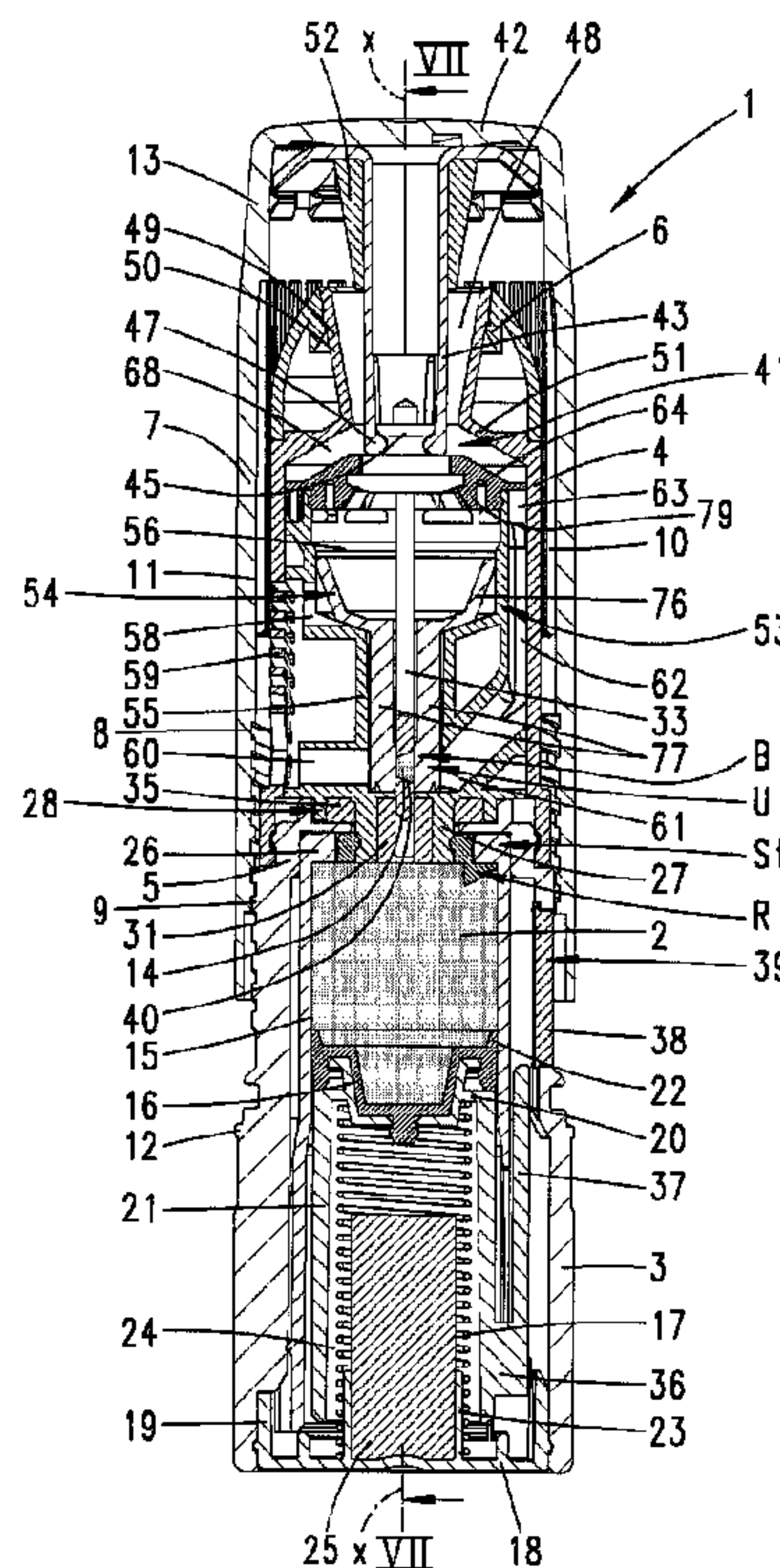




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(54) **Titre : DISPOSITIF DE DOSAGE POUR INHALER UNE SUBSTANCE EN POUDRE**
(54) **Title: DOSING DEVICE FOR THE INHALATION OF A POWDER SUBSTANCE**



(57) **Abrégé/Abstract:**

The invention relates to a dosing device (1) which can be activated by the vacuum air stream of the user, for the inhalation of a powder substance (2), particularly medicine, which is arranged in a supply chamber (15) and which can be brought out of the same into an open emptying-ready position (B) by means of a dosing chamber (4) of a dosing rod (33) when the mouthpiece-closure cap(7) is removed. In particular, the invention suggests, in order to improve dispensing, the provision of two air paths, of which one serves to open and empty the dosing chamber, and/or the second air path (a) penetrates directly into a ring chamber (63) in order to mix with the air flow containing the substance.



1 ABSTRACT

2 The invention relates to a dosing device (1) which can be activated by the vacuum air
3 stream of the user, for the inhalation of a powder substance (2), particularly medicine, which is
4 arranged in a supply chamber (15) and which can be brought out of the same into an open
5 emptying-ready position (B) by means of a dosing chamber (4) of a dosing rod (33) when the
6 mouthpiece-closure cap(7) is removed. In particular, the invention suggests, in order to improve
7 dispensing, the provision of two air paths, of which one serves to open and empty the dosing
8 chamber, and/or the second air path (a) penetrates directly into a ring chamber (63) in order to
9 mix with the air flow containing the substance.

Dosing Device for the Inhalation of a Powder Substance

The invention relates to a metering device which can be activated by the user's suction airstream and is intended for the inhalation of a pulverulent substance, in particular a medicinal substance, according to the preamble of the main claim.

A metering device of the type in question is known from WO 2006/021546 A1. The quantity of substance separated off in the metering chamber is moved into a closed emptying-standby position. As a result of a user breathing in, a piston moves and opens the metering chamber. Thereafter, the latter is connected to an air-flow path for clearing the separated-off quantity of substance out of the metering chamber and transferring it into the airstream which is to be sucked in.

In view of this known prior art, it may be considered to be a technical problem of the invention to develop in an advantageous manner a metering device of the type in question in respect of optimum air channeling. WO 02/26299 has already proposed to use the suction airstream both for displacing a metering rod and for conveying the substance through the mouthpiece. These solutions, however, can only be used with the metering device in the upright position, that is to say they cannot be used, in practice, when the user is lying in bed. There is also a risk of the inhaler-substance mixture separating.

The problem of optimum air channeling is solved substantially by the subject matter of Claim 1. Two airstreams meet in an annular chamber, one of the airstreams initially opening the metering chamber and then coming into contact with the other airstream in the annular chamber. The configuration selected for the piston means that only a relatively low mass needs to be shifted when the piston is displaced, but a large-area engagement surface is provided, and this makes it easier for the piston to be moved out of the emptying-standby position into the emptying-release position by means of the user's suction airstream. Accordingly, only a relatively low level of suction airstream energy is required in order to release the metering chamber. Furthermore, the narrow construction of the piston makes it possible to achieve increased levels of air energy during inhalation.

In an advantageous development, it is provided that, in its upper end position, the upper periphery of the piston engages in front of an annular wall, which belongs to an annular

1 chamber, and preferably the ceiling of the latter has peripherally extending, projecting wings
2 which leave intermediate spaces between them. Disposed downstream of the same is a ceiling
3 portion which constitutes an oblique deflecting wall with concentrating action. Further preferably,
4 the piston, which has air flowing around it during inhalation, i.e. during suction-air activation by
5 the user, releases the path to the annular chamber in the upper position, i.e. in the emptying-
6 release position of the metering chamber, with sealing engagement against the annular wall of
7 the annular chamber. The annular chamber acts in the manner of a vortex chamber, in which
8 the powder which is to be inhaled is distributed optimally in the suction air. The powder which is
9 to be inhaled consists, for example, of a basic body, such as lactose, which can be transported
10 by a suction stream and is suitable as a carrier for fine micronized drug particles adhering to its
11 surface. These basic bodies are usually of different sizes. On account of the powder-laden
12 suction air flowing through the annular chamber, the particles of powder are rendered more or
13 less the same size, i.e. relatively large particles of powder are broken up as a result of the
14 vortexing and the associated centrifugal forces. The powder-laden suction air is extracted by
15 suction through the intermediate spaces which are formed between the wings extending radially
16 outward from the cover and from where the suction air passes, in slightly concentrated form,
17 into the mouthpiece of the metering device. It is possible to distribute, over the circumference of
18 the cover, wings and interspaces of the same width, as seen in the circumferential direction.
19 However, it is also possible to provide wings and/or interspaces of different widths in the
20 circumferential direction. This creates at the end of the annular chamber, as seen in the
21 direction in which flow takes place around the annular chamber, forced guidance of the powder-
22 laden airstream, through an interspace provided correspondingly on the cover, into the
23 mouthpiece. In a development of the subject matter of the invention, it is provided that some of
24 the wings are of circumferentially wider configuration, in order to form a deflecting-wall wing for
25 the powder-laden suction airstream. This wing is preferably directed, in first instance, in the axial
26 direction of the annular chamber. The deflecting-wall wing forces the incoming suction airstream
27 to deflect into a plane of circulation directed transversely to the annular chamber. By virtue of
28 the deflecting-wall wing being acted upon at relatively high speed, relatively large particles of
29 powder are broken up. The metering rod is retained in an inner cylinder, which can be rotated
30 by the closure cap, such that it can be displaced along the axial extent of the inner cylinder. The
31 rotation of the inner cylinder is transmitted to the metering rod. This inner cylinder is provided,
32 on the lateral-wall side, with an axially running channel which extends from the emptying side of
33 the metering chamber and terminates in the annular chamber, the deflecting-wall wing being
34 provided in order to deflect the axial airstream direction into the orbital plane. Accordingly, this

1 deflecting-wall wing is disposed in the manner of a cover in axial extension of the channel, with
2 the radial outlet being left in the process. Via this channel, following the suction-air-induced
3 raising operation of the piston and the associated release of the metering chamber, the
4 separated-off dose of substance is sucked out and fed, via the annular chamber, to the user
5 who is building up the suction airstream. In a preferred configuration, deflection from the radial
6 flow direction into the axial flow direction is achieved by two channel deflection regions which
7 are located directly one after the other and each cause flow to be deflected by 45 degrees. An
8 intermediate channel portion which runs at an angle of approximately 45 degrees to a plane
9 oriented transversely to the axis of the device, and connects the emptying side of the metering
10 chamber to the axially running channel, is thus also preferably provided.

11
12 A total of two air-flow paths are created, of which the one causes the metering chamber to be
13 emptied and the second leads directly into an annular chamber which is located upstream of the
14 mouthpiece and where the two airstreams meet. Accordingly, the one particle-laden airstream
15 established during the inhalation operation is channeled separately. The quantity of air which is
16 required for inhalation is fed, in part, via the first air-flow path within the annular chamber. If the
17 metering chamber is closed, the metering chamber can be opened via this air-flow path, for
18 example via the suction-air-activated piston. By virtue of the air-flow paths being separated, a
19 stream of air which is not laden with particles is formed initially. In the event of correct
20 inhalation, approximately 50 liters of air per minute flow through the device, which quantities of
21 air result from at least the two airstreams being added together, one fraction being fed, in first
22 instance, via the first flow path, which opens the metering chamber. In a preferred configuration,
23 this opening of the metering chamber, for example by virtue of a piston being displaced out of
24 an emptying-standby position into an emptying-release position, takes place at an opening
25 pressure of approximately 2 kPa, and furthermore with an airflow of 18 to 22 liters of air per
26 minute. The airstream of the second air-flow path, which leads directly from the metering
27 chamber into the annular chamber, the annular chamber being located upstream of the
28 mouthpiece, has a significantly higher flow speed than the airstream which results in the
29 metering chamber being emptied.

30
31 In a preferred configuration, the second airstream is sucked in through a grille-wall portion. The
32 latter leaves a free opening cross-section which allows the necessary quantity of air to be easily
33 sucked in. Further preferably, the air-inlet grille surface is located on the outer cylinder, which
34 cannot be rotated in relation to the inner cylinder and continues the closure cap, on that side of

1 the metering rod which is located opposite to the emptying direction of the metering chamber.
2 This means that there is clear structural separation of the air-flow paths.
3

4 A compact construction of such a metering device is further achieved in that a flow channel
5 directed toward the metering chamber is disposed beneath the air-inlet grille surface, even in
6 the position assumed by the metering chamber in an emptying-standby position, and this flow
7 channel even allows a visual check as to whether the metering chamber is full and/or closed. In
8 a preferred configuration, this channel passes through the outer cylinder beneath the air-inlet
9 grille surface for the first air-flow path in the region of an appropriately formed air-inlet opening.
10 As a result of this configuration, the two air-flow paths open, in respect of the air-inlet openings,
11 to the same side of the outer cylinder. Via the flow channel provided beneath the air-inlet grille
12 surface, in the emptying-release position, the metering chamber is cleared preferably
13 transversely to the device axis in order for the separated-off substance to be transported via the
14 second air-flow path, passing through the annular chamber into the mouthpiece, all this being as
15 a consequence of suction-air activation on the part of the user. In a further-preferred
16 configuration, the interior of the inner cylinder is available entirely for the free distribution of the
17 air sucked in through the air-inlet grille surface, and it is in flow connection with the annular
18 chamber.
19

20 In a further configuration of the invention, the lateral wall of the outer cylinder has at least one
21 air-inlet opening, preferably two radially opposite air-inlet openings. Further air-flow paths are
22 achieved via these separate air-inlet openings, these further air-flow paths being separated from
23 the other two air-flow paths at least in the emptying-standby position. It is thus provided, in an
24 advantageous development of the subject matter of the invention, that the air-inlet openings
25 open out in a tangentially directed manner into the annular chamber, a common flow direction
26 being predetermined in the process, this further being a flow direction which is even
27 predetermined by the other two air-flow paths. These air-inlet openings achieve a kind of initial
28 ignition in order to deflect the rest of the air-flow paths in the desired flow direction within the
29 annular chamber.
30

31 The substance which is to be inhaled is stored in a storage chamber, into which the metering
32 chamber penetrates for filling purposes. In order to assist the filling operation of the metering
33 chamber here, and furthermore to achieve the situation where the uppermost layer of the
34 substance store, which has the metering chamber passing through it, is always loosened, a

1 rotor-like blade is retained on the lower periphery of the inner cylinder, for example clipped
2 thereon, which blade interacts with an inwardly directed stator-like shoulder of the storage-
3 chamber wall. This allows the replenishment and the density of the substance in the storage
4 chamber to be kept constant. Added to this is a loosening effect which is provided in the area
5 surrounding the metering chamber and prevents fractions of the substance from coming to a
6 halt. Furthermore, the rotor, in interaction with the stator, is configured such that, when the rotor-
7 like blades are moved back when the closure cap is replaced and screwed on and the metering
8 chamber is lowered into the storage chamber, the uppermost substance layer is subjected to
9 slight contact pressure, in order thus to provide, in the storage chamber, an evened-out
10 uppermost substance-quantity region associated with the metering chamber.

11
12 Finally, it has also proven to be advantageous to provide, in the region of the storage-chamber
13 wall, a filling-level indicator which makes it possible to ascertain the amount of filling. In the
14 simplest configuration, this can be coupled directly to the axial movement of a pressure piston
15 which is disposed in the storage chamber and subjects the stored quantity of substance to
16 loading from beneath in the direction of the inner cylinder. This pressure piston advances as
17 substance is removed, and this can be observed via the filling-level indicator.

18
19 The invention is explained in more detail hereinbelow with reference to the accompanying
20 drawing, which merely constitutes an exemplary embodiment and in which:

21
22 Figure 1 shows the vertical section through a metering device according to the invention
23 in the basic position, with the cap closed;

24
25 Figure 2 shows a further vertical section along line II-II in Figure 1;

26
27 Figure 3 shows an enlargement of an upper region of the device according to Figure 1;

28
29 Figure 4 shows a sectional illustration corresponding to Figure 1, relating to the situation
30 where the storage chamber for the substance which is to be inhaled has been
31 more or less emptied;

32
33 Figure 5 shows the section along line V-V in Figure 4;

- 1 Figure 6 shows a further illustration corresponding to Figure 1, this time during removal
2 of the closure cap;
3
- 4 Figure 7 shows the section along line VII-VII in Figure 6;
5
- 6 Figure 8 shows the vertical section according to Figure 1, but following removal of the
7 closure cap and the resulting displacement of a metering chamber into the
8 emptying-standby position;
9
- 10 Figure 9 shows the section along line IX-IX in Figure 8;
11
- 12 Figure 10 shows a detail-view illustration corresponding to Figure 3, relating to the
13 situation according to Figure 8;
14
- 15 Figure 11 shows a follow-up illustration to Figure 8, but relating to a position assumed
16 during inhalation;
17
- 18 Figure 12 shows the section along line XII-XII in Figure 11;
19
- 20 Figure 13 shows a further detail-view illustration corresponding to Figure 3, but relating to
21 the situation according to Figure 11;
22
- 23 Figure 14 shows a further vertical-section illustration corresponding to Figure 1, this time
24 relating to an intermediate position as the closure cap is being replaced
25 following completion of inhalation;
26
- 27 Figure 15 shows a follow-up illustration to Figure 14, relating to an intermediate position;
28
- 29 Figure 16 shows a follow-up illustration to Figure 15, relating to an intermediate position
30 as the operation of screwing on the closure cap continues;
31
- 32 Figure 17 shows the cross-section through the metering device in the emptying-standby
33 position along line XVII-XVII in Figure 8;
34

- 1 Figure 18 shows the cross-sectional illustration through the metering device along line
2 XVIII-XVIII in Figure 11;
3
- 4 Figure 19 shows an illustration which corresponds to Figure 17 and has been taken along
5 line XIX-XIX in Figure 11, relating to the emptying-release position;
6
- 7 Figure 20 shows the section along line XX-XX in Figure 11 through the storage chamber,
8 with the substance which is stored here having been left out;
9
- 10 Figure 21 shows a perspective detail illustration of an inner cylinder of the metering
11 device;
12
- 13 Figure 22 shows a further perspective illustration of the inner cylinder;
14
- 15 Figure 23 shows a perspective detail illustration of the metering rod of the metering
16 device;
17
- 18 Figure 24 shows a perspective detail illustration of the piston;
19
- 20 Figure 25 shows a further perspective detail illustration of a rotor-like blade for disposing
21 on the inner cylinder;
22
- 23 Figure 26 shows a further perspective illustration of the rotor-like blade; and
24
- 25 Figure 27 shows, in a detail drawing, the bottom view of a cover of an annular chamber.
26
- 27 The metering device 1 which is illustrated in the figures and is intended for the inhalation of a
28 pulverulent substance 2, in particular a medicinal substance, is realized as a short-elongate
29 device which can readily be carried in a pocket and has a cylindrical housing 3 which
30 determines its shape.
31
- 32 The cylindrical, tube-like housing 3 has, at the head end, an outer cylinder 4 which can be
33 rotated about the device axis x relative to the housing 3. This outer cylinder is secured in a
34 rotatable manner on the housing 3 in the region of an end-side radial step 5.

