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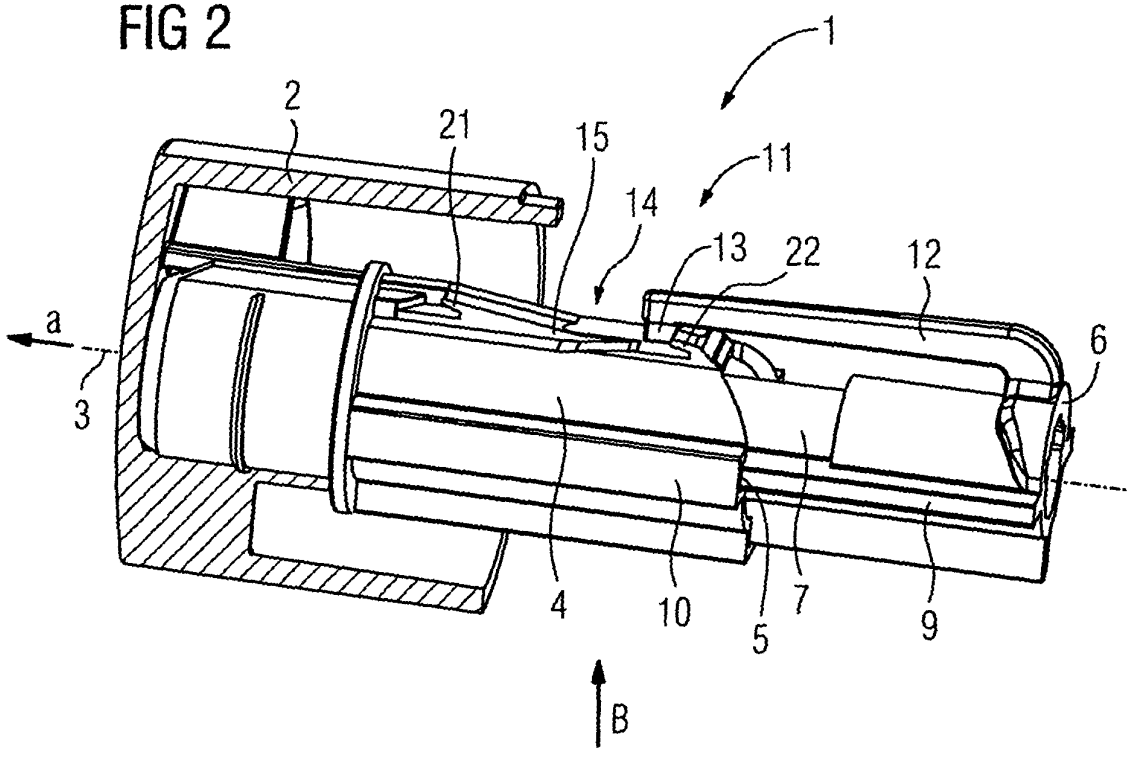
(54) Switching and/or adjusting element for an appliance, especially for a domestic appliance

(57) The invention relates to a switching and/or adjusting element (1) for an appliance, especially for a domestic appliance, for switching and/or adjusting an operation parameter of the appliance comprising an adjusting knob (2), wherein the adjusting knob (2) can be arrested in a first position (A) and in a second position (B), wherein a shaft (4) has an opening (5) along at least a part of its axial extension, wherein a housing element (6) is fixed at the appliance, having a carrier part (7) which can be inserted in axial direction (a) into the opening (5), wherein spring means (8) are arranged for axially biasing the shaft (4) relatively to the carrier part (7), wherein means for preventing rotation (9,10) are arranged at the shaft (4) and the carrier part (7), wherein arresting means (11) are arranged for selectively arresting the shaft (4) in the first or in the second position (A, B), wherein the arresting means (11) comprise one single elastic arm (12).

FIG 2



EP 2 244 152 A1

Description

[0001] The invention relates to a switching and/or adjusting element for an appliance, especially for a domestic appliance, for switching and/or adjusting an operation parameter of the appliance by rotating an adjusting knob around an axis.

[0002] Switching or adjusting elements of this kind are well known in the art. They are used e. g. for selecting the temperature or intensity of a heating element of a domestic oven by turning a knob to a definite angular position.

[0003] A special design of such a switching or adjustment element comes up with the possibility that the adjustment knob of the element can be moved axially between two different positions. In a first position the adjustment knob protrudes from a faceplate of the domestic appliance for ergonomically rotating the adjustment knob into the desired position. After this, the adjustment know can be pressed axially into a second position, so that substantially a flat surface of the faceplate plus switching element comes into being.

[0004] Consequently, the switching or adjustment element must be equipped in this case with arresting means which allow the positioning of the adjustment knob in the two mentioned positions.

[0005] Respective solutions are known from DE 103 06 583 A1, from EP 1 712 974 B1, from EP 1 526 422 B1, from EP 0 671 681 B1, from WO 2007/008182 A1, from WO 98/11574 and from DE 10 2007 002 183 A1.

[0006] The pre-known designs have some drawbacks: In some applications a quite huge number of parts are necessary which causes respective high costs for manufacturing and assembly. Furthermore, it has been found that the switching noises are quite loud. Finally, the required guide rails for the cooperation with a crank head weaken the parts so that the stiffness of some of the preknown solutions is not satisfactory.

[0007] Therefore, it is an object of the invention to improve a switching and/or adjusting element of the kind mentioned above so that as few parts as possible are required. Furthermore, a stiff and compact design is aimed. Also the switching noises should be as little as possible.

[0008] The solution of this object according to the invention is characterized in that the switching and/or adjusting element has the following features: The adjusting knob is arranged torque proof on a shaft which can be moved axially along the axis and can be arrested in a first position and in a second position. The shaft has an opening along at least a part of its axial extension. A housing element is fixed at the appliance, having a carrier part which can be inserted in axial direction into the opening. Spring means are arranged for axially biasing the shaft relatively to the carrier part. Furthermore, means for preventing rotation are arranged at the shaft and the carrier part for preventing a relative rotation between the shaft and the carrier part. Arresting means are arranged for selectively arresting the shaft in the first or in the second position, wherein the arresting means comprise one single elastic arm which is fixed with the housing element and which has a crank head at its axial end and wherein the crank head contacts the shaft at a radial outer side at a guide rail which is arranged in the radial outer side of the shaft.

[0009] The means for preventing rotation are preferably formed by at least one radial extending rib which is arranged at the outer circumference of the carrier part, wherein the rib extends into a recess which extends in axial direction and which is arranged in the inner surface of the opening. The housing element, the carrier part and the elastic arm are preferably made of one single piece. Beneficially, the housing element, the carrier part and the elastic arm are made from plastic material. Normally an injection moulding process is employed for this.

[0010] Preferably, the guide rail for the crank head has a first guiding area with a ramp part for deflecting the elastic arm in the circumferential direction of the shaft. In this case the guide rail for the crank head can have a second guiding area opposite to the first guiding area. The second guiding area can have a flat surface. Preferably a slanted section is arranged at the radial outer side along a part of the second guiding area for moving the crank head in radial direction during its travel along the slanted section.

[0011] Furthermore, it is possible that the first and the second guiding areas are merging at one location in a transition area at one common radial level. The first and the second guiding areas can furthermore merge at another location in a transition area, wherein the transition area comprises a radial step.

[0012] The guide rail can comprises a first hook section for arresting the crank head of the elastic arm in the first position. Also, the guide rail can comprises a second hook section for arresting the crank head of the elastic arm in the second position.

[0013] The guide rail can comprises a deflection surface which is arranged near the transition area, wherein the deflection surface is arranged under an angle relatively to the axial direction for deflecting the crank head in the circumferential direction of the shaft. The crank head can then have a corresponding counter surface with the same angle as the deflection surface.

[0014] The spring means are beneficially a coil spring.

[0015] The switching and/or adjusting element is preferably part of a domestic oven.

[0016] According to the suggested solution of the invention the number of parts which are necessary for the switching and adjusting element is reduced to a minimum.

[0017] The parts and especially the shaft do not need big recesses for the engagement of the crank head into the guide rail and thus a quite stiff design is reached. This allows also a reduction in material and weight of the element. So, also a spring element with a bigger diameter can be employed with an improved spring characteristic.

[0018] Also a very compact design becomes possible.

[0019] By the reduction of the feed path during switching between the two positions of the element the switching noises can be reduced.

[0020] Another advantage of the proposed invention is that the guide track for the crank head does not have any openings or apertures thus making the guide track quite stable. In pre-known solutions such openings are provided in the guide track.

[0021] In the drawings embodiments of the invention are depicted.

FIG 1 shows a perspective view, partially broken, of a switch- ing and/or adjusting element of a domestic oven in a po- sition (position A) in which the adjusting knob of the element is in an inner position according to a first em- bodiment of the invention,

FIG 2 shows a perspective view of the switching and/or adjust- ing element, partially broken, in a position (position B) in which the adjusting knob of the element is in an outer position for being rotated according to the first embodi-

FIG 3 ment of the invention, shows a cross sectional side view through a switching and/or adjusting element in the position B according to the first embodiment of the invention,

FIG 4 shows the view C according to FIG 3, partially broken ac- cording to the first embodiment of the invention,

FIG 5 shows a perspective view of the shaft of the switching and/or adjusting element according to the first embodi- ment of the invention,

FIG 6 shows a perspective view of the housing element with car- rier part and elastic arm of the switching and/or adjust- ing element according to the first embodiment of the in- vention,

FIG 7 shows an enlarged part of the view C according to FIG 3 in a sectional depiction, where the position A is taken according to the first embodiment of the invention,

FIG 8 shows a detail of the arrangement of FIG 3 with the switching and/or adjusting element being in the position A according to the first embodiment of the invention,

FIG 9 shows a perspective view of the switching and/or adjust- ing element, partially broken, in the position A accord- ing to a second embodiment of the invention,

FIG 10 shows a perspective view of the switching and/or adjust- ing element, partially broken, in the position B accord- ing to the second embodiment of the invention,

FIG 11 shows a cross sectional side view through a switching and/or adjusting element in the position A according to

FIG 12 the second embodiment of the invention, shows a cross sectional side view through a switching and/or adjusting element in the position B according to the second embodiment of the invention,

FIG 13 shows a perspective view of the shaft of the switching and/or adjusting element according to the second embodi- ment of the invention,

FIG 14 shows a perspective view of the housing element with car- rier part and elastic arm of the switching and/or adjust- ing element according to the second embodiment of the in- vention,

FIG 15 shows a view seen from the radial direction on the shaft of the switching and/or adjusting element and its guide rail according to the second embodiment of the invention,

FIG 16 shows a detail of the arrangement analogue to FIG 8 ac- cording to the second embodiment of the invention,

FIG 17 shows a perspective view of the switching and/or adjust- ing element, partially broken, in the position A accord- ing to a third embodiment of the invention,

FIG 18 shows a perspective view of the switching and/or adjust- ing element, partially broken, in the position B accord- ing to the third embodiment of the invention,

FIG 19 shows a cross sectional side view through a switching and/or adjusting element in the position A for according to the third embodiment of the invention,

FIG 20 shows the view D according to FIG 19, partially broken according to the third embodiment of the invention,

FIG 21 shows a cross sectional side view through a switching and/or adjusting element in the position B according to the third embodiment of the invention,

FIG 22 shows the view E according to FIG 21, partially broken according to the third embodiment of the invention,

FIG 23 shows a perspective view of the shaft of the switching and/or adjusting element according to the third embodi- ment of the invention,

FIG 24 shows a perspective view of the housing element with car- rier part and elastic arm of the switching and/or adjust- ing element according to the third embodiment of the in- vention,

FIG 25 shows a view seen from the radial direction on the shaft of the switching and/or adjusting element and its guide rail according to the third embodiment of the invention,

FIG 26 shows a detail of the arrangement analogue to FIG 8 ac- cording to the third embodiment of the invention.

