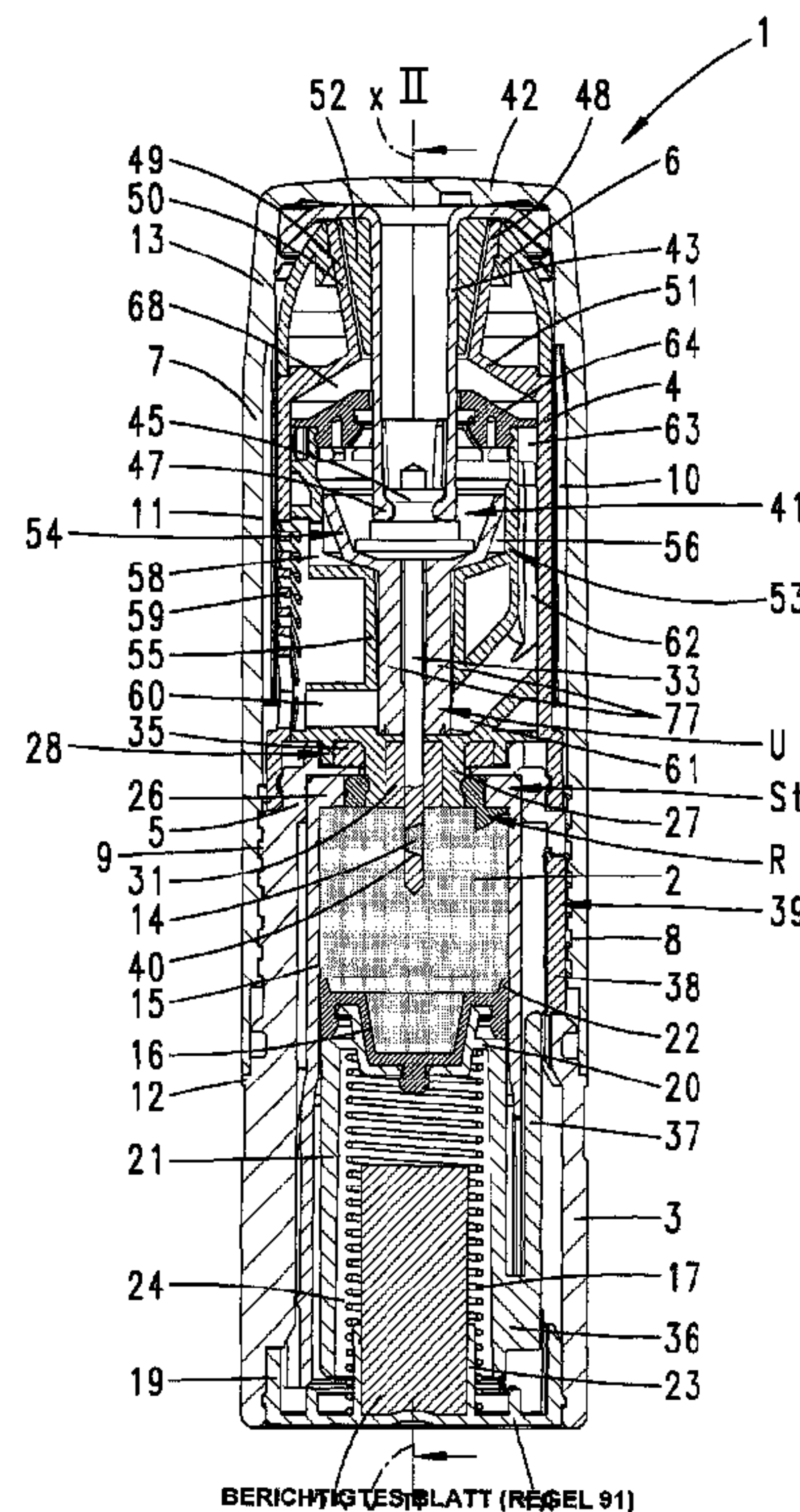




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(54) **Titre : DISPOSITIF DE DOSAGE DESTINE A L'INHALATION D'UNE SUBSTANCE PULVERULENTE**
(54) **Title: METERING DEVICE FOR INHALING A POWDERY SUBSTANCE**



(57) **Abrégé/Abstract:**

The invention relates to a metering device (1) which can be activated by the suction airflow of the user for inhaling a powdery substance (2), in particular of medicinal type, which is arranged in a supply chamber (15) and can be brought out of there into an apparent discharge standby position (B) by removing the mouthpiece sealing cap (7) by means of a metering chamber (40) of a metering rod (33). The invention proposes providing piston- extensible tabs (77) for sealing off the metering chamber, particularly for the facilitated opening of the metering chamber (40).



1 **ABSTRACT**

2 The invention relates to a metering device (1) which can be activated by the suction
3 airflow of the user for inhaling a powdery substance (2), in particular of medicinal type, which is
4 arranged in a supply chamber (15) and can be brought out of there into an apparent discharge
5 standby position (B) by removing the mouthpiece sealing cap (7) by means of a metering
6 chamber (40) of a metering rod (33). The invention proposes providing piston-extensible tabs
7 (77) for sealing off the metering chamber, particularly for the facilitated opening of the metering
8 chamber (40).

Metering Device for Inhaling a Powdery 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 the 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 the inhalation operation, in particular in respect of the movement of the piston into the emptying-release position.

This problem is substantially solved by the subject matter of Claim 1, this being based on the fact that the piston, which is of disk-like configuration in the upper region, is provided with tongues which extend from the underside of the disk, close the metering chamber in the emptying-standby position and release the metering chamber when the piston is displaced by the user's suction airstream. This configuration gives a space-saving solution which, in terms of the piston configuration, saves weight and runs smoothly. The piston is minimized in terms of its functional portions and, correspondingly, has a piston surface which is used for displacing the piston, and also has tongues which cover over the metering chamber in the emptying-standby position. The piston disk is preferably formed more or less as a planar component or, in a further configuration, in the manner of a dished cap with the opening of the dish directed away from the piston-activation surface. The piston disk here has a material or wall thickness which is sufficient to ensure sufficient inherent stability of the disk, thus, for example, 0.5-2 mm, furthermore, for example, 1 mm. The tongues are formed integrally, and in a single unit, with this piston disk. They extend, on both sides of a central piston axis, from the piston-activation surface. The tongues here may also be of cross-sectionally rectangular configuration, with a cross-sectional length corresponding to a multiple of the cross-sectional width. As an alternative, it is also possible for the tongues to be cross-sectionally configured in the manner of circle segments, with a flat side associated with the metering chamber. The configuration

1 selected for the piston means that only a relatively low mass needs to be shifted when the
2 piston is displaced, but a large-area engagement surface is provided, and this makes it easier
3 for the piston to be moved out of the emptying-standby position into the emptying-release
4 position by means of the user's suction airstream. Accordingly, only a relatively low level of
5 suction airstream energy is required in order to release the metering chamber. Furthermore, the
6 narrow construction of the piston makes it possible to achieve increased levels of air energy
7 during inhalation. It is also possible for a plurality of metering chambers to be covered over,
8 without increased levels of friction, as a result of the narrow tongues. The metering rod can also
9 easily be exchanged at any time, for example for adaptation to a dose of substance.

10
11 In an advantageous development, it is provided that, in its upper end position, the upper
12 periphery of the piston engages in front of an annular wall, which belongs to an annular
13 chamber, and preferably the ceiling of the latter has peripherally extending, projecting wings
14 which leave intermediate spaces between them. Disposed downstream of the same is a ceiling
15 portion which constitutes an oblique deflecting wall with concentrating action. Further preferably,
16 the piston, which has air flowing around it during inhalation, i.e. during suction-air activation by
17 the user, releases the path to an annular chamber in the upper position, i.e. in the emptying-
18 release position of the metering chamber. The powder which is to be inhaled consists, for
19 example, of a basic body, such as lactose, which can be transported by a suction stream and is
20 suitable as a carrier for fine micronized drug particles adhering to its surface. The powder-laden
21 suction air is extracted by suction through intermediate spaces which are formed between the
22 wings extending radially outward from the cover and from where the suction air passes, in
23 slightly concentrated form, into the mouthpiece of the metering device. A further, space-saving
24 solution is achieved by the latching head of the metering rod being partially sunken into the
25 upper depression of the disk piston, the latching head being sunken into the abovementioned
26 dish-like hollow of the piston. The metering rod is retained in an inner cylinder, which can be
27 rotated by the closure cap, such that it can be displaced along the axial extent of the inner
28 cylinder. The rotation of the inner cylinder is transmitted to the metering rod. This inner cylinder
29 is provided, on the lateral-wall side, with an axially running channel which extends from the
30 emptying side of the metering chamber and terminates in the annular chamber, it being possible
31 for the deflecting-wall wing to be provided in order to deflect the axial airstream direction into the
32 orbital plane. Accordingly, this deflecting-wall wing is disposed in the manner of a cover in axial
33 extension of the channel, with the radial outlet being left in the process. Via this channel,
34 following the suction-air-induced raising operation of the piston and the associated release of
35 the metering chamber, the separated-off dose of substance is sucked out and fed, via an
36 annular chamber, to the user who is building up the suction airstream. Conventional suction in

1 the radial direction out of the metering chamber gives rise, in first instance, to deflection into the
2 axially running channel, this being correspondingly associated with a baffle-plate action for
3 breaking up coarse powder particles. In a preferred configuration, deflection from the radial flow
4 direction into the axial flow direction is achieved by two channel deflection regions which are
5 located directly one after the other and each cause flow to be deflected by 45 degrees. An
6 intermediate channel portion which runs at an angle of approximately 45 degrees to a plane
7 oriented transversely to the axis of the device, and connects the emptying side of the metering
8 chamber to the axially running channel, is thus also preferably provided.

9
10 Along their lower free periphery, the tongues are split in a lip-like manner in order to achieve a
11 clamping action in interaction with the metering rod, and/or for sealing interaction with a sealing
12 seat. Furthermore, the tongues have material-reinforced sealing surfaces, for closing the
13 metering chamber on both sides in the emptying-standby position. Following displacement of
14 the metering rod with the metering chamber into the emptying-standby position, it is possible for
15 the closure cap to be screwed on again without any adverse effects, even if inhalation has not
16 been carried out, and this results in the return displacement of the metering rod. Since only the
17 sealing surfaces, which interact with the metering chamber, are material-reinforced, the rest of
18 the axial portions of the tongues, as seen in cross-section, are spaced apart from the associated
19 wide surface of the metering rod by the extent of the material reinforcement. This configuration
20 minimizes the frictional forces of the piston with the tongues during the suction-air-induced axial
21 displacement. A sucking-in flow channel, which is directed toward one of the two tongues,
22 constitutes a visual check for visually checking whether the rod is located in the removal-
23 standby position.

24
25 The substance which is to be inhaled is stored in a storage chamber, into which the metering
26 chamber penetrates for filling purposes. In order to assist the filling operation of the metering
27 chamber here, and furthermore to achieve the situation where the uppermost layer of the
28 substance store, which has the metering chamber passing through it, is always loosened, a
29 rotor-like blade is mounted on the lower periphery of the inner cylinder, for example clipped
30 thereon, which blade interacts with an inwardly directed stator-like shoulder of the storage-
31 chamber wall. This allows the replenishment and the density of the substance in the storage
32 chamber to be kept constant. Added to this is a loosening effect which is provided in the area
33 surrounding the metering chamber and prevents fractions of the substance from coming to a
34 halt. Furthermore, the rotor, in interaction with the stator, is configured such that, when the rotor-
35 like blades are moved back when the closure cap is replaced and screwed on and the metering
36 chamber is lowered into the storage chamber, the uppermost substance layer is subjected to

1 slight contact pressure, in order thus to provide, in the storage chamber, an evened-out
2 uppermost substance-quantity region associated with the metering chamber. This results in the
3 metering chamber having a filling which can be reliably enclosed by the tongues.

4
5 Finally, it has also proven to be advantageous to provide, in the region of the storage-chamber
6 wall, a filling-level indicator which makes it possible to ascertain the amount of filling. In the
7 simplest configuration, this can be coupled directly to the axial movement of a pressure piston
8 which is disposed in the storage chamber and subjects the stored quantity of substance to
9 loading from beneath in the direction of the inner cylinder. This pressure piston advances as
10 substance is removed, and this can be observed via the filling-level indicator.