1
2 This likewise cylindrical, tube-like outer cylinder 4 merges, at the head end of the device 1, into
3 an attached mouthpiece 6 which is formed appropriately for the mouth, for example is flattened.

4 This mouthpiece 6 can have a cup-like closure cap 7 engaging over it in a protective manner.

5 This closure cap is realized as a screw cap, for which reason an associated internal thread 8
6 engages in a corresponding external thread 9 on the lateral wall of the housing 3.

7
8 The outer cylinder 4 is connected to the closure cap 7 in a rotationally fixed manner, for which
9 reason the outer cylinder has, on the outside of its lateral wall, vertically oriented ribs 10 which
10 interact with correspondingly positioned, slot-like vertical grooves 11 on the inside of the wall of
11 the closure cap 7. Accordingly, screw-action actuation of the closure cap 7 causes the outer
12 cylinder 4 to be rotated about the device axis x.

13
14 At the foot end, the end periphery of the cup-like closure cap 7 engages in a stop-limiting
15 manner, and with sealing via a cone, against an annular shoulder 12, which is achieved on
16 account of the abovementioned step of the cylindrical housing 3.

17
18 The closure cap 7 serves, at the same time, as an actuating handle 13 for dispensing the
19 pulverulent substance 2 in reproducible sub-quantities 14, for which purpose use is made of the
20 axial screw-action displacement provided by the threaded engagement between the internal
21 thread 8 and external thread 9. The substance 2 is accommodated (possibly such that it can be
22 refilled) in a storage chamber 15 of the housing 3. A metering device conveys a respective sub-
23 quantity 14 of substance to a transfer location U located outside the storage chamber 15.

24
25 The meterable substance is a (usually medicinal) pulverulent substance 2. It is possible for
26 basic bodies such as lactose, which are capable for example of transporting a suction stream, to
27 be carriers for fine micronized drug particles adhering to the surface.

28
29 The storage chamber 15 is terminated at the bottom by a cup-like pressure-exerting base 16,
30 which is spring-loaded in the direction of the mouthpiece 6 by means of a compression spring
31 17. The compression spring 17 has its foot-side end turn supported on a base cap 18, which
32 closes the housing 3 there. This base cap is in latching engagement with that portion of the
33 housing 3 which is of larger cross-section here on its inside wall, a corresponding latching collar
34 19 of the base cap 18 engaging in a matching annular groove of the housing 3.

1
2 The head-side end turn of the biased compression spring 17 subjects an inner shoulder 20 of a
3 hollow piston 21 of the piston-like means 16/21 to loading action. As can be seen from the
4 illustrations, the pressure-exerting base 16, which is in the form of a graduated cup, is
5 connected with latching action to the hollow piston 21 in the region of the inner shoulder 20.
6

7 The cup periphery of the pressure-exerting base 16 forms an annular lip 22 which, on account
8 of its elastomeric material, strips substance off the wall of the storage chamber 15 without
9 leaving any residues.
10

11 In the exemplary embodiment illustrated, the compression spring 17 is a cylindrical spring
12 which, in the state in which it is relieved of stressing, has a length corresponding approximately
13 to ten times the maximum contact-pressure length. The contact-pressure length is defined by
14 the extent of axial displacement of the pressure-exerting base 16 between a lower position
15 according to Figure 1, this position corresponding to the filling position, and an upper, stop-
16 limited position of the pressure-exerting base 16 in the storage chamber 15 according to Figure
17 4. Thus, the exemplary embodiment illustrated provides a contact-pressure length of 15 mm. As
18 a result of the configuration of the spring, in particular as a result of the selected length of the
19 spring, the pressure-exerting base 16 is subjected to a constant spring pressure over the entire
20 contact-pressure length, and this leads to the substance being compressed uniformly
21 throughout the duration of use of the device 1.
22

23 A hollow upright stub 23 extends centrally from the base cap 18. Together with the hollow piston
24 21 which encloses it at a distance apart, this hollow upright stub forms a chamber 24 for the
25 compression spring 17. The hollow upright stub 23 contains, in its center, a moisture-absorbing
26 material in the form of a drying-agent capsule 25. At the transition to the outer cylinder 4, which
27 follows the housing 3 in the axial direction, the storage chamber 15 terminates with a chamber
28 ceiling 26 formed integrally with the lateral wall of the storage chamber 15. Passing through the
29 center of this chamber ceiling is a cylinder portion 27 of a rotary part 28 which extends in a
30 plane perpendicular to the device axis x. This rotary part is of substantially plate-like
31 configuration and is connected in a rotationally fixed manner to the outer cylinder 4 and,
32 accordingly, can be rotated about the device axis x in relation to the chamber ceiling 26. The
33 cylinder portion 27 extends on the underside of the rotary part 28, passing through the chamber

1 ceiling 26. The lower free end surface of the cylinder portion 27 is located in the plane of that
2 surface of the chamber ceiling 26 which covers the storage chamber 15.

3
4 The diameter of the through-opening in the chamber ceiling 26 is larger than the diameter of the
5 cylinder portion 27. A holder, of annular shape in plan view, for a rotor blade R, is positioned in
6 the annular gap which remains. This rotor blade is connected in a rotationally fixed manner to
7 the cylinder portion 27.

8
9 The inner surface of the rotor ring 30, this inner surface being directed toward the storage
10 chamber 15, is located in the plane of the correspondingly directed end surface of the cylinder
11 portion 27.

12
13 The rotor R, which is illustrated on its own in Figures 25 and 26, carries on the underside, that is
14 to say in the direction toward the storage chamber 15, a blade 29. This is a blade 29 which is in
15 the form of a spherical-cap portion and projects radially outward beyond the ring 30 of the rotor
16 R. The blade 29 correspondingly engages beneath that region of the chamber ceiling 26 which
17 adjoins the rotor R radially on the outside, that surface of the blade 29 which is directed toward
18 the chamber ceiling 26 being of planar configuration. This surface of the blade 29 engages
19 against the top surface of the chamber which is directed toward the blade. The blade 29
20 extends radially as far as the inner wall of the storage chamber 15. From this radially outer
21 region, the blade 29 slopes up convexly in the radially inward direction, as seen in cross-
22 section, to an axial height corresponding approximately to the extent by which the blade 29
23 projects radially beyond the rotor ring 30.

24
25 As a result of this arrangement, the blade 29 of the rotor R projects into the substance stored in
26 the storage chamber 15. The shoulder formed by the chamber ceiling 26, in interaction with the
27 blade 29 or rotor R, which can be rotated relative to the storage chamber 15, forms a stator St.

28
29 The rotor R is clipped on the cylinder portion 27 of the rotary part 28 via the rotor ring 30.

30
31 The cylinder portion 27 accommodates a sealing bushing 31 in its center. This bushing consists
32 of a rubber material or a similar elastic material. This leaves, in its center, a cross-sectionally
33 slot-like guide opening 32 for a cross-sectionally adapted metering rod 33.

1 In the simplest configuration, the sealing bushing 31 and also an annular seal 35 provided
2 between the rotary part 28 and a housing portion 34, which engages over the chamber ceiling
3 26 on the housing side, may be produced by two-component injection molding together with the
4 rotary part 28 and, furthermore, with an inner cylinder, which will be described in more detail. It
5 is also possible in this respect, however, for the rubber or elastomer parts to be provided
6 subsequently during production.

7
8 At the foot end, the hollow piston 21, which is connected with latching action to the pressure-
9 exerting base 16, has a radial extension arm 36. Integrally formed on the latter is an axially
10 oriented indicating protrusion 37 which engages over the storage-chamber wall on its outside.
11 The axial position of this indicating protrusion, this position being reached in dependence on the
12 position of the pressure-exerting base, can be seen by the user from the outside through a
13 viewing window 38 provided in the housing. A filling-level indicator 39 is provided as a result.

14
15 The metering rod 33 is appropriately configured for functioning as a moving metering chamber
16 40 for the sub-quantity 14 of substance which is to be dispensed, the metering rod 33 moving
17 linearly along the longitudinal center axis x-x of the substantially rotationally symmetrical device
18 1, and this being accompanied by a rotary movement executed about the longitudinal center
19 axis x-x. The metering rod 33 is formed substantially as a flat part with an elongate-rectangular
20 cross-section. The length ratio of narrow side to broad side is approximately 1:3 in the
21 exemplary embodiment illustrated.

22
23 At the end which is directed away from the mouthpiece 6, the metering rod 33 forms a portion
24 which tapers to a point more or less in the manner of a cross-recessed screwdriver tip. The two
25 mirror-symmetrical oblique flanks here extend from the respective broad sides of the metering
26 rod 33 (cf. Figure 20).

27
28 On account of the metering rod 33 being carried along in rotation, the cross-sectional
29 configuration of the metering rod 33 and the tapering of the free end region have a loosening,
30 displacing effect in the central region in relation to the mass of pulverulent substance 2.

31
32 The metering chamber 40 is realized as a transverse hole which runs substantially
33 perpendicularly to the longitudinal center axis x-x and has an axis which passes through the
34 broad-side surfaces of the metering rod 33. The transverse hole is formed conically, so that the

1 transverse hole tapers in the direction of one broad-side surface of the metering rod 33.

2 Furthermore, as can be seen for example from the illustration in Figure 2, the metering chamber
3 40, which is formed in the region of that end of the metering rod 33 which projects into the mass
4 of substance, is disposed eccentrically in relation to the broad-side surfaces of the metering rod
5 33, that is to say it is offset laterally in relation to the longitudinal axis x-x.

6
7 The displacement path of the metering chamber 40, which moves linearly, and, at the same
8 time, in rotation, allows, in both end positions of the metering rod 33, for the cross-section of the
9 guide opening 32 to be kept closed, with metering-chamber-filling scraping or stripping action
10 over the length of the said opening 32.

11
12 The mouthpiece end of the closure cap 7 forms a docking location 41 between the metering rod
13 33 and closure cap 7, this docking location disengaging when subjected to overloading. The
14 latching means on the closure-cap side here is a resilient hook annulus which is formed in the
15 region of the free end of a hollow cylinder 43 disposed centrally on the underside of a closure-
16 cap ceiling 42. The corresponding end of the metering rod 33 is rotationally symmetrical in
17 cross-section, a disk-like radial collar 44, furthermore, projecting out in the transition region from
18 the flat-part portion to the cylindrical end portion. At an axial spacing from this radial collar 44,
19 that end region of the metering rod 33 which is directed away from the flat part forms a latching
20 head 45. A wasp-waist-like annular groove 46 is formed between this latching head and the
21 radial collar 44. Inwardly directed noses 47 of the resilient tongues of the hook annulus engage
22 in this annular groove. The noses 47 can pass over the latching head 45 in both axial directions.
23 The latching action may be fairly tight, since it is released and reinstated during the screwing-
24 action displacement of the cap.

25
26 The central opening 48 of the mouthpiece 6 is formed in the region of a dispersing part 49. This
27 dispersing part 49 opens conically outward, that is to say in the direction away from the storage
28 chamber 15, the wall 50 of the dispersing part merging, in the direction toward the storage
29 chamber 15, into an annular, roof-like ceiling portion 51. At the same time, the latter forms the
30 upper terminal of the outer cylinder 4, which carries the mouthpiece 6.

31
32 The central free space created by the dispersing part 49 has the hollow cylinder 43, which
33 carries the noses 47, passing through it centrally in the cap-closed position. The annular space

1 which forms here between the hollow cylinder 43 and the dispersing-part wall is filled by a
2 further drying-agent capsule 52 in the cap-closed position.

3
4 The outer cylinder 4 accommodates an inner cylinder 53, passing through the center of which is
5 the metering rod 33 and, in the cap-closed position, the hollow cylinder 43 belonging to the
6 closure cap. The inner cylinder is connected in a rotationally fixed manner to the outer cylinder
7 4.

8
9 This inner cylinder 53 is configured substantially as a hollow body and carries, in its center, an
10 axially displaceable piston 54. The piston 54 is guided more or less in the lower half of the inner
11 cylinder 53, directed toward the storage chamber 15, by a cross-sectionally round guide portion
12 55.

13
14 That portion of the inner cylinder 53 which is directed away from the storage chamber 15 forms
15 a piston-head displacement region 56 which has a cross-section larger than that of the guide
16 portion 55 and of which the axially oriented wall 57 has radial openings 58, 58' and 58". These
17 radial openings are in flow connection with a grille-wall portion 59 of the outer cylinder.

18
19 Formed beneath the grille-wall portion 59, and furthermore at the foot end of the guide portion
20 55 of the inner cylinder, is a radially oriented flow channel 60, which likewise opens toward the
21 grille-wall portion 59. This flow channel may also serve as a window for visually monitoring the
22 metering rod 33. It opens out into the free space left in the center by the guide portion 55.

23 Radially opposite the flow channel 60, the guide portion 55 is adjoined by an intermediate
24 channel portion 61 which, starting from the guide portion 55, and with the inclusion of an angle
25 of 45° in relation to a plane oriented perpendicularly to the axis x, slopes up in the direction of
26 the associated wall of the outer cylinder 4 in order then to merge, at the end, into an axially
27 directed channel 62. This channel 62 is formed by an axially oriented, slot-like, radially
28 outwardly opening recess in the lateral surface of the inner cylinder. The channel 62 is covered
29 over radially by the associated wall of the outer cylinder 4.

30
31 As well as the radial opening 58, which can be seen by way of example in the sectional
32 illustration in Figure 1, two further radial openings 58' and 58" are provided, and these each
33 enclose, as seen in a plane oriented transversely to the axis x, an angle of 90° in relation to this

1 radial opening 58 and, by virtue of the inner-cylinder wall being configured appropriately, are in
2 direct air-flow connection with the grille-wall portion 59.

3
4 The axially oriented channel 62 has its end which is directed toward the mouthpiece 6 opening
5 out into an annular chamber 63. The latter forms a vortex chamber. The ceiling 64 of the latter is
6 of cross-sectionally roof-like configuration and is provided with peripherally extending, projecting
7 wings 65, 66. These engage peripherally against the inner wall of the outer cylinder 4 and, as
8 seen in the circumferential direction, leave intermediate spaces 67 between them, through
9 which an air-flow connection is achieved between the annular chamber 63 and a further annular
10 space 68 left between the dispersing-part ceiling portion 51 and the annular-chamber ceiling 64.

11
12 The ceiling 64 is secured on the inside wall of the inner cylinder 53 by an axially directed flange
13 69.

14
15 The base of the annular chamber 63 is formed by an annular collar 70 which projects radially
16 outward on the outside wall of the inner cylinder 53 at an axial spacing from the wings 65, 66 of
17 the ceiling 64. It is also the case that this annular collar is supported peripherally on the inside
18 wall of the outer cylinder 4. This annular collar 70 is interrupted by the axially oriented channel
19 62. The annular chamber 63 is bounded in the radially inward direction by an end-side wall
20 portion which belongs to the inner cylinder 53 and serves for latching the ceiling 64. The
21 resulting annular-chamber wall is provided with slot-like through-passages 71 in order to provide
22 air-flow connection between the annular chamber 63 and the piston-head displacement region
23 56.

24
25 As can furthermore be seen, in particular, from the sectional illustration in Figure 18, the outer-
26 cylinder wall is provided, level with the annular chamber 63, with two diametrically opposite air-
27 inlet openings 72. These open out tangentially into the annular chamber 63, and this,
28 furthermore, predetermines a common flow direction. Accordingly, a sucking-in action through
29 the air-inlet openings 72 results in a predetermined air flow in the annular chamber 63. The
30 axially oriented channel 62 opens out, as seen in the flow direction, immediately downstream of
31 the mouth of one air-inlet opening 72 in the annular chamber 63, so that the airstream entering
32 into the annular chamber 63 through the axial channel 62 is deflected specifically in the desired
33 vortexing direction via the air-inlet openings 72.

1 The wings of the ceiling 64 are of different widths as seen in the circumferential direction. Thus,
2 two diametrically opposite wings 65 are approximately three times the width of the rest of the
3 wings 66, as seen in the circumferential direction. One of these broader wings 65 covers over
4 the mouth region of the axial channel 62 into the annular chamber 63 and, accordingly, forms a
5 deflecting-wall wing 73 for the suction airstream entering into the annular chamber 63 through
6 the axial channel 62.

7
8 As can further be seen, in particular, from the illustration in Figure 27, the wings 66 extend
9 circumferentially, in the exemplary embodiment described, over an angle β of 15° . The
10 intermediate spaces 67 left between the wings 66 and 65 likewise extend circumferentially over
11 an angle α of 15° , while the peripheral edges of the broader wings 65 enclose an angle δ of 45° .

12
13 Other distributions are also possible in this respect (for example smaller wings – larger
14 intermediate spaces; larger wings – smaller intermediate spaces; irregular configuration of
15 wings and intermediate spaces).

16
17 An interrupter 74 is disposed in the annular chamber 63 adjacent to the mouth of the axial
18 channel 62 in the annular chamber 63, the interrupter being in the airflow direction through the
19 air inlet openings 72. This interrupter limits the circumferential path of the annular chamber 63
20 and, accordingly as a result of this configuration, this path is of an interrupted form rather than
21 being annular throughout. The rear flank of the interrupter 74, this flank being oriented counter
22 to the flow direction, constitutes a run-on slope 75, connecting the annular-chamber base to the
23 annular-chamber ceiling, which contains the intermediate spaces 67. This causes the airstream
24 in the end region of the annular chamber 63 to be forcibly deflected axially upward into the
25 further annular space 68.

26
27 The piston 54, which is retained in a rotationally fixed, but axially displaceable manner, in the
28 inner cylinder 53, has, in first instance, a piston head 76 which opens in disk form in the
29 direction of the mouthpiece. This piston head opens conically in cross-section. Two parallel,
30 axially oriented tongues 77 are integrally formed on the underside of the piston disk. The piston
31 54 consist of a rubber-like material.

32
33 Along their lower free periphery, the tongues 77, which accommodate the cross-sectional
34 contour of the guide portion 55 of the inner cylinder 53 on their outside wall, are split in a lip-like

1 manner and, furthermore, in their free peripheral region, they have material-reinforced sealing
2 surfaces 78.

3
4 The flat part of the metering rod 33 is guided between the tongues 77, the sealing surfaces 78,
5 in interaction with the flat part of the metering rod 33, having a stripping and sealing action.

6
7 In a basic position of the device according to the illustration in Figure 1, the free peripheries of
8 the tongues 77, these peripheries being split in a lip-like manner, engage, within an axial
9 depression, against the upper side of the cylinder portion 27.

10
11 Furthermore, in this basic position, the disk-like piston head 76 rests in a stop-limited manner on
12 a base region of the piston-head displacement region 56. The encircling peripheral region of the
13 free end of the piston head 76 engages with sealing action against the associated inner wall of
14 the inner cylinder 53.

15
16 Furthermore, in this basic position, the head of the metering rod 33, that is to say the radial
17 collar 44 and latching head 45 of the same, rests in the depression created by the disk-like
18 configuration of the piston head 76.

19
20 The piston head 76 here is located at an axial distance beneath the ceiling 64.