[0022] In FIG 1 till FIG 8 a switching and/or adjusting element 1 of a domestic oven and its parts are shown by which an operation parameter of the domestic appliance can be adjusted. For adjusting the parameter an adjustment knob 2 is employed. The adjustment knob 2 has a substantial cylindrical shape. It can be rotated around an axis 3 to a desired rotational position. The adjustment knob 2 is connected with a shaft 4 in a torque proof way. The shaft 4 has an opening 5 (see FIG 2) with substantially circular cross section.

[0023] A housing element 6 is connected to the domestic appliance and has a carrier part 7 with a substantially cylindrical shape. The diameter of the carrier part 7 fits to the opening 5, i. e. the carrier part 7 can be inserted into the opening 5.

[0024] As can be seen from FIG 3 a spring means being a coil spring are arranged between the shaft 4 and the carrier part 7 which force those two parts away from another in axial direction a.

[0025] Between the shaft 4 and the carrier part 7 means 9, 10 are arranged for preventing a rotational movement between the two parts. Those means consist of a radial extending rib 9 at the outer circumference of the carrier part 7 extending into a corresponding recess 10 which is formed into the inner surface of the opening 5 (see specifically FIG 2).

[0026] The adjusting knob 2 with the shaft 4 can be arrested in two positions A and B relatively to the housing element 6 and the carrier part 7 respectively. In the first position A (see e. g. FIG 1) the adjusting knob 2 is pushed in a telescopic way into the housing element 6 to obtain a flat surface of the operation panel of the domestic appliance. The second position B (see e. g. FIG 2) is used for turning the adjusting knob 2. Here the adjusting knob 2 protrudes out from the operation panel of the appliance.

[0027] Arresting means 11 (see FIG 1) are employed to move the adjusting knob 2 and the shaft 4 between the two positions A and B. The arresting means 11 have a single elastic arm 12 which is formed from the material of the housing element 6 and the carrier part 7. The elastic arm 12 has a crank head 13 at its axial end.

[0028] The shaft 4 is equipped with a guide trail 15 at a radial outer side 14 of the shaft 4. This guide trail 15 is designed to cooperate with the crank head 13 of the elastic arm 12.

[0029] As can be seen in the different figures the guide trail 15 has a first guiding area 16, comprising a ramp part 17. Furthermore, the guide trail 15 has a second guiding area 18, being arranged opposite to the first guiding area 16. The first and the second guiding areas 16 and 18 form slides for the crank head 13 of the elastic arm 12 when a relative axial movement between the shaft 4 and the carrier part 7 occurs. In the end regions of the movement transition areas 19', 19" (see FIG 5) are arranged at which the crank head 13 can transit from the first guiding area 16 to the second guiding area 18. While the transition at one end takes place at a common radial level (see transition area 19'), the transition area 19" at the other end has a radial step 20 (see FIG 5).

[0030] For arresting the shaft 4 relatively to the carrier part 7 in the two positions A and B a first hook section 21 and a second hook section 22 are arranged in the respective location. As can be seen e. g. from FIG 1 and FIG 2 the crank head 13 of the elastic arm 12 can hook into the respective hook sections 21 and 22.

[0031] When bringing the adjusting knob 2 and the shaft 4 from the outer position B in the inserted position A the crank head 13 of the elastic arm 12 slides along the first guiding area 16 and the ramp part 17 via the first hook section 21 on a support area 25 (see e. g. FIG 8). As the length of the gap L1 (see FIG 8) between the support area 25 and the beginning of the first hook section 21 is smaller than the length LK of the crank head 13, it is not possible that the crank head 13 snaps in front of a third guiding area 26 when being pressed once only. After the axial pressure on the adjusting knob 2 and the shaft 4 is released the upper side 27 of the crank head 13 slides along a slant 28 into the hooked position, i. e. into the first hook section 21. Only now it is possible, that the crank head 13 with a chamfer 29 snaps in front of the third guiding area 26. Now, the interlock in the position A is done.

[0032] To bring the switching and/or adjusting element 1 and the adjusting knob 2 respectively into the position B, i. e. to drive the adjusting knob 2 outwardly for turning, the adjusting knob 2 is pressed axially. By doing this the movement of the shaft 4 presses the chamfer 29 (see FIG 8) against the third guiding area 26, so that the crank head 13 is pushed in circumferential direction until a side area 30 of the crank head 13 (see FIG 7) slides down the radial step 20 (due to a radial biasing of the elastic arm 12 against the radial outer side 14 of the shaft 4), so that the crank head 13 contacts the second guiding area 18.

[0033] If the axial pressure on the adjusting know 2 is released, the shaft 4 can slide into the position B relatively to the housing element 6 and the carrier part 7 respectively due to the force of the spring means 8. During this operation the side area 30 of the crank head 13 (see FIG 7) slides along the second guiding area 18, while a bottom surface 31 of the crank head 13 (see FIG 6) contacts the radial outer side 14 of the shaft 4 and more specifically the sliding track 32 (see FIG 7).

[0034] The sliding track 32 has a slanted section 33 (see FIG 1 and FIG 7) which brings the crank head 13 radially back to the radial position which is reached in the position B, i. e. the slanted section 33 balances the radial difference of the radial step 20. At the end of the slanted section 33 the crank head 13 snaps due to the elastic property of the elastic arm 12 back in the initial position, i. e. when reached the transition area 19'. The final position B is reached, when a hook part 34 (see FIG 8) of the crank head 13 hooks into the second hook section 22.

[0035] A deflection surface 23 (see FIG 5) of the guide rail 15 and a corresponding counter surface 24 of the crank head 13 (see Fig 6 and Fig 7) make sure that a relative axial movements of the parts 4 and 7 cause a movement of the crank head 13 to the side, i. e. in circumferential direction. The chamfer 29 and the counter surface 24 correspond to another.

[0036] The elastic arm 12 and also the sliding surfaces which are contacted radially by the crank head 13 can be arranged in a slanted way so that the elastic arm 12 is not biased in the position A and/or B.

[0037] Two slightly modified embodiments of the invention are shown in figures 9 till 16 (second embodiment) and in figures 17 till 26 (third embodiment).

[0038] Referring now to figures 9 till 16 the operation of the switching and/or adjusting element 1 is as follows: When the element is brought into the position A the crank head 13 of the elastic arm 12 slides along the first guiding area 16 and the ramp part 17 on the support area 25. The crank head 13 of the elastic arm 12 is pressed by this operation in circumferential direction by the first guiding area 16; also the crank head 13 contacts radially the radial outer side 14. If the crank head 13 has passed the first guiding area 16 it snaps back in the initial middle position due to the elastic property of the elastic arm 12. If the axial pressure onto the adjusting knob 2 is now released the upper side 27 of the crank head 13 slides below the slant 28 of the first hook section 21.

[0039] Only now it is possible that the crank head 13 with its chamfer 29 snaps in front of the third guiding area 26. Position A is reached.

[0040] The way back into position B is done as explained for the embodiment according figures 1 till 8.

[0041] Referring now to figures 17 till 26 the operation of the switching and/or adjusting element 1 is as follows: When the element is brought into the position A the crank head 13 of the elastic arm 12 slides along the first guiding area 16 and the ramp part 17. By this the crank head 13 is pushed to the side in circumferential direction by the first guiding area 16 and ramp part 17. If the crank head 13 has passed the first guiding area 16 it snaps back and contacts a limitations area 35 (see FIG 23). If the axial pressure onto the adjusting knob 2 is now released the side area 30 of the crank head 13 slides now along the limitation area 35 until the crank head 13 is completely in front of the limitation area 35. Only now the crank head 13 can snap back into its middle or initial position due to the elastic property of the elastic arm 12. Now the hook part 34 can slide under the first hook section 21.

[0042] Reference Numerals

1	Switching and/or adjusting element
2	Adjusting knob
3	Axis
4	Shaft
5	Opening
6	Housing element
7	Carrier part
8	Spring means
9, 10	Means for preventing rotation
9	Radial extending rib
10	Recess
11	Arresting means
12	Elastic arm
13	Crank head
14	Radial outer side
15	Guide rail
16	First guiding area
17	Ramp part
18	Second guiding area
19'	Transition area
19"	Transition area
20	Radial step
21	First hook section
22	Second hook section
23	Deflection surface
24	Counter surface
25	Support area
26	Third guiding area
27	Upper side
28	Slant
29	Chamfer
30	Side area
31	Bottom surface
32	Sliding track
33	Slanted section
34	Hook part
35	Limitation area

a	Axial direction
A	First position
B	Second position
L1	Length
LK	Length

Claims

1. Switching and/or adjusting element (1) for an appliance, especially for a domestic appliance, for switching and/or adjusting an operation parameter of the appliance by rotating an adjusting knob (2) around an axis (3),
wherein the adjusting knob (2) is arranged torque proof on a shaft (4) which can be moved axially (a) along the axis (3) and can be arrested in a first position (A) and in a second position (B),
wherein the shaft (4) has an opening (5) along at least a part of its axial extension,
wherein a housing element (6) is fixed at the appliance, having a carrier part (7) which can be inserted in axial direction (a) into the opening (5),
wherein spring means (8) are arranged for axially biasing the shaft (4) relatively to the carrier part (7),
wherein means for preventing rotation (9, 10) are arranged at the shaft (4) and the carrier part (7) for preventing a relative rotation between the shaft (4) and the carrier part (7), wherein arresting means (11) are arranged for selectively arresting the shaft (4) in the first or in the second position (A, B),
wherein the arresting means (11) comprise one single elastic arm (12) which is fixed with the housing element (6) and which has a crank head (13) at its axial end and
wherein the crank head (13) contacts the shaft (4) at a radial outer side (14) at a guide rail (15) which is arranged in the radial outer side (14) of the shaft (4).

