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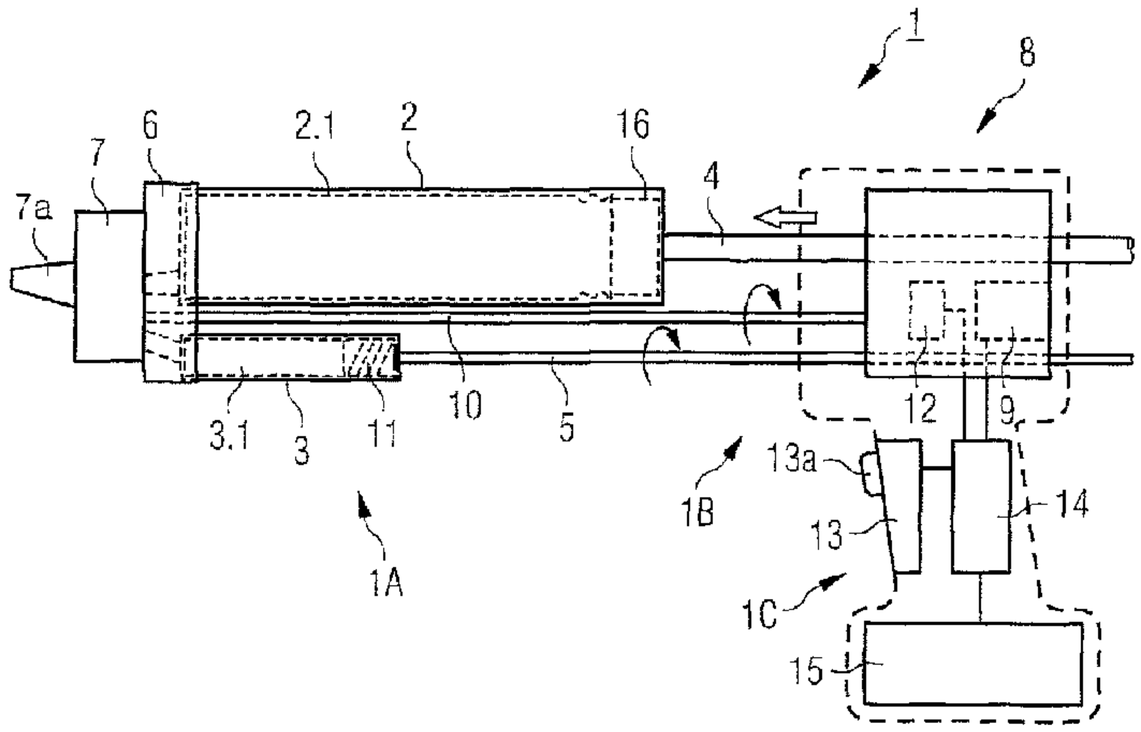

(57) Abrégé/Abstract:
The invention relates to a drive apparatus (1B) of a metering and mixing device (1A) for multi-component materials in particular multi-component adhesives, which metering and mixing device has at least two cartridge-accommodating devices (2, 3) for accommodating replaceable cartridges (2.1, 3.1) having individual material components, a discharging device for simultaneously discharging the material components from the cartridges (2.1, 3.1) through the component outlets by means of discharging plungers (11, 16) that plunge into the cartridge-accommodating device (2, 3) and a mixing device (7), which is connected to the component outlets and mixes the discharged material components and dispenses the material components in the mixed state, comprising a transmission unit (8) for connecting an in particular electric drive machine (9), wherein the transmission unit (8) has coupling means (24) for the forced connection of a discharge of at least two material components by correspondingly synchronized actuation of corresponding discharging plungers (11, 16) by means of respective discharging rods (4, 5).

Abstract

The invention relates to a drive apparatus (1B) of a metering and mixing device (1A) for multi-component materials in particular multi-component adhesives, which metering and mixing device has at least two cartridge-accommodating devices (2, 3) for accommodating replaceable cartridges (2.1, 3.1) having individual material components, a discharging device for simultaneously discharging the material components from the cartridges (2.1, 3.1) through the component outlets by means of discharging plungers (11, 16) that plunge into the cartridge-accommodating device (2, 3) and a mixing device (7), which is connected to the component outlets and mixes the discharged material components and dispenses the material components in the mixed state, comprising a transmission unit (8) for connecting an in particular electric drive machine (9), wherein the transmission unit (8) has coupling means (24) for the forced connection of a discharge of at least two material components by correspondingly synchronized actuation of corresponding discharging plungers (11, 16) by means of respective discharging rods (4, 5).

DRIVE DEVICE OF A METERING AND MIXING DEVICE

DESCRIPTION

Technical Area

The invention relates to a drive apparatus of a metering and mixing device for multi-component materials, especially multi-component adhesives, which has at least two interconnected cartridge-accommodating devices for accommodating replaceable cartridges having individual material components, a discharge device for simultaneously discharging the material components from the cartridges through component outlets by means of discharging plungers that plunge into the cartridge-accommodating device, wherein at least one discharging plunger has a threading which by rotating can create a forward drive of this discharge plunger, and has a mixing device which is connected to the component outlets and mixes the discharged material components and dispenses them in the mixed state.

Prior Art

A metering and mixing device with the above-mentioned structure is the subject of European Patent Application 10 196 972.3 of the applicant.

A similar metering and mixing device for mixing a dental impression compound is already known from DE 3 233 366 A1. This device comprises a stirring unit, designed as a disposable part, with a base body that has a mixing chamber, several feed channels opening separately into the mixing chamber for the components of the impression compound, and outlet openings for the mixed impression compound. The stirring unit also has a stirrer arranged rotatably in the mixing chamber which is driven by drive apparatus against which the stirring unit is held removably. The components of the impression compound are held in reservoir cylinders and are forced by plungers 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 plungers can be varied so that both the ratio of the plunger advance speed which determines the setting time of the impression compound and the overall advance or the duration of advance and 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 2009/039112 A1, WO 2008/076941 A1 and EP 2 279 379 A1.

Presentation of the Invention

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

According to one aspect of the invention there is provided a drive apparatus of a metering and mixing device for multi-component materials, which has at least two cartridge-accommodating devices for accommodating replaceable cartridges with individual material components, a discharging device for simultaneous discharging of the material components from the cartridges through component outlets with the aid of a first discharge plunger and a second discharge plunger plunging into the cartridge-accommodating device or cartridges and a mixing device connected to the component outlets, which mixes the discharged material components and discharges them in mixed form, with a transmission unit for connection of a drive machine, wherein the transmission unit has coupling means for forced connection of the discharge of at least two material components by correspondingly synchronized actuation of the corresponding first and second discharging plungers over a first discharging rod and a second.

The multi-component materials may be multi-component adhesive materials. The transmission unit may be adapted for connection of an electrical drive motor. The transmission unit can be designed for axial drive of the first discharge plunger driven over the

first discharging rod for discharging a material component A and for rotary drive of a threaded second discharge plunger driven over the second, spindle-like discharging rod for discharging a material component B and has a component group that is movable axially under reactive pressure during the discharge of a material component A and a switchable coupling means is provided, which connects the second discharging rod to the drive machine when the movable component group has moved by a predetermined amount under the reaction pressure.

The switchable coupling device may be a first coupling element, which in the axial direction is substantially fixed with respect to the drive machine and has a second coupling element which is positioned substantially fixed in the axial direction with respect to the movable component group, such that it moves with the component group under the reactive pressure and during its displacement comes to engage with the first coupling element. The switchable coupling device can be designed as a form-locking coupling. The switchable coupling device may be a claw coupling.

First and second coupling elements of the form-locking coupling can be designed as self-locating elements. The switchable coupling device may be designed as a force-locking coupling. The switchable coupling device can be a frictional coupling. The movable component group or the second coupling element may have associated to it a counter-pressure spring element, which supplies a counter-pressure force directed against the reactive pressure built up during the discharging of component A for defining the point of action of the coupling device. The movable component group or second coupling element may have associated to it a forward pressure spring element for supplying an adjusting pressure force directed parallel to the counter-pressure during discharging of component A for fine adjustment of the action point of the coupling device. The counter-pressure spring element and/or the forward pressure spring element can be designed as a coil spring, plate

spring or leaf spring made of metal. The counter-pressure spring element and/or the forward pressure spring element can may be designed as a coil spring, plate spring or leaf spring made of spring steel. The first discharging rod can be designed as a gear rack which has associated to it a suitably adapted drive gear of the transmission unit.