21
22 The device 1 cited functions as follows:

23 In order to prepare for inhalation, the closure cap 7 is first of all removed by unscrewing. As the
24 closure cap 7 is being unscrewed upward, the coupling mentioned results in the outer cylinder 4
25 being carried along in rotation and, via this outer cylinder, the inner cylinder 53 as well as, in the
26 exemplary embodiment cited, all those parts above the storage-chamber plane which are not
27 connected in a rotationally fixed manner to the housing 3. Accordingly, the metering rod 33 is
28 also carried along in rotation, and furthermore, the action of the closure cap 7 being unscrewed
29 upward gives rise, at the same time, to axial displacement of the metering rod 33 via the
30 docking location 41, which causes helical displacement of the metering chamber 40 into the as
31 yet closed emptying-standby position B according to the illustration in Figures 6 and 7, in which
32 it is aligned with the flow channel 60.

1 By virtue of the metering chamber 40 being disposed eccentrically in relation to the axis of
2 rotation of the metering rod 33, it is filled optimally as a result of penetrating helically through the
3 mass of substance, assisted by the rotor. The larger-diameter opening surface of the metering
4 chamber 40 here is oriented in the direction of rotation.

5
6 The simultaneously rotating blade 29 of the rotor R here causes the surrounding mass of
7 substance to be in a constantly loosened state, a shoveling effect being achieved. When the
8 rotor R rotates in the opposite direction – as the closure cap 7 is screwed on again – the blade
9 29 interacts with the stator St in order to scrape off substance 2 from the surface of the stator
10 and to press the substance 2 down, as a result of which the mass of substance is evened out.
11 The blade 29 of the rotor R, accordingly, acts on the mass of substance in both directions of
12 rotation.

13
14 When the removal-standby position B of the metering rod 33 is reached, the metering rod is
15 secured with latching action. For this purpose, the radial collar 44 of the metering rod 33 moves
16 behind latching fingers 79 which are formed on the underside of the ceiling 64.

17
18 As the screwing-action displacement of the closure cap 7 continues, the latching in the region of
19 the docking location 41 between the hollow cylinder 43 and the metering rod 33 is eliminated.
20 Accordingly, the noses 47 leave the annular groove 46, whereupon the closure cap 7 can be
21 removed. The device 1 is now prepared for inhalation.

22
23 The screwing-action displacement of the closure cap 7 makes it possible to provide sufficient
24 force for producing the latching between the radial collar 44 and latching fingers 79 and,
25 furthermore, for eliminating the latching between the latching head 45 and noses 47 on the cap.

26
27 The tongues 77 of the piston 54 cover over the metering chamber 40 on each side. Accordingly,
28 in this position, it is not possible for the sub-quantity 14 of substance to trickle out even in part.
29 Rather, the substance is held reliably captive in the metering chamber 40. This prevents cases
30 of double metering when inhalation is not carried out, but the device is closed-off again via the
31 closure cap 7. Furthermore, in the removal-standby position B of the metering chamber 40, it is
32 also possible for the device 1 to be put to one side. Even if the device 1 experiences normal
33 kinds of impacts, this does not result in the sub-quantity 14 of substance which is to be inhaled
34 trickling out, which would falsify the inhalation result.

1
2 The inhalation operation takes place automatically by the user subjecting the device to suction
3 air, in the simplest case by the user breathing in.
4

5 Air is sucked in via the mouthpiece 6, and this, in first instance, by virtue of the piston head 76
6 being subjected to the action of air, results in the piston 54 being displaced axially in the
7 direction of the ceiling 64. In the case of the exemplary embodiment illustrated, the pressure
8 required to trigger the device is approximately 2 kgPa. Triggering takes place, as far as
9 possible, in abrupt fashion.
10

11 In the raised position, the upper free peripheral region of the piston head 76 engages against
12 the underside of an annular wall 80 of the ceiling 64. The annular space of the inner cylinder 53
13 which then encloses the free peripheral region of the piston head 76 is widened radially, as a
14 result of which radial flow takes place around the piston 54 in the region of the piston head 76.
15 This gives a main airstream a which flows through the grille-wall portion 59, passing through the
16 radial openings 58, 58' and 58'', into the piston-head displacement region 56 and passes, by
17 way of the annular-space region left radially outside the piston head 76, through the openings
18 71 into the annular chamber 63. Approximately 85 to 90% of the total inhalation air volume is
19 transported via this air-flow path.
20

21 At the same time, via the always open radial air-inlet openings 72, air is sucked in directly into
22 the annular chamber 63, in order to predetermine the vortexing direction in the annular chamber
23 63.
24

25 By virtue of the axially displaced piston 54, the tongues 77 are likewise displaced axially, in
26 order to release the metering chamber 40. The axial displacement of the piston 54 is assisted
27 by the guide portion 55, which accommodates the tongues 77, widening slightly in the direction
28 of the piston head 76, as a result of which there is a reduction in the friction between the
29 tongues 77 and the wall of the guide portion 55. It is also the case that the friction between the
30 tongues 77 and the flat part of the metering rod 33 is minimized, being on the region of the
31 sealing surfaces 78.
32

33 The metering chamber 40 is then located in a removal-release position F, in which it lies freely
34 in the flow path between the flow channel 60 and intermediate channel portion 61. In the

1 exemplary embodiment illustrated, approximately 10 to 15% of the inhalation air volume is
2 transported via this substance-transporting airstream b.

3
4 The metering chamber is cleared out with through-suction from the flow channel 60, this,
5 furthermore, taking place from the smaller opening surface in the direction of the larger opening
6 surface of the metering chamber 40. The two-fold deflection through in each case approximately
7 45° into the angled intermediate channel portion 61 and, from the latter, into the axially oriented
8 channel 62 results, in the manner of a baffle-plate effect, in the initial breaking up of relatively
9 large particles of powder, which further leads to an improved inhalation result.

10
11 The substance-laden airstream flowing axially, at relatively high speed, into the annular
12 chamber 63 via the channel 62 is deflected via the deflecting-wall wing 73 and, assisted by the
13 initial flow by way of the radial air-inlet openings 72, in the circumferential direction. Relatively
14 large particles of powder are further broken up on this deflecting-wall wing 73.

15
16 As a result of this configuration, the substance-laden airstream is guided outside the piston
17 region. The piston 54 merely has powder-free air flowing around it.

18
19 Optimum distribution of the sub-quantity 14 of substance which is to be inhaled is achieved in
20 the annular chamber 63. The substance-laden air passes out through the intermediate spaces
21 67 for inhalation. Relatively heavy particles of powder which have possibly not been broken up,
22 or have not been sufficiently broken up, are directed into the annular space 68 at the latest via
23 the interrupter 74.

24
25 In the annular chamber 63, the initially substantially axially inflowing airstreams a and b are
26 directed in a common horizontal direction of circulation in order then to pass jointly into the
27 mouthpiece 6, with axial passage through the ceiling 64.

28
29 A number of features are provided in order to indicate successful inhalation to the user. In first
30 instance, a visual check can be carried out in that the piston 54, once raised by suction air, is
31 retained in its raised position on account of the, albeit low, frictional forces present. The piston
32 54, or the tongues 77 thereof, can be seen in the removal-standby position B through the
33 radially outwardly open flow channel 60. This can be further assisted by the tongues 77 being
34 conspicuously colored. Once inhalation has taken place and the piston 54 has been raised

1 correspondingly, the tongues 77 cannot be seen. Rather, there is a free view of the empty
2 metering chamber 40. It is also the case that the action of the piston 54 striking against the
3 underside of the sealing 64 can be sensed both acoustically and by touch.

4
5 Once inhalation has taken place, and alternatively also if it is not desired to effect inhalation
6 from the removal-standby position B, the closure cap 7 is screwed on again, the latching
7 between the radial collar 44 and the latching fingers 79 being eliminated in first instance by
8 virtue of the latching head 45 being acted upon by the noses 47. The retaining forces of this
9 latching connection are of a correspondingly smaller magnitude than the amount of force which
10 is necessary for deflecting the noses 47. As the action of screwing the closure cap 7 downward
11 continues, the radial collar 44 on the metering rod displaces the piston 54 back again into its
12 basic position. At the same time, with axial displacement and corresponding rotary movement,
13 the metering rod 33 is displaced downward into the storage chamber. The action of the piston
14 54 being displaced back via the metering rod 33 terminates with the free ends of the tongues
15 77, which are formed in the manner of lips, striking against the facing ceiling surface of the
16 cylinder part 27. As the downward-screwing displacement continues, finally the noses 47 enter
17 into the annular groove 46 of the metering rod 33. This final latching action is discernable to the
18 user acoustically and by touch, to indicate that the closing operation is at an end. It is thus also
19 ensured that a latching action between the metering rod 33 and closure cap 7 which causes the
20 metering rod 33, and thus the metering chamber 40, to be carried along into the removal-
21 standby position B is only achieved in the lowermost position of the metering rod 33, in which
22 position the metering chamber 40 is filled. Accordingly, there is always a filled metering
23 chamber 40 available when the metering rod 33 is raised.

24
25 Incorrect operation is reliably avoided. Improper closure of the device 1 means that, during the
26 next attempt at inhalation, the metering rod 33, which has accordingly not been raised, on the
27 one hand closes the passage between the flow channel 60 and intermediate channel portion 61
28 by way of its flat-part portion. It is also the case that the metering rod 33 continues to act on the
29 associated surface of the piston head 76 via the radial collar 44. Accordingly, when an attempt
30 is made at inhalation, the closure of the flow channel 60 and the blocking of the piston 54
31 means that it is not possible to build up any air flow (with the exception of the small amount of
32 flow via the small radial air-inlet openings 72). This clearly signals incorrect positioning to the
33 user. This can only be eliminated by the device 1 being properly closed.

1 All features disclosed are (in themselves) pertinent to the invention. The disclosure content of
2 the associated/attached priority documents (copy of the prior application) is hereby also
3 included in full in the disclosure of the application, also for the purpose of incorporating features
4 of these documents in claims of the present application.

1 **List of Reference Signs**

- 2
- | | |
|----|---------------------------|
| 1 | Device |
| 2 | Substance |
| 3 | Housing |
| 4 | Outer cylinder |
| 5 | Radial step |
| 6 | Mouthpiece |
| 7 | Closure cap |
| 8 | Internal thread |
| 9 | External thread |
| 10 | Ribs |
| 11 | Grooves |
| 12 | Annular shoulder |
| 13 | Actuating handle |
| 14 | Sub-quantity of substance |
| 15 | Storage chamber |
| 16 | Pressure-exerting base |
| 17 | Compression spring |
| 18 | Base cap |
| 19 | Latching collar |
| 20 | Inner shoulder |
| 21 | Hollow piston |
| 22 | Annular lip |
| 23 | Upright stub |
| 24 | Spring chamber |
| 25 | Drying-agent capsule |
| 26 | Chamber ceiling |
| 27 | Cylinder portion |
| 28 | Rotary part |
| 29 | Blade |
| 30 | Rotor ring |
| 31 | Sealing bushing |
| 32 | Guide opening |

- 33 Metering rod
- 34 Housing portion
- 35 Annular seal
- 36 Radial extension arm
- 37 Indicating protrusion
- 38 Viewing window
- 39 Filling-level indicator
- 40 Metering chamber
- 41 Docking location
- 42 Closure-cap ceiling
- 43 Hollow cylinder
- 44 Radial collar
- 45 Latching head
- 46 Annular groove
- 47 Noses
- 48 Mouthpiece opening
- 49 Dispersing part
- 50 Wall
- 51 Ceiling portion
- 52 Drying-agent capsule
- 53 Inner cylinder
- 54 Piston
- 55 Guide portion
- 56 Piston-head displacement region
- 57 Region wall
- 58 Radial opening
- 58' Radial opening
- 58'' Radial opening
- 59 Grille-wall portion
- 60 Flow channel
- 61 Intermediate channel portion
- 62 Channel
- 63 Annular chamber
- 64 Ceiling

65	Wing
66	Wing
67	Intermediate spaces
68	Annular space
69	Flange
70	Annular collar
71	Openings
72	Air-inlet openings
73	Deflecting-wall wing
74	Interrupter
75	Run-on slope
76	Piston head
77	Tongues
78	Sealing surfaces
79	Latching finger
80	Annular wall
x	Device axis
B	Removal-standby position
F	Removal-release position
R	Rotor
St	Stator
U	Transfer location
α	Angle of intermediate spaces 67
β	Angle of wings 66
δ	Angle of wings 65
a	Main airstream
b	Substance-transporting airstream

WE CLAIM:

1. A metering device (1) adapted to be activated by a user's suction airstream for inhalation of a pulverulent substance (2) which is moveable out of a storage chamber (15) when a mouthpiece-closure cap (7) is removed by means of a metering chamber (40) into an emptying-standby position (B), in which emptying-standby position the metering chamber (40) is closed by a piston (54), the piston (54) being displaceable, by means of the user's suction airstream, in the direction of a mouthpiece (6) into an emptying-release position (F), in which emptying-release position the metering chamber (40) is released/opened and the substance (2) is removable by means of the user's suction airstream, characterized by two air-flow paths (a, b), a first path (a) and a second path (b), the airstream through the first path (a) opening the metering chamber (40) by displacement of the piston (54) from the emptying-standby position to the emptying-release position and the airstream through the second path (b) leading directly from the metering chamber (40) into an annular chamber (63), which is located upstream of the mouthpiece (6) and where both airstreams meet.
2. The metering device according to Claim 1, characterized in that one of the airstreams is sucked in through an air-inlet grille surface.
3. The metering device according to Claim 2, characterized in that the air-inlet grille surface (59) on an outer cylinder (4) is located on that side of a metering rod (33) which is located opposite to the emptying direction of the metering chamber (40) wherein the metering rod is configured for functioning as the metering chamber.
4. The metering device according to Claim 3, characterized in that a flow channel (60) directed toward the metering chamber (40) is disposed beneath the air-inlet grille surface (59), level with the position assumed by the metering chamber (40) in the emptying-standby position (B).
5. The metering device according to Claim 1, characterized in that a part of wings (65), which form a ceiling of the annular chamber (63), is of relatively wide configuration in the circumferential direction, in order to form a deflecting-wall wing (73) for the suction airstream.

6. The metering device according to Claim 3, characterized in that a latching head (45) of the metering rod (33) is at least partially sunken into an upper depression of the piston (54), the piston being a disk piston.
7. The metering device according to Claim 5, characterized by the provision, on a lateral-wall side of an inner cylinder (53) which is moved by the closure cap (7), of an axially running channel (62) which extends from the emptying side of the metering chamber (40) and terminates in the annular chamber (63), the deflecting-wall wing (73) being provided in order to deflect the axial airstream direction into the circumferential plane.
8. The metering device according to Claim 7, characterized in that the interior of the inner cylinder (53) is available entirely for the free distribution of the air sucked in through an air-inlet grille surface (59), and it is in flow connection with the annular chamber (63).
9. The metering device according to Claim 3, characterized in that a lateral wall of the outer cylinder (4) has two radially opposite air-inlet openings (72).
10. The metering device according to Claim 9, characterized in that the air-inlet openings (72) open out in a tangentially directed manner into the annular chamber (63), a common flow direction being predetermined in the process.
11. The metering device according to Claim 7, characterized in that, in the region of an upper layer of the storage chamber, a rotor-like blade (29) is clipped in on a lower periphery of the inner cylinder (53), and it interacts with an inwardly directed stator-like shoulder of a storage-chamber wall and is in contact with the stator-like shoulder.
12. The metering device according to Claim 1, characterized by an indicator (39), in the region of a storage-chamber wall, for indicating the actual filling level of the storage chamber (15).
13. The metering device according to Claim 12, characterized in that an upward movement of a metering-chamber piston (16) is stopped.

14. The metering device according to Claim 3, characterized in that the metering rod (33) is latched in a disengageable manner in its upper position.
15. The metering device according to Claim 14, characterized in that a radial collar of the metering rod (33) moves behind latching fingers (79) which are formed on a ceiling of the annular chamber.
16. The metering device according to claim 3, characterized in that the lateral wall of the outer cylinder (4) has at least one air-inlet opening (72).
17. The metering device according to any one of claims 1 to 16, characterized in that the pulverulent substance is a medicinal substance.
18. An inhaler comprising the metering device according to any one of claims 1 to 17.
19. A metering device activated by a suction airstream of a user and is intended for inhalation of a pulverulent substance, including a medicinal substance, the metering device comprising:
- a mouthpiece-closure cap;
 - a piston;
 - a mouthpiece;
 - an annular chamber disposed upstream of said mouthpiece;
 - a storage chamber storing the pulverulent substance which is moveable out of said storage chamber when said mouthpiece-closure cap is removed;
 - a metering rod having a metering chamber for removing the pulverulent substance out of said storage chamber into an emptying-standby position,
 - in the emptying-standby position said metering chamber being closed by said piston, said piston being displaceable by the suction airstream of the user, in a direction of said mouthpiece into an emptying-release position,
 - in the emptying-release position said metering chamber being released/opened and the pulverulent substance is removeable by means of the suction airstream of the user; and
 - two axially offset air-flow paths,

a first airstream through a first path of said two axially offset air-flow paths opening said metering chamber by displacement of said piston from the emptying-standby position to the emptying-release position and

a second airstream through a second path of said two axially offset air-flow paths leading directly from said metering chamber into said annular chamber,

said annular chamber is disposed upstream of said mouthpiece and where both of the airstreams meet.

20. The metering device according to claim 19, further comprising
an outer cylinder having an air-inlet grille surface and one of the first or second airstreams is sucked in through said air-inlet grille surface.
21. The metering device according to claim 20, wherein
said air-inlet grille surface on said outer cylinder is disposed on that side of said metering rod which is located opposite to an emptying direction of said metering chamber.
22. The metering device according to claim 21, further comprising:
a flow channel directed toward said metering chamber and disposed beneath said air-inlet grille surface,
level with a position assumed by said metering chamber in the emptying-standby position.
23. The metering device according to claim 19,
wherein said annular chamber has a ceiling formed from wings and part of said wings is of a relatively wide configuration in a circumferential direction, in order to form a deflecting-wall wing for the suction airstream.
24. The metering device according to claim 19, wherein:
said piston has an upper depression formed therein; and
said metering rod has a latching head that is at least partially sunken into said upper depression of said piston.

25. The metering device according to claim 19, further comprising:
an axial running channel;
a deflecting-wall wing; and
an inner cylinder having a lateral-wall side, on said lateral-wall side of said inner cylinder which is moved by said closure cap, of said axially running channel
which extends from an emptying side of said metering chamber and terminates in said annular chamber, said deflecting-wall wing being provided to deflect an axial airstream direction into a circumferential plane.
26. The metering device according to claim 20,
further comprising an inner cylinder having an interior available entirely for a free distribution of air sucked in through said air-inlet grille surface, and
it is in flow connection with said annular chamber.
27. The metering device according to claim 20,
wherein said outer cylinder has a lateral wall with two radially opposite air-inlet openings formed therein.
28. The metering device according to claim 27,
wherein said air-inlet openings open out in a tangentially directed manner into said annular chamber,
a common flow direction being predetermined in the process.
29. The metering device according to claim 25,
wherein said storage chamber has a storage-chamber wall with an inwardly directed stator-shaped shoulder; and
further comprising a rotor-shaped blade disposed in a region of an upper layer of the pulverulent substance,
said rotor-shaped blade is clipped in on a lower periphery of said inner cylinder, and interacts with said inwardly directed stator-shaped shoulder of said storage-chamber wall and is in contact with said inwardly directed stator-shaped shoulder.
30. The metering device according to claim 19,

wherein said storage chamber has a storage-chamber wall; and
further comprising an indicator in a region of said storage-chamber wall, for indicating an actual filling level of said storage chamber.