2. Switching and/or adjusting element according to claim 1, **characterized in that** the means for preventing rotation (9, 10) are formed by at least one radial extending rib (9) which is arranged at the outer circumference of the carrier part (7), wherein the rib (9) extends into a recess (10) which extends in axial direction (a) and which is arranged in the inner surface of the opening (5).

3. Switching and/or adjusting element according to claim 1 or 2, **characterized in that** the housing element (6), the carrier part (7) and the elastic arm (12) are made of one single piece.

4. Switching and/or adjusting element according to claim 3, **characterized in that** the housing element (6), the carrier part (7) and the elastic arm (12) are made from plastic material.

5. Switching and/or adjusting element according to one of claims 1 till 4, **characterized in that** the guide rail (15) for the crank head (13) has a first guiding area (16) with a ramp part (17) for deflecting the elastic arm in the circumferential direction of the shaft (4).

6. Switching and/or adjusting element according to claim 5, **characterized in that** the guide rail (15) for the crank head (13) has a second guiding area (18) opposite to the first guiding area (16).

7. Switching and/or adjusting element according to claim 6, **characterized in that** the second guiding area (18) has a flat surface, wherein preferably a slanted section (33) is arranged at the radial outer side (14) along at least a part of the second guiding area (18) for moving the crank head (13) in radial direction during its travel along the slanted section (33).

8. Switching and/or adjusting element according to claim 5 and 6, **characterized in that** the first and the second guiding areas (16, 18) are merging at one location in a transition area (19, 19') at one common radial level.

9. Switching and/or adjusting element according to claim 5 and 6, **characterized in that** the first and the second guiding areas (16, 18) are merging at another location in a transition area (19, 19"), wherein the transition area (19") comprises a radial step (20).

10. Switching and/or adjusting element according to one of claims 1 till 9, **characterized in that** the guide rail (15) comprises a first hook section (21) for arresting the crank head (13) of the elastic arm (12) in the first position (A).

11. Switching and/or adjusting element according to one of claims 1 till 9, **characterized in that** the guide rail (15) comprises a second hook section (22) for arresting the crank head (13) of the elastic arm (12) in the second position (B).

12. Switching and/or adjusting element according to one of claims 8 till 11, **characterized in that** the guide rail (15) comprises a deflection surface (23) which is arranged near the transition area (19), wherein the deflection surface (23) is arranged under an angle relatively to the axial direction (a) for deflecting the crank head (13) in the circumferential direction of the shaft (4).

13. Switching and/or adjusting element according to claim 12, **characterized in that** the crank head (13) has a corresponding counter surface (24) with the same angle as the deflection surface (23).

14. Switching and/or adjusting element according to at least one of claims 1 till 13, **characterized in that** the spring means (9) are a coil spring.

15. Switching and/or adjusting element according to at

least one of claims 1 till 14, **characterized in that** it is part of a domestic oven.

FIG 1

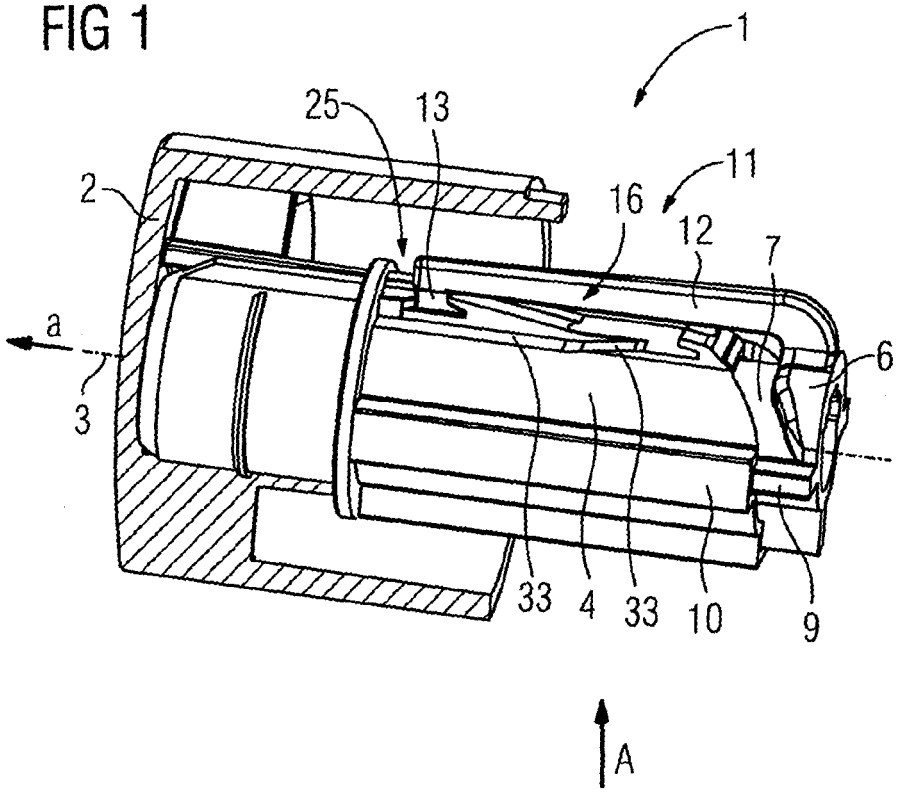

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FIG 2

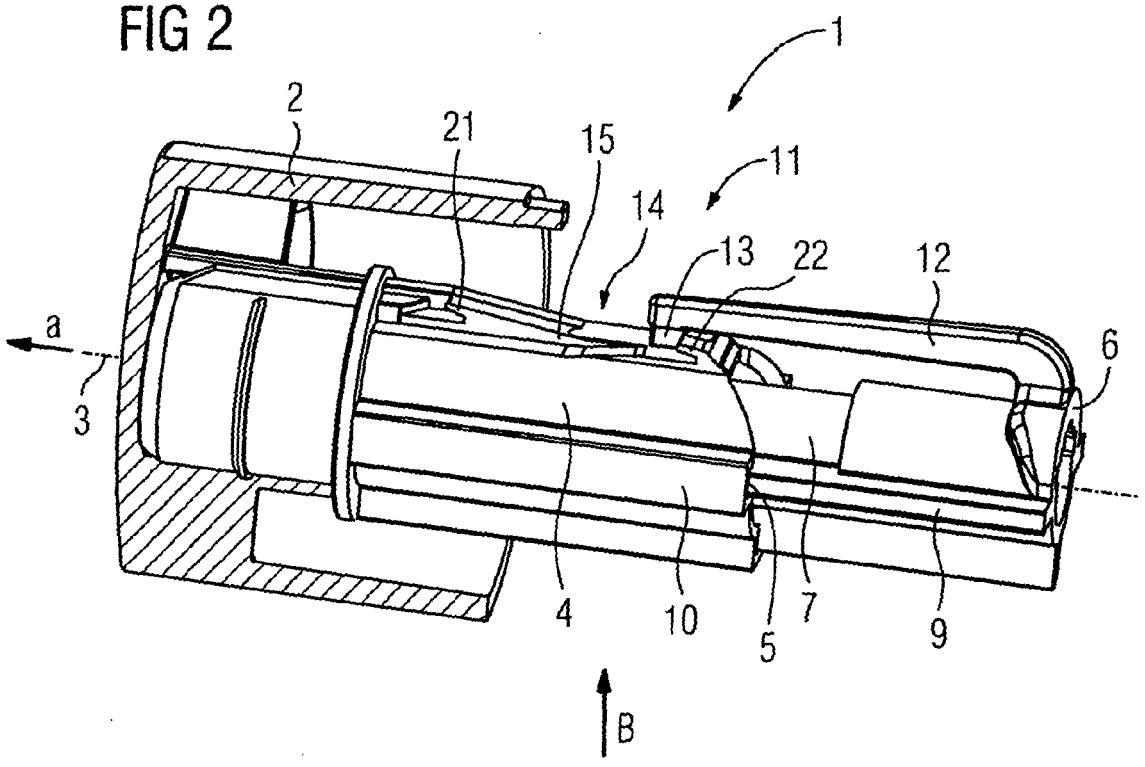
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FIG 3