The first discharging rod may have associated to it two drive gears designed as coil gears. The drive gear or drive gears of the transmission unit associated to the gear rack may be mounted movably with regard to the gear rack such that it/they can assume a position mechanically decoupled from the gear rack. The second discharging rod in a rear part, relative to the position in use, of its length, may have a spiral-toothed, non-self-locking spindle section and at the front end has an engaging element for engaging in the second discharge plunger, wherein the transmission unit may have a driven gear spiral-toothed in its interior, adapted to the spiral-toothing of the spindle section. The front section of the second discharging rod, outside of the spiral-toothed spindle section, an entrained braking element may be provided for guaranteeing axial movement of the discharging rod in idle mode as well. The transmission unit may comprise a rotary shaft connection section for connecting a drive shaft of an active mixer provided in the metering and mixing device.

According to another aspect of the invention there is provided an application device for multi-component materials comprising: a drive apparatus as defined herein, with an integrated electric drive machine and battery power supply therefor, and an operating and control unit. The multi-component materials can be multi-component adhesive materials.

The invention includes the consideration of making sure, in the driving of a metering and mixing device for multi-component materials, that a certain component is only discharged if another component that is supposed to react with the first is supplied simultaneously. According to the ideas of the inventor this should specifically be guaranteed even if the components are contained in cartridges of different design and different sizes

and/or have different mechanical properties. Accordingly the invention includes the concept of providing a transmission unit for connecting a drive machine, wherein the transmission unit has coupling means for forced connection of the discharge of at least two material components by correspondingly synchronized actuation of the corresponding discharging plungers by means of respective discharging rods.

Specifically, the transmission unit is designed for axial drive of a first discharging plunger for discharging a material component A driven over a first discharging rod and for

rotary drive of a second discharging plunger provided with threading and driven over a second spindle-like discharging rod for discharging a material component B, and it has a transmission unit axially movable under reaction pressure during discharging of material component A. In this embodiment furthermore a switchable coupling device is provided, which connects the second discharging rod with the drive machine when the movable unit has advanced by a certain amount under the reaction pressure. The coupling device is automatically switchable, specifically upon reaching a certain reaction pressure value during the discharge of material component A.

In one embodiment for realizing this automatic switching function of the movable component group (or the coupling element associated to it) a counter-pressure spring element is associated, which supplies a counterforce directed against the reaction pressure during discharge of component A to establish the action point of the coupling unit. In an additional embodiment the component group of the coupling element has a pressure spring element connected to it to supply an adjusting pressure force directed in parallel to the counter-pressure during discharge of component A for fine adjustment of the action point of the coupling device.

In an additional embodiment of the invention the switchable coupling device has a first coupling element which is positioned in the axial direction, essentially immovably with reference to the drive machine or apparatus housing. The execution and positioning of a second coupling element is established such that at a fixed pressure value, under the pressure emerging from the cartridge of material component A and transferred over the first drive plunger and the first discharging rod, it advances with the movable transmission component group. This coupling element engages with the first coupling element in moving the component group mentioned.

In an additional advantageous embodiment of the invention the switchable coupling

device is designed as a form-locking coupling, especially a claw coupling. Furthermore it is preferably provided that the coupling elements of the form-locking coupling are designed as self-locating elements. Alternatively the switchable coupling can be designed as a force-locking coupling, especially a frictional coupling.

In an additional embodiment the discharging rod associated to the discharge plunger for component A is designed as a conventional gear rack in a simple and cost-advantageous manner, and the corresponding parts of the transmission unit are designed adapted to this. In particular, at least one drive gear -- preferably two drive gears -- in the transmission are provided for meshing with the gear rack, which can further preferably be designed as one or more coil gears. Basically, however, design of the first drive rod as a spindle is also possible, and may have associated to it, for example, a ball spindle drive with removable threaded sleeve or a ball spindle drive with threaded surrounding spindle.

In an additional embodiment the drive gears of the transmission unit engaged with the first discharging rod during normal operation of the transmission unit are movable relative to the discharging rods to decouple them from the discharging rods and as a result, guarantee their practically resistance-free manual withdrawal for reloading the mixing and metering device.

In an additional embodiment the drive of the second discharge plunger for discharging material component B is achieved with novel means. Specifically, the corresponding discharging rod in the rear part of its lengthwise dimension, based on the position of use, has a spiral-toothed, non-self-locking spindle section and at the front end an engaging element engaging in the second discharge plunger, and the corresponding section of the transmission unit comprises a drive gear with interior spiral teeth adapted to the spiral teeth of the spindle section.

In an additional embodiment it is provided that the transmission unit comprises a

rotary shaft connection section for connecting a drive shaft of an active mixer provided in the metering and mixing device.

According to yet another aspect of the present invention there is provided a drive apparatus of a metering and mixing device for multi-component materials, the drive apparatus comprising:

at least two cartridge-accommodating devices configured to accommodate replaceable cartridges with individual material components, respectively, wherein a first one of the at least two cartridge-accommodating devices is configured to accommodate a first one of the replaceable cartridges containing a first one of the material components, and a second one of the at least two cartridge-accommodating devices is configured to accommodate a second one of the replaceable cartridges containing a second one of the material components configured to react with the first one of the material components when the first and second material components are respectively discharged from the first and second cartridges;

a discharging device configured to simultaneously discharge the material components from the cartridges through component outlets with the aid of first and second discharging plungers for respectively plunging into a corresponding one of the first and second cartridge-accommodating devices or the first and second cartridges;

a mixing device connected to the component outlets for mixing discharged material components and discharging the material components in mixed form; and

a transmission unit for connection to a drive machine, wherein the transmission unit includes a coupling for a forced connection of the discharge of the first and second material components by correspondingly synchronized actuation of the first

and second discharging plungers via a corresponding one of a first discharging rod and a second discharging rod, so that the first one of the material components is discharged only if the second one of the material components is discharged simultaneously.

According to still another aspect of the present invention there is provided a device for multi-component materials, the device comprising:

an integrated electric drive machine;

an operating and control unit;

a battery power supply for the integrated electric drive machine and the operating and control unit; and

a drive apparatus of a metering and mixing device, the drive apparatus including:

at least two cartridge-accommodating devices configured to accommodate replaceable cartridges with individual material components, respectively,

wherein a first one of the at least two cartridge-accommodating devices is configured to accommodate a first one of the replaceable cartridges containing a first one of the material components, and a second one of the at least two cartridge-accommodating devices is configured to accommodate a second one of the replaceable cartridges containing a second one of the material components configured to react with the first one of the material components when the first and second material components are respectively discharged from the first and second cartridges;

a discharging device configured to simultaneously discharge the material components from the cartridges through component outlets with the aid of first and second discharging plungers for respectively plunging into a corresponding one of the first and second cartridge-accommodating devices or

the first and second cartridges;

a mixing device connected to the component outlets for mixing the discharged material components and discharging the material components in mixed form; and

a transmission unit for connection to a drive machine, wherein the transmission unit includes a coupling for a forced connection of the discharge of the first and second material components by correspondingly synchronized actuation of the first and second discharging plungers via a corresponding one of a first discharging rod and a second discharging rod, so that the first one of the components is discharged only if the second one of the components is discharged simultaneously.

Brief Description of the Invention

In the following, the invention will be described in greater detail based on the preferred exemplified 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.

Specifically the drawings show the following:

Fig. 1 a side view of an application device according to the invention for a 2-component adhesive;

Fig. 2 a representation of the structure of the transmission unit 8 of the application device according to Fig. 1,

Fig. 3A/3B perspective view of an embodiment of the transmission component serving to drive the gear rack 4,

Fig. 4 a schematic diagram (perspective view) for explaining an additional

variant of the drive of the gear rack 4,

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,

Fig. 7A/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 and

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

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 device 1A and a corresponding drive device 1B and finally an apparatus body 1C are separately designated as essential components.