31. The metering device according to claim 30, further comprising
a metering-chamber piston and an upward movement of said metering-chamber piston is stopped.

32. The metering device according to claim 19,
wherein said metering rod is latched in a disengageable manner in its emptying-standby position.

33. The metering device according to claim 32, wherein:
said annular chamber has a ceiling with latching fingers formed thereon; and
said metering rod has a radial collar that moves behind said latching fingers which are formed on said ceiling.

34. The metering device according to claim 20,
wherein said outer cylinder comprises a lateral wall with at least one air-inlet opening formed therein.

35. A metering device activated by a suction airstream of a user and is intended for inhalation of a pulverulent substance, including a medicinal substance, the metering device comprising:

- a mouthpiece-closure cap;
- a piston;
- a mouthpiece;
- an annular chamber disposed upstream of said mouthpiece;
- a storage chamber storing the pulverulent substance which is moveable out of said storage chamber when said mouthpiece-closure cap is removed;
- a metering rod having a metering chamber for removing the pulverulent substance out of said storage chamber into an emptying-standby position,

in the emptying-standby position said metering chamber being closed by said piston, said piston being displaceable by the suction airstream of the user, in a direction of said mouthpiece into an emptying-release position,

in the emptying-release position said metering chamber being released/opened and the pulverulent substance is removeable by means of the suction airstream of the user; and

two axially offset air-flow paths,

an first airstream through a first path of said two axially offset air-flow paths opening said metering chamber by displacement of said piston from the emptying-standby position to the emptying-release position and

an second airstream through a second path of said two axially offset air-flow paths leading directly from said metering chamber into said annular chamber, said annular chamber is disposed upstream of said mouthpiece and where both of the airstreams meet;

an axial running channel;

a deflecting-wall wing; and

an inner cylinder having a lateral-wall side, on said lateral-wall side of said inner cylinder which is moved by said closure cap, of said axially running channel

which extends from an emptying side of said metering chamber and terminates in said annular chamber,

said deflecting-wall wing being provided to deflect an axial airstream direction into a circumferential plane.

36. A metering device activated by a suction airstream of a user and is intended for inhalation of a pulverulent substance, including a medicinal substance, the metering device comprising:

a mouthpiece-closure cap;

a piston;

a mouthpiece;

an annular chamber disposed upstream of said mouthpiece;

a storage chamber storing the pulverulent substance which is moveable out of said storage chamber when said mouthpiece-closure cap is removed;

a metering rod having a metering chamber for removing the pulverulent substance out of said storage chamber into an emptying-standby position,

in the emptying-standby position said metering chamber being closed by said piston, said piston being displaceable by the suction airstream of the user, in a direction of said mouthpiece into an emptying-release position,

in the emptying-release position said metering chamber being released/opened and the pulverulent substance is removeable by means of the suction airstream of the user; and two axially offset air-flow paths,

an first airstream through a first path of said two axially offset air-flow paths opening said metering chamber by displacement of said piston from the emptying-standby position to the emptying-release position and

an second airstream through a second path of said two axially offset air-flow paths leading directly from said metering chamber into said annular chamber, said annular chamber is disposed upstream of said mouthpiece and where both of the airstreams meet;

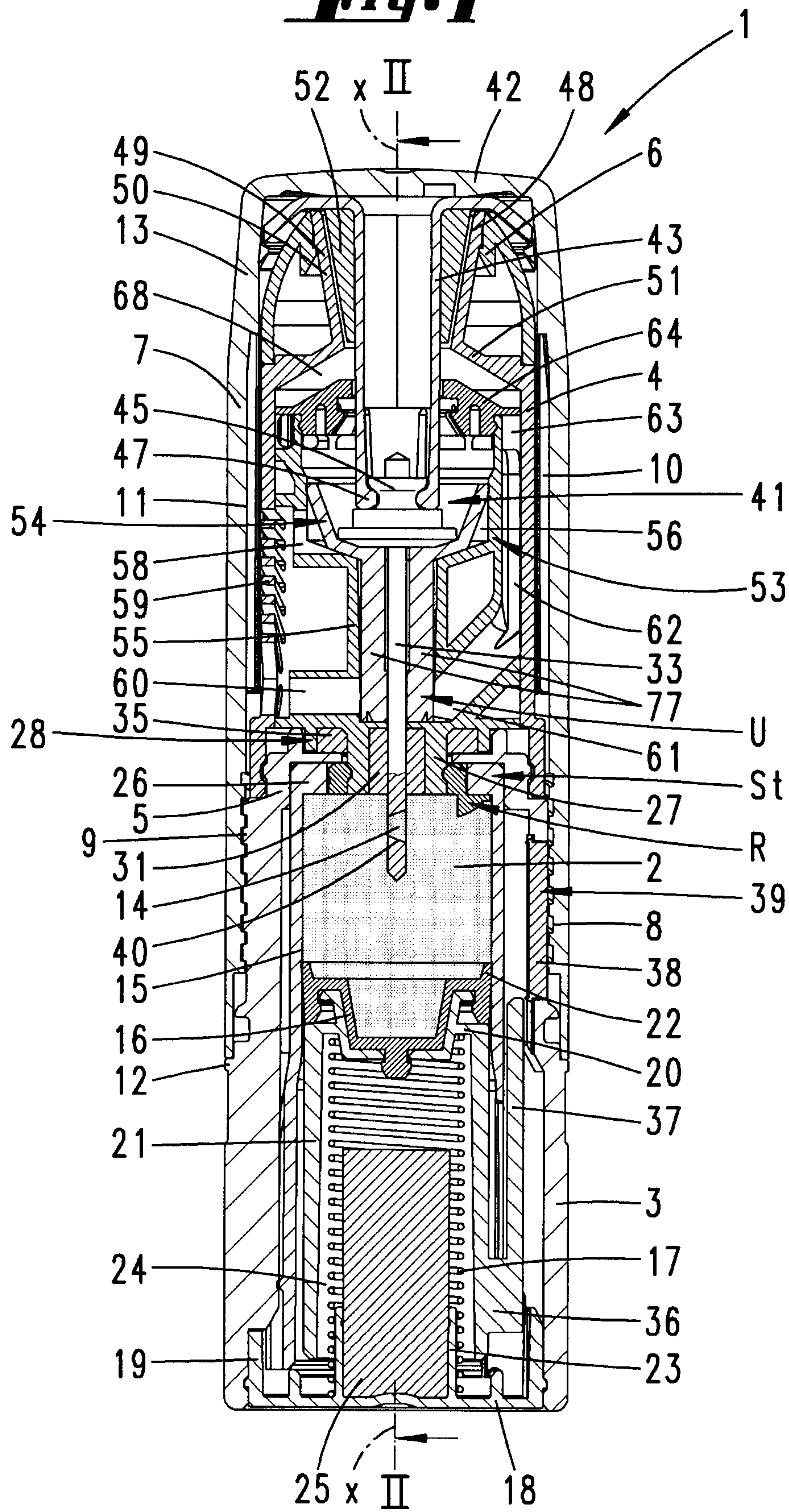
wherein said storage chamber comprises a storage-chamber wall; and

further comprising an indicator in a region of said storage-chamber wall, for indicating an actual filling level of said storage chamber.

37. An inhaler comprising the metering device according to any one of claims 19 to 36.

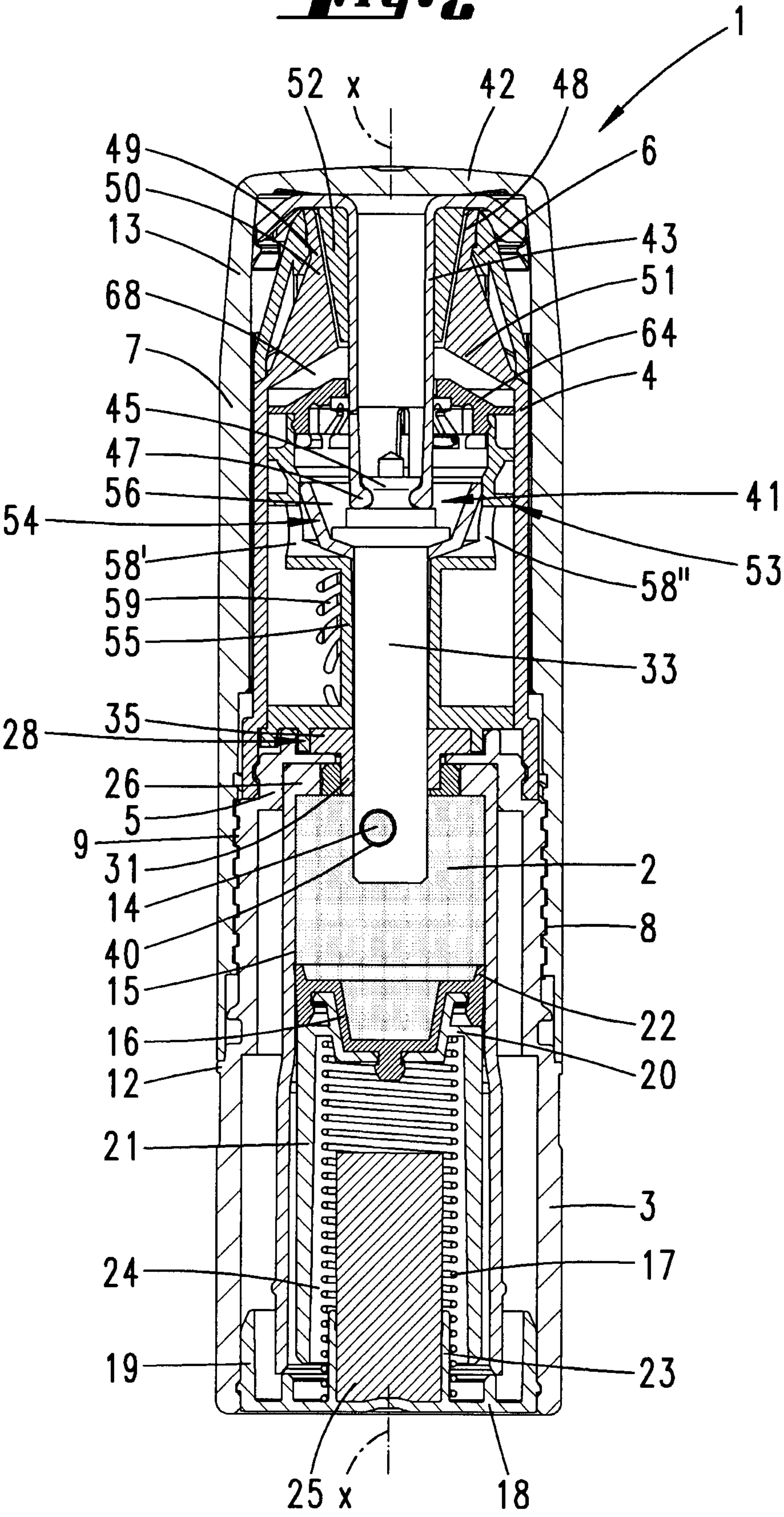
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Fig. 1



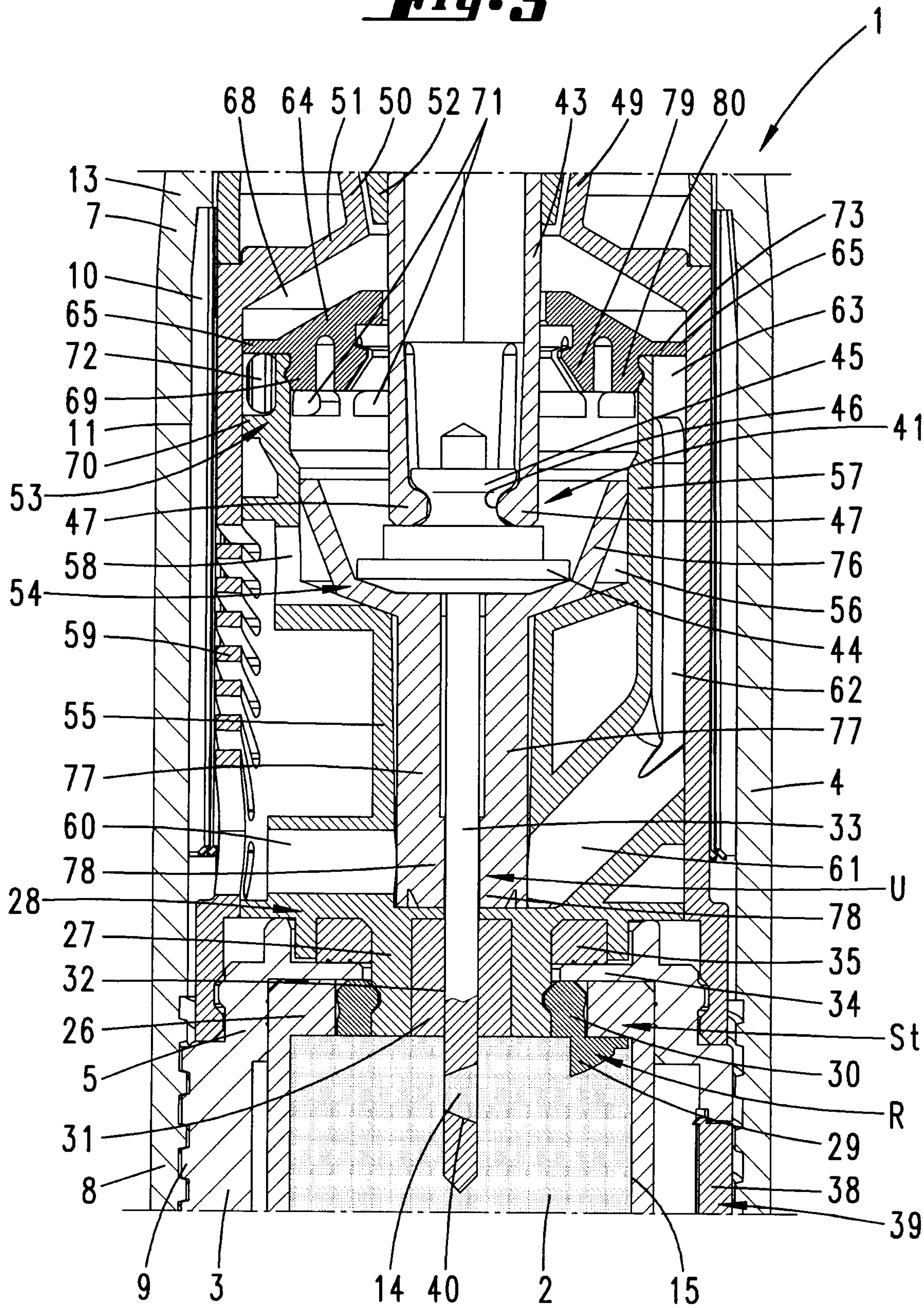
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Fig. 2