11
12 The invention is explained in more detail hereinbelow with reference to the accompanying
13 drawing, which merely constitutes an exemplary embodiment and in which:

14
15 Figure 1 shows the vertical section through a metering device according to the invention
16 in the basic position, with the cap closed;

17
18 Figure 2 shows a further vertical section along line II-II in Figure 1;

19
20 Figure 3 shows an enlargement of an upper region of the device according to Figure 1;

21
22 Figure 4 shows a sectional illustration corresponding to Figure 1, relating to the situation
23 where the storage chamber for the substance which is to be inhaled has been
24 more or less emptied;

25
26 Figure 5 shows the section along line V-V in Figure 4;

27
28 Figure 6 shows a further illustration corresponding to Figure 1, this time during removal
29 of the closure cap;

30
31 Figure 7 shows the section along line VII-VII in Figure 6;

32
33 Figure 8 shows the vertical section according to Figure 1, but following removal of the
34 closure cap and the resulting displacement of a metering chamber into the
35 emptying-standby position;

- 1 Figure 9 shows the section along line IX-IX in Figure 8;
2
- 3 Figure 10 shows a detail-view illustration corresponding to Figure 3, relating to the
4 situation according to Figure 8;
5
- 6 Figure 11 shows a follow-up illustration to Figure 8, but relating to a position assumed
7 during inhalation;
8
- 9 Figure 12 shows the section along line XII-XII in Figure 11;
10
- 11 Figure 13 shows a further detail-view illustration corresponding to Figure 3, but relating to
12 the situation according to Figure 11;
13
- 14 Figure 14 shows a further vertical-section illustration corresponding to Figure 1, this time
15 relating to an intermediate position as the closure cap is being replaced
16 following completion of inhalation;
17
- 18 Figure 15 shows a follow-up illustration to Figure 14, relating to an intermediate position;
19
- 20 Figure 16 shows a follow-up illustration to Figure 15, relating to an intermediate position
21 as the operation of screwing on the closure cap continues;
22
- 23 Figure 17 shows the cross-section through the metering device in the emptying-standby
24 position along line XVII-XVII in Figure 8;
25
- 26 Figure 18 shows the cross-sectional illustration through the metering device along line
27 XVIII-XVIII in Figure 11;
28
- 29 Figure 19 shows an illustration which corresponds to Figure 17 and has been taken along
30 line XIX-XIX in Figure 11, relating to the emptying-release position;
31
- 32 Figure 20 shows the section along line XX-XX in Figure 11 through the storage chamber,
33 with the substance which is stored here having been left out;
34
- 35 Figure 21 shows a perspective detail illustration of an inner cylinder of the metering
36 device;

1
2 Figure 22 shows a further perspective illustration of the inner cylinder;
3
4 Figure 23 shows a perspective detail illustration of the metering rod of the metering
5 device;
6
7 Figure 24 shows a perspective detail illustration of the piston;
8
9 Figure 25 shows a further perspective detail illustration of a rotor-like blade for disposing
10 on the inner cylinder;
11
12 Figure 26 shows a further perspective illustration of the rotor-like blade; and
13
14 Figure 27 shows, in a detail drawing, the bottom view of a cover of an annular chamber.
15

16 The metering device 1 which is illustrated in the figures and is intended for the inhalation of a
17 pulverulent substance 2, in particular a medicinal substance, is realized as a short-elongate
18 device which can readily be carried in a pocket and has a cylindrical housing 3 which
19 determines its shape.
20

21 The cylindrical, tube-like housing 3 has, at the head end, an outer cylinder 4 which can be
22 rotated about the device axis x relative to the housing 3. This outer cylinder is secured in a
23 rotatable manner on the housing 3 in the region of an end-side radial step 5.
24

25 This likewise cylindrical, tube-like outer cylinder 4 merges, at the head end of the device 1, into
26 an attached mouthpiece 6 which is formed appropriately for the mouth, for example is flattened.
27 This mouthpiece 6 can have a cup-like closure cap 7 engaging over it in a protective manner.
28 This closure cap is realized as a screw cap, for which reason an associated internal thread 8
29 engages in a corresponding external thread 9 on the lateral wall of the housing 3.
30

31 The outer cylinder 4 is connected to the closure cap 7 in a rotationally fixed manner, for which
32 reason the outer cylinder has, on the outside of its lateral wall, vertically oriented ribs 10 which
33 interact with correspondingly positioned, slot-like vertical grooves 11 on the inside of the wall of
34 the closure cap 7. Accordingly, screw-action actuation of the closure cap 7 causes the outer
35 cylinder 4 to be rotated about the device axis x.
36

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

4
5 The closure cap 7 serves, at the same time, as an actuating handle 13 for dispensing the
6 pulverulent substance 2 in reproducible sub-quantities 14, for which purpose use is made of the
7 axial screw-action displacement provided by the threaded engagement between the internal
8 thread 8 and external thread 9. The substance 2 is accommodated (possibly such that it can be
9 refilled) in a storage chamber 15 of the housing 3. A metering device conveys a respective sub-
10 quantity 14 of substance to a transfer location U located outside the storage chamber 15.

11
12 The meterable substance is a (usually medicinal) pulverulent substance 2. It is possible for
13 basic bodies such as lactose, which are capable for example of transporting a suction stream, to
14 be carriers for fine micronized drug particles adhering to the surface.

15
16 The storage chamber 15 is terminated at the bottom by a cup-like pressure-exerting base 16,
17 which is spring-loaded in the direction of the mouthpiece 6 by means of a compression spring
18 17. The compression spring 17 has its foot-side end turn supported on a base cap 18, which
19 closes the housing 3 there. This base cap is in latching engagement with that portion of the
20 housing 3 which is of larger cross-section here on its inside wall, a corresponding latching collar
21 19 of the base cap 18 engaging in a matching annular groove of the housing 3.

22
23 The head-side end turn of the biased compression spring 17 subjects an inner shoulder 20 of a
24 hollow piston 21 of the piston-like means 16/21 to loading action. As can be seen from the
25 illustrations, the pressure-exerting base 16, which is in the form of a graduated cup, is
26 connected with latching action to the hollow piston 21 in the region of the inner shoulder 20.

27
28 The cup periphery of the pressure-exerting base 16 forms an annular lip 22 which, on account
29 of its elastomeric material, strips substance off the wall of the storage chamber 15 without
30 leaving any residues.

31
32 In the exemplary embodiment illustrated, the compression spring 17 is a cylindrical spring
33 which, in the state in which it is relieved of stressing, has a length corresponding approximately
34 to ten times the maximum contact-pressure length. The contact-pressure length is defined by
35 the extent of axial displacement of the pressure-exerting base 16 between a lower position
36 according to Figure 1, this position corresponding to the filling position, and an upper, stop-

1 limited position of the pressure-exerting base 16 in the storage chamber 15 according to Figure
2 4. Thus, the exemplary embodiment illustrated provides a contact-pressure length of 15 mm. As
3 a result of the configuration of the spring, in particular as a result of the selected length of the
4 spring, the pressure-exerting base 16 is subjected to a constant spring pressure over the entire
5 contact-pressure length, and this leads to the substance being compressed uniformly
6 throughout the duration of use of the device 1.

7
8 A hollow upright stub 23 extends centrally from the base cap 18. Together with the hollow piston
9 21 which encloses it at a distance apart, this hollow upright stub forms a chamber 24 for the
10 compression spring 17. The hollow upright stub 23 contains, in its center, a moisture-absorbing
11 material in the form of a drying-agent capsule 25. At the transition to the outer cylinder 4, which
12 follows the housing 3 in the axial direction, the storage chamber 15 terminates with a chamber
13 ceiling 26 formed integrally with the lateral wall of the storage chamber 15. Passing through the
14 center of this chamber ceiling is a cylinder portion 27 of a rotary part 28 which extends in a
15 plane perpendicular to the device axis x.

16
17 This rotary part is of substantially plate-like configuration and is connected in a rotationally fixed
18 manner to the outer cylinder 4 and, accordingly, can be rotated about the device axis x in
19 relation to the chamber ceiling 26. The cylinder portion 27 extends on the underside of the
20 rotary part 28, passing through the chamber ceiling 26. The lower free end surface of the
21 cylinder portion 27 is located in the plane of that surface of the chamber ceiling 26 which covers
22 the storage chamber 15.

23
24 The diameter of the through-opening in the chamber ceiling 26 is larger than the diameter of the
25 cylinder portion 27. A holder, of annular shape in plan view, for a rotor blade R, is positioned in
26 the annular gap which remains. This rotor blade is connected in a rotationally fixed manner to
27 the cylinder portion 27.

28
29 The inner surface of the rotor ring 30, this inner surface being directed toward the storage
30 chamber 15, is located in the plane of the correspondingly directed end surface of the cylinder
31 portion 27.

32
33 The rotor R, which is illustrated on its own in Figures 25 and 26, carries on the underside, that is
34 to say in the direction toward the storage chamber 15, a blade 29. This is a blade 29 which is in
35 the form of a spherical-cap portion and projects radially outward beyond the ring 30 of the rotor
36 R. The blade 29 correspondingly engages beneath that region of the chamber ceiling 26 which

1 adjoins the rotor R radially on the outside, that surface of the blade 29 which is directed toward
2 the chamber ceiling 26 being of planar configuration. This surface of the blade 29 engages
3 against the top surface of the chamber which is directed toward the blade. The blade 29
4 extends radially as far as the inner wall of the storage chamber 15. From this radially outer
5 region, the blade 29 slopes up convexly in the radially inward direction, as seen in cross-
6 section, to an axial height corresponding approximately to the extent by which the blade 29
7 projects radially beyond the rotor ring 30.

8
9 As a result of this arrangement, the blade 29 of the rotor R projects into the substance stored in
10 the storage chamber 15. The shoulder formed by the chamber ceiling 26, in interaction with the
11 blade 29 or rotor R, which can be rotated relative to the storage chamber 15, forms a stator St.

12
13 The rotor R is clipped on the cylinder portion 27 of the rotary part 28 via the rotor ring 30.

14
15 The cylinder portion 27 accommodates a sealing bushing 31 in its center. This bushing consists
16 of a rubber material or a similar elastic material. This leaves, in its center, a cross-sectionally
17 slot-like guide opening 32 for a cross-sectionally adapted metering rod 33.

18
19 In the simplest configuration, the sealing bushing 31 and also an annular seal 35 provided
20 between the rotary part 28 and a housing portion 34, which engages over the chamber ceiling
21 26 on the housing side, may be produced by two-component injection molding together with the
22 rotary part 28 and, furthermore, with an inner cylinder, which will be described in more detail. It
23 is also possible in this respect, however, for the rubber or elastomer parts to be provided
24 subsequently during production.

25
26 At the foot end, the hollow piston 21, which is connected with latching action to the pressure-
27 exerting base 16, has a radial extension arm 36. Integrally formed on the latter is an axially
28 oriented indicating protrusion 37 which engages over the storage-chamber wall on its outside.
29 The axial position of this indicating protrusion, this position being reached in dependence on the
30 position of the pressure-exerting base, can be seen by the user from the outside through a
31 viewing window 38 provided in the housing. A filling-level indicator 39 is provided as a result.

32
33 The metering rod 33 is appropriately configured for functioning as a moving metering chamber
34 40 for the sub-quantity 14 of substance which is to be dispensed, the metering rod 33 moving
35 linearly along the longitudinal center axis x-x of the substantially rotationally symmetrical device
36 1, and this being accompanied by a rotary movement executed about the longitudinal center

1 axis x-x. The metering rod 33 is formed substantially as a flat part with an elongate-rectangular
2 cross-section. The length ratio of narrow side to broad side is approximately 1:3 in the
3 exemplary embodiment illustrated.

4
5 At the end which is directed away from the mouthpiece 6, the metering rod 33 forms a portion
6 which tapers to a point more or less in the manner of a cross-recessed screwdriver tip. The two
7 mirror-symmetrical oblique flanks here extend from the respective broad sides of the metering
8 rod 33 (cf. Figure 20).

9
10 On account of the metering rod 33 being carried along in rotation, the cross-sectional
11 configuration of the metering rod 33 and the tapering of the free end region have a loosening,
12 displacing effect in the central region in relation to the mass of pulverulent substance 2.

13
14 The metering chamber 40 is realized as a transverse hole which runs substantially
15 perpendicularly to the longitudinal center axis x-x and has an axis which passes through the
16 broad-side surfaces of the metering rod 33. The transverse hole is formed conically, so that the
17 transverse hole tapers in the direction of one broad-side surface of the metering rod 33.

18 Furthermore, as can be seen for example from the illustration in Figure 2, the metering chamber
19 40, which is formed in the region of that end of the metering rod 33 which projects into the mass
20 of substance, is disposed eccentrically in relation to the broad-side surfaces of the metering rod
21 33, that is to say it is offset laterally in relation to the longitudinal axis x-x.

22
23 The displacement path of the metering chamber 40, which moves linearly, and, at the same
24 time, in rotation, allows, in both end positions of the metering rod 33, for the cross-section of the
25 guide opening 32 to be kept closed, with metering-chamber-filling scraping or stripping action
26 over the length of the said opening 32.

27
28 The mouthpiece end of the closure cap 7 forms a docking location 41 between the metering rod
29 33 and closure cap 7, this docking location disengaging when subjected to overloading. The
30 latching means on the closure-cap side here is a resilient hook annulus which is formed in the
31 region of the free end of a hollow cylinder 43 disposed centrally on the underside of a closure-
32 cap ceiling 42. The corresponding end of the metering rod 33 is rotationally symmetrical in
33 cross-section, a disk-like radial collar 44, furthermore, projecting out in the transition region from
34 the flat-part portion to the cylindrical end portion. At an axial spacing from this radial collar 44,
35 that end region of the metering rod 33 which is directed away from the flat part forms a latching
36 head 45. A wasp-waist-like annular groove 46 is formed between this latching head and the

1 radial collar 44. Inwardly directed noses 47 of the resilient tongues of the hook annulus engage
2 in this annular groove. The noses 47 can pass over the latching head 45 in both axial directions.
3 The latching action may be fairly tight, since it is released and reinstated during the screwing-
4 action displacement of the cap.