The metering and mixing device 1A comprises, shown as examples, two cartridge-accommodating devices 2 and 3 with different diameters and different lengths for a tubular sack 2.1 and a fixed cartridge 3.1. The larger cartridge-accommodating device 2 is actuated with an axially movable first drive plunger ("linear plunger") 16 that is connected to a first drive rod (gear rack) 4 and is advanced by this in a linear fashion into the cartridge-accommodating device 2. The cartridge-accommodating device 3, which has a substantially smaller diameter and also is substantially shorter than the cartridge-accommodating device 2, according to the invention is actuated by a second drive plunger ("rotary plunger"), which on its outside has a threading that engages with the inner wall of the cartridge-accommodating device 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 input 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 discharging rod 5 and finally an outlet for a likewise rotating drive shaft 10, which operates a rotary mixer 7. The two cartridge-accommodating devices 2 and 3 on the discharge side are connected with a cartridge coupling 6, through which the material also present in the cartridge-accommodating

devices 2 and 3 is delivered from the component outlets to the rotary mixer 7, which is likewise connected to the cartridge coupling 6. The design of such a rotary mixer is known. It has a drive tip 7a attached at the front, through which the mixed material is ultimately discharged.

The drive unit 8 in the embodiment of the metering and mixing device 1 shown here is driven with the aid of an electric machine 9. In this as well a microswitch 12 is provided, the function of which will be described further below. The device body 1C essentially 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 drive unit 8 somewhat more accurately; 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 transmission components forming part of the gear rack 4 are at the bottom and the components belonging to the second discharging rod 5 are shown at the top.

The transmission unit 8 comprises a first component group 18 fixed in place relative to a wall of an apparatus housing 17 of the application device and a second component group 19 carried movably in the apparatus housing. The two transmission component groups 18 and 19 are clamped elastically together by means of a counter-pressure spring 20 (shown here symbolically) and the movable component group 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 component group 18 comprises a planetary transmission 22, which is in contact with a drive pinion of the drive machine, 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 component group 28 and a second coupling element 24b fixed in place relative to the second component group 19. A transmission component 25 placed in the second component group 19 for driving the first discharging rod (gear rack) will be described below.

The microswitch 12 is permanently attached to the first component group 18; this is designed and positioned such that it is actuated in a predetermined movement position of the second component group 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 component group 19 has advanced forward relative to the first component group 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 component group also does not touch the microswitch 12. The exact resting position of the second component group 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 component group on startup of the apparatus.

On startup the drive force proceeds from the drive machine over the planetary transmission 22 and the transmission component 25 to the gear rack 4 and causes it to move in the drive direction of the metering and mixing device (to the left in Fig. 1 and Fig. 2). As soon as the first discharge plunger 16 encounters the end of the filled cartridge 2.1 facing it, a reactive pressure builds up, because of the viscosity of the material 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

component group 19 relative to the first component group 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 machine also reaches the spindle-like second discharging rod 5, setting this into rotation and driving the self-cutting plunger. At the same time the microswitch 12 is actuated by the movement of the second component group 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 transmission component group 19 remains in the outlet state shifted relative to the first component group 18, until the first discharge plunger 16 encounters the end of the partially filled cartridge. Only at this time is a reaction force built up there which presses the second component group 19 against the first component group 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 transmission 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 transmission. Two coil gears 25c with helical teeth are engaged with the screw 25a, with a claw coupling 25d associated to each of them. With the displaceable coupling element of this coupling 25d in each case a straight-toothed drive

pinion 25e is permanently connected, which in the engaged state of the coupling 25d moves along with the coil 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 essentially 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 transmission 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 transmission 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 exemplified 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 plunger 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 flank 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 permanently connected to or 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 designed as a cylindrical axis and in this area has an entrained 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 discharge plunger. The braking element 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 (caused for example by lack of correct engagement between the discharging rod and the separate discharge plunger) can be recognized immediately and the occurrence of incorrect adhesion points can be suppressed.

Fig. 6 shows a sectional view of additional essential parts of the transmission unit 8 with the discharging rods 4 and 5 in place to make their position assignment clear. With regard to the screw drive 25' for driving the first discharging rod 4, the construction is somewhat modified versus the transmission 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.

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

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 -- or in addition to this or as a sensory replacement for it -- a current detection unit 32 for detecting the machine current of the drive machine 9, which is supplied to this over a machine 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.

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 machine. The processing 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 machine control signal is emitted in all operating situations of the application device by the control signal output unit 14c.

Figs. 9A and 9B for example show time sequences based on machine current-time diagrams, which each start at a point A with an increase in the detected machine 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 machine current value of 0, after which, during a brief phase D, the sensor signal processing unit 14a tests whether the machine 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 machine 9.

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 machine 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 deliberately released, and as long as a corresponding signal is available from the microswitch 12, starts the machine return stroke at practically the same time.

With the procedure described in both variants, an unnecessary return stroke of the machine in case of accidental or very brief release of the trigger can be 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 materials, especially component A (which would still be under drive pressure if the machine were simply turned off) can be suppressed. At the same time, with the (slight) return stroke and with the end of effect of the reaction force coming from component A the second transmission component group 19 is made to return to its initial position at a maximum distance from the first component group 18, thus releasing the coupling 24 and the microswitch 12. This is a suitable shutoff and non-use state of the application device.

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 drive apparatus of a metering and mixing device for multi-component materials, the drive apparatus comprising:

at least two cartridge-accommodating devices configured to accommodate replaceable cartridges with individual material components, respectively, wherein a first one of the at least two cartridge-accommodating devices is configured to accommodate a first one of the replaceable cartridges containing a first one of the material components, and a second one of the at least two cartridge-accommodating devices is configured to accommodate a second one of the replaceable cartridges containing a second one of the material components configured to react with the first one of the material components when the first and second material components are respectively discharged from the first and second cartridges;

a discharging device configured to simultaneously discharge the material components from the cartridges through component outlets with the aid of first and second discharging plungers for respectively plunging into a corresponding one of the first and second cartridge-accommodating devices or the first and second cartridges;

a mixing device connected to the component outlets for mixing discharged material components and discharging the material components in mixed form; and

a transmission unit for connection to a drive machine, wherein the transmission unit includes a coupling for a forced connection of the discharge of the first and second material components by correspondingly synchronized actuation of the first and second discharging plungers via a corresponding one of a first discharging rod and a second discharging rod, so that the first one of the material components is discharged only if the second one of the material components is discharged simultaneously.

2. The drive apparatus according to claim 1, further comprising:

an axial drive of the first discharging plunger driven over the first discharging rod for discharging the first one of the material components and for rotary drive of the second discharging plunger driven over the second discharging rod for discharging the second one of the material components, wherein the second discharge plunger is threaded, and wherein the second discharging rod is spindle-like.

3. The drive apparatus according to claim 2, further comprising:

a component group that is movable axially under reactive pressure during the discharge of the first one of the material components.

4. The drive apparatus according to claim 3, further comprising:

a switchable coupling device, which is configured to connect the second discharging rod to the drive machine of the transmission unit when the movable component group has moved by a predetermined amount under the reaction pressure.

5. The drive apparatus according to claim 4, wherein the switchable coupling device further comprises:

a first coupling element, which is fixed in an axial direction with respect to the drive machine; and

a second coupling element which is fixed in the axial direction with respect to the movable component group, such that the second coupling element will move with the component group under the reactive pressure and, during its displacement, come to engage with the first coupling element.

6. The drive apparatus according to claim 4 or 5, wherein the switchable coupling device is a form-locking coupling.

7. The drive apparatus according to claim 4 or 5, wherein the switchable coupling device is a claw coupling.

8. The drive apparatus according to claim 6, comprising:

die coupling elements of the form-locking coupling, which are self-locating elements.