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Fig. 3



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Fig. 5

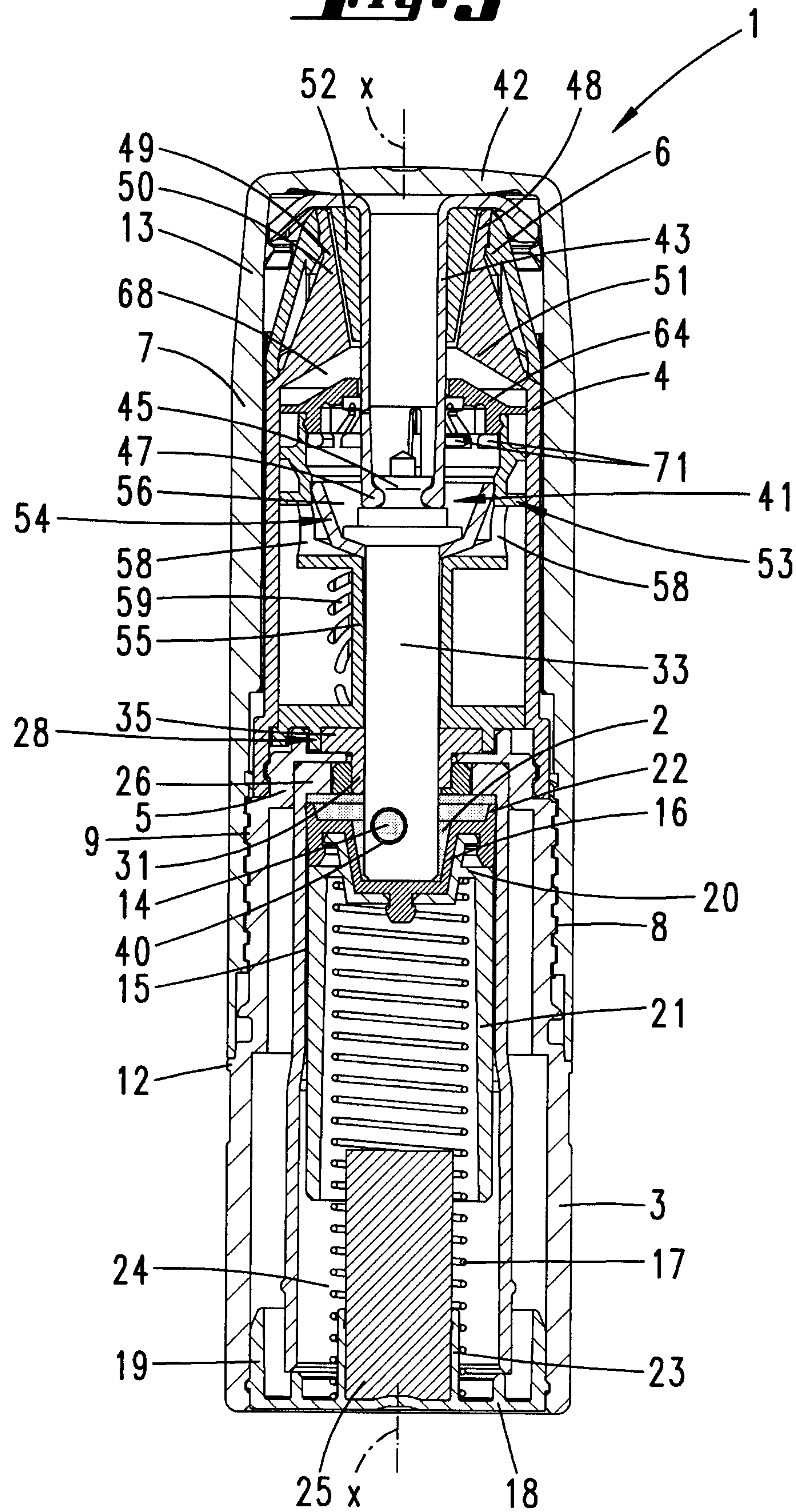


Fig. 6

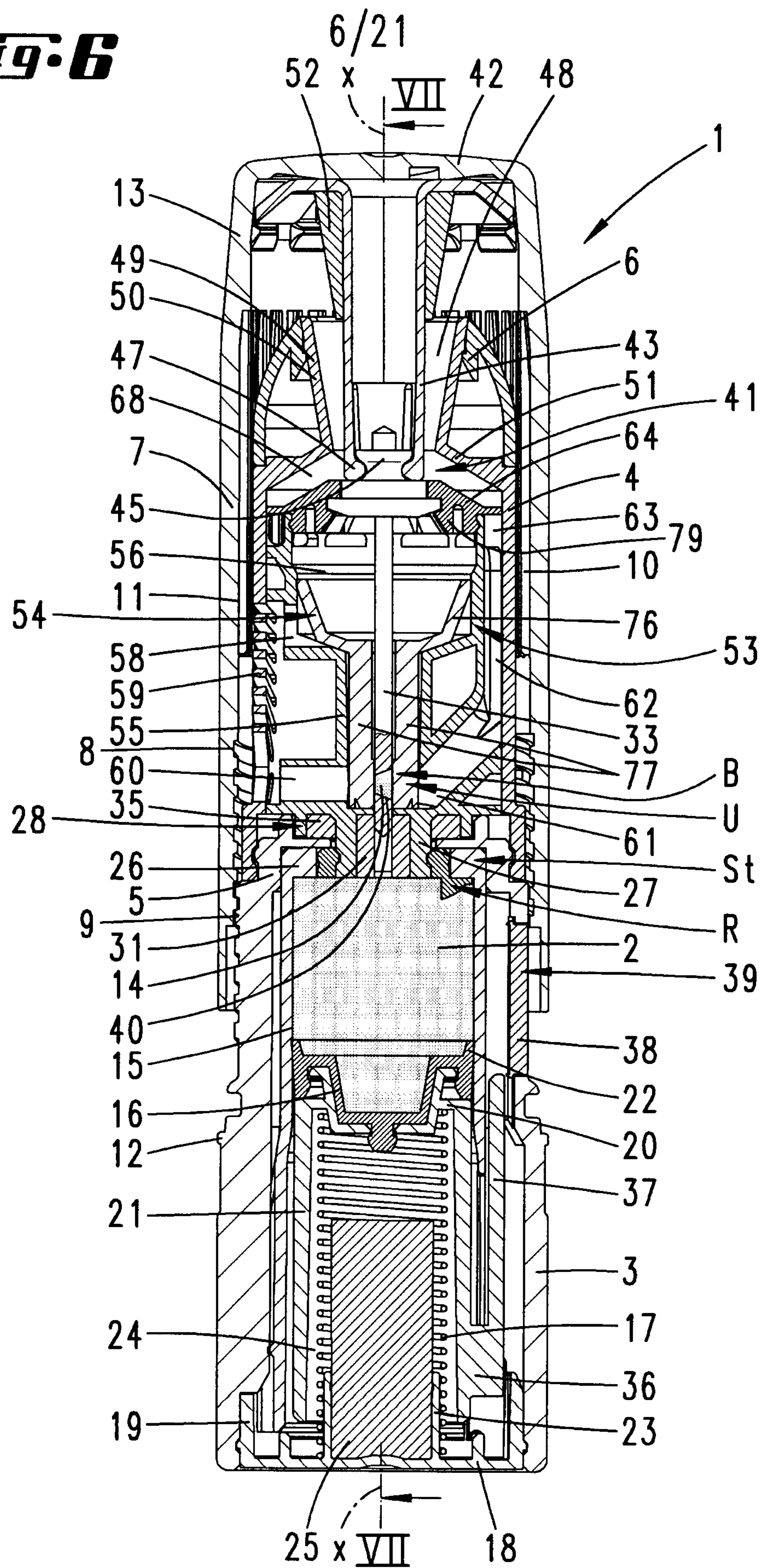
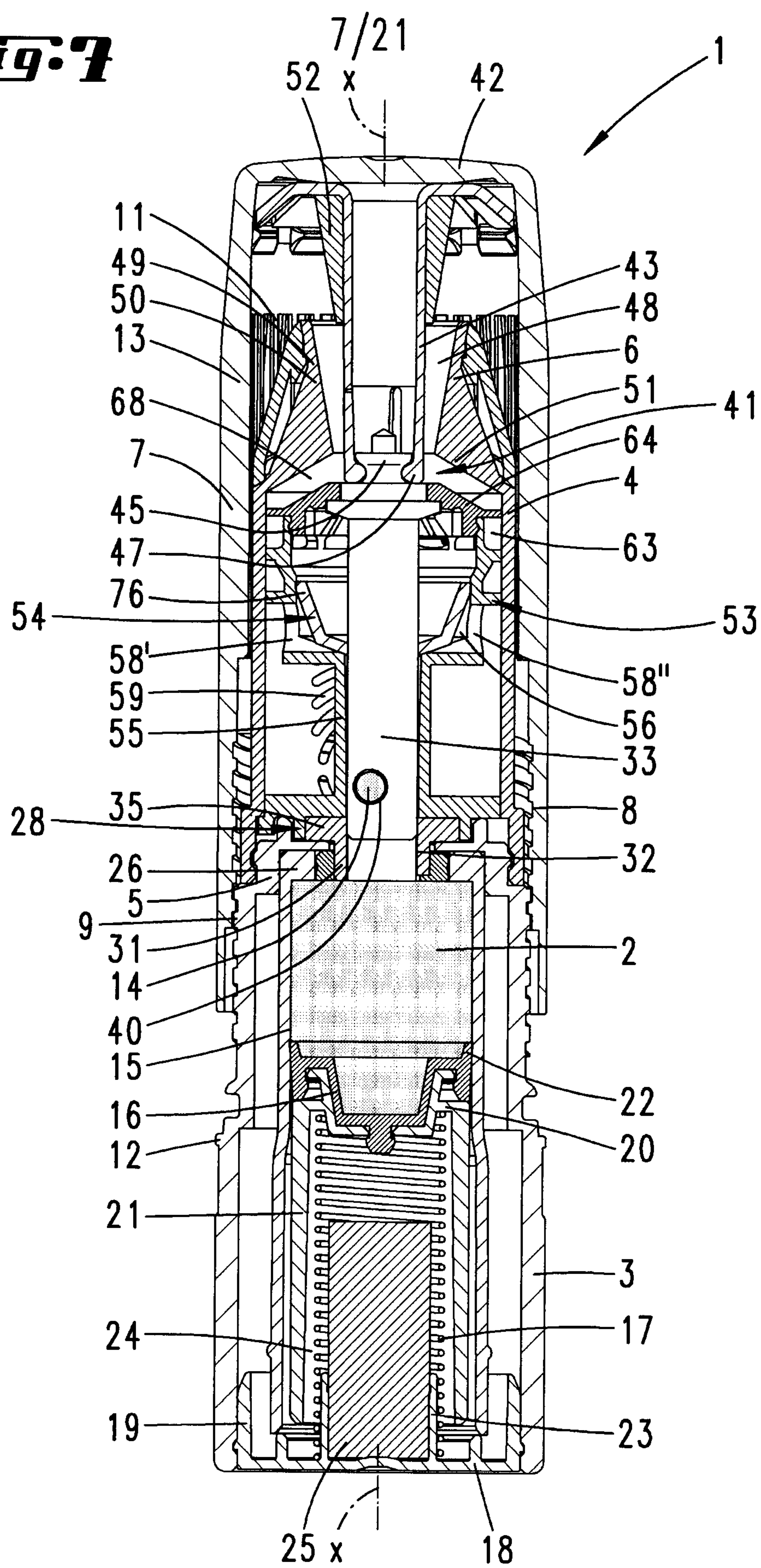
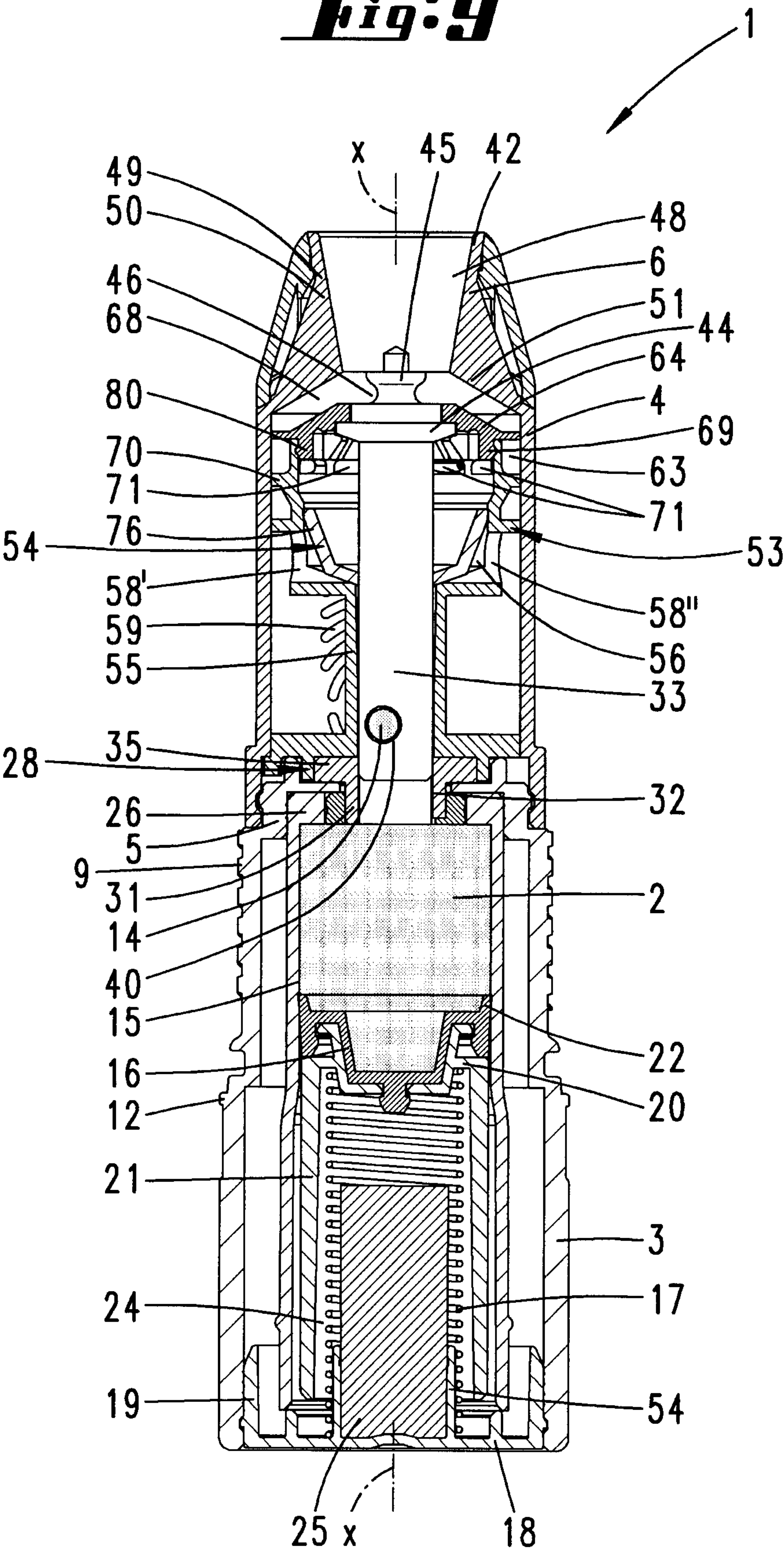


Fig: 7



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Fig. 9



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Fig. 10

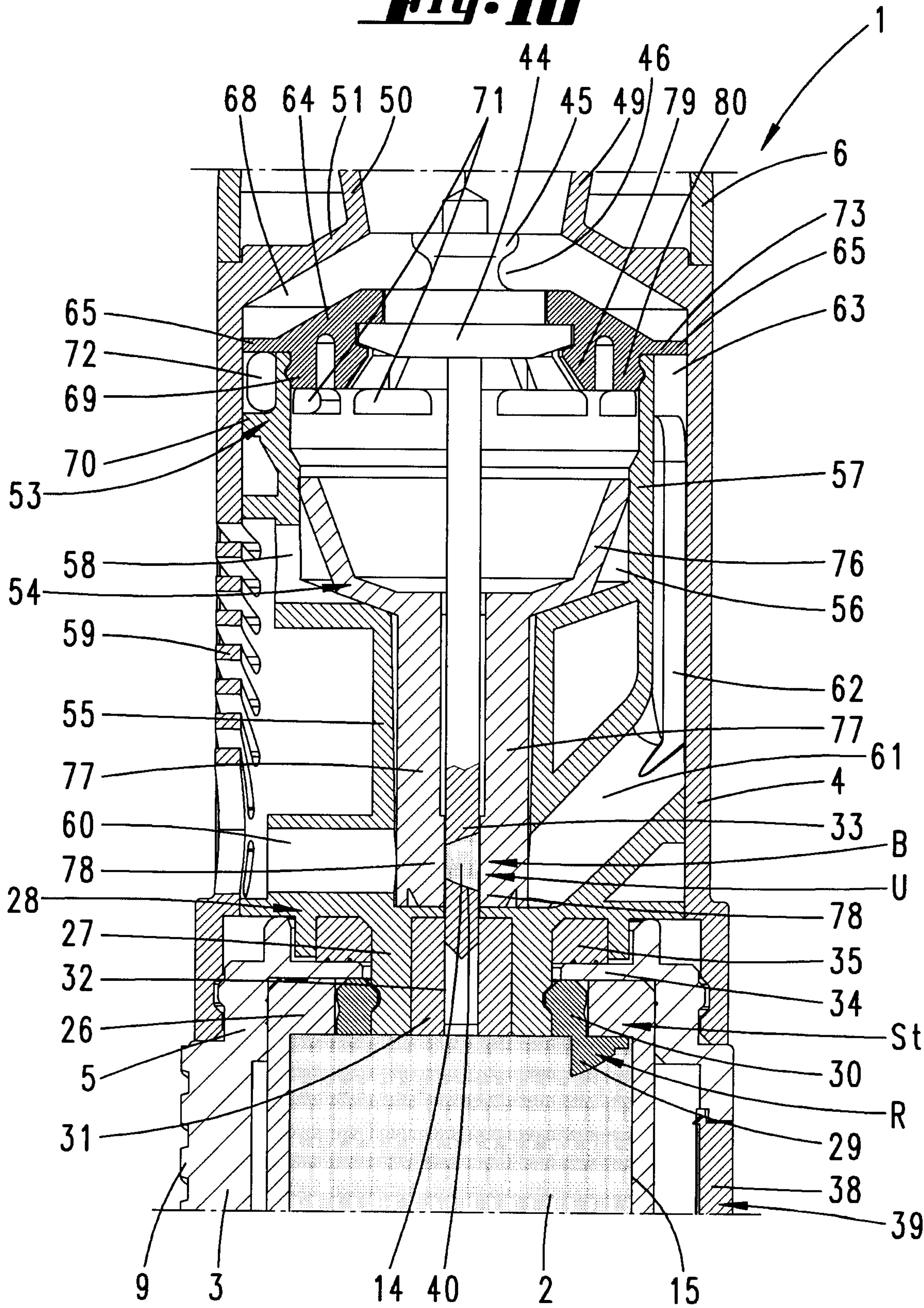
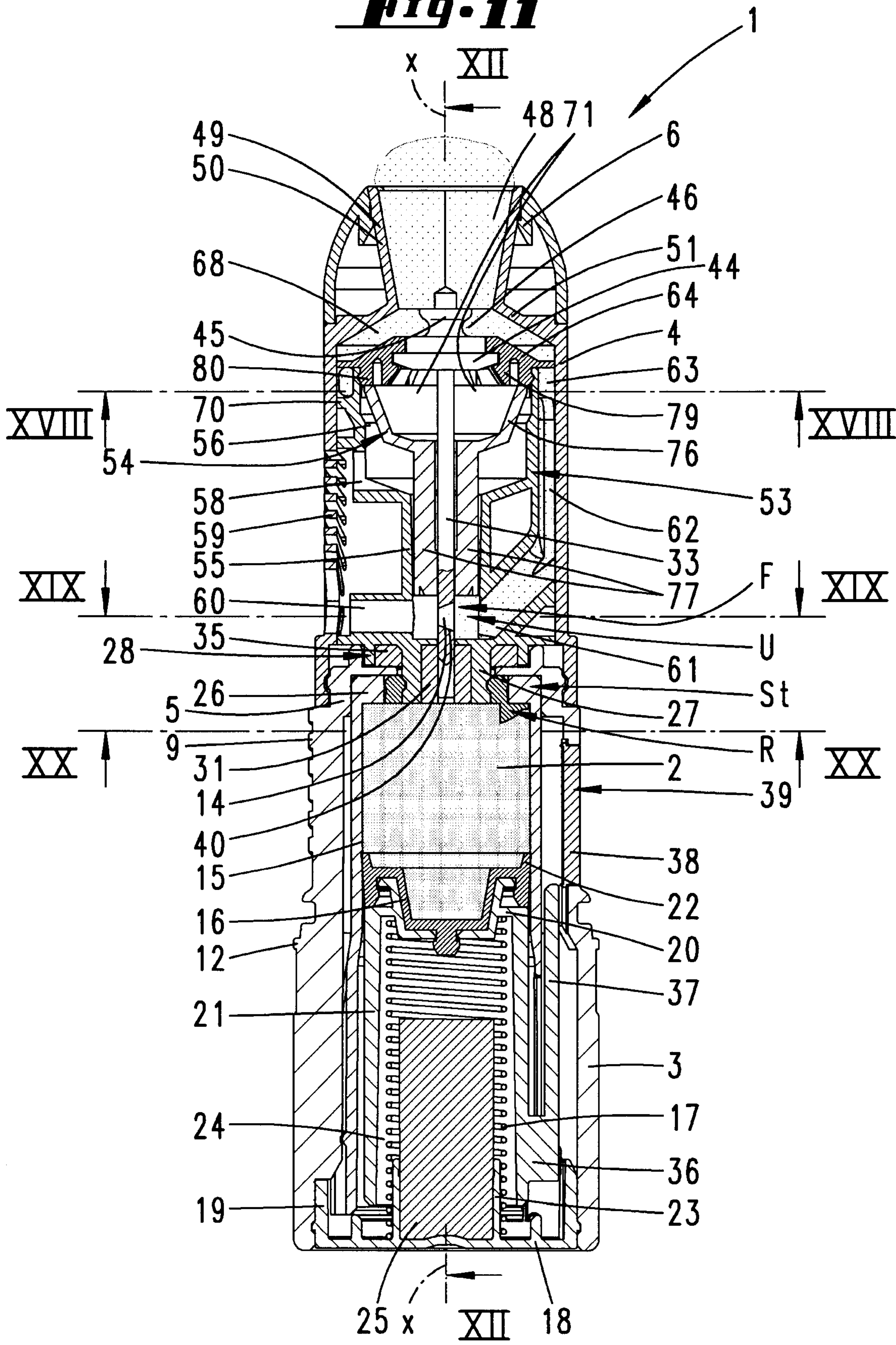