5
6 The central opening 48 of the mouthpiece 6 is formed in the region of a dispersing part 49. This
7 dispersing part 49 opens conically outward, that is to say in the direction away from the storage
8 chamber 15, the wall 50 of the dispersing part merging, in the direction toward the storage
9 chamber 15, into an annular, roof-like ceiling portion 51. At the same time, the latter forms the
10 upper end of the outer cylinder 4, which carries the mouthpiece 6.

11
12 The central free space created by the dispersing part 49 has the hollow cylinder 43, which
13 carries the noses 47, passing through it centrally in the cap-closed position. The annular space
14 which forms here between the hollow cylinder 43 and the dispersing-part wall is filled by a
15 further drying-agent capsule 52 in the cap-closed position.

16
17 The outer cylinder 4 accommodates an inner cylinder 53, passing through the center of which is
18 the metering rod 33 and, in the cap-closed position, the hollow cylinder 43 belonging to the
19 closure cap. The inner cylinder is connected in a rotationally fixed manner to the outer cylinder
20 4.

21
22 This inner cylinder 53 is configured substantially as a hollow body and carries, in its center, an
23 axially displaceable piston 54. The piston 54 is guided more or less in the lower half of the inner
24 cylinder 53, directed toward the storage chamber 15, by a cross-sectionally round guide portion
25 55.

26
27 That portion of the inner cylinder 53 which is directed away from the storage chamber 15 forms
28 a piston-head displacement region 56 which has a cross-section larger than that of the guide
29 portion 55 and of which the axially oriented wall 57 has radial openings 58, 58' and 58". These
30 radial openings are in flow connection with a grille-wall portion 59 of the outer cylinder.

31
32 Formed beneath the grille-wall portion 59, and furthermore at the foot end of the guide portion
33 55 of the inner cylinder, is a radially oriented flow channel 60, which likewise opens toward the
34 grille-wall portion 59. This flow channel may also serve as a window for visually monitoring the
35 metering rod 33. It opens out into the free space left in the center by the guide portion 55.
36 Radially opposite the flow channel 60, the guide portion 55 is adjoined by an intermediate

1 channel portion 61 which, starting from the guide portion 55, and with the inclusion of an angle
2 of 45° in relation to a plane oriented perpendicularly to the axis x, slopes up in the direction of
3 the associated wall of the outer cylinder 4 in order then to merge, at the end, into an axially
4 directed channel 62. This channel 62 is formed by an axially oriented, slot-like, radially
5 outwardly opening recess in the lateral surface of the inner cylinder. The channel 62 is covered
6 over radially by the associated wall of the outer cylinder 4.

7
8 As well as the radial opening 58, which can be seen by way of example in the sectional
9 illustration in Figure 1, two further radial openings 58' and 58'' are provided, and these each
10 enclose, as seen in a plane oriented transversely to the axis x, an angle of 90° in relation to this
11 radial opening 58 and, by virtue of the inner-cylinder wall being configured appropriately, are in
12 direct air-flow connection with the grille-wall portion 59.

13
14 The axially oriented channel 62 has its end which is directed toward the mouthpiece 6 opening
15 out into an annular chamber 63. The latter forms a vortex chamber. The ceiling 64 of the latter is
16 of cross-sectionally roof-like configuration and is provided with peripherally extending, projecting
17 wings 65, 66. These engage peripherally against the inner wall of the outer cylinder 4 and, as
18 seen in the circumferential direction, leave intermediate spaces 67 between them, through
19 which an air-flow connection is achieved between the annular chamber 63 and a further annular
20 space 68 left between the dispersing-part ceiling portion 51 and the annular-chamber ceiling 64.

21
22 The ceiling 64 is secured on the inside wall of the inner cylinder 53 by an axially directed flange
23 69.

24
25 The base of the annular chamber 63 is formed by an annular collar 70 which projects radially
26 outward on the outside wall of the inner cylinder 53 at an axial spacing from the wings 65, 66 of
27 the ceiling 64. It is also the case that this annular collar is supported peripherally on the inside
28 wall of the outer cylinder 4. This annular collar 70 is interrupted by the axially oriented channel
29 62. The annular chamber 63 is bounded in the radially inward direction by an end-side wall
30 portion which belongs to the inner cylinder 53 and serves for latching the ceiling 64. The
31 resulting annular-chamber wall is provided with slot-like through-passages 71 in order to provide
32 air-flow connection between the annular chamber 63 and the piston-head displacement region
33 56.

34
35 As can furthermore be seen, in particular, from the sectional illustration in Figure 18, the outer-
36 cylinder wall is provided, level with the annular chamber 63, with two diametrically opposite air-

1 inlet openings 72. These open out tangentially into the annular chamber 63, and this,
2 furthermore, predetermines a common flow direction. Accordingly, a sucking-in action through
3 the air-inlet openings 72 results in a predetermined air flow in the annular chamber 63. The
4 axially oriented channel 62 opens out, as seen in the flow direction, immediately downstream of
5 the mouth of one air-inlet opening 72 in the annular chamber 63, so that the airstream entering
6 into the annular chamber 63 through the axial channel 62 is deflected specifically in the desired
7 vortexing direction via the air-inlet openings 72.

8
9 The wings of the ceiling 64 are of different widths as seen in the circumferential direction. Thus,
10 two diametrically opposite wings 65 are approximately three times the width of the rest of the
11 wings 66, as seen in the circumferential direction. One of these broader wings 65 covers over
12 the mouth region of the axial channel 62 into the annular chamber 63 and, accordingly, forms a
13 deflecting-wall wing 73 for the suction airstream entering into the annular chamber 63 through
14 the axial channel 62.

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

20
21 Other distributions are also possible in this respect (for example smaller wings – larger
22 intermediate spaces; larger wings – smaller intermediate spaces; irregular configuration of
23 wings and intermediate spaces).

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

34
35 The piston 54, which is retained in a rotationally fixed, but axially displaceable manner, in the
36 inner cylinder 53, has, in first instance, a piston head 76 which opens in disk form in the

1 direction of the mouthpiece. This piston head opens conically in cross-section. Two parallel,
2 axially oriented tongues 77 are integrally formed on the underside of the piston disk. The piston
3 54 consist of a rubber-like material.

4
5 Along their lower free periphery, the tongues 77, which accommodate the cross-sectional
6 contour of the guide portion 55 of the inner cylinder 53 on their outside wall, are split in a lip-like
7 manner and, furthermore, in their free peripheral region, they have material-reinforced sealing
8 surfaces 78.

9
10 The flat part of the metering rod 33 is guided between the tongues 77, the sealing surfaces 78,
11 in interaction with the flat part of the metering rod 33, having a stripping and sealing action.

12
13 In a basic position of the device according to the illustration in Figure 1, the free peripheries of
14 the tongues 77, these peripheries being split in a lip-like manner, engage, within an axial
15 depression, against the upper side of the cylinder portion 27.

16
17 Furthermore, in this basic position, the disk-like piston head 76 rests in a stop-limited manner on
18 a base region of the piston-head displacement region 56. The encircling peripheral region of the
19 free end of the piston head 76 engages with sealing action against the associated inner wall of
20 the inner cylinder 53.

21
22 Furthermore, in this basic position, the head of the metering rod 33, that is to say the radial
23 collar 44 and latching head 45 of the same, rests in the depression created by the disk-like
24 configuration of the piston head 76.

25
26 The piston head 76 here is located at an axial distance beneath the ceiling 64.

27
28 The device 1 cited functions as follows:

29 In order to prepare for inhalation, the closure cap 7 is first of all removed by unscrewing. As the
30 closure cap 7 is being unscrewed upward, the coupling mentioned results in the outer cylinder 4
31 being carried along in rotation and, via this outer cylinder, the inner cylinder 53 as well as, in the
32 exemplary embodiment cited, all those parts above the storage-chamber plane which are not
33 connected in a rotationally fixed manner to the housing 3. Accordingly, the metering rod 33 is
34 also carried along in rotation, and furthermore, the action of the closure cap 7 being unscrewed
35 upward gives rise, at the same time, to axial displacement of the metering rod 33 via the
36 docking location 41, which causes helical displacement of the metering chamber 40 into the as

1 yet closed emptying-standby position B according to the illustration in Figures 6 and 7, in which
2 it is aligned with the flow channel 60.

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

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

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

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

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

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

1 kinds of impacts, this does not result in the sub-quantity 14 of substance which is to be inhaled
2 trickling out, which would falsify the inhalation result.

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

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

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

22
23 At the same time, via the always open radial air-inlet openings 72, air is sucked in directly into
24 the annular chamber 63, in order to predetermine the vortexing direction in the annular chamber
25 63.

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

34
35 The metering chamber 40 is then located in a removal-release position F, in which it lies freely
36 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
35 correspondingly, the tongues 77 cannot be seen. Rather, there is a free view of the empty

1 metering chamber 40. It is also the case that the action of the piston 54 striking against the
2 underside of the sealing 64 can be sensed both acoustically and by touch.

3
4 Once inhalation has taken place, and alternatively also if it is not desired to effect inhalation
5 from the removal-standby position B, the closure cap 7 is screwed on again, the latching
6 between the radial collar 44 and the latching fingers 79 being eliminated in first instance by
7 virtue of the latching head 45 being acted upon by the noses 47. The retaining forces of this
8 latching connection are of a correspondingly smaller magnitude than the amount of force which
9 is necessary for deflecting the noses 47. As the action of screwing the closure cap 7 downward
10 continues, the radial collar 44 on the metering rod displaces the piston 54 back again into its
11 basic position. At the same time, with axial displacement and corresponding rotary movement,
12 the metering rod 33 is displaced downward into the storage chamber. The action of the piston
13 54 being displaced back via the metering rod 33 terminates with the free ends of the tongues
14 77, which are formed in the manner of lips, striking against the facing ceiling surface of the
15 cylinder part 27. As the downward-screwing displacement continues, finally the noses 47 enter
16 into the annular groove 46 of the metering rod 33. This final latching action is discernable to the
17 user acoustically and by touch, to indicate that the closing operation is at an end. It is thus also
18 ensured that a latching action between the metering rod 33 and closure cap 7 which causes the
19 metering rod 33, and thus the metering chamber 40, to be carried along into the removal-
20 standby position B is only achieved in the lowermost position of the metering rod 33, in which
21 position the metering chamber 40 is filled. Accordingly, there is always a filled metering
22 chamber 40 available when the metering rod 33 is raised.

23
24 Incorrect operation is reliably avoided. Improper closure of the device 1 means that, during the
25 next attempt at inhalation, the metering rod 33, which has accordingly not been raised, on one
26 hand closes the passage between the flow channel 60 and intermediate channel portion 61 by
27 way of its flat-part portion. It is also the case that the metering rod 33 continues to act on the
28 associated surface of the piston head 76 via the radial collar 44. Accordingly, when an attempt
29 is made at inhalation, the closure of the flow channel 60 and the blocking of the piston 54
30 means that it is not possible to build up any air flow (with the exception of the small amount of
31 flow via the small radial air-inlet openings 72). This clearly signals incorrect positioning to the
32 user. This can only be eliminated by the device 1 being properly closed.