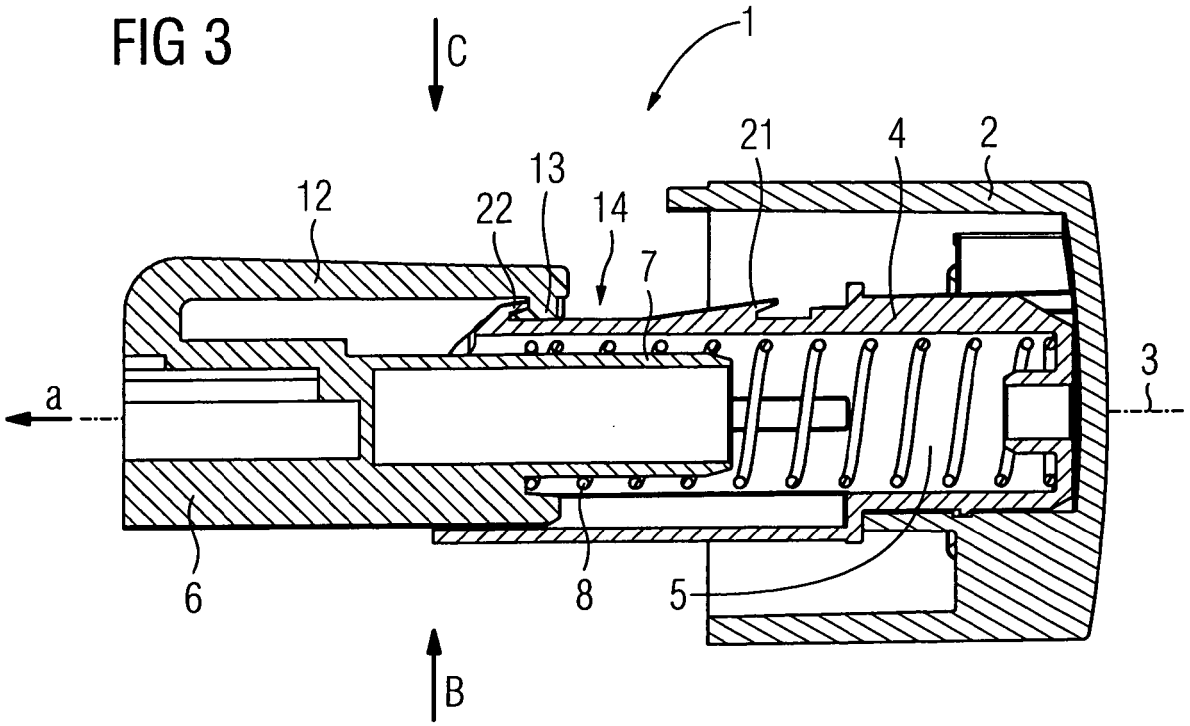

FIG 4

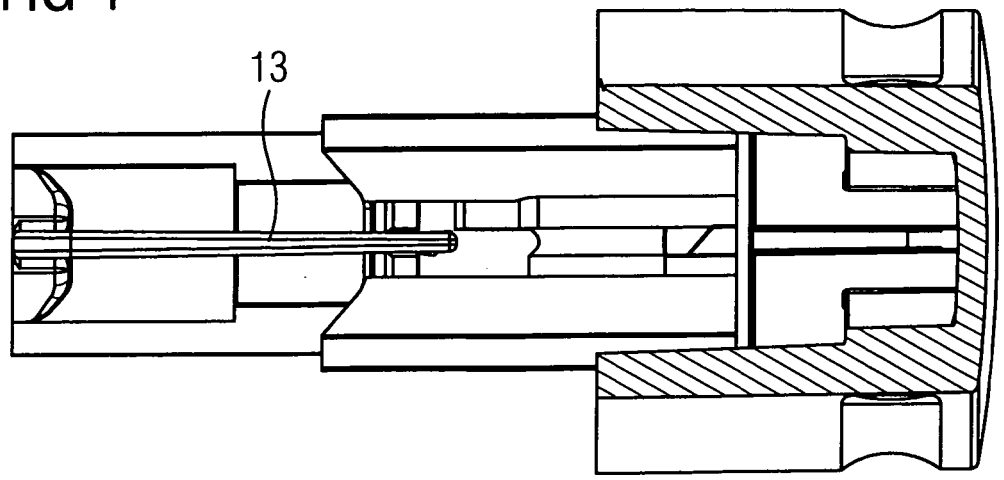

FIG 5

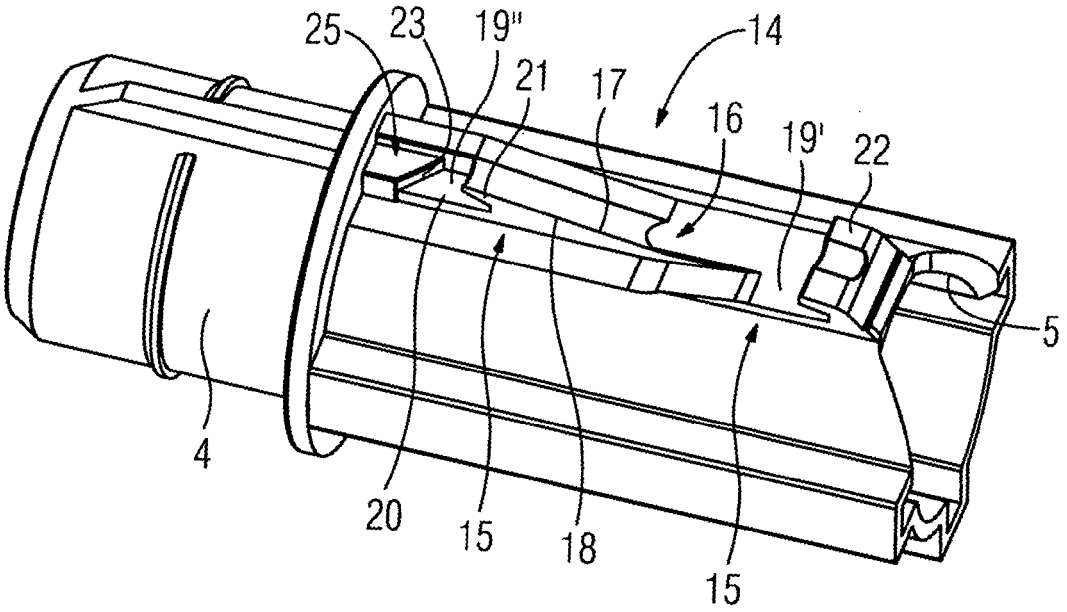

FIG 6

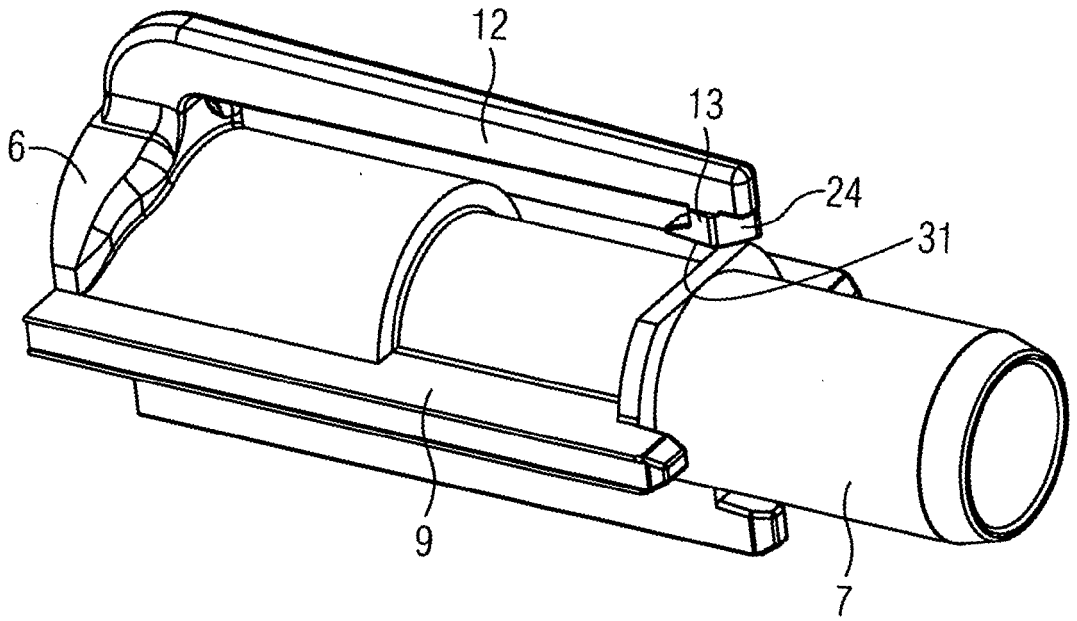

FIG 7

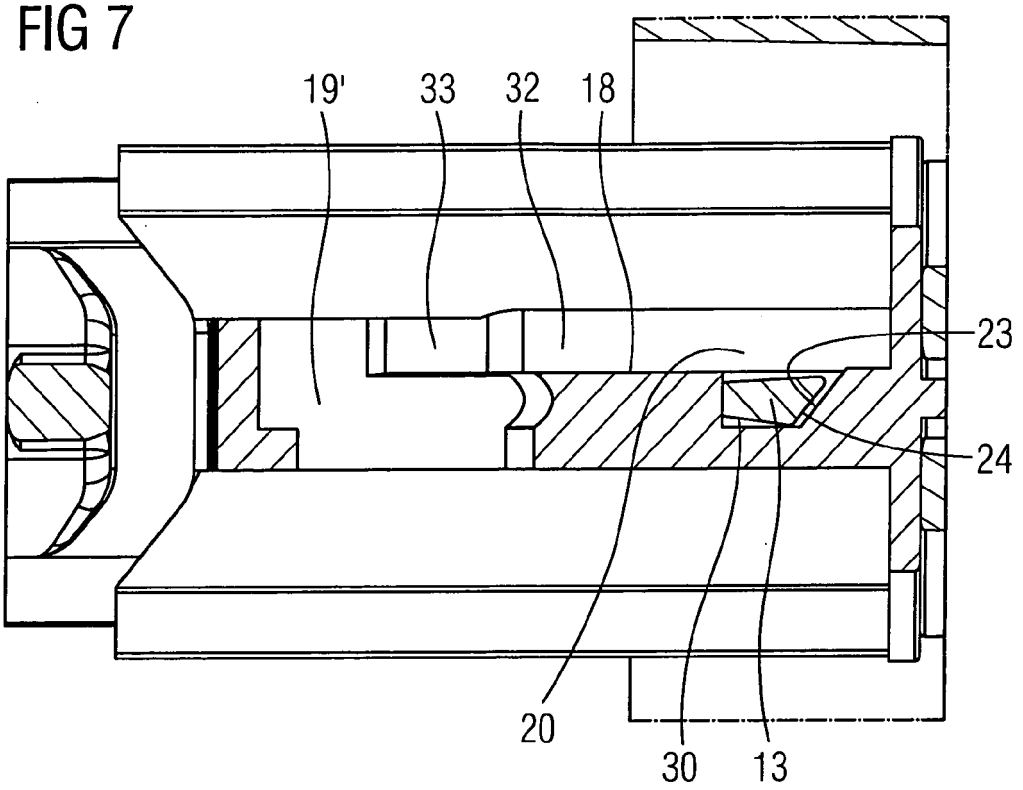

FIG 8