9. The drive apparatus according to claim 4 or 5, wherein the switchable coupling device is a force-locking coupling.

10. The drive apparatus according to claim 4 or 5, wherein the switchable coupling device is a frictional coupling.

11. The drive apparatus according to any one of claims 2 to 10, further comprising:

a counter-pressure spring element for supplying a counter-pressure force directed against the reactive pressure built up during discharge of the first one of the material components.

12. The drive apparatus according to claim 11, further comprising:

a forward pressure spring element for supplying an adjusting pressure force directed parallel to the counter-pressure during discharging of the first one of the material components.

13. The drive apparatus according to claim 12, wherein at least one of the counter-pressure spring element and the forward pressure spring element is a coil spring, plate spring or leaf spring made of metal.

14. The drive apparatus according to any one of claims 2 to 13, wherein the first discharging rod is a gear rack, and the transmission unit includes at least one drive gear.

15. The drive apparatus according to claim 14, wherein the at least one drive gear of the transmission unit associated with the gear rack of the first discharging rod is movably mounted with regard to the gear rack for mechanical decoupling from the gear rack.

16. The drive apparatus according to any one of claims 2 to 15, wherein the second discharging rod possesses a rear end part and a front part relative to a position in use, wherein at the rear part the second discharging rod has a spiral-toothed, non-self-locking spindle section,

wherein at the front part the second discharging rod has an engaging element for engaging in the second discharging plunger, and

wherein the transmission unit has a driven gear spiral-toothed in its interior, adapted to the spiral-toothing of the spindle section.

17. The drive apparatus according to claim 16, comprising:

an entrained braking element in a front section of the second discharging rod and outside of the spiral-toothed spindle section, wherein the braking element is configured to provide axial movement of the discharging rod during idling.

18. The drive apparatus according to any one of claims 1 to 17, further comprising:

a rotary shaft connection for connecting a drive shaft of the transmission unit to an active mixer in the metering and mixing device.

19. A device for multi-component materials, the device comprising:

an integrated electric drive machine;

an operating and control unit;

a battery power supply for the integrated electric drive machine and the operating and control unit; and

a drive apparatus of a metering and mixing device, the drive apparatus including:

at least two cartridge-accommodating devices configured to accommodate replaceable cartridges with individual material components, respectively, wherein a first one of the at least two cartridge-accommodating devices is configured to accommodate a first one of the replaceable cartridges containing a first one of the material components, and a second one of the at least two cartridge-accommodating devices is configured to accommodate a second one of the replaceable cartridges containing a second one of the material components configured to react with the first one of the material components when the first and second material components are respectively discharged from the first and second cartridges;

a discharging device configured to simultaneously discharge the material components from the cartridges through component outlets with the aid of first and second discharging plungers for respectively plunging into a corresponding one of the first and second cartridge-accommodating devices or the first and second cartridges;

a mixing device connected to the component outlets for mixing the discharged material components and discharging the material components in mixed form; and

a transmission unit for connection to a drive machine, wherein the transmission unit includes a coupling for a forced connection of the discharge of the first and second material components by correspondingly synchronized actuation of the first and second discharging plungers via a corresponding one of a first discharging rod and a second discharging rod, so that the first one of the components is discharged only if the second one of the components is discharged simultaneously.

FIG 1

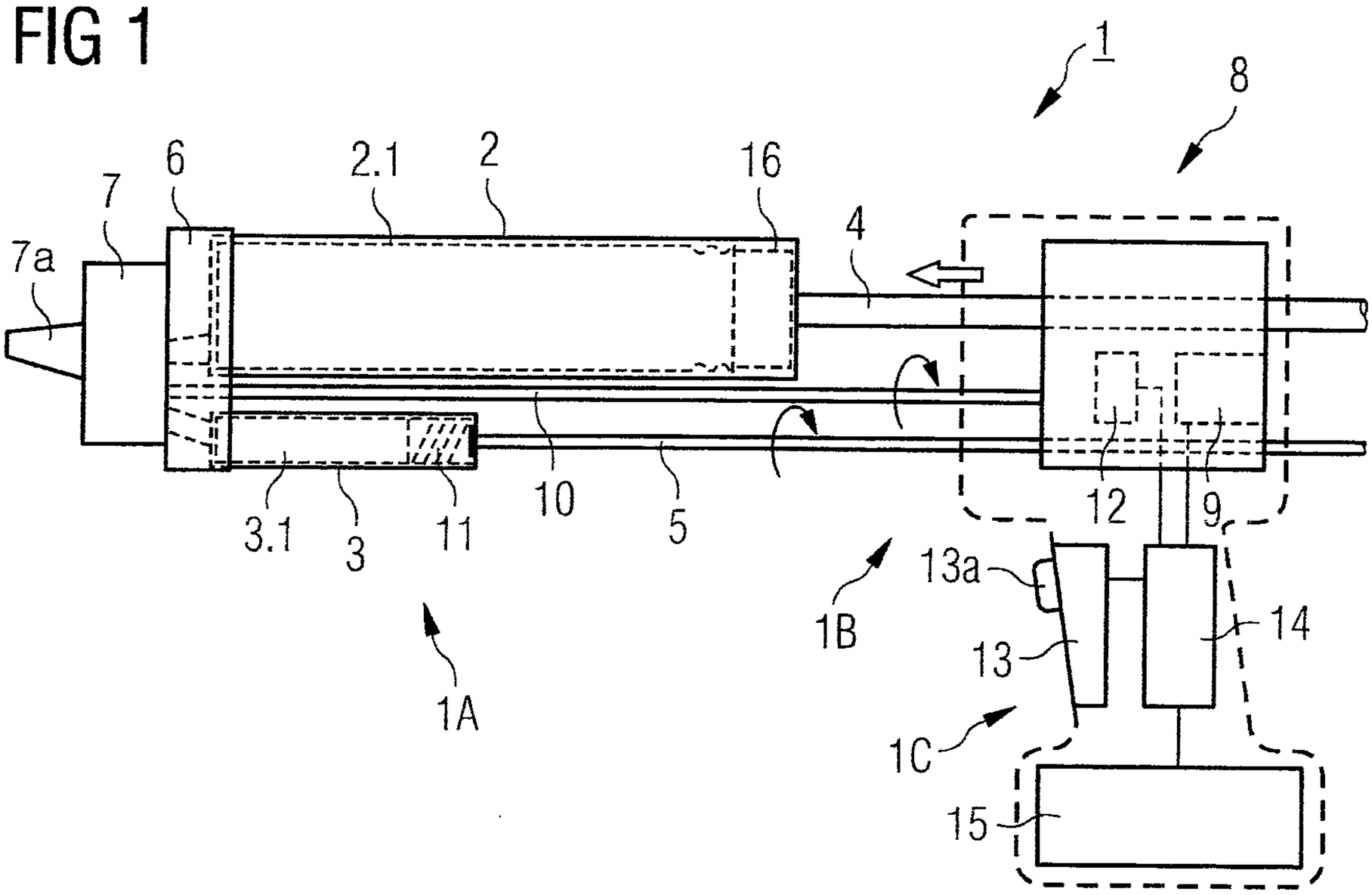
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FIG 2