33
34 All features disclosed are (in themselves) pertinent to the invention. The disclosure content of
35 the associated/attached priority documents (copy of the prior application) is hereby also

- 1 included in full in the disclosure of the application, also for the purpose of incorporating features
- 2 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:

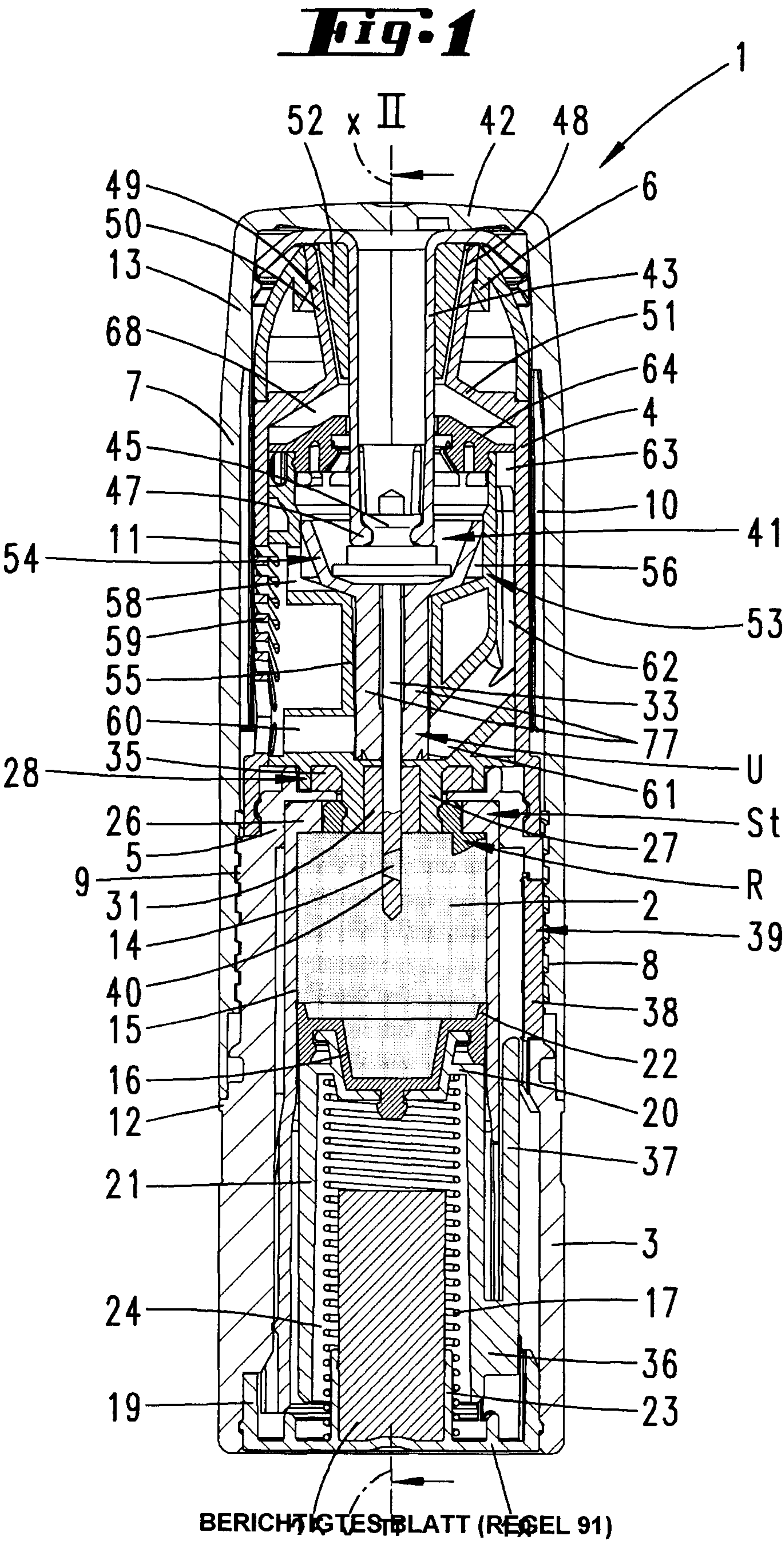
1. A metering device (1) adapted to be activated by a user's suction airstream for inhalation of a pulverulent substance (2) which is disposed in a storage chamber (15) and is moveable out of the storage chamber by means of at least one metering chamber (40) of a metering rod (33) into an emptying-standby position (B), in which emptying-standby position the at least one metering chamber (40) is closed by a piston (54), which piston is displaceable in the direction of a mouthpiece (6), by means of the user's suction airstream, into an emptying-release position, characterized in that the piston (54), which is of disk-like configuration in an upper region, is provided with tongues (77) which extend from an underside of the disk, close the at least one metering chamber (40) in the emptying-standby position and release/open the metering chamber (40) when the piston is displaced by the user's suction airstream into the emptying-release position.
2. The metering device according to claim 1, characterized in that, in its upper end position, the upper periphery of the piston (54) engages in front of an annular wall (80), which belongs to an annular chamber (63).
3. The metering device according to claim 2, characterized in that a ceiling (64) of the annular chamber (63) is provided with peripherally extending, projecting wings (65, 66) which leave intermediate spaces (67) between them.
4. The metering device according to claim 2, characterized in that an inclined deflecting wall (51) is provided above a ceiling (64) of the annular chamber (63).
5. The metering device according to claim 3, characterized in that a part of the wings (65) 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 2, characterized in that a latching head (45) of the metering rod (33) is at least partially sunken into an upper depression of the disk piston (54).

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 a 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 1, characterized in that, along their lower free periphery, the tongues (77) are split in a lip-like manner in order to achieve a clamping action.
9. The metering device according to claim 8, characterized in that the tongues (77) have material-reinforced sealing surfaces (78).
10. The metering device according to claim 1, characterized in that in alignment with the metering chamber (40) – in the as yet closed emptying-standby position – a channel (60) is directed toward one of the tongues (77) in order to allow a visual check.
11. The metering device according to claim 5, 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, and it is in flow connection with the annular chamber (63).
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.
13. The metering device according to claim 1, characterized in that the upward movement of a metering-chamber piston (16) is stopped.
14. The metering device according to claim 1, characterized in that the metering rod (33) is latched in a disengageable manner in its upper position.
15. The metering device according to claim 3 or 14, characterized in that a radial collar of the metering rod (33) moves behind latching fingers (79) which are formed on a ceiling (64).

16. The metering device according to any one of claims 1 to 15, characterized in that the pulverulent substance is a medicinal ingredient.
17. An inhaler comprising the metering device according to any one of claims 1 to 16.
18. The inhaler according to claim 17, characterized by two drying-agent capsules (25 and 52) in the two end regions of the inhaler.
19. A metering device adapted to be activated by a user's suction airstream and intended for an inhalation of a pulverulent substance, including a medicinal substance, the metering device comprising:
- a piston slidably engaged with a metering rod, the piston having a disk-shaped upper region with tongues extending from an underside of the disk-shaped region;
 - a mouthpiece; and
 - a storage chamber for storing the pulverulent substance;
- wherein the metering rod has a metering chamber configured to move a portion of the pulverulent substance out of said storage chamber into an emptying-standby position; and
- wherein the tongues cover and close the metering chamber when the metering chamber is in the emptying-standby position and then release/open the metering chamber when the piston is displaced by the user's suction airstream.
20. The metering device according to claim 19, further comprising an annular chamber having an annular wall, and wherein in an upper end position, an upper periphery of said piston engages in front of said annular wall.
21. The metering device according to claim 20, wherein said annular chamber has a ceiling with peripherally extending, projecting wings which leave intermediate spaces between them.
22. The metering device according to claim 21, further comprising an inclined deflecting wall disposed above said ceiling of said annular chamber.

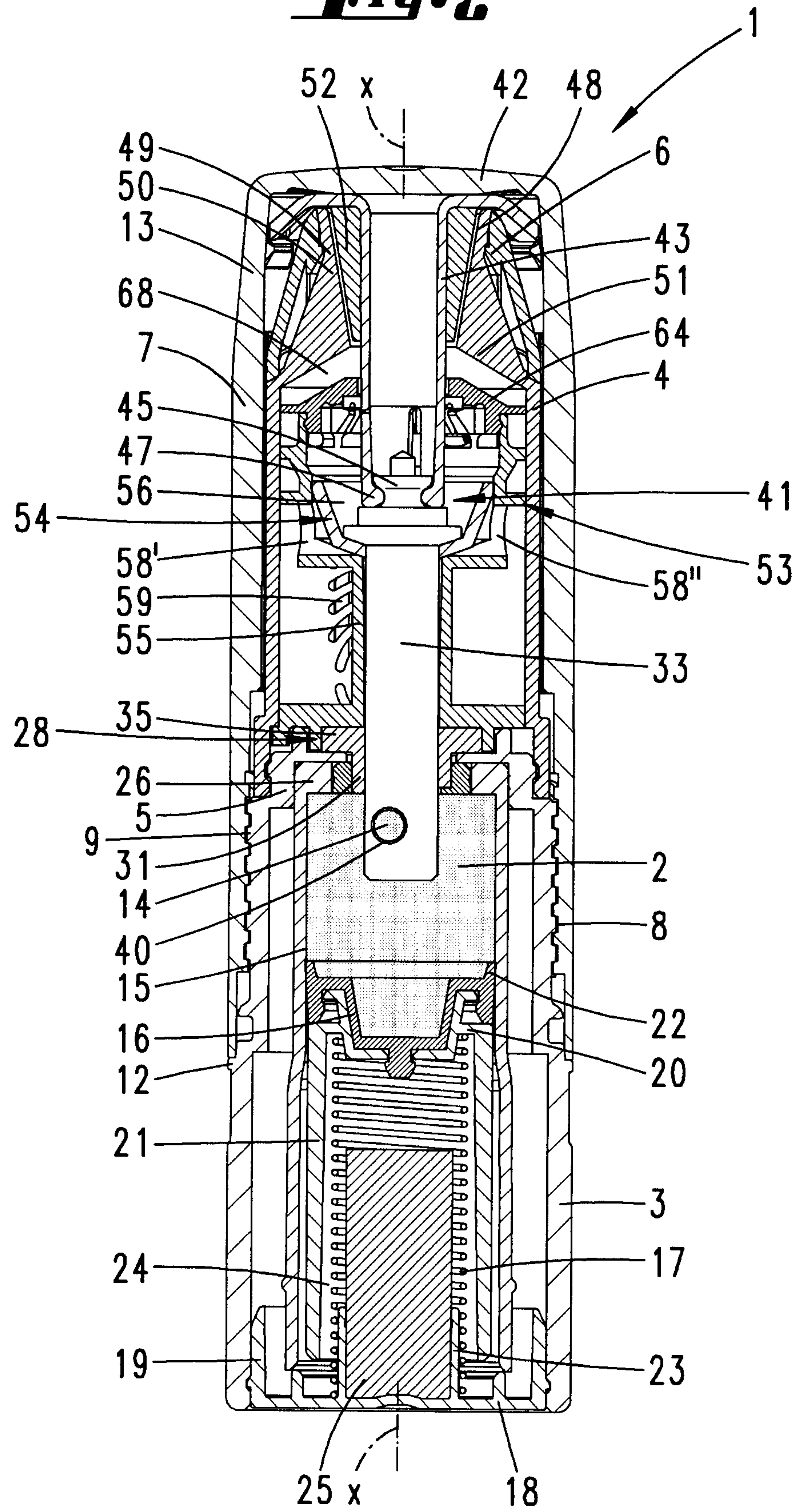
23. The metering device according to claim 21, wherein part of said projecting wings is of a relatively wide configuration in a circumferential direction, in order to form a deflecting-wall wing for the suction airstream.
24. The metering device according to claim 21, wherein: said ceiling has latching fingers formed thereon; and said metering rod has a radial collar which moves behind said latching fingers.
25. The metering device according to claim 20, further comprising:
an axially running channel having a closure cap, said axially running channel extending from an emptying side of said metering chamber and terminates in said annular chamber;
an inner cylinder having a lateral-wall side and being moved by said closure cap; and
a deflecting-wall wing provided for deflecting an axial airstream direction into a circumferential plane and disposed on said lateral-wall side.
26. The metering device according to claim 19, wherein: said piston has an upper depression formed therein; and said metering rod has a latching head being at least partially sunken into said upper depression of said piston.
27. The metering device according to claim 19, wherein along their lower free periphery, said tongues are split in a lip-shaped manner in order to achieve a clamping action.
28. The metering device according to claim 19, wherein said tongues have material-reinforced sealing surfaces.
29. The metering device according to claim 19, further including a channel in alignment with said metering chamber, in an as yet closed removal standby position said channel is directed toward one of said tongues, to allow a visual check.
30. The metering device according to claim 19, wherein said storage chamber has a storage-chamber wall; and further comprising an indicator disposed in a region of said storage-chamber wall for indicating an actual filling level.

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 an upper position.
33. The metering device according to claim 19, wherein said metering chamber is one of a plurality of metering chambers.
34. An inhaler comprising the metering device according to any one of claims 19 to 33.
35. The inhaler according to claim 34, wherein the inhaler has two end regions and wherein the inhaler has two drying-agent capsules disposed in the two end regions.



