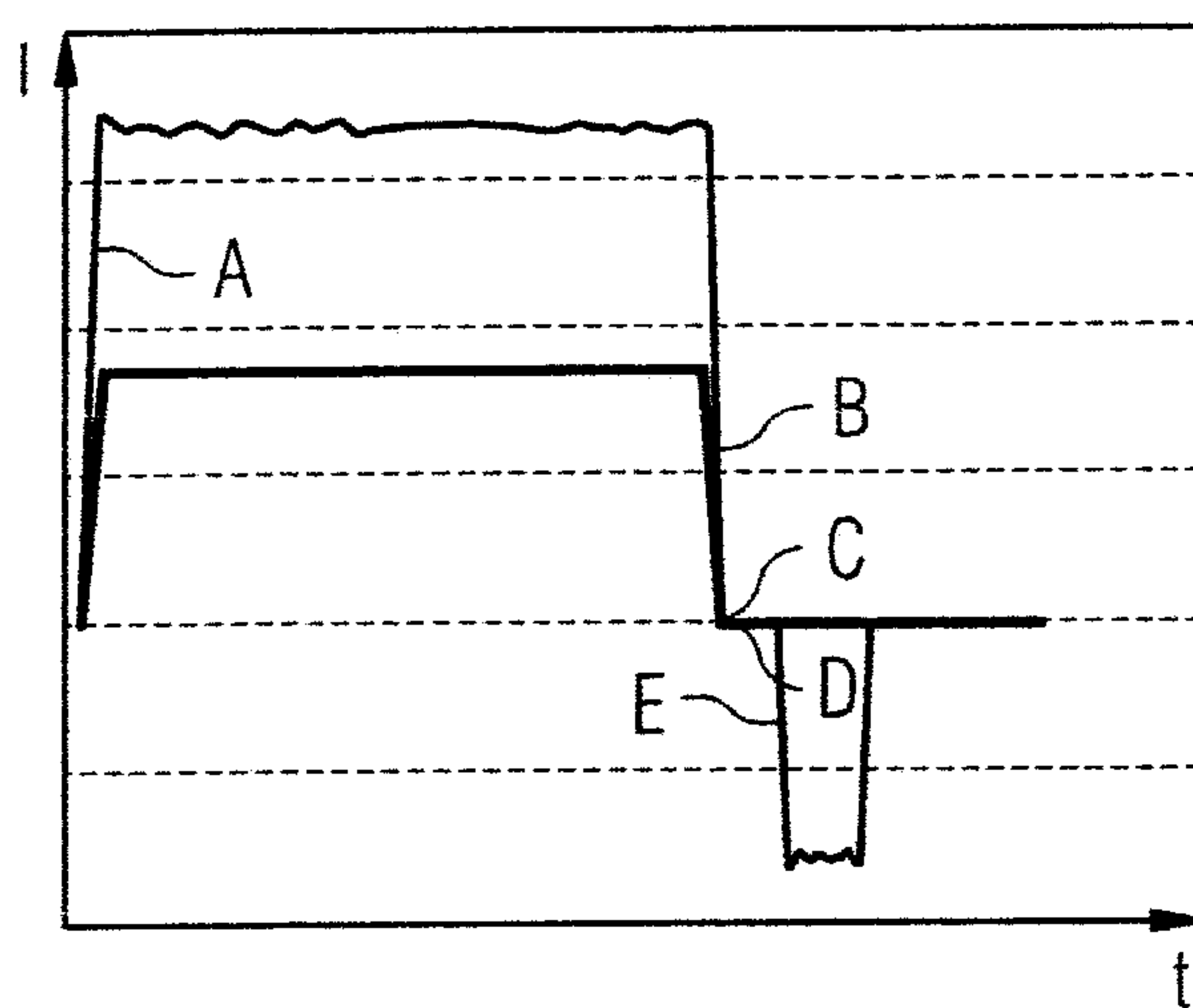


FIG 9B