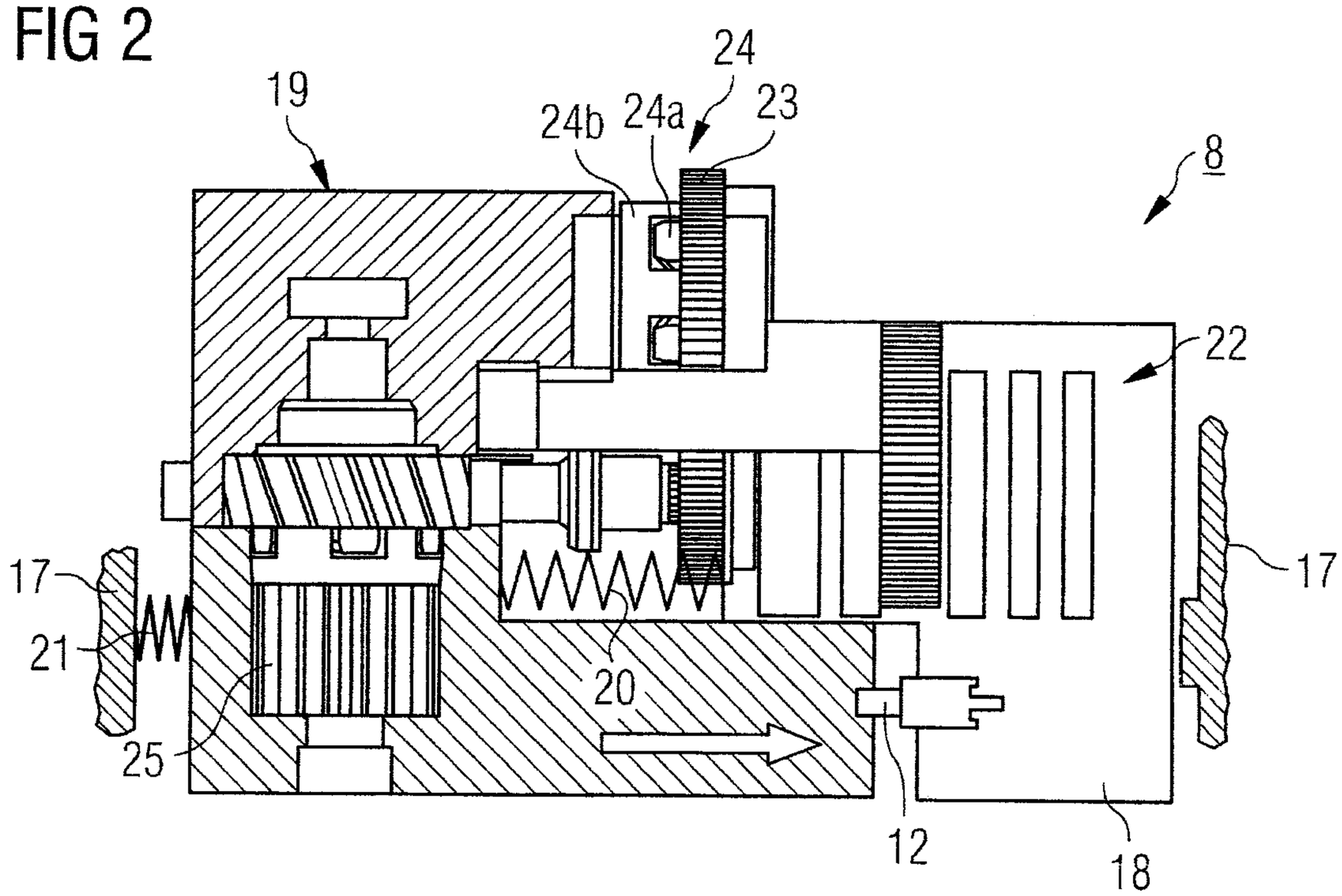
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FIG 3A