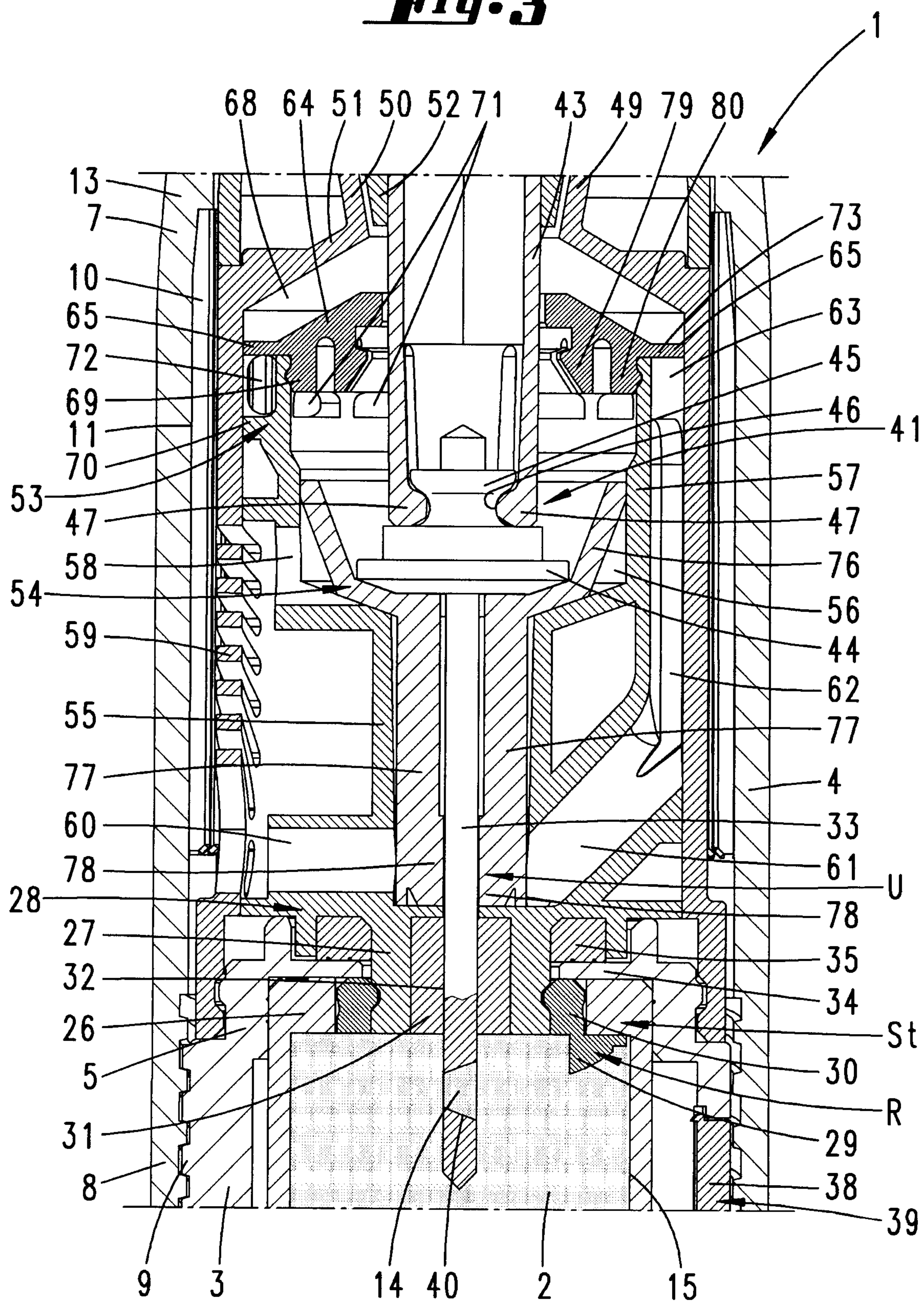
2/21

Fig. 2



3/21

Fig: 3



5/21

Fig: 5

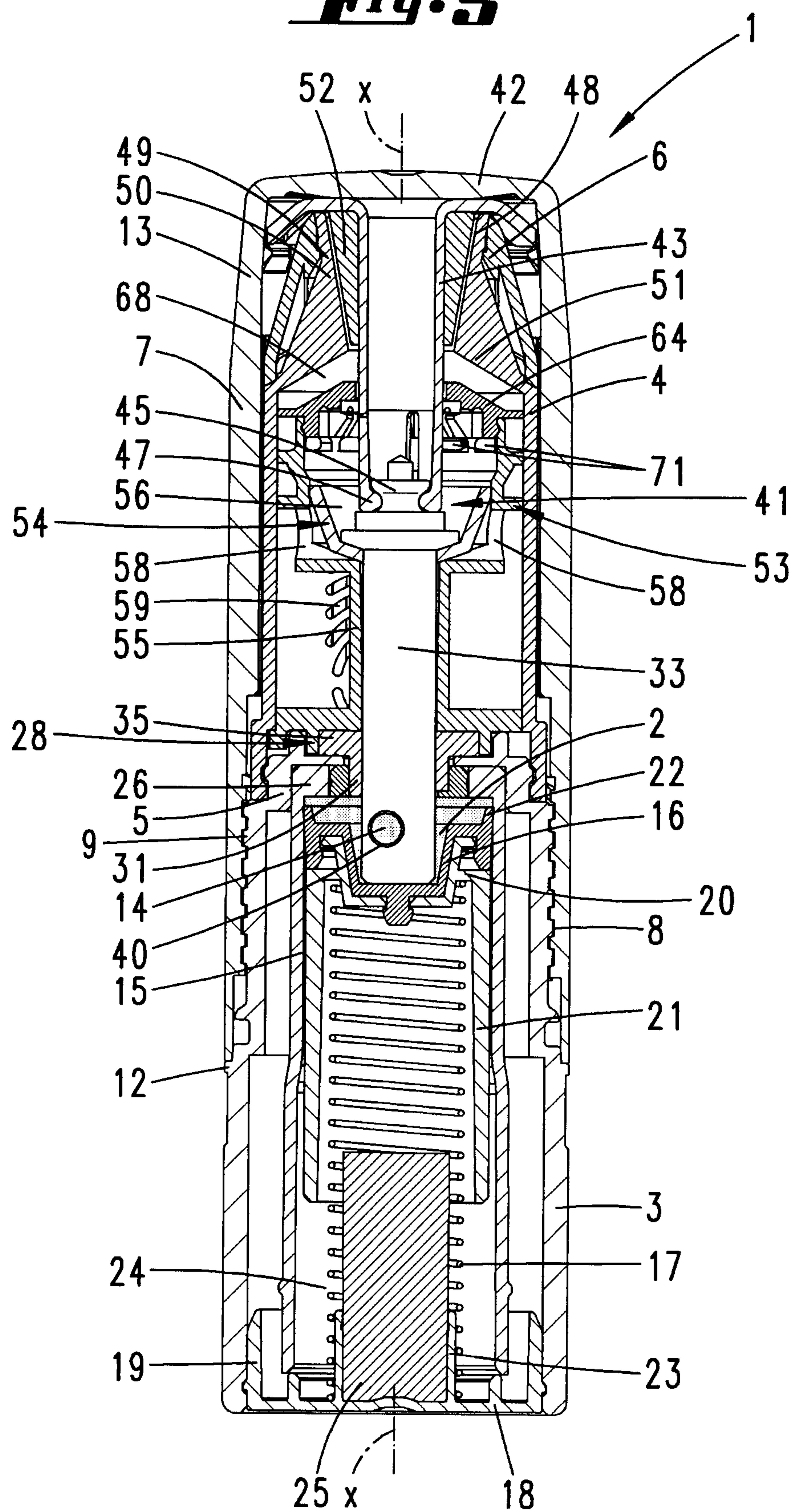


Fig. 6

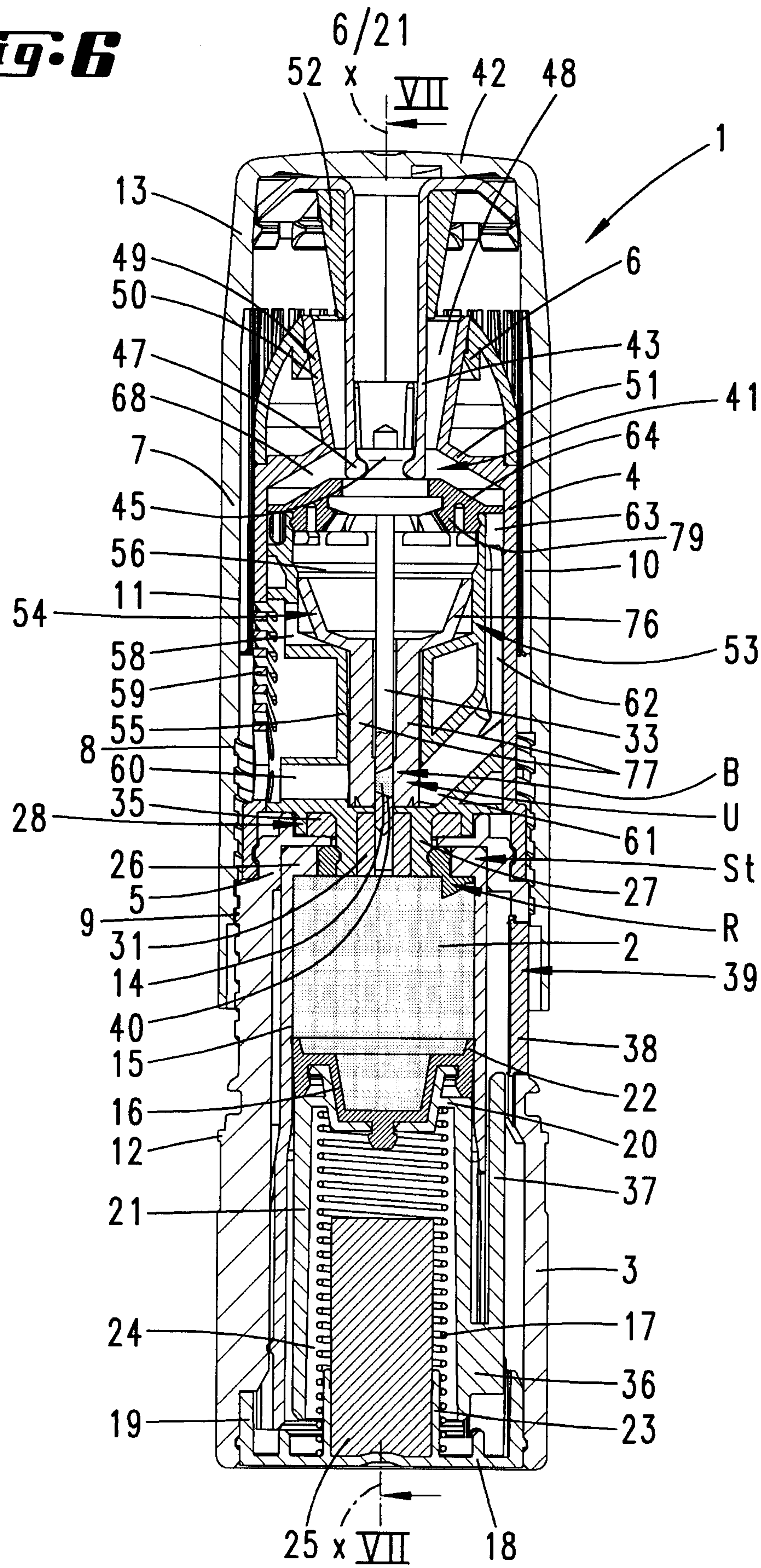
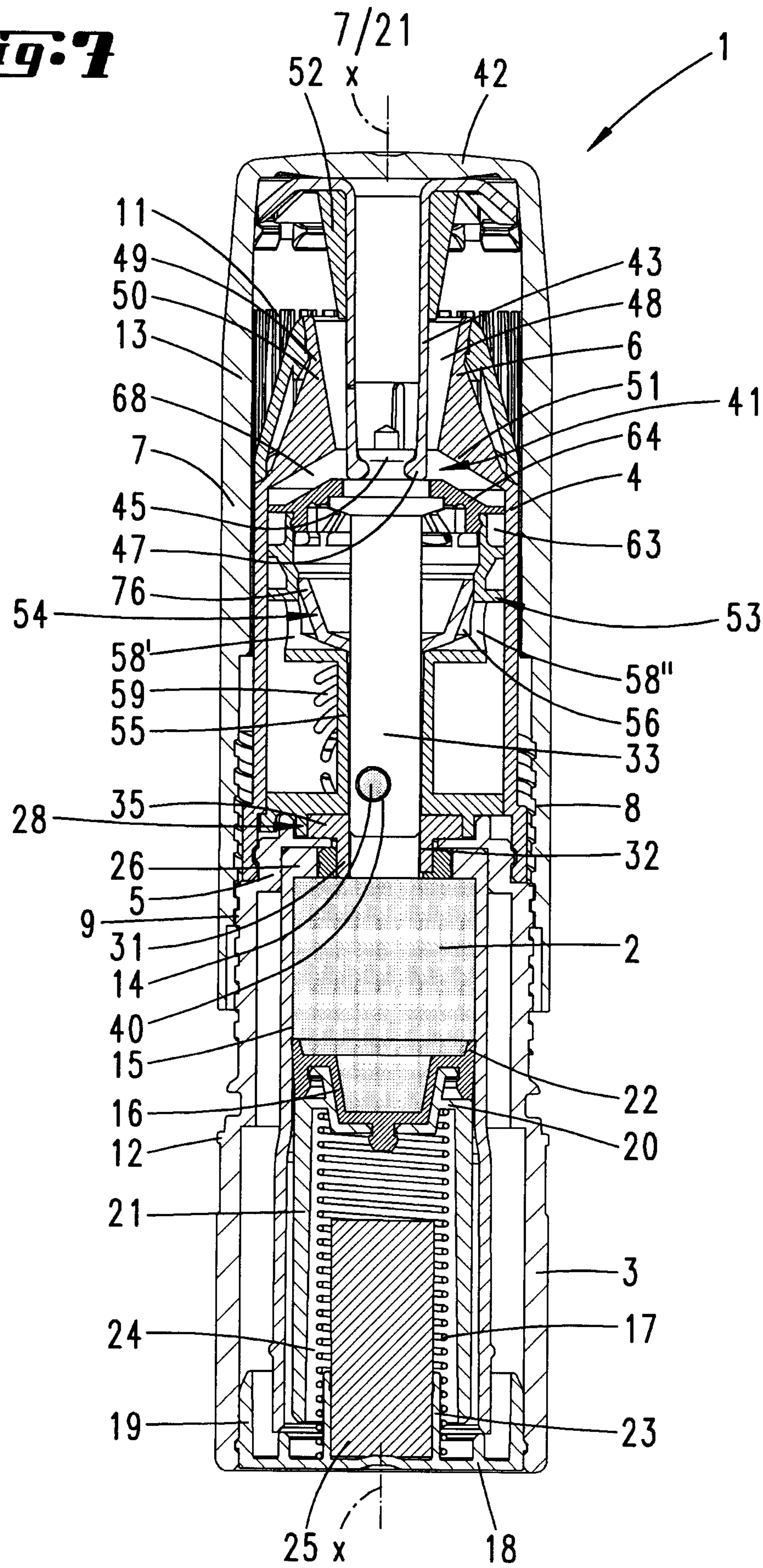
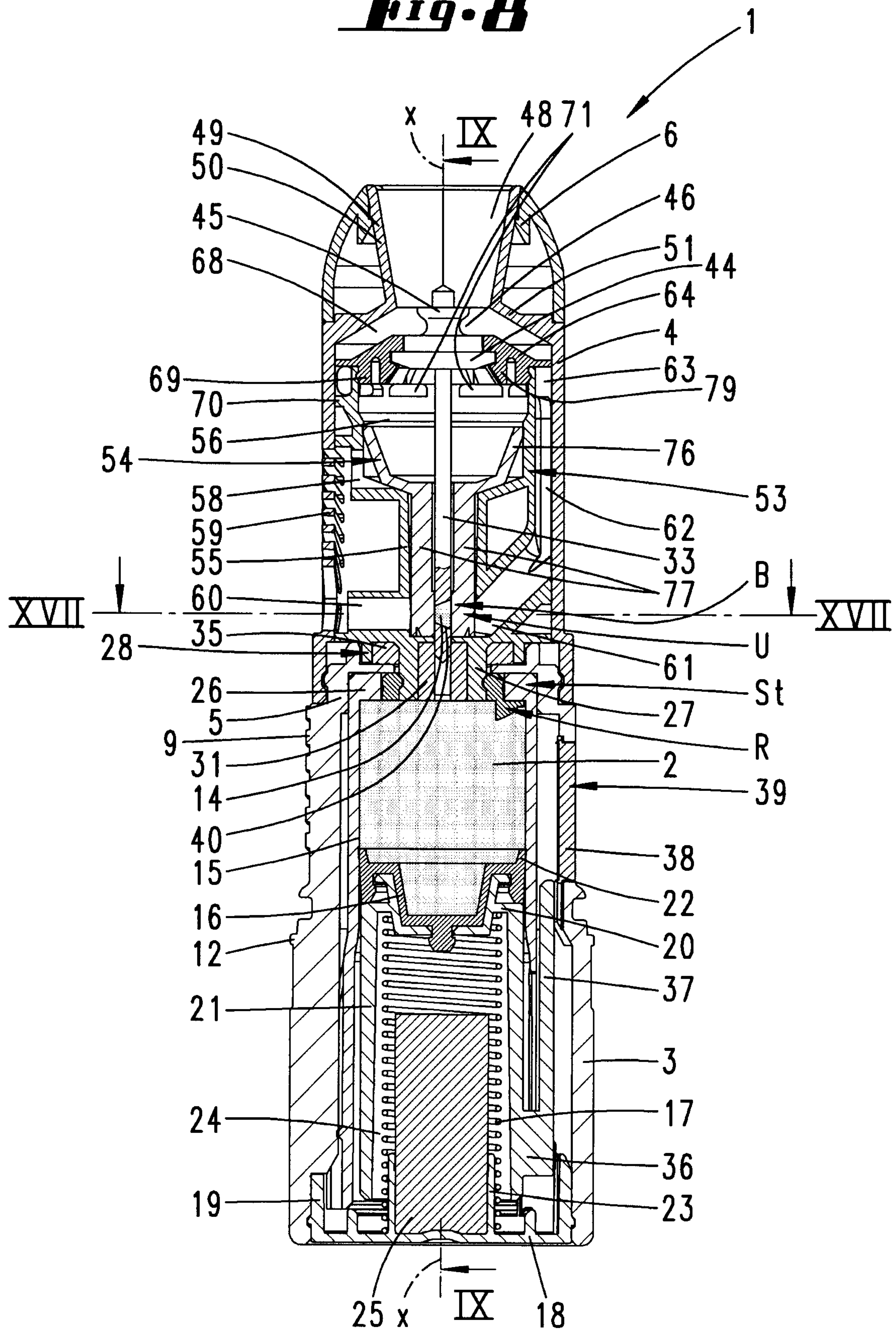