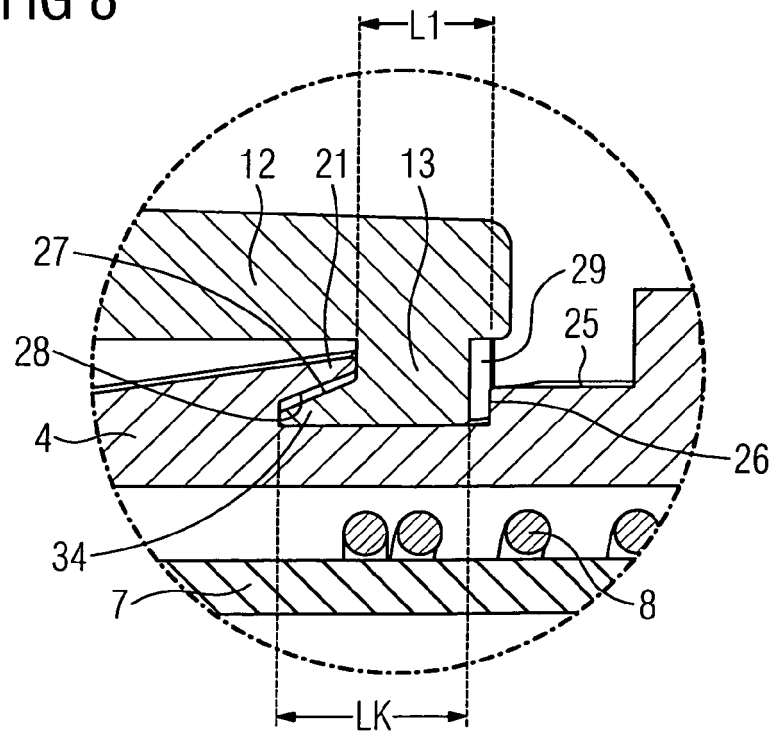

FIG 9

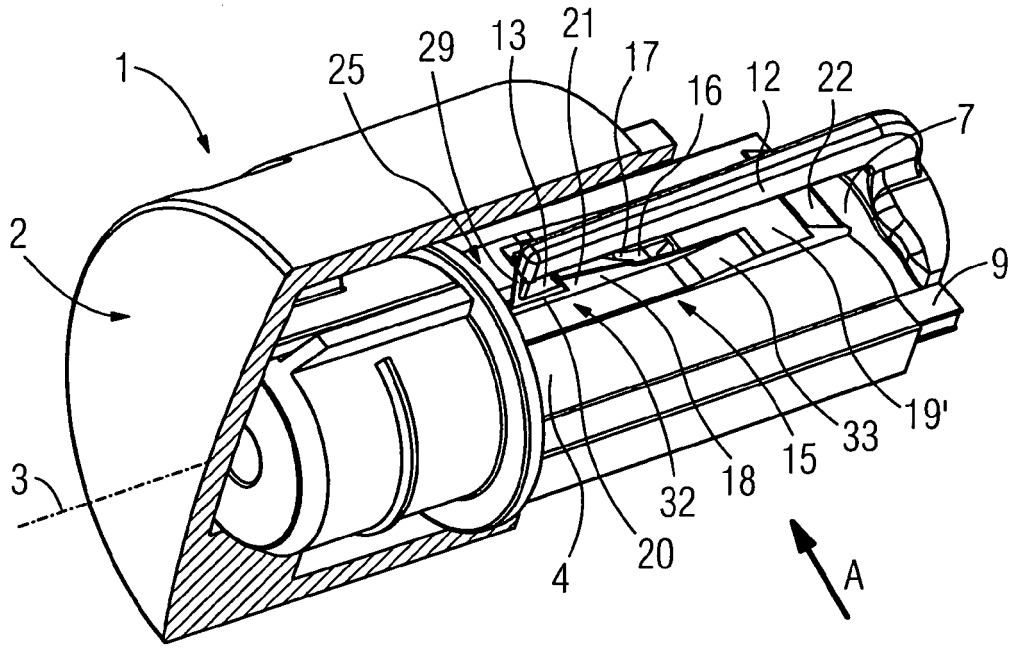
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FIG 10

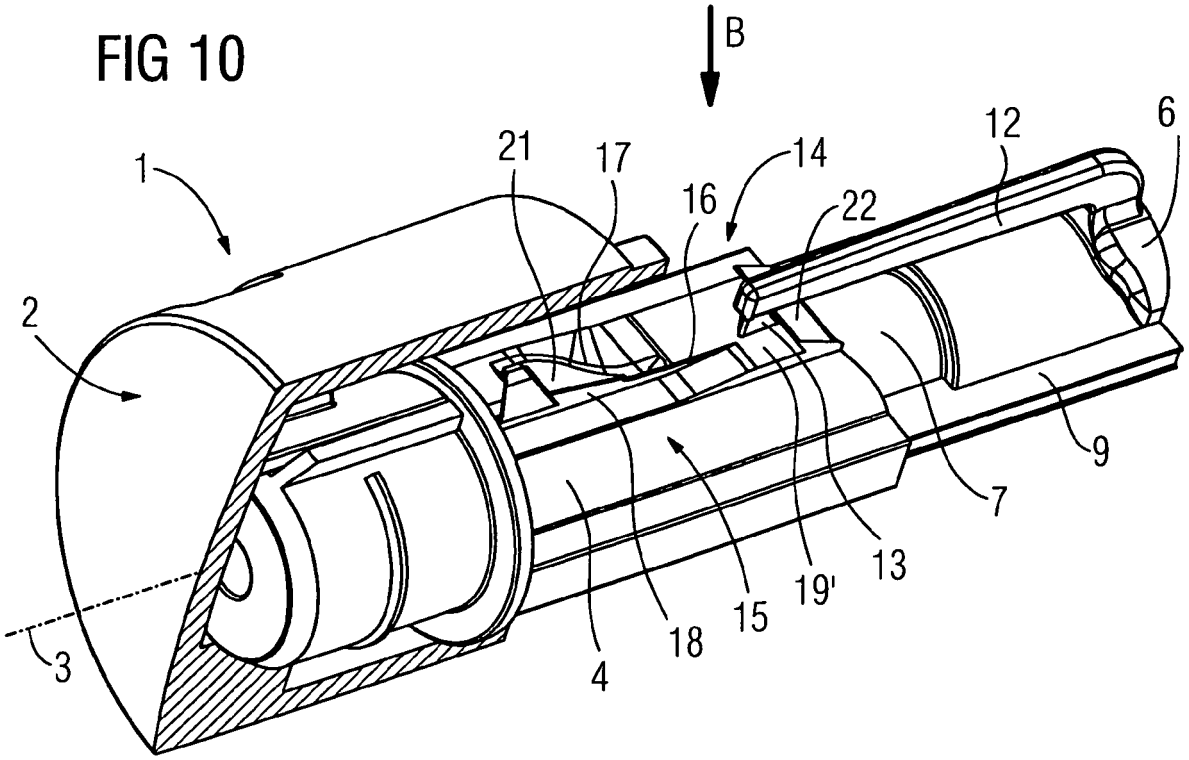
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FIG 11