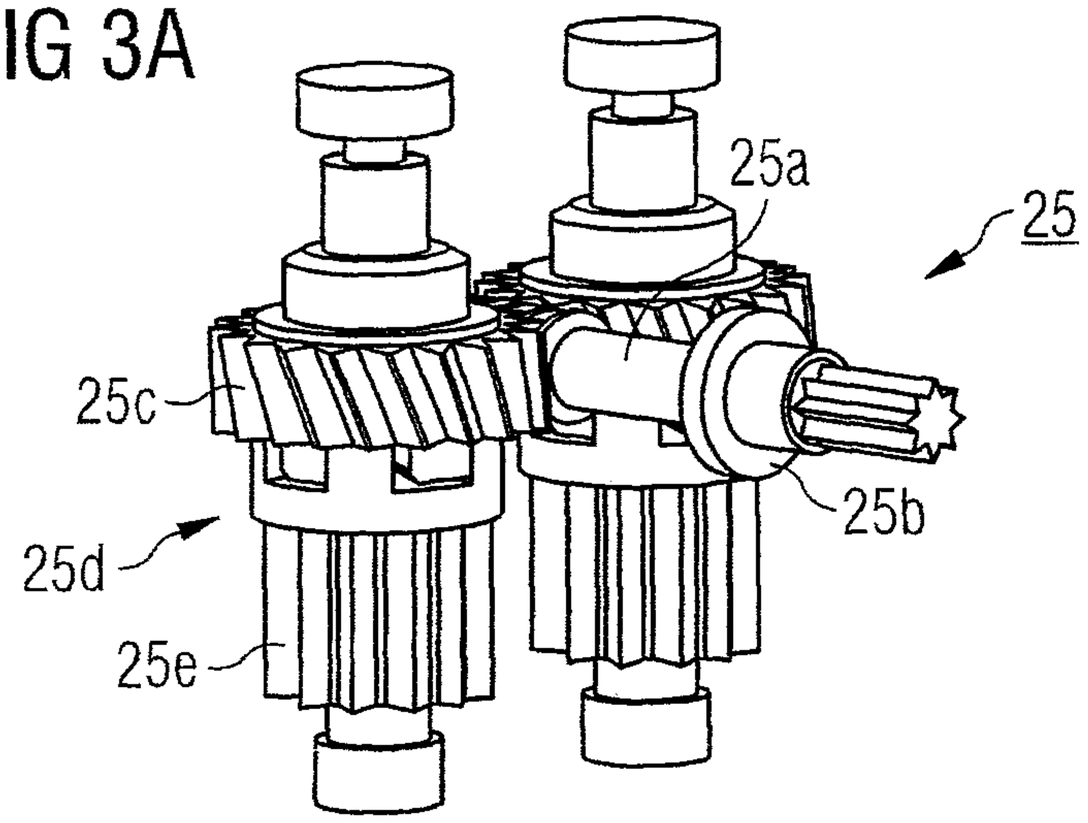


FIG 3B

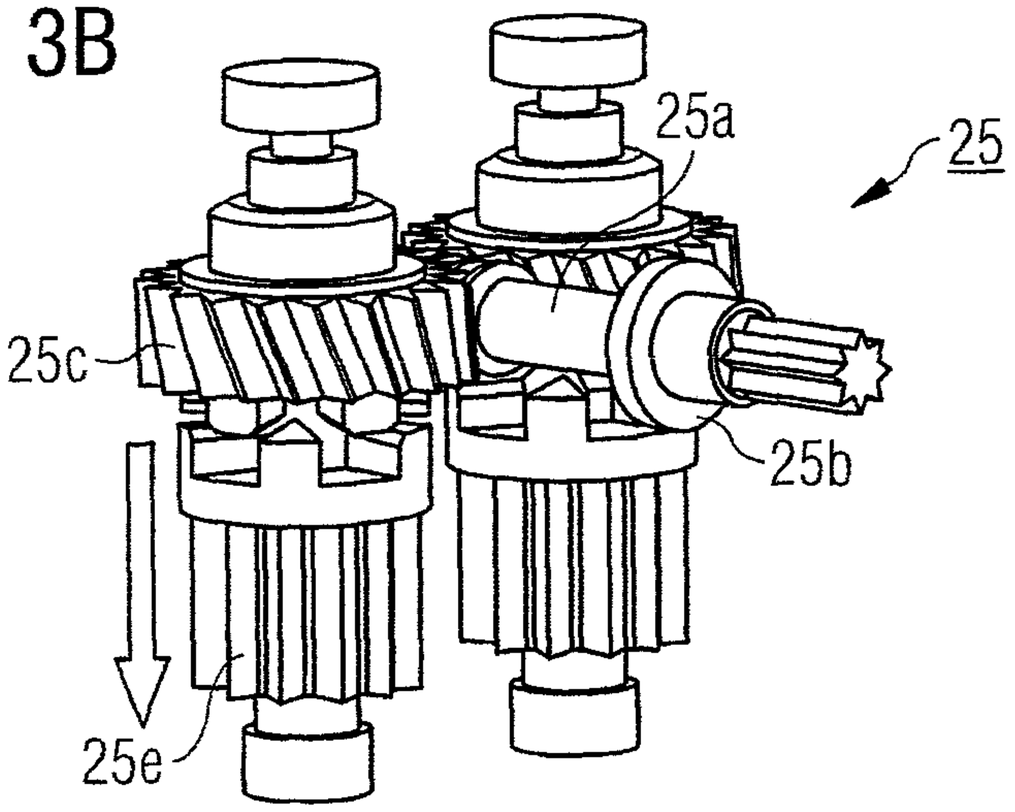
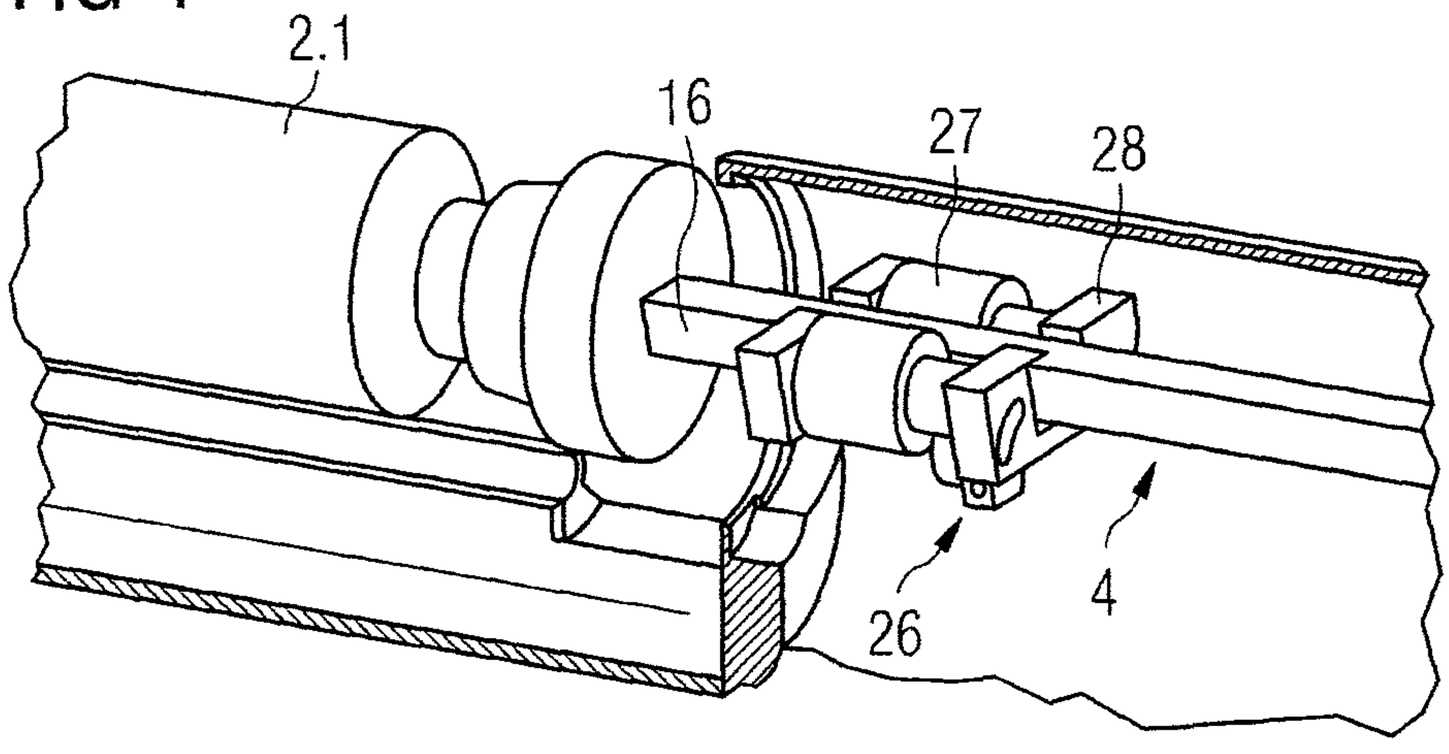