Fig. 7



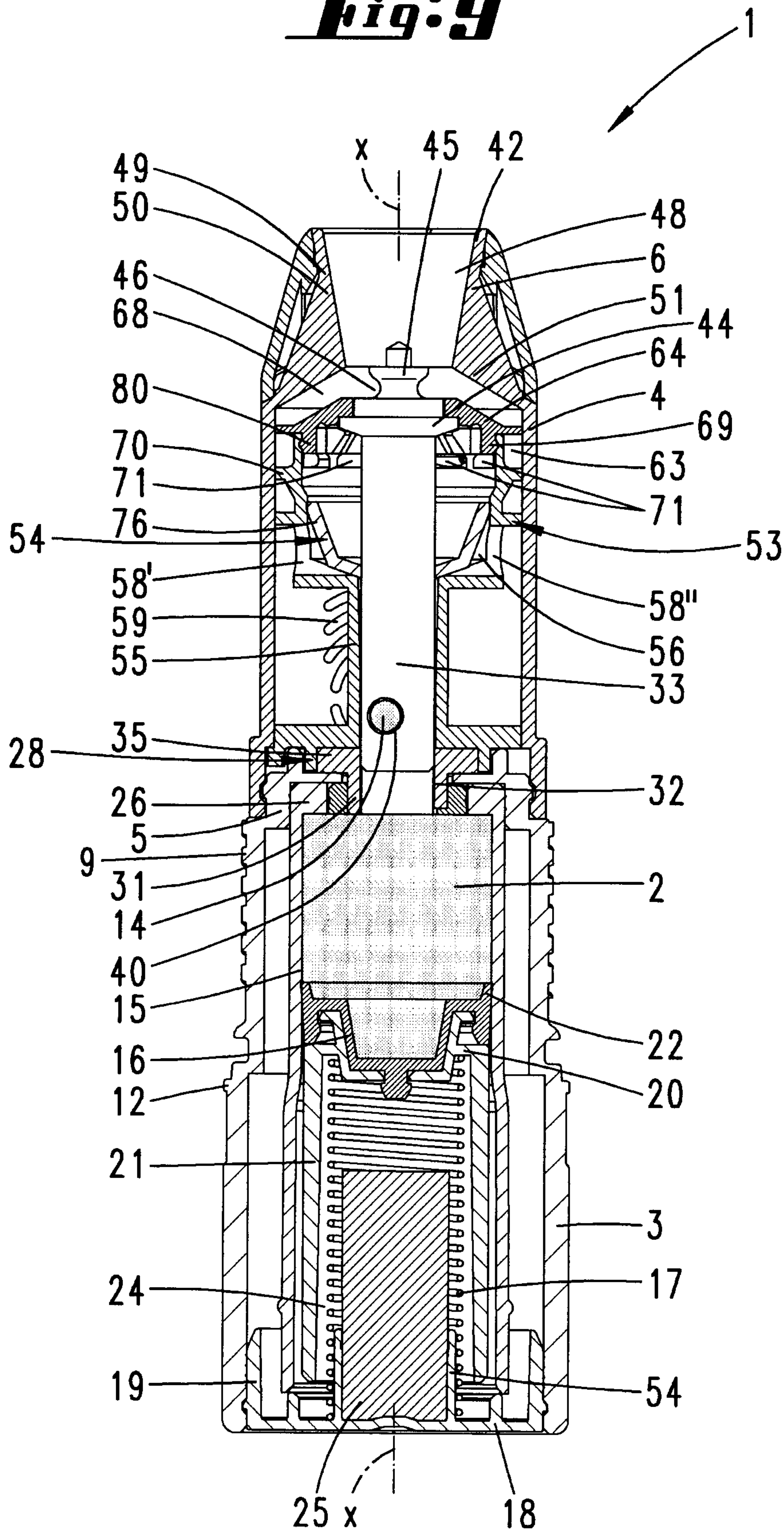
8/21

Fig: 8



9/21

Fig. 9



10/21

Fig. 10

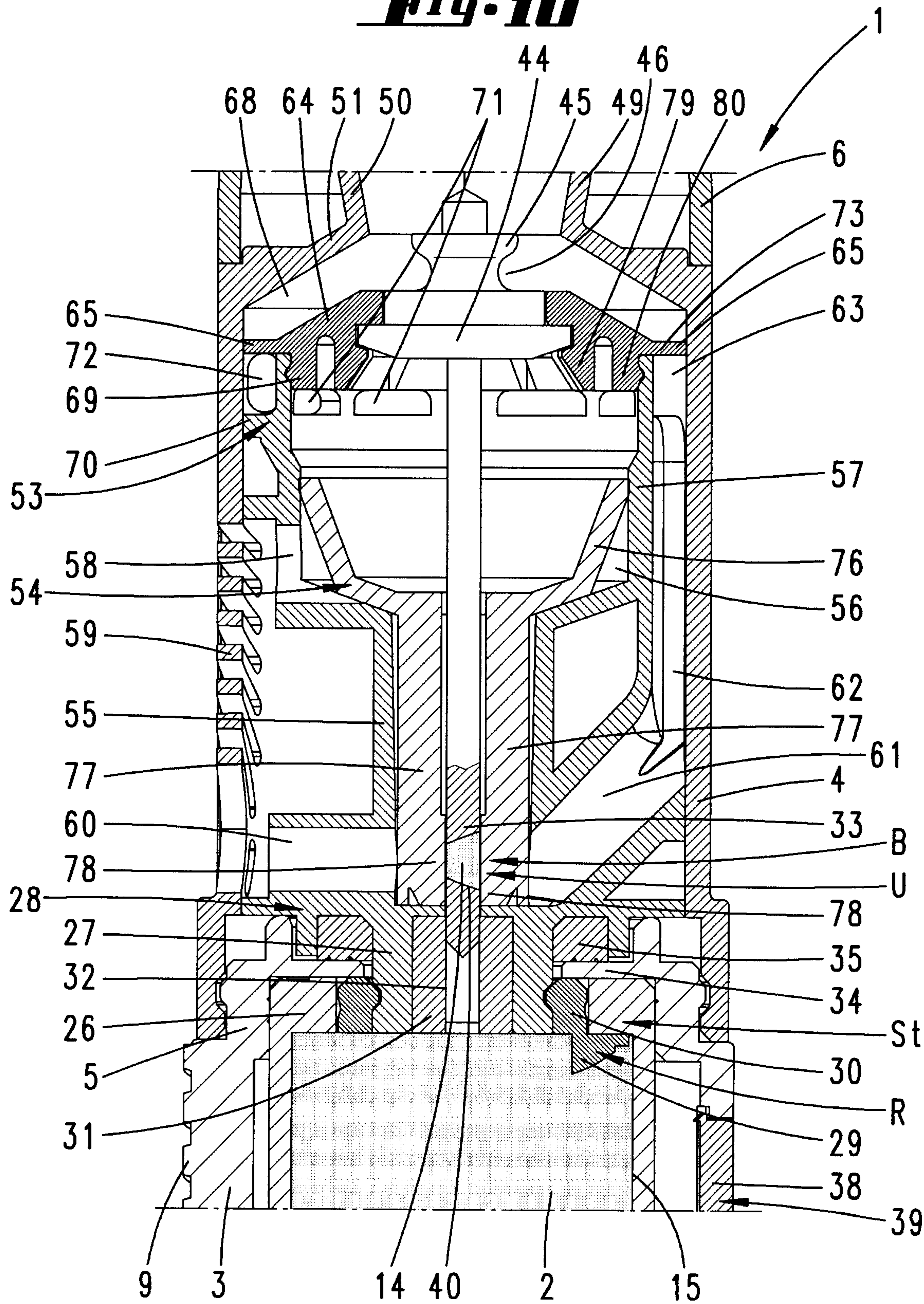
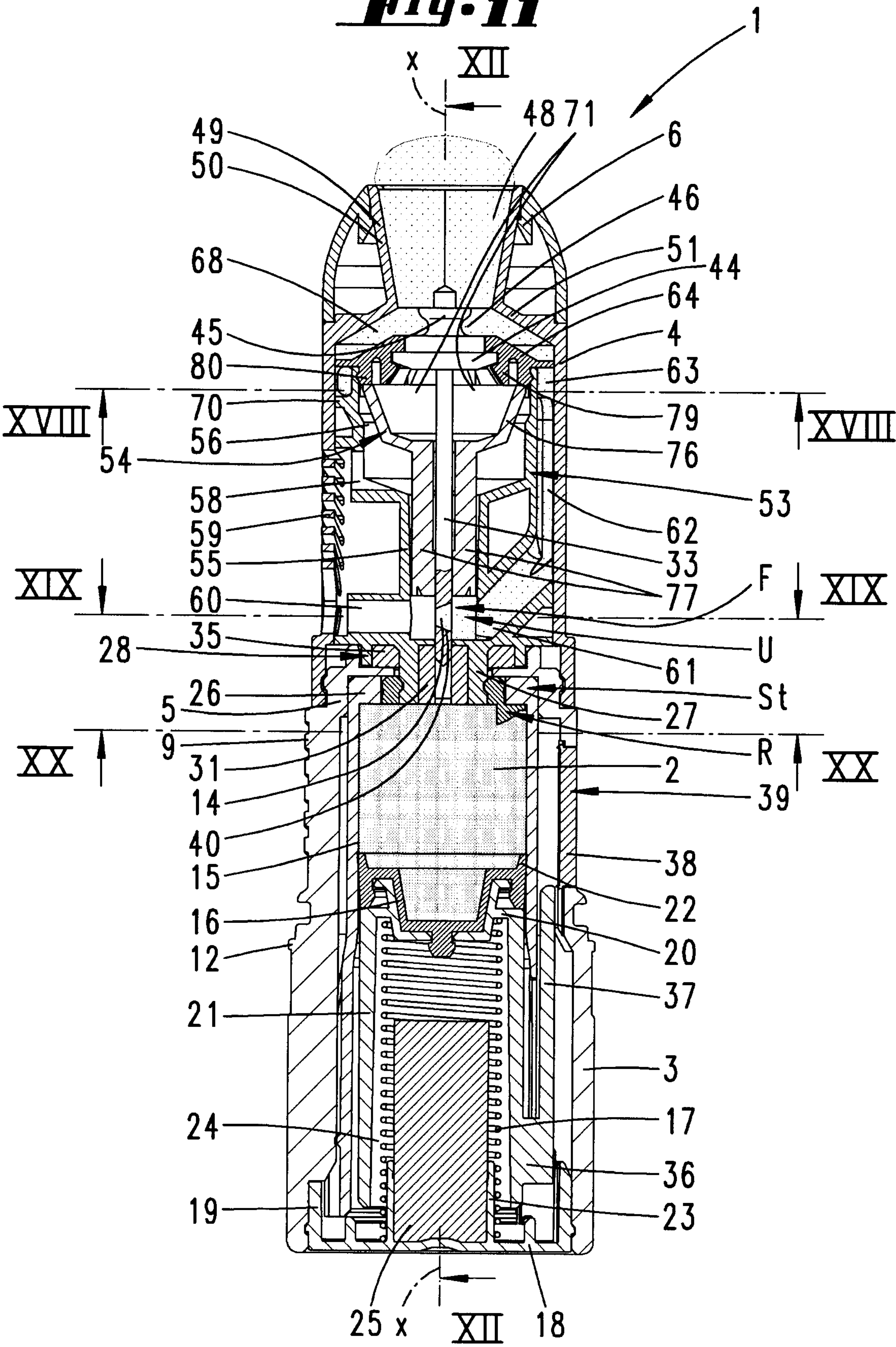