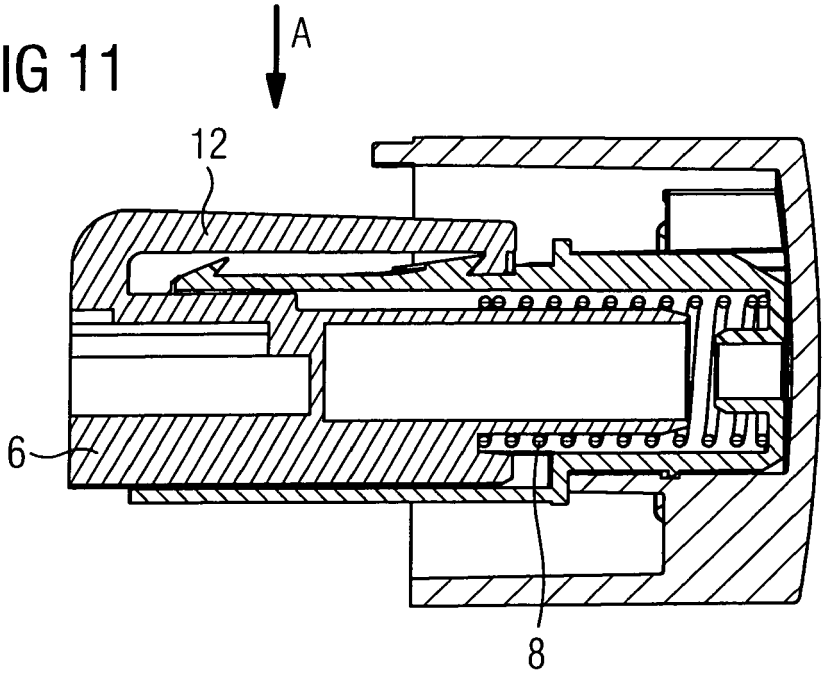


FIG 12

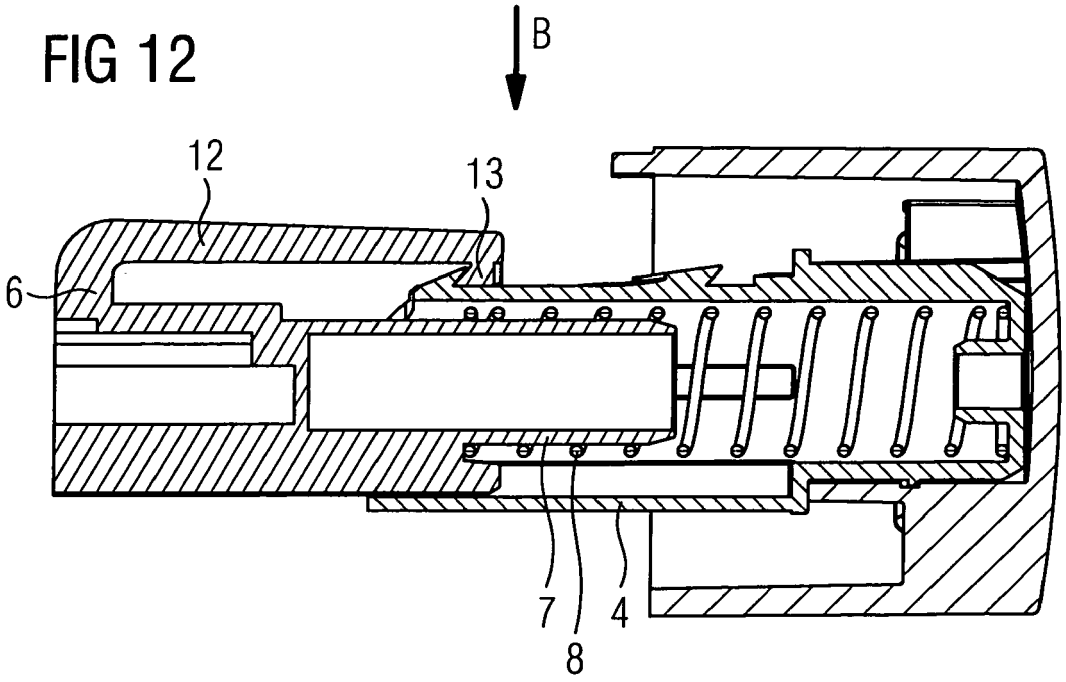


FIG 13

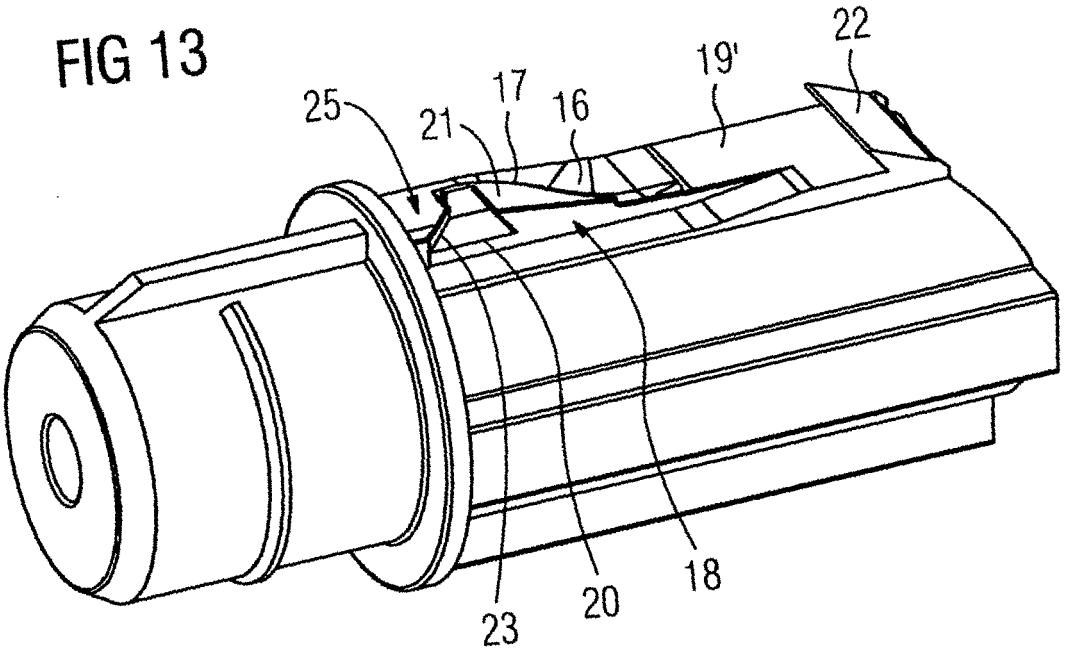


FIG 14

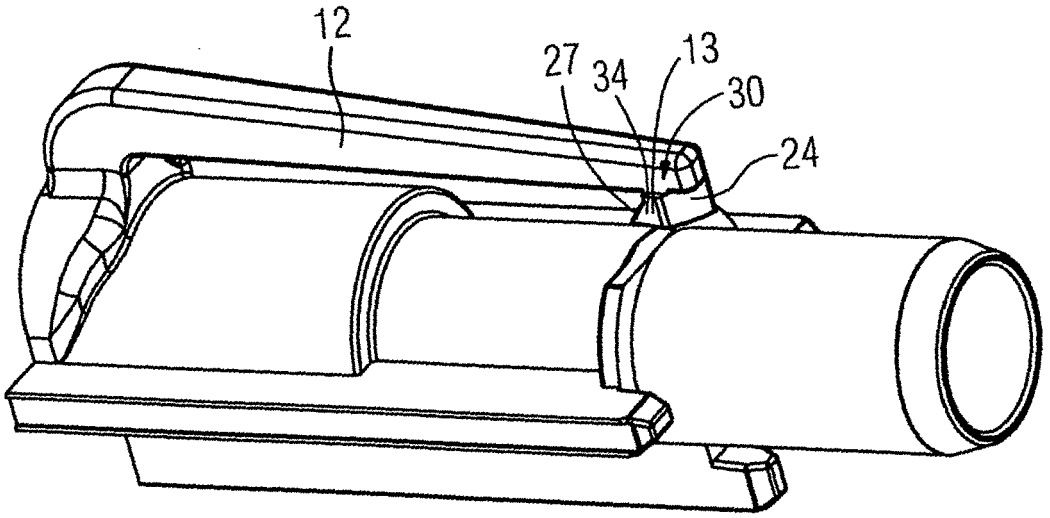


FIG 15

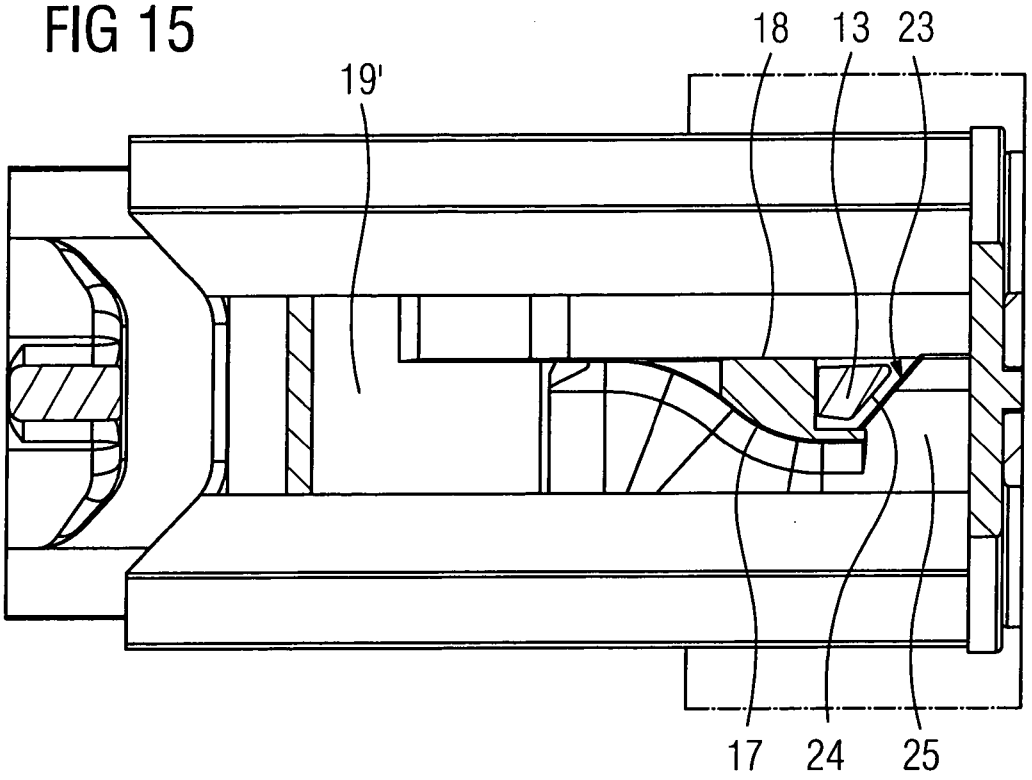


FIG 16

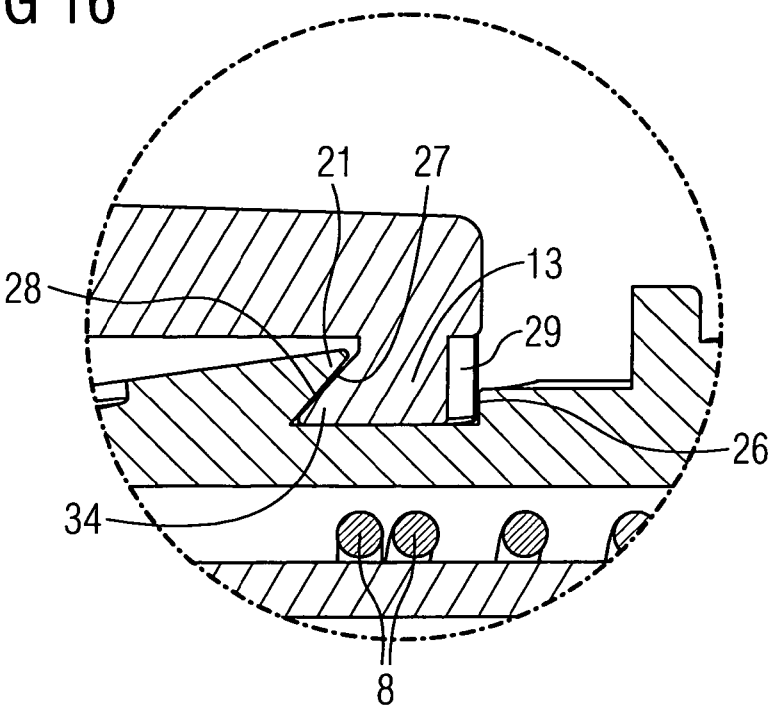


FIG 17

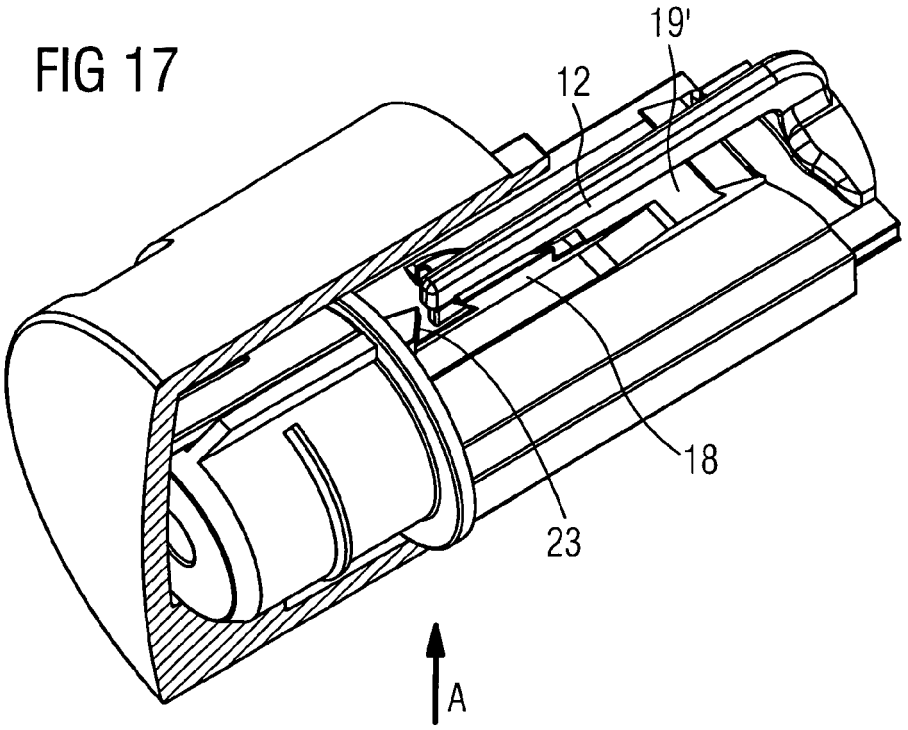


FIG 18