FIG 4



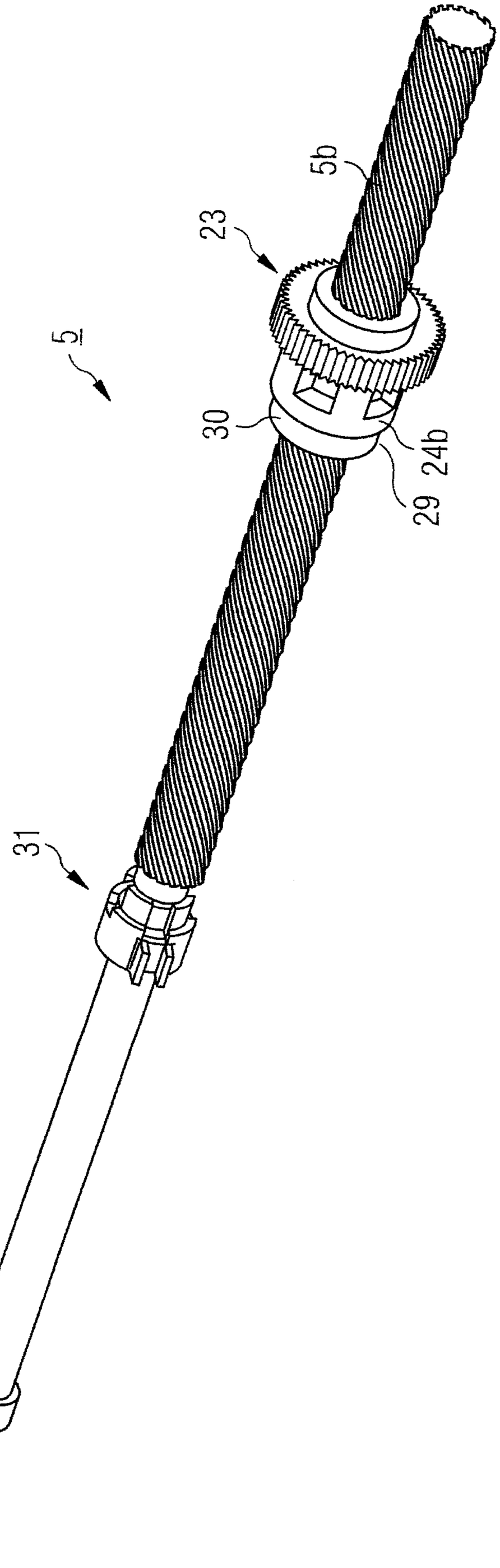


FIG 5

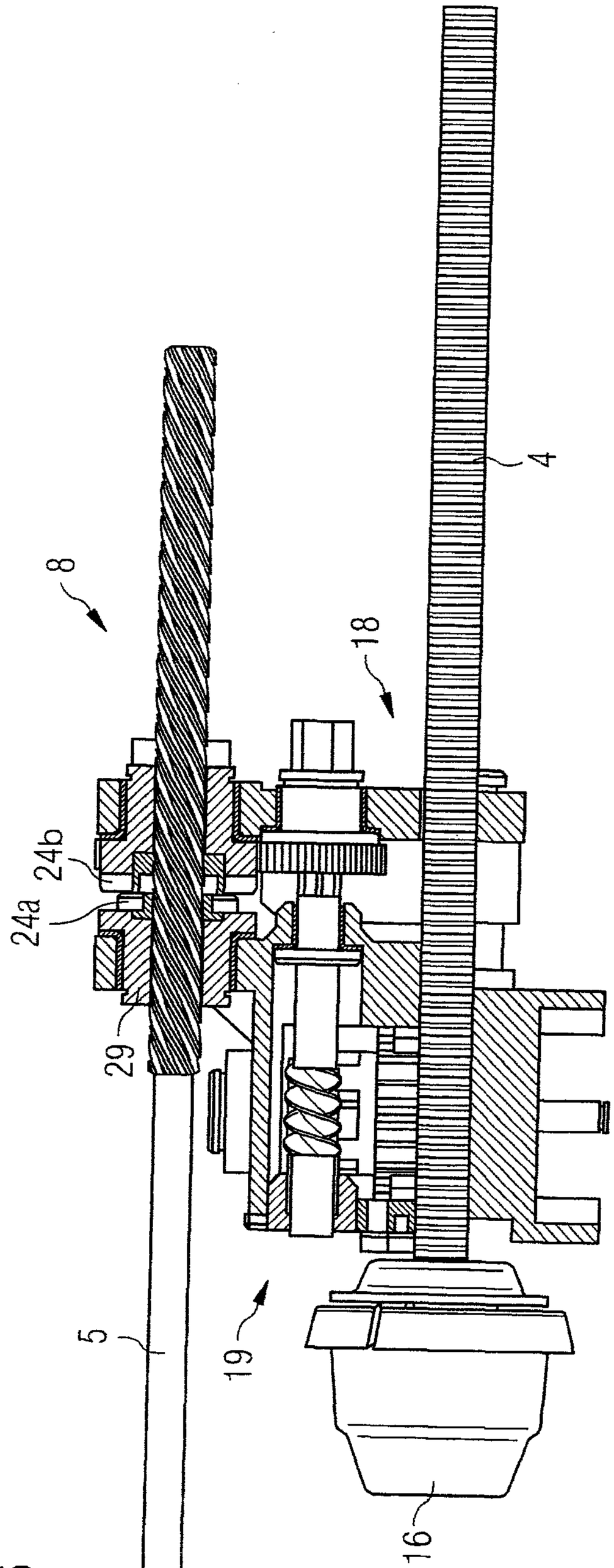


FIG 6

FIG 7A

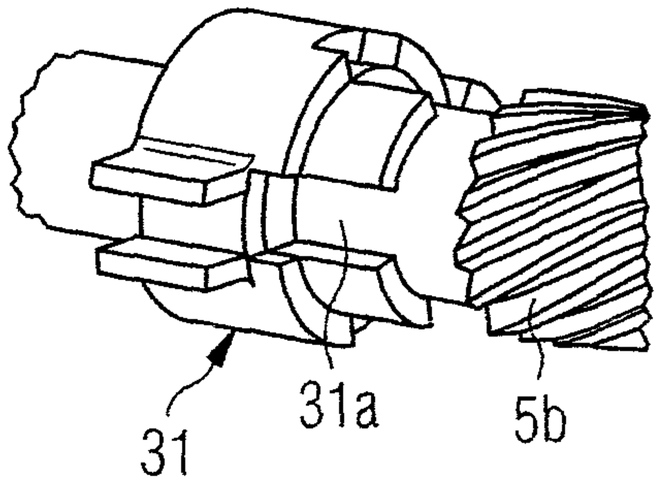


FIG 7B

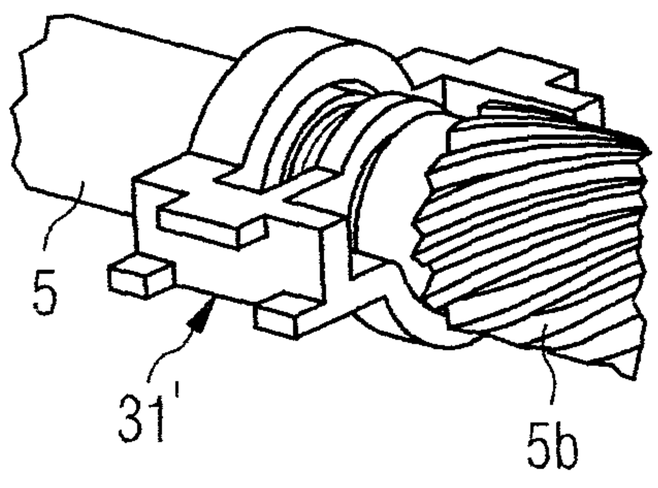


FIG 8