Fig. 11



12/21

Fig. 12

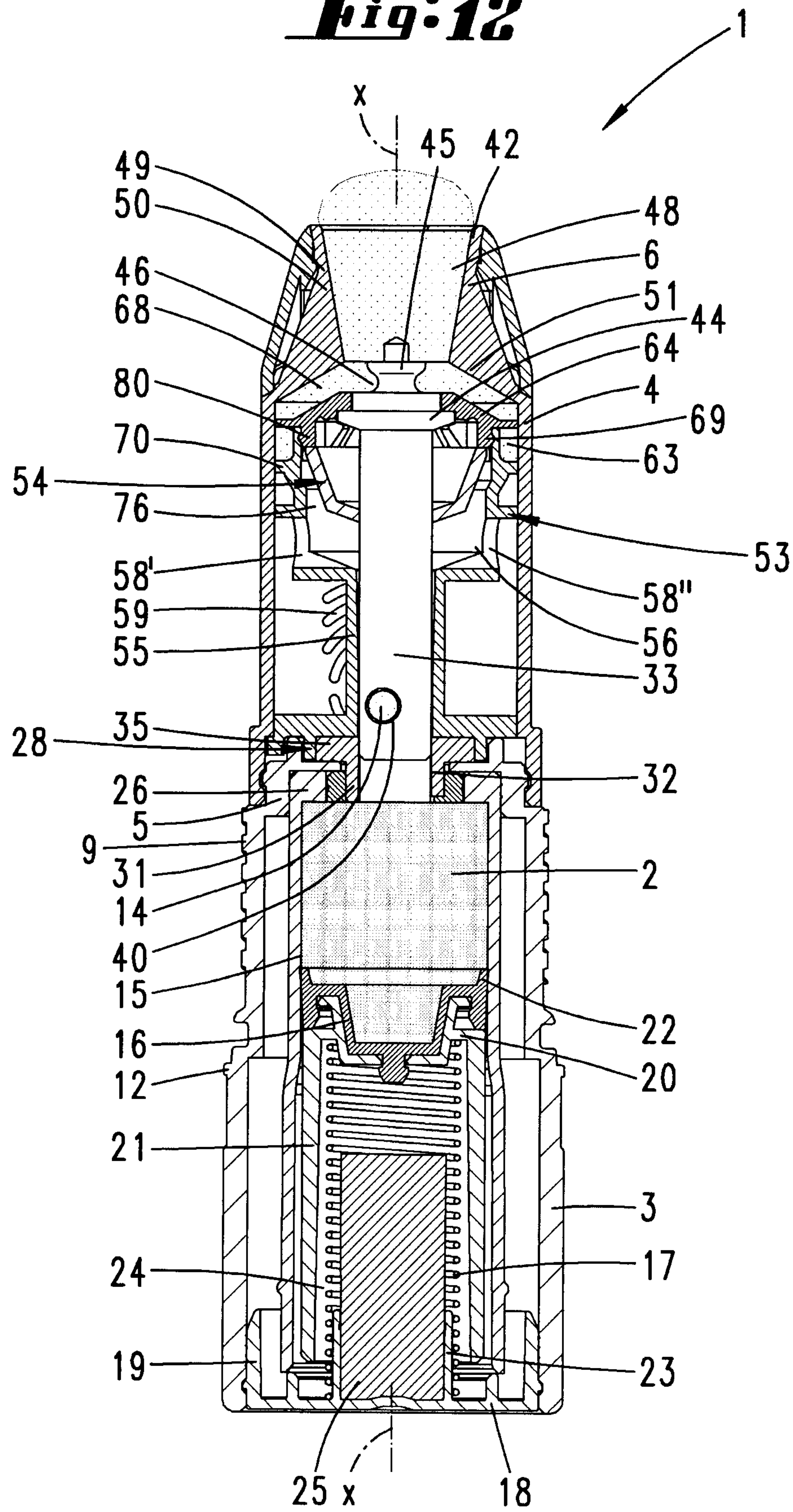


Fig. 13

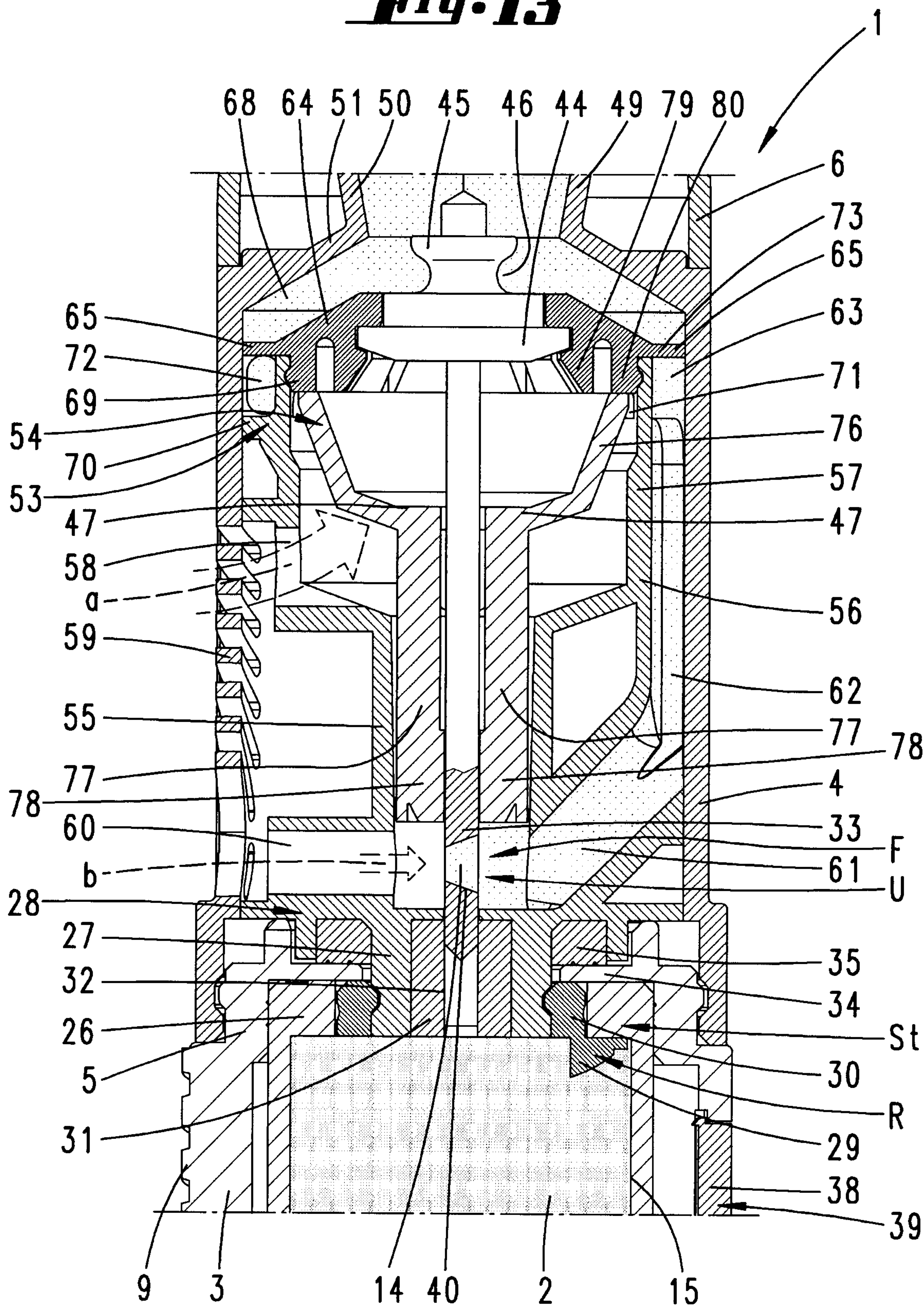


Fig. 14

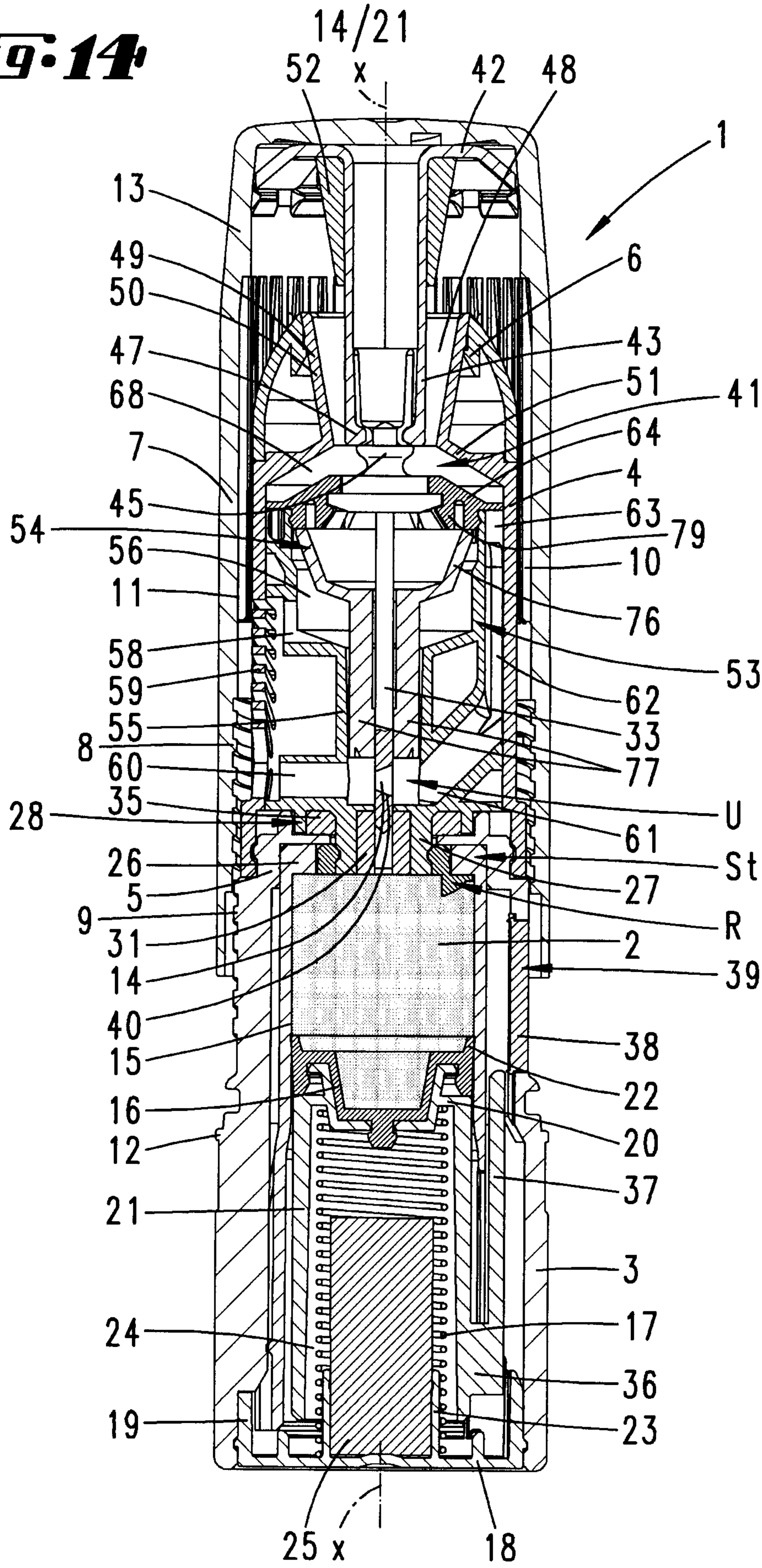