Fig. 11



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Fig. 12

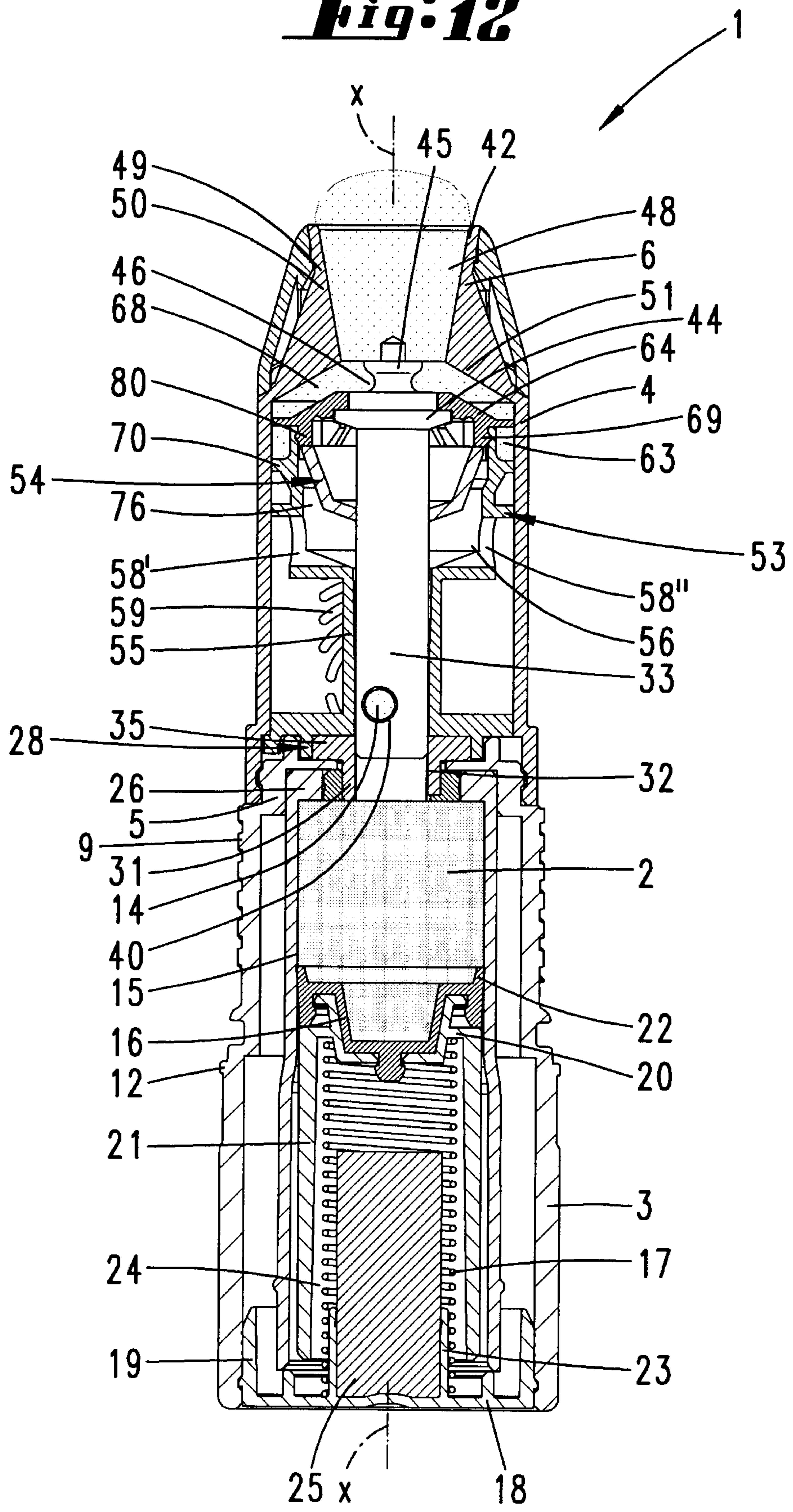


Fig. 13

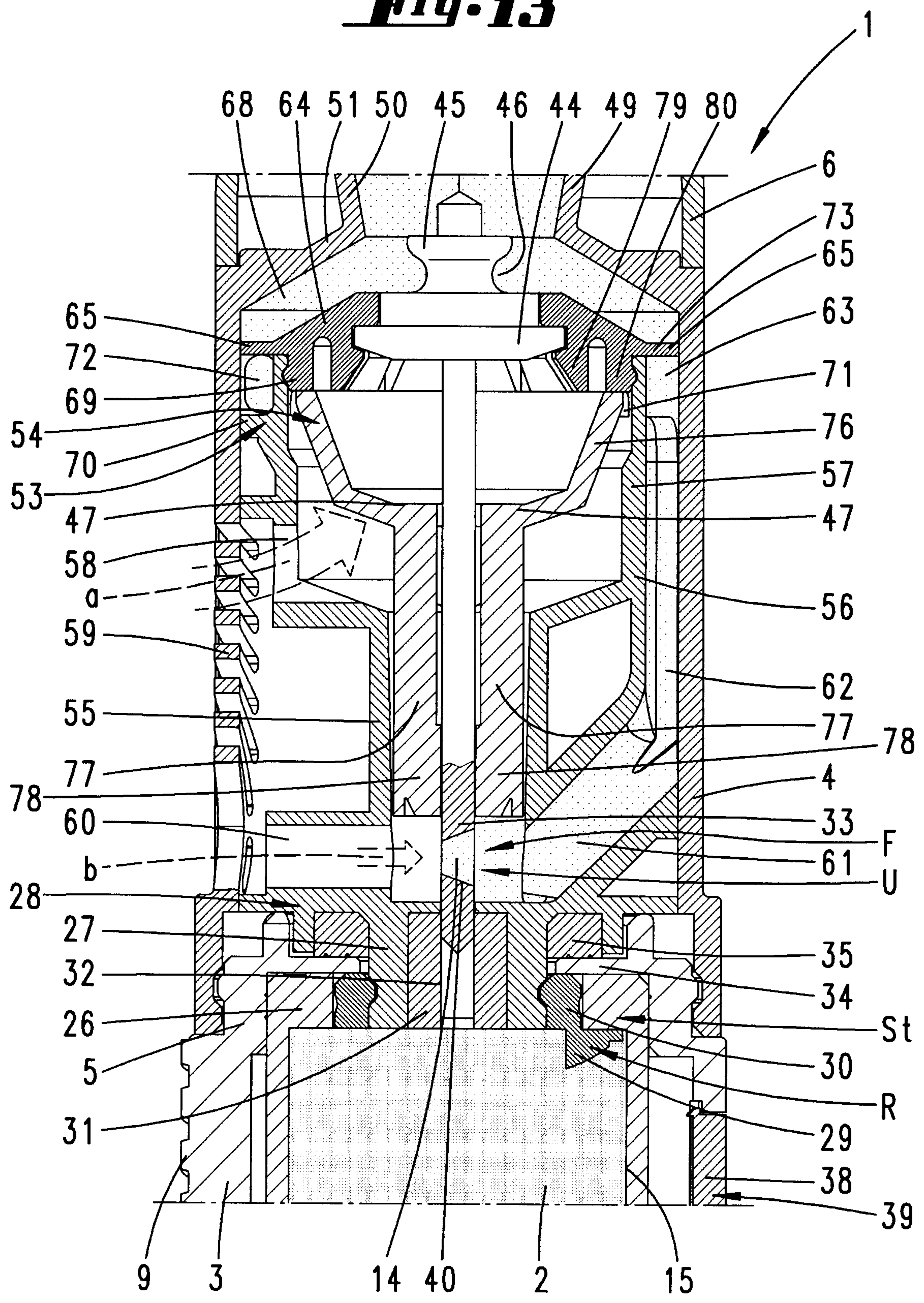
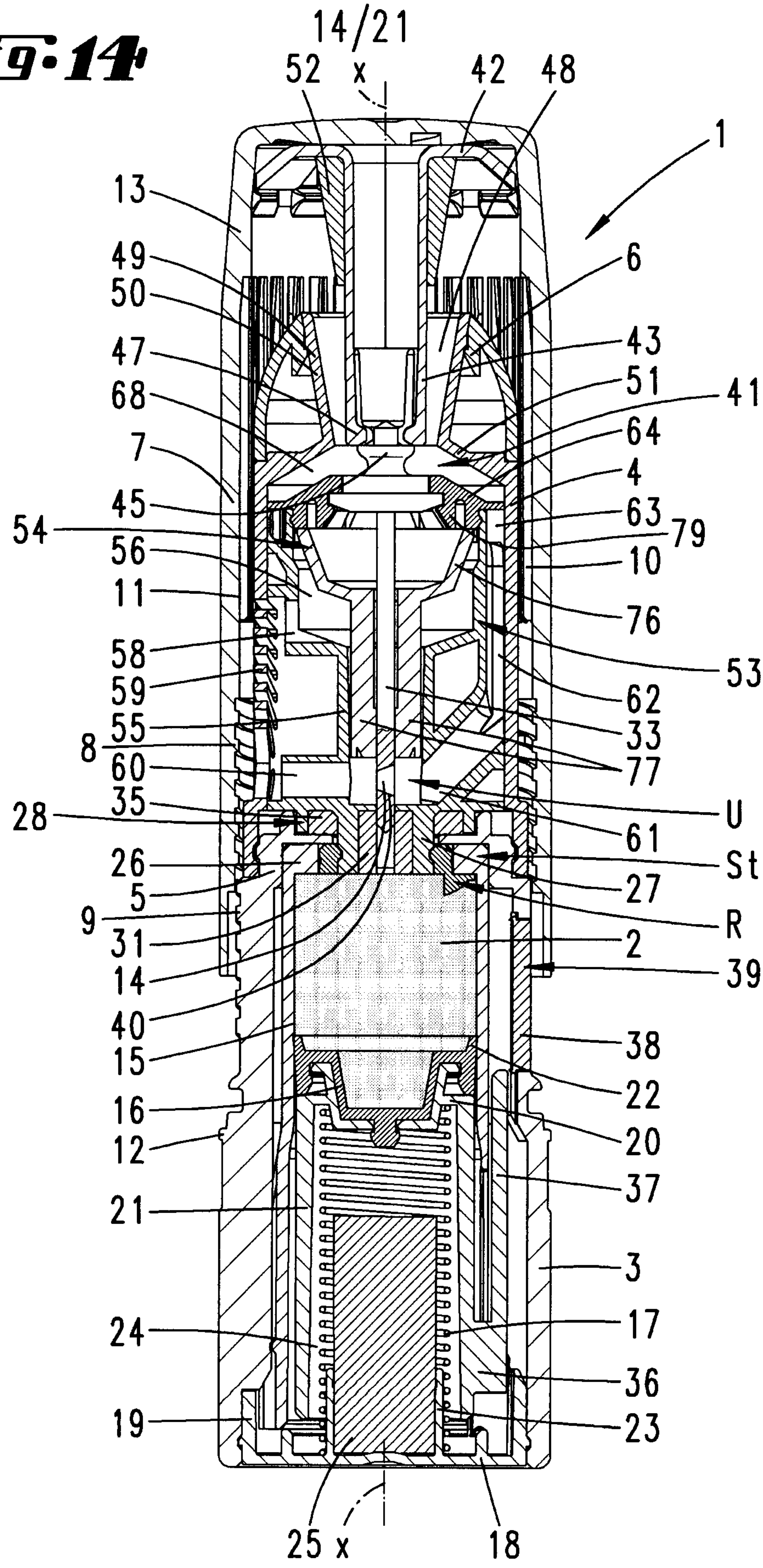
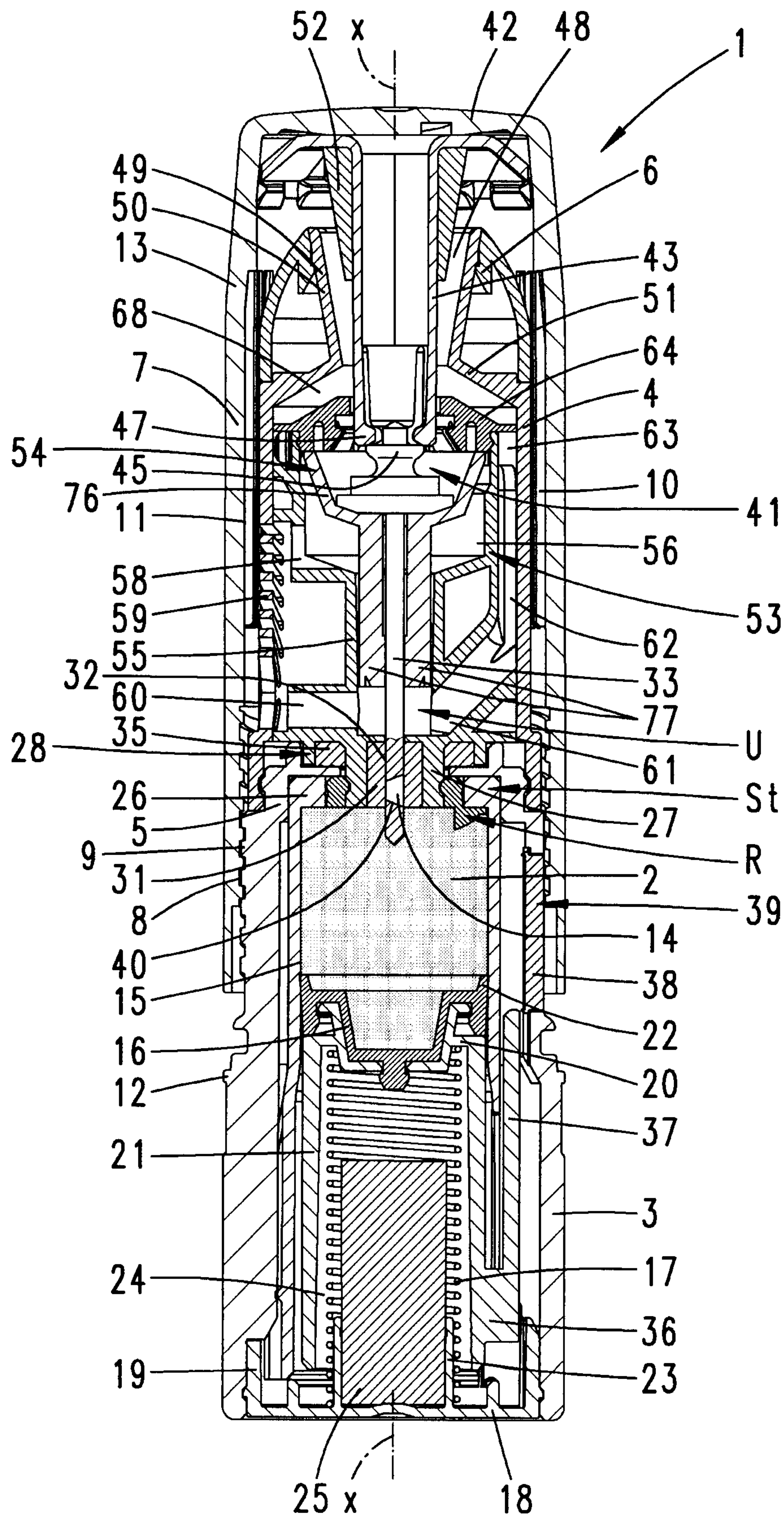