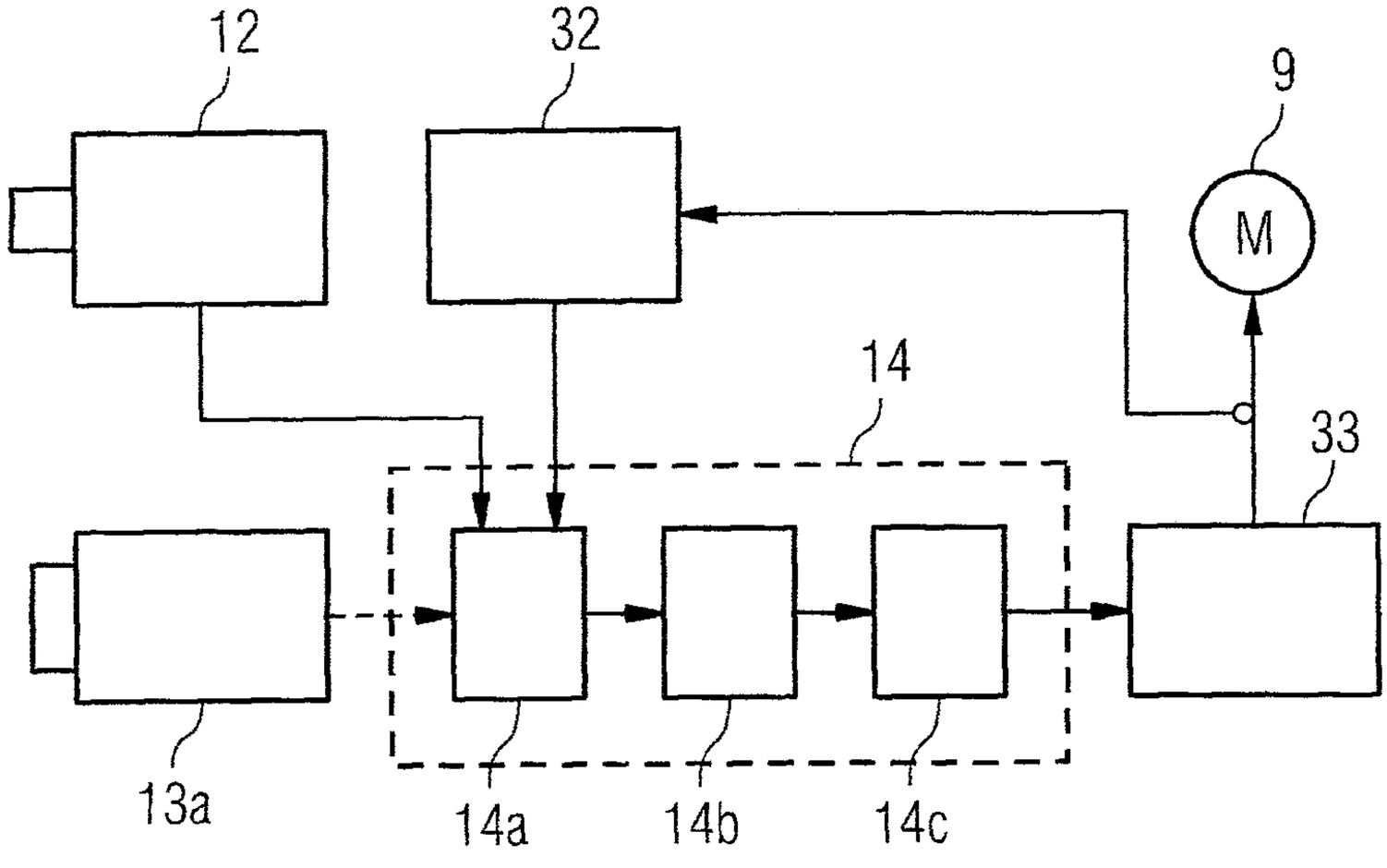


FIG 9A

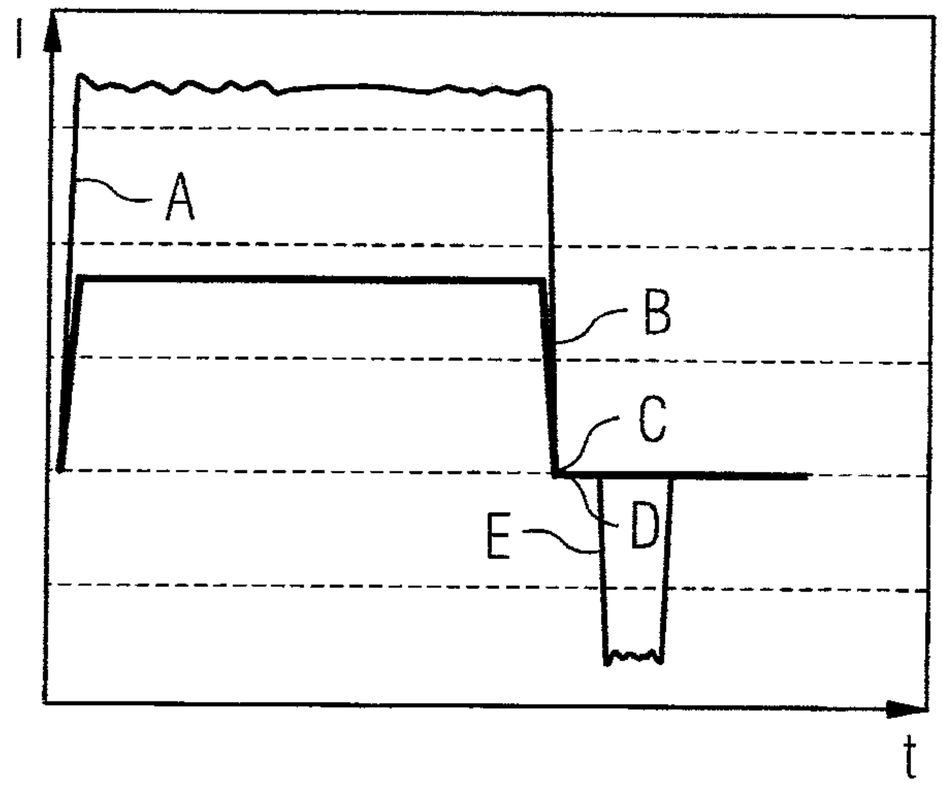
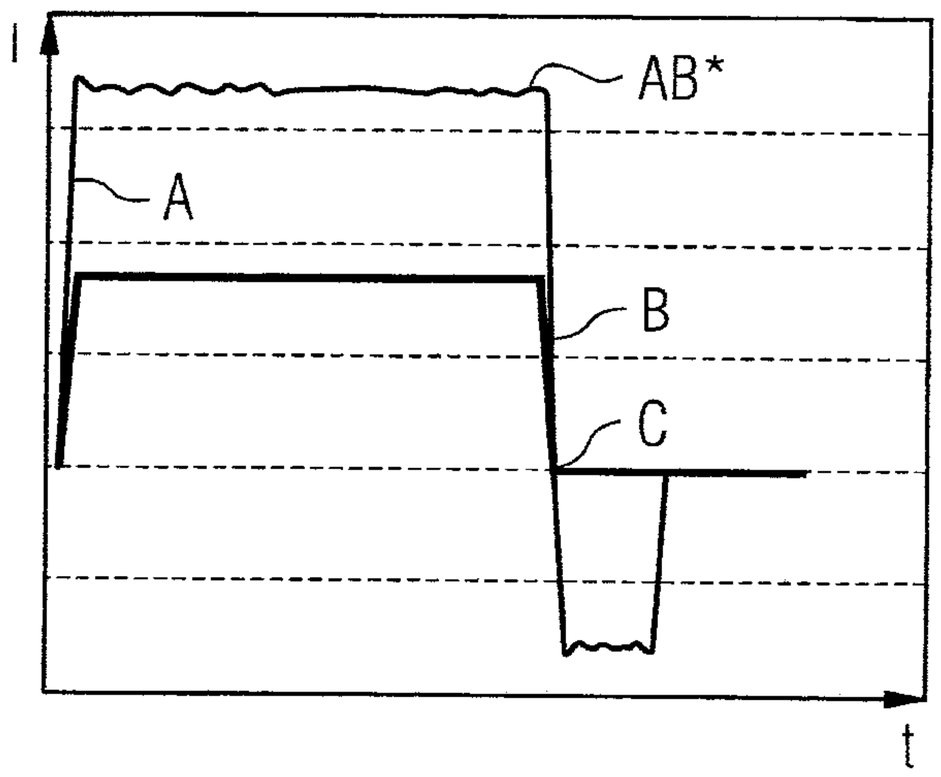
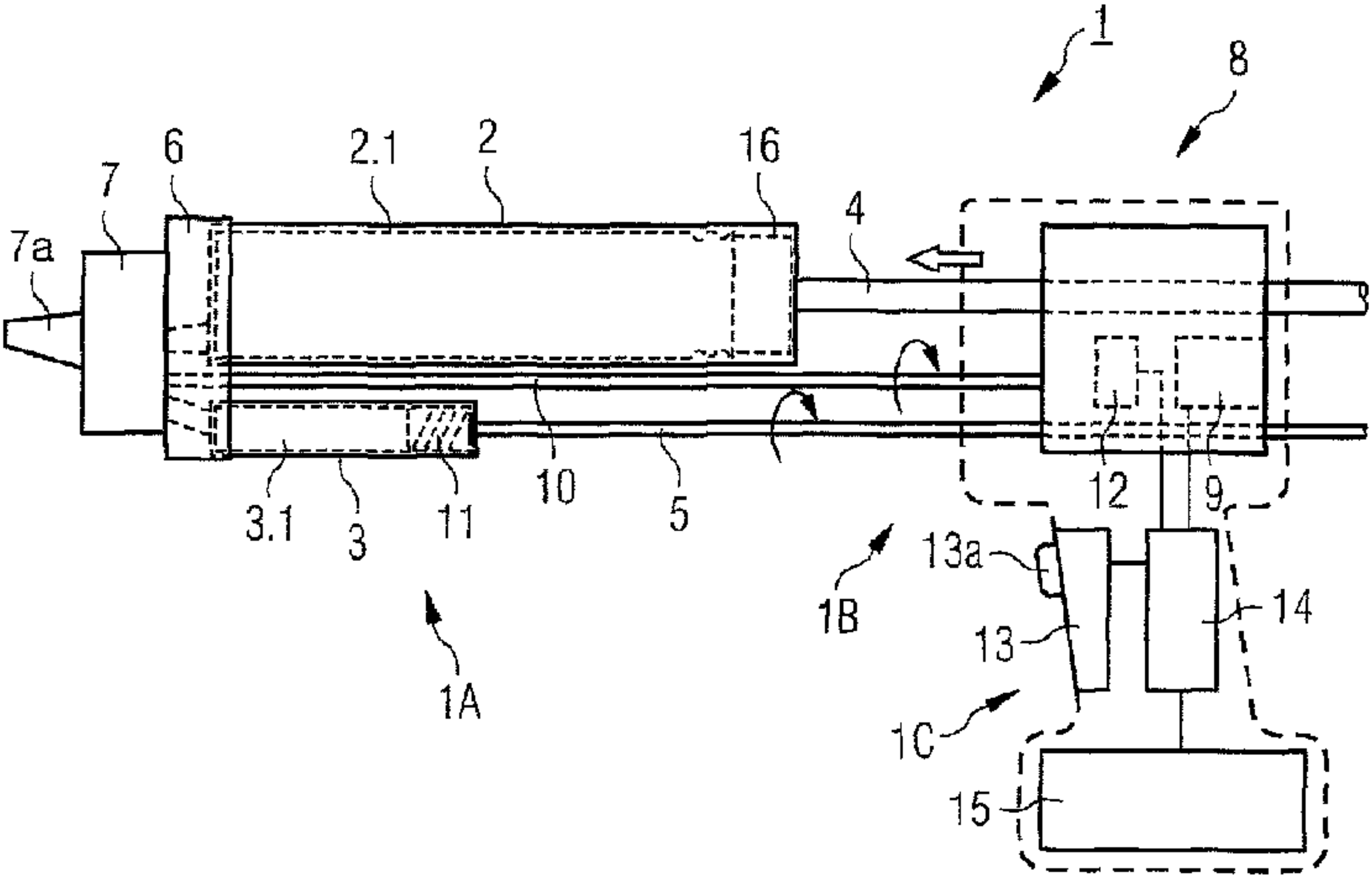


FIG 9B

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