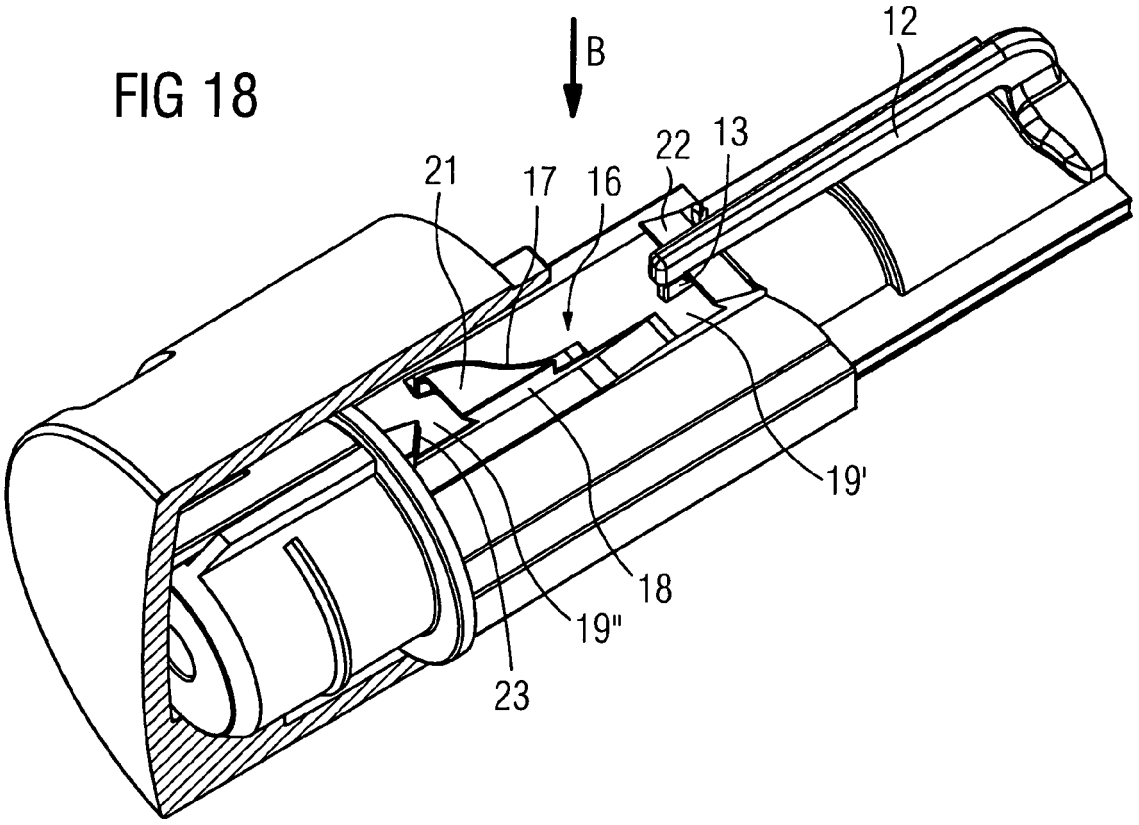


FIG 19

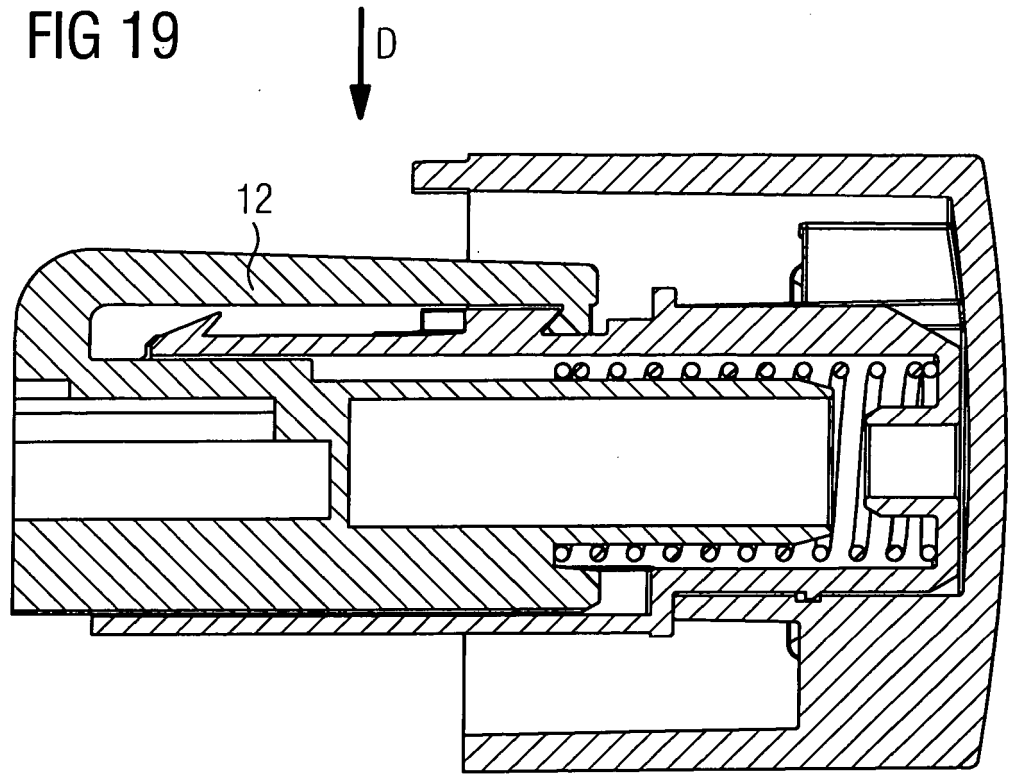


FIG 20

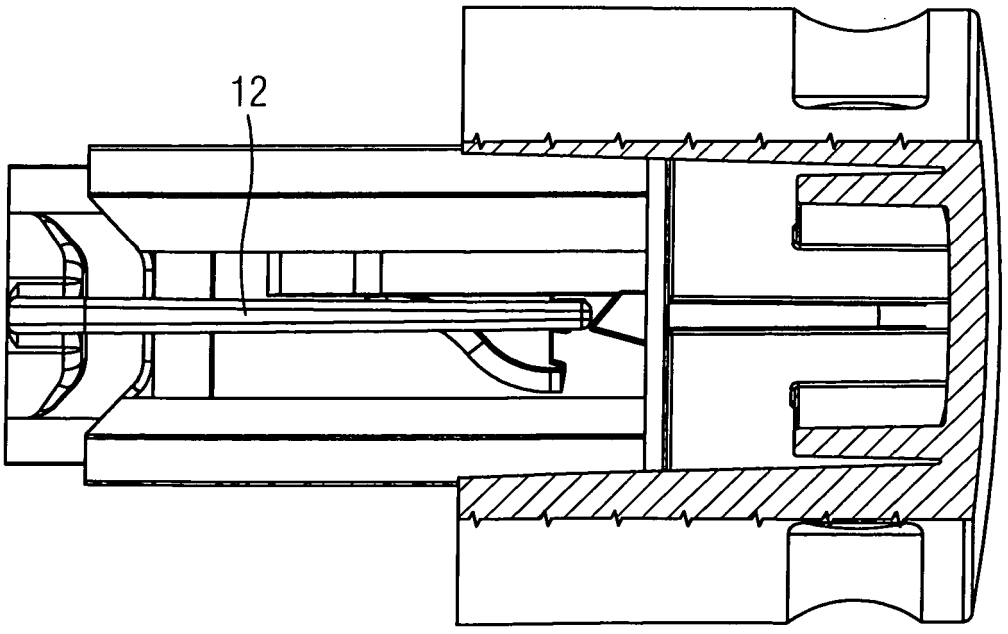


FIG 21

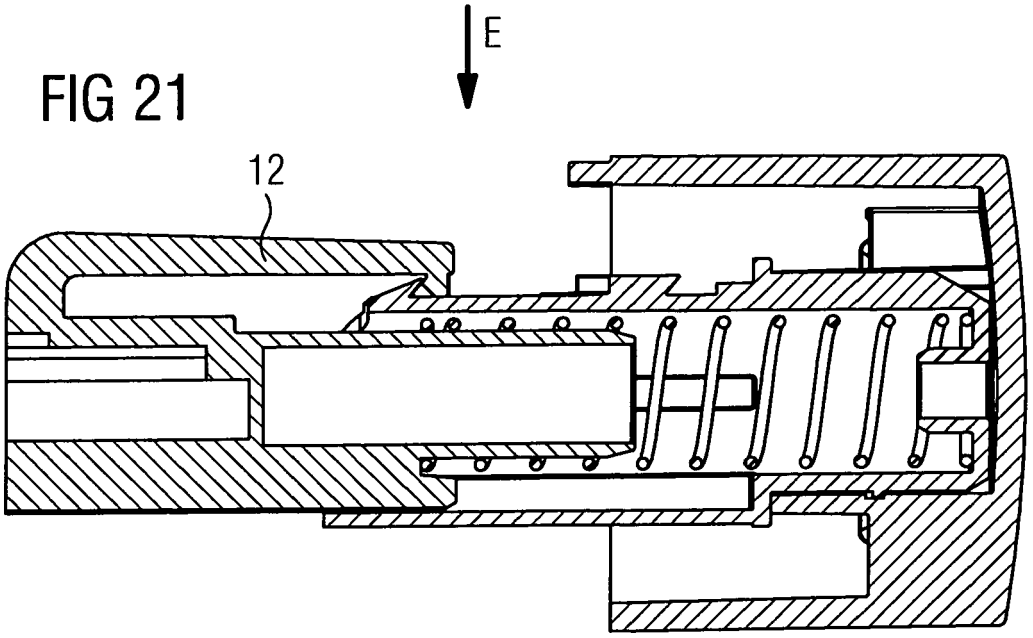


FIG 22

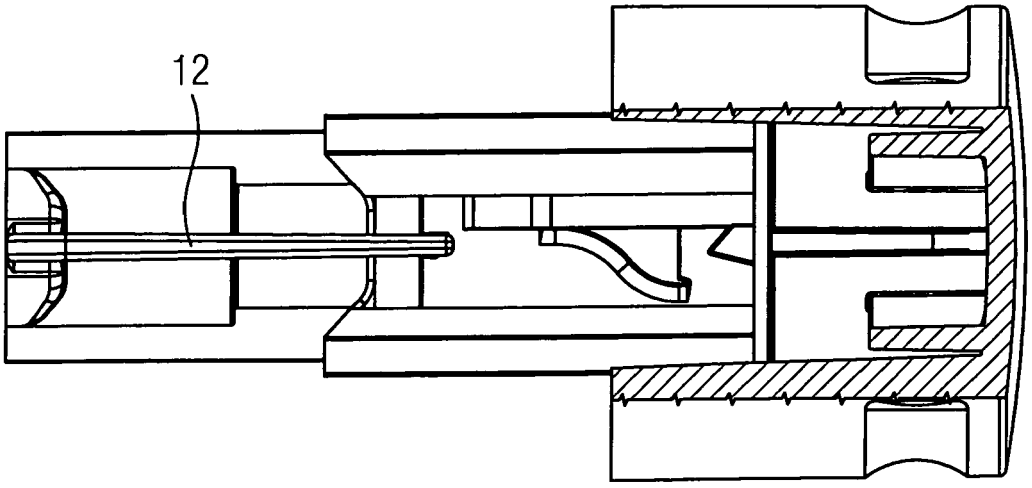


FIG 23

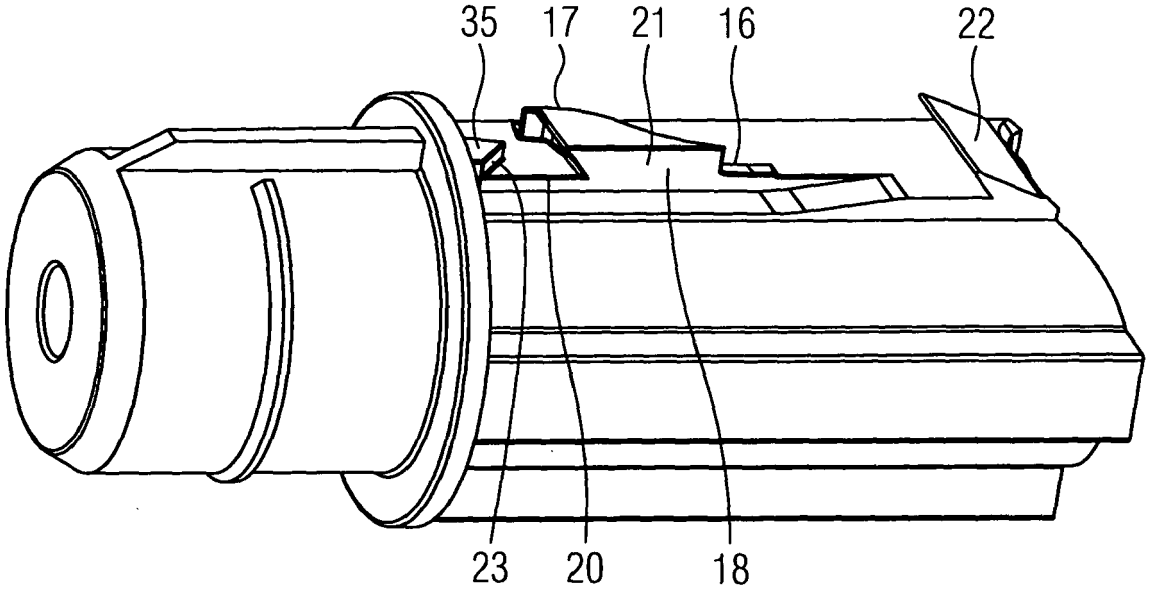


FIG 24

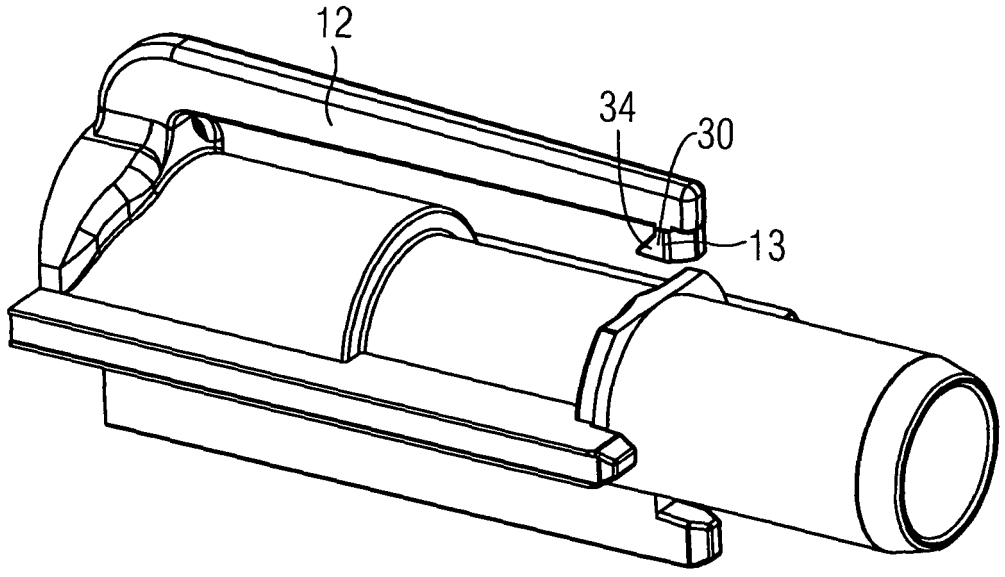


FIG 25