Fig. 14



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Fig. 15



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Fig. 16

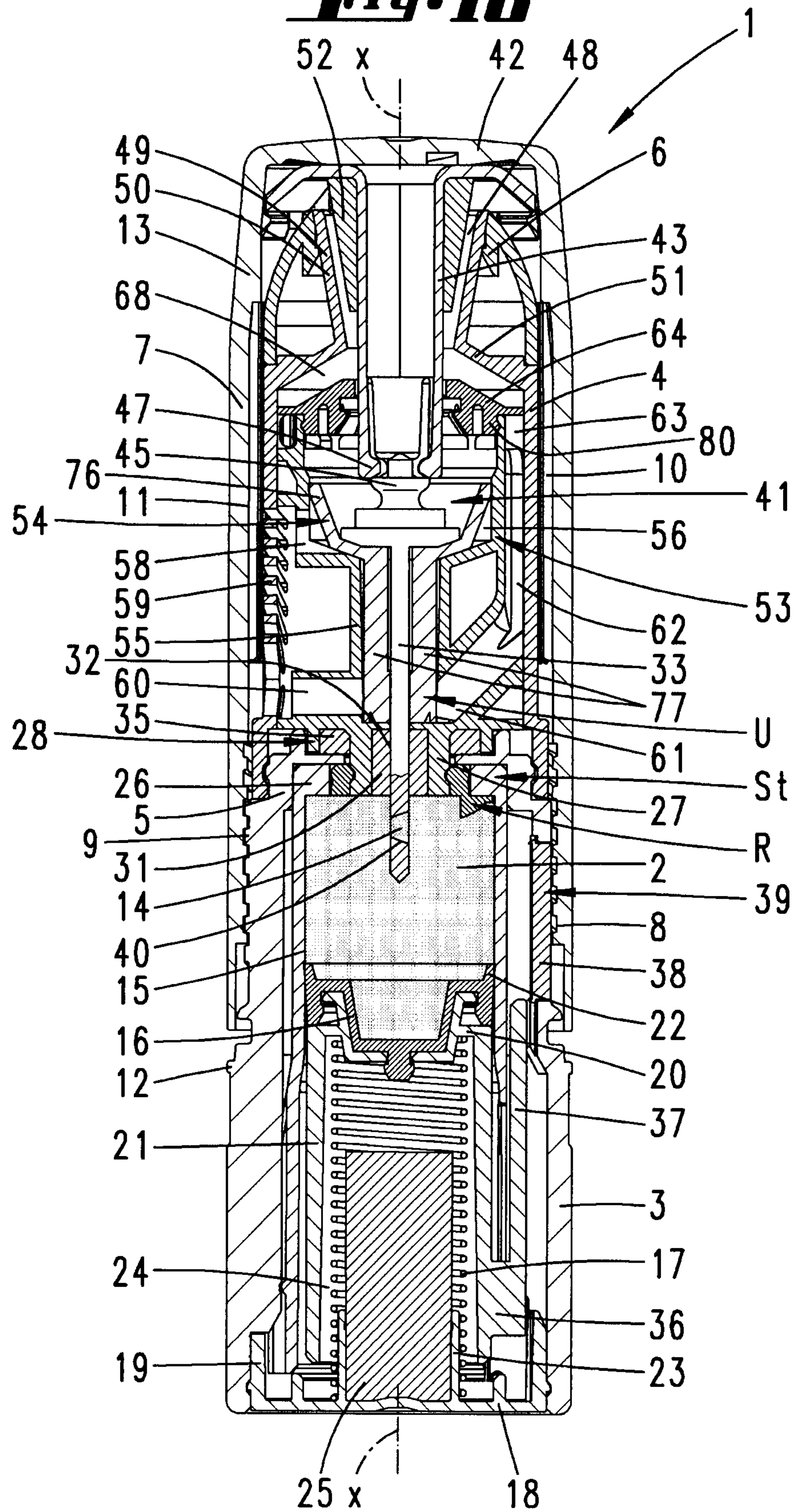


Fig. 17

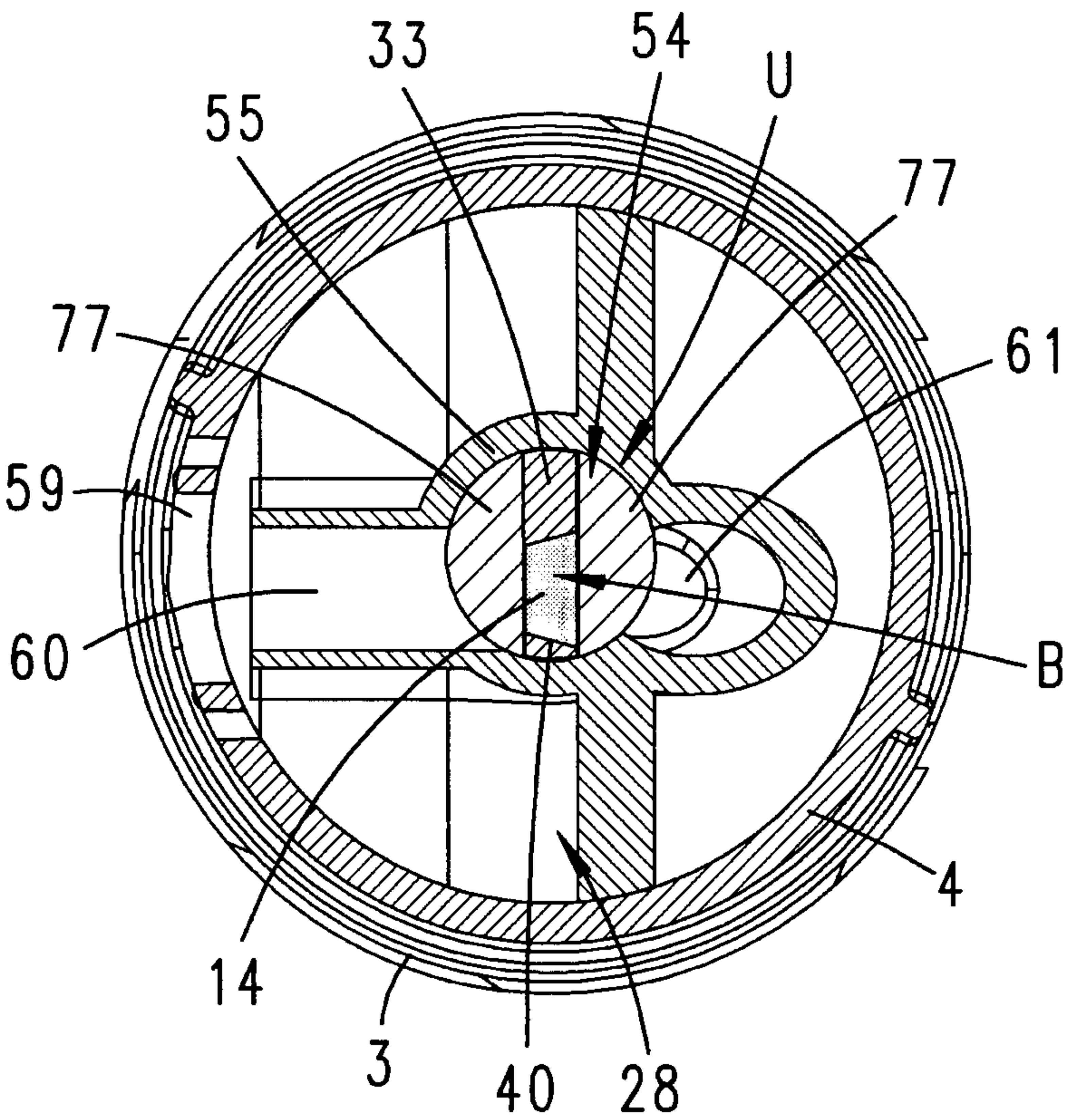


Fig. 18

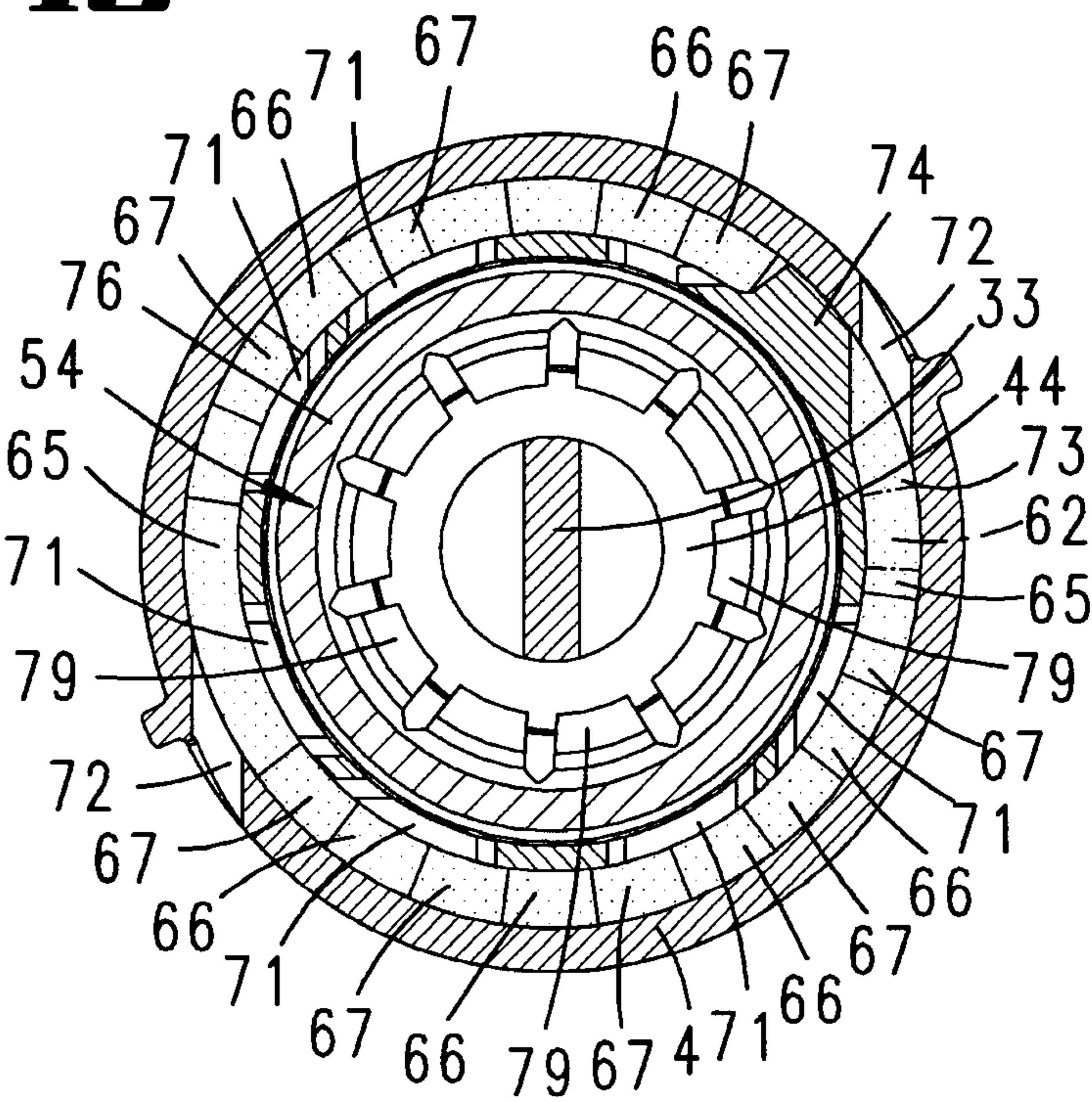


Fig. 19

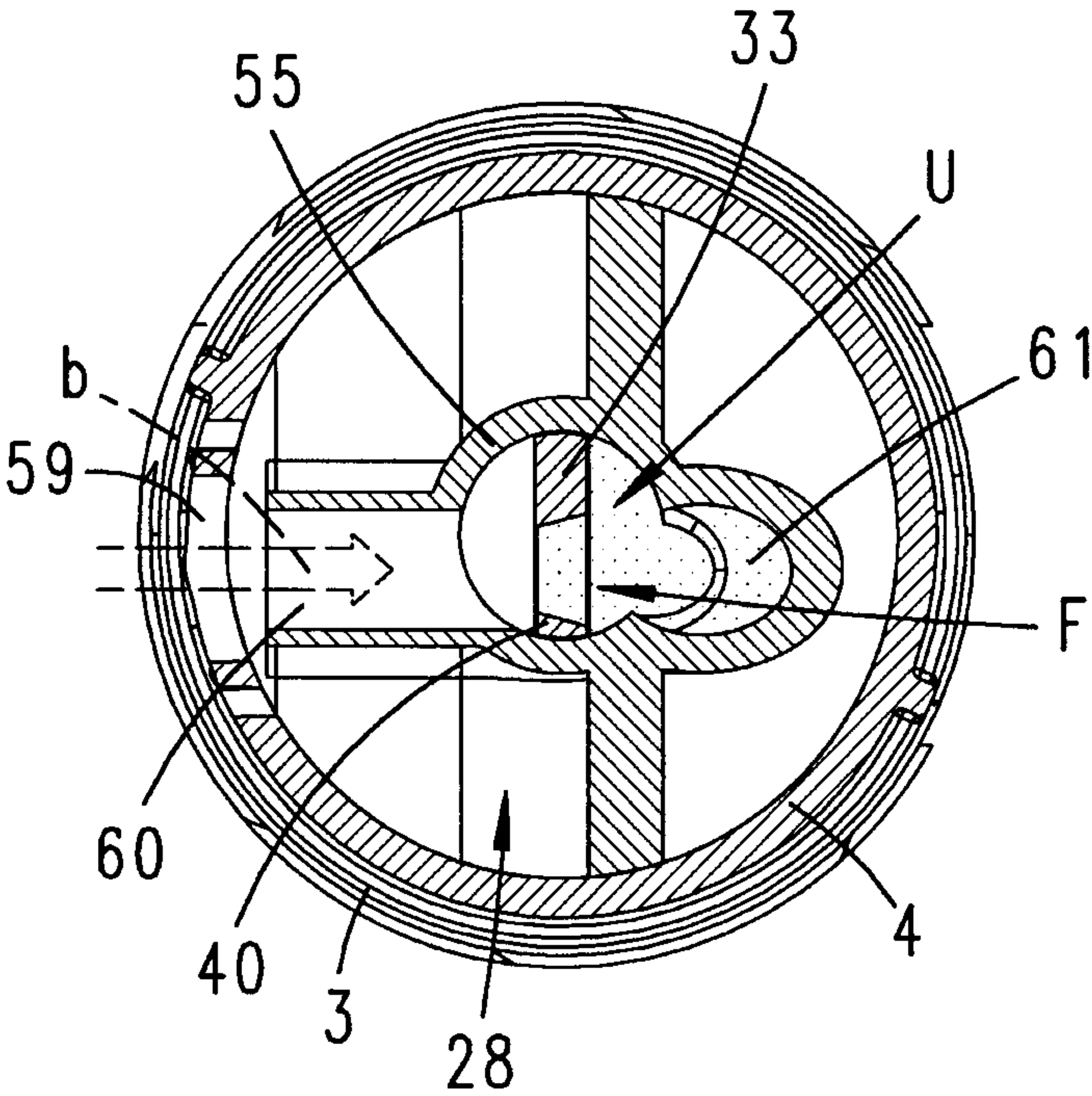


Fig. 20

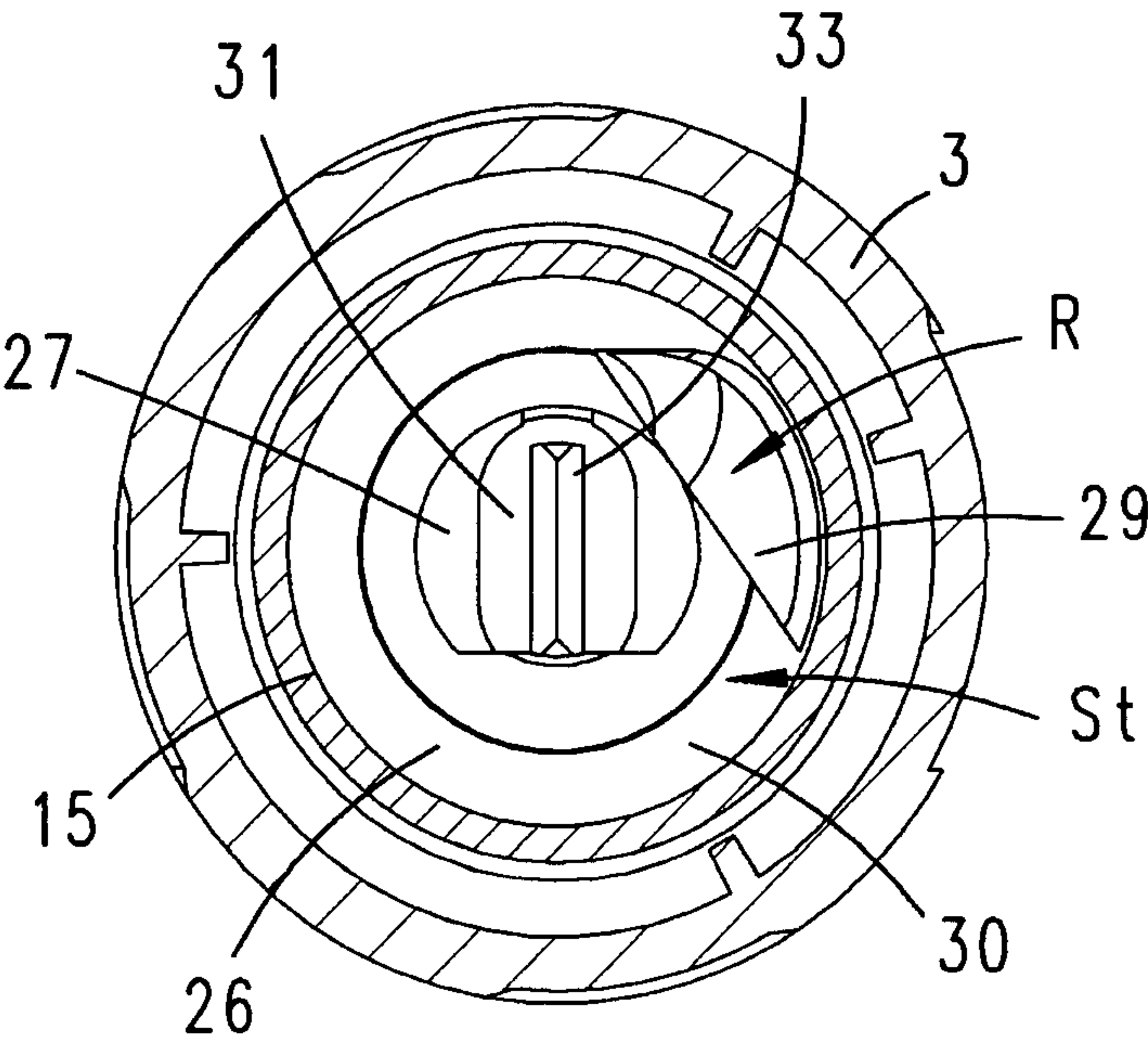


Fig. 22

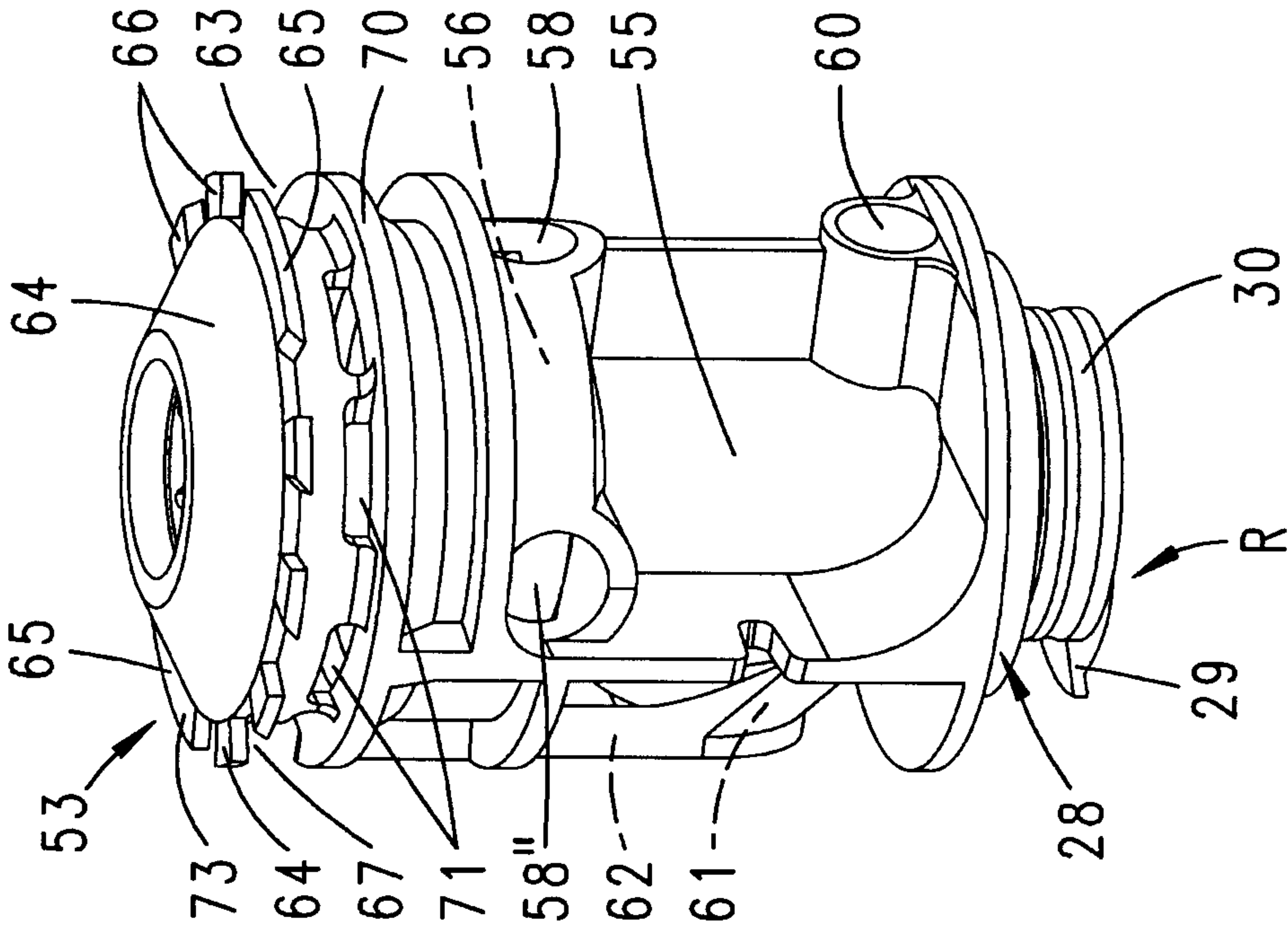
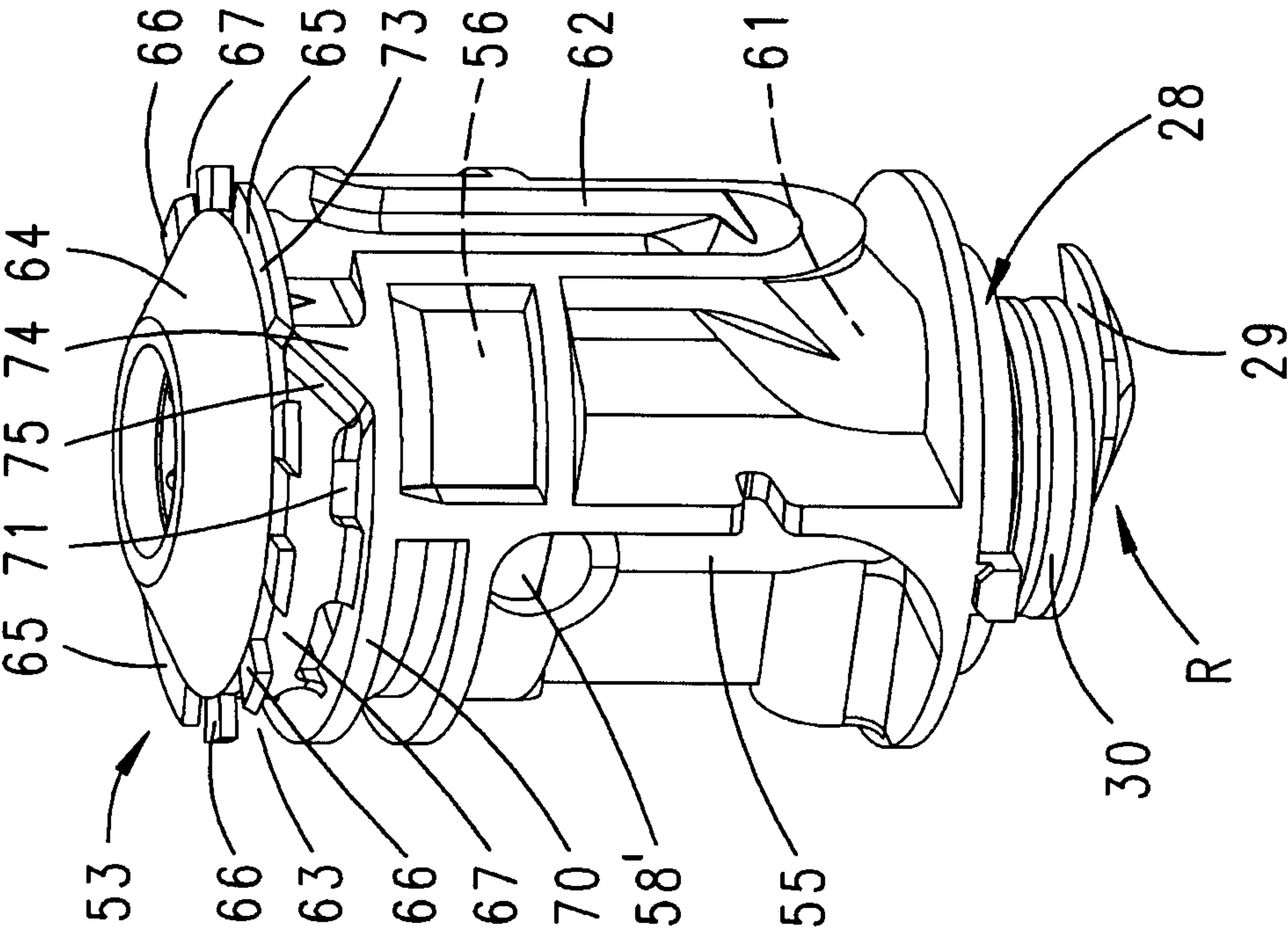


Fig. 21



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Fig. 23

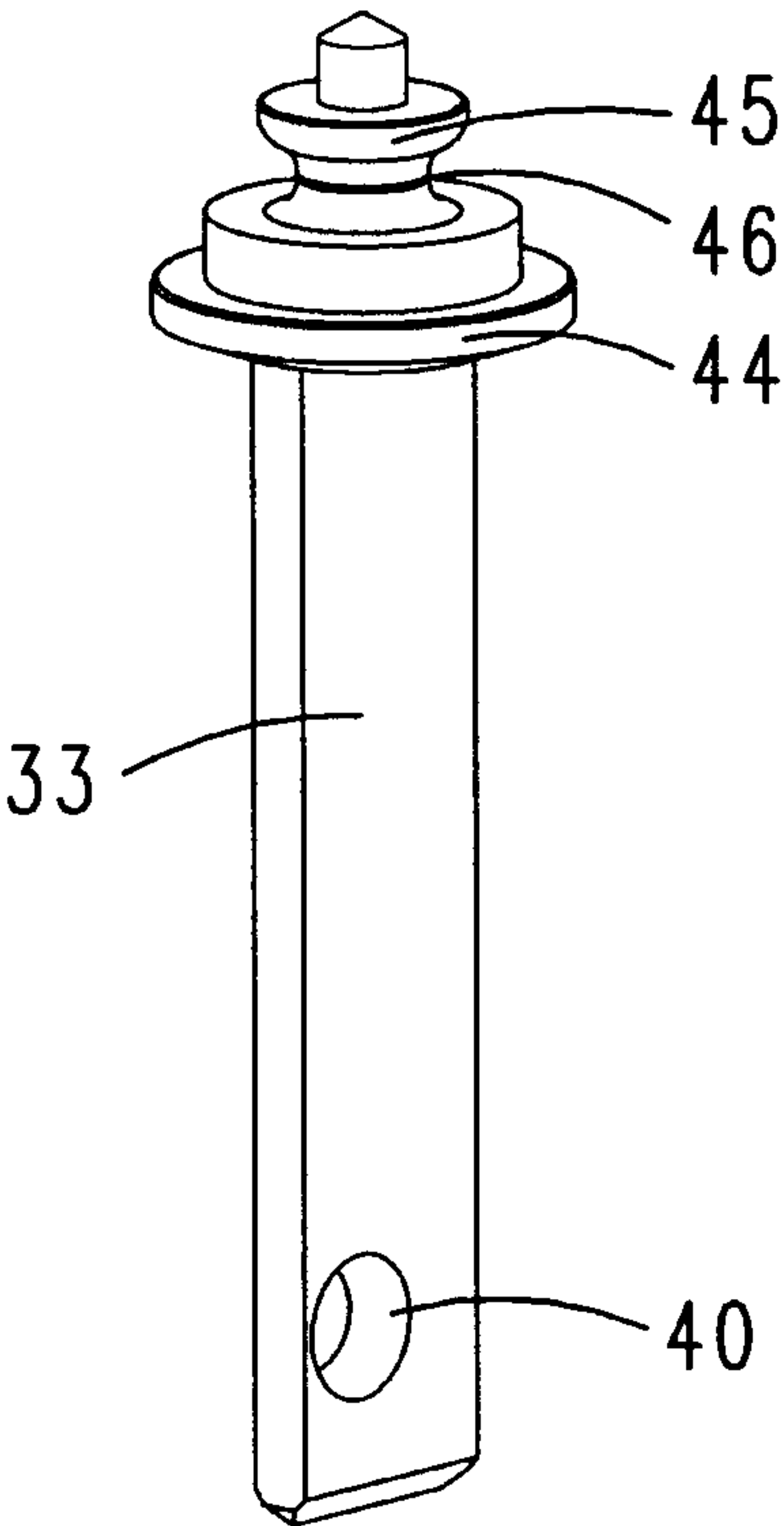


Fig. 24

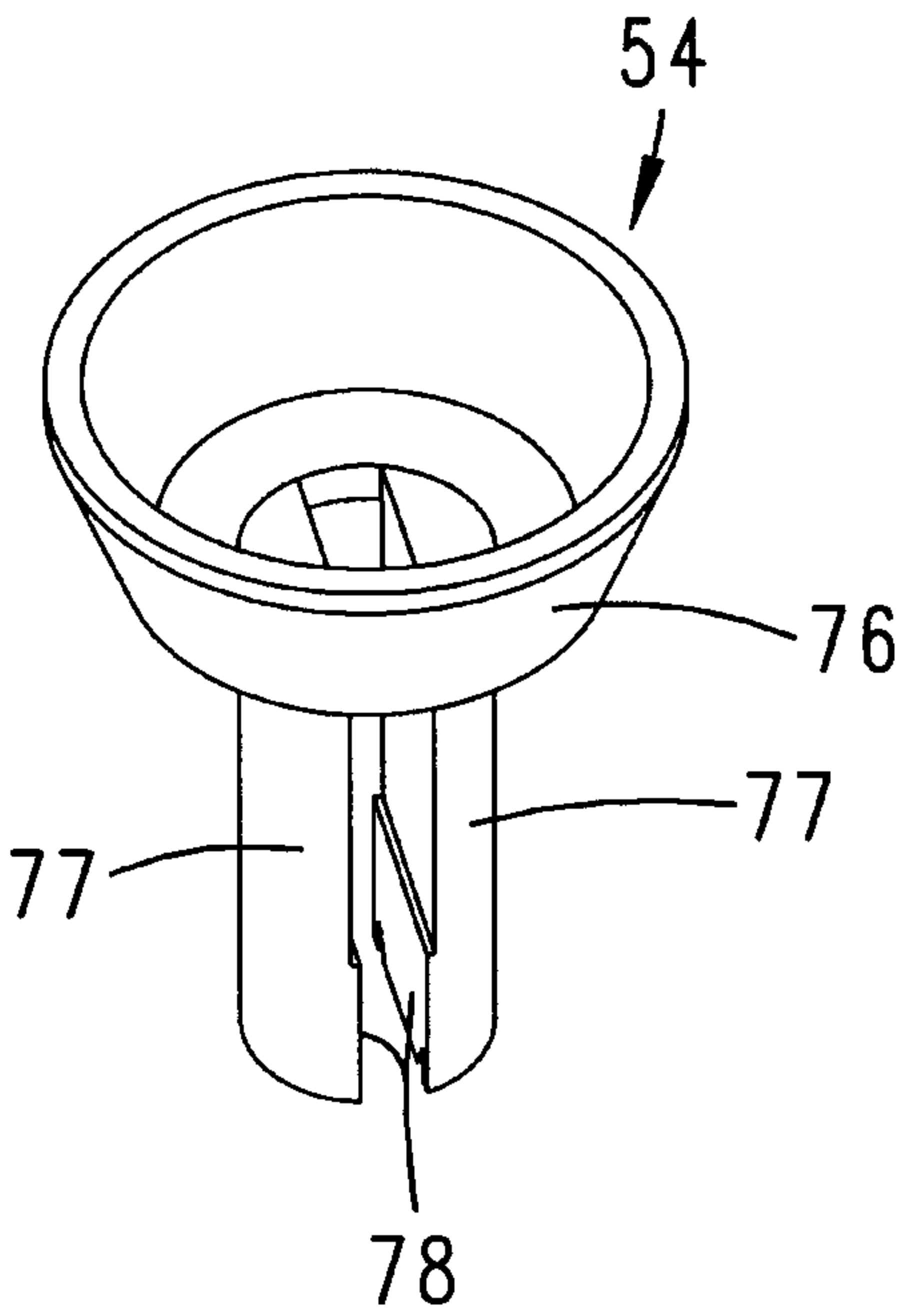


Fig. 25

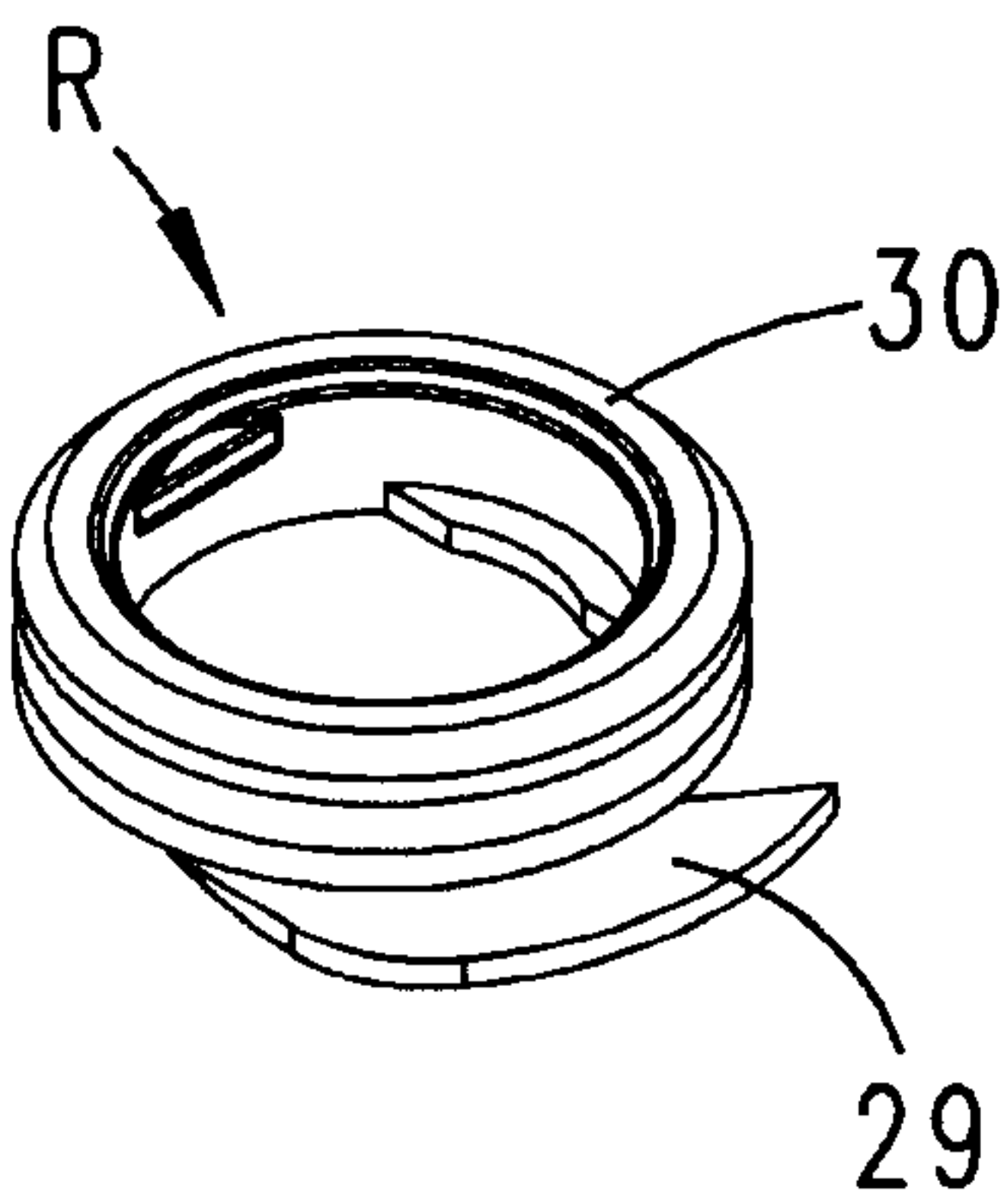


Fig. 26

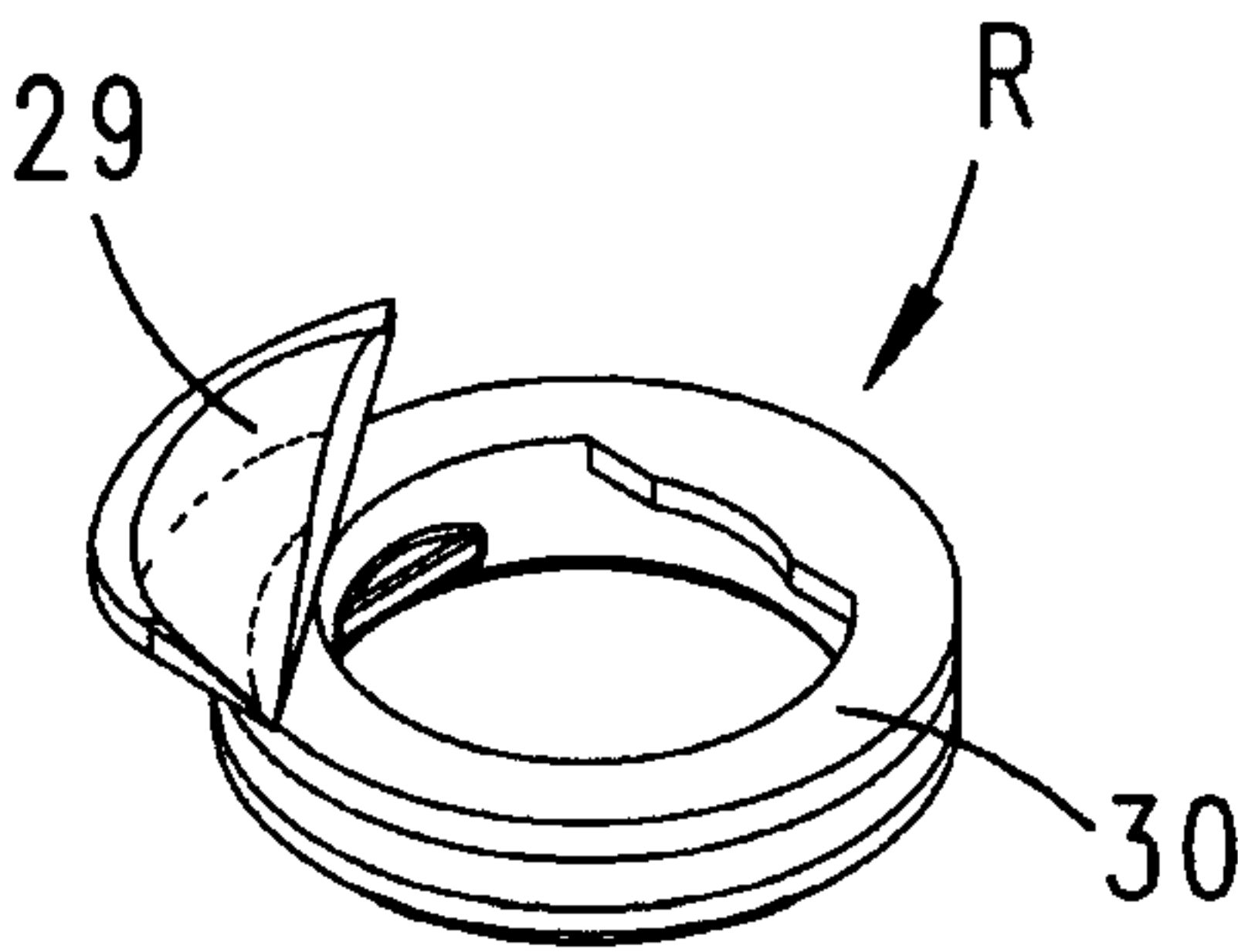


Fig. 27