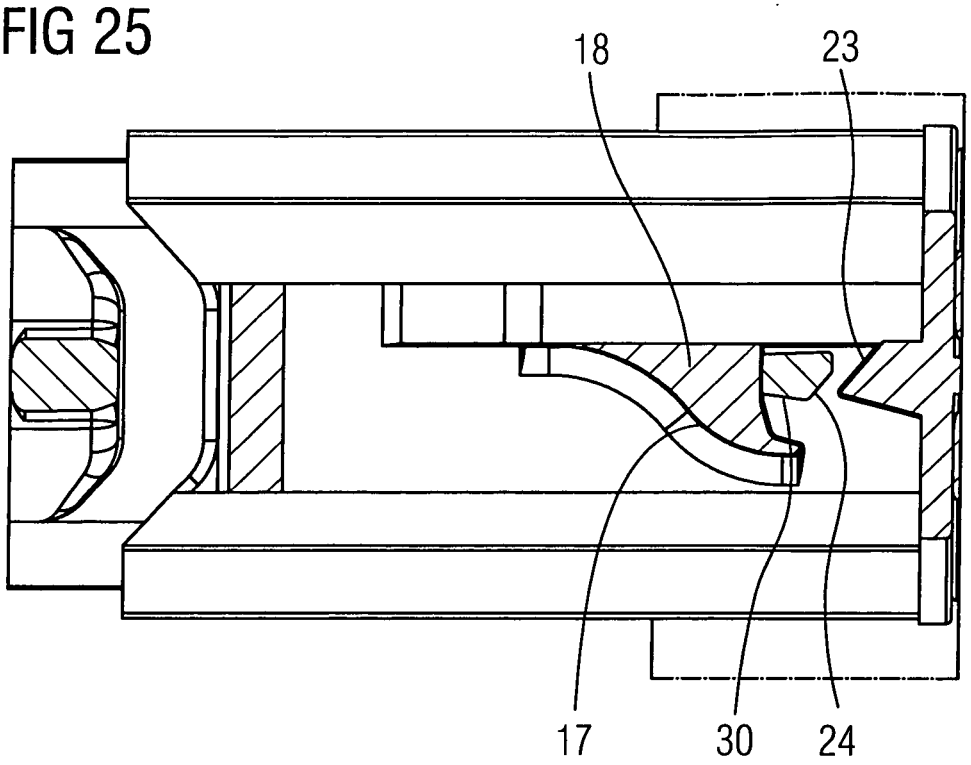
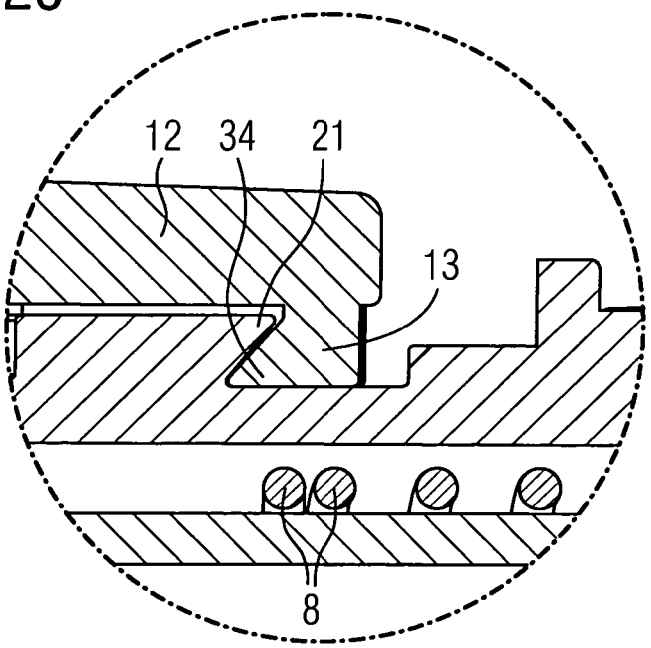


FIG 26



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EUROPEAN SEARCH REPORT

Application Number
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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	3 September 2009	Popescu, Alexandru

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