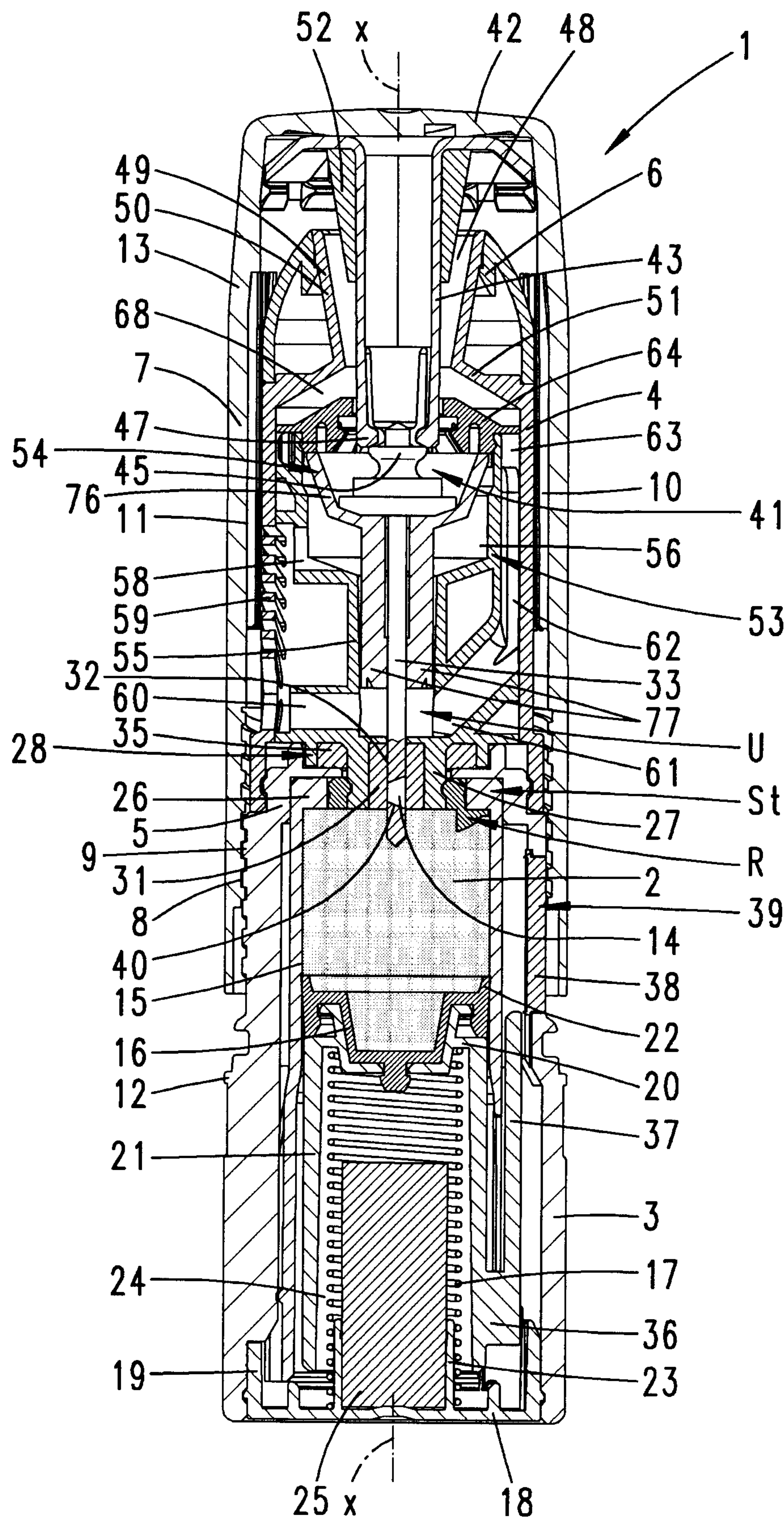


Fig. 15

15/21



16/21

Fig. 16

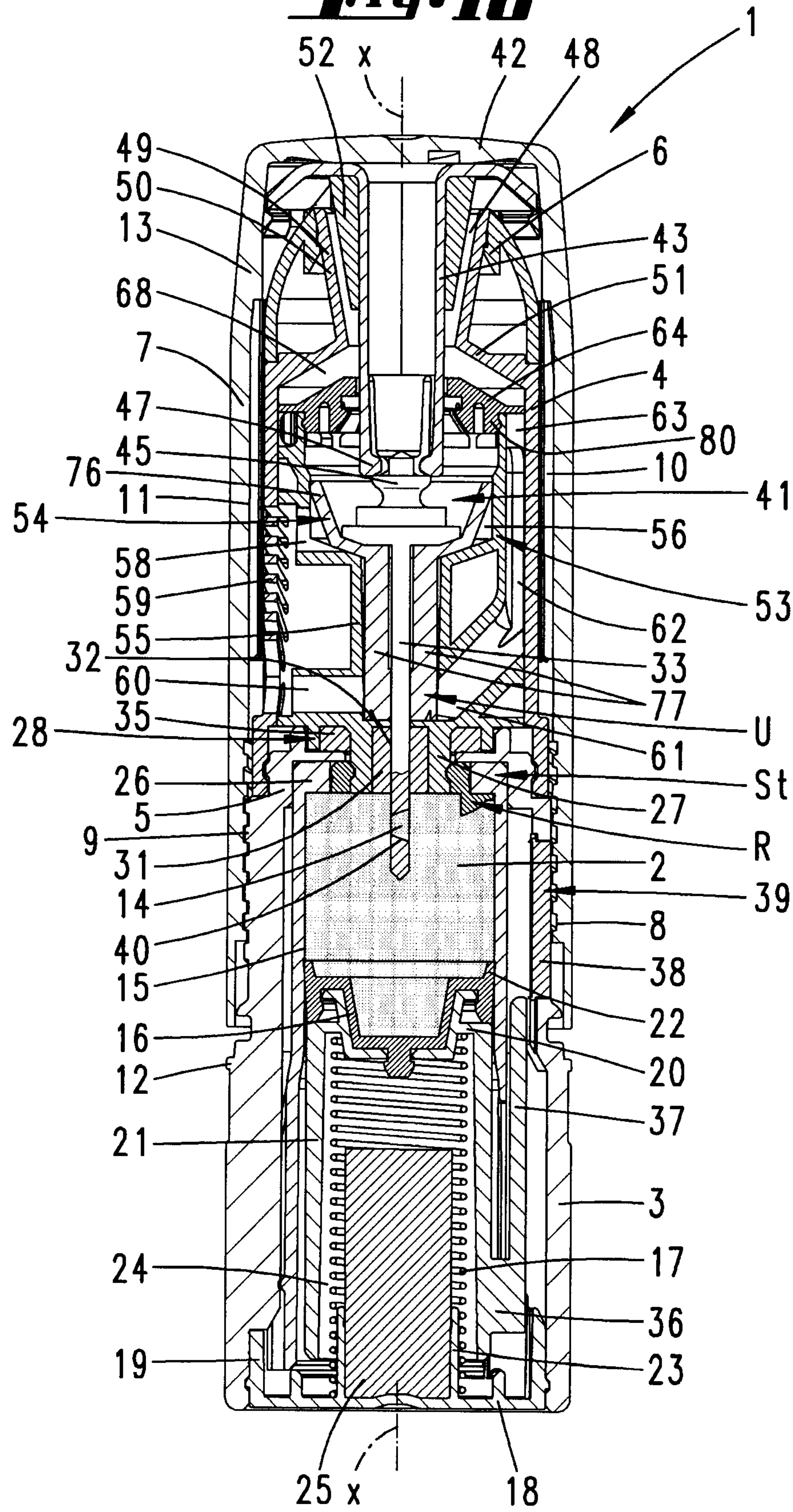


Fig. 17

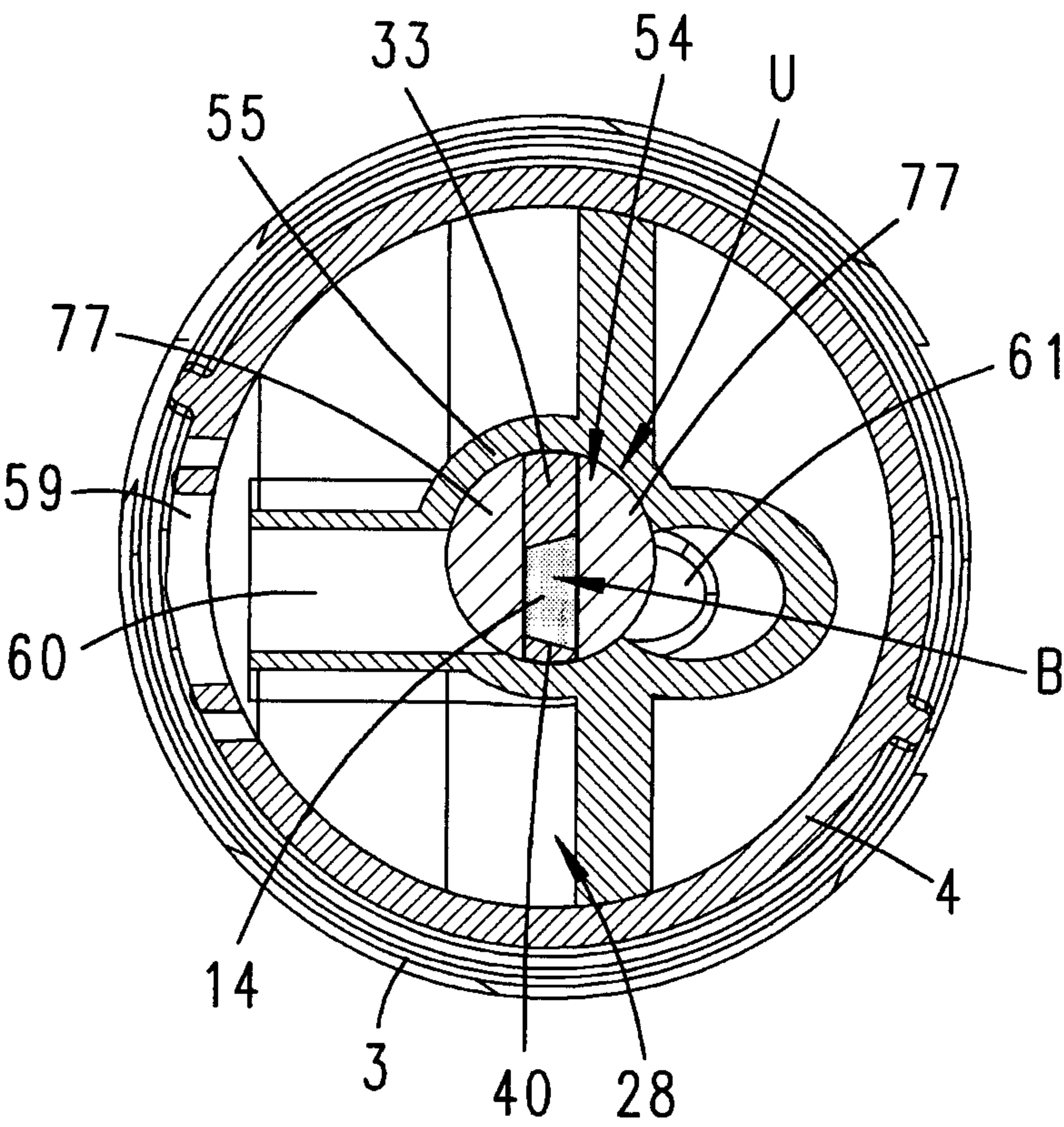


Fig. 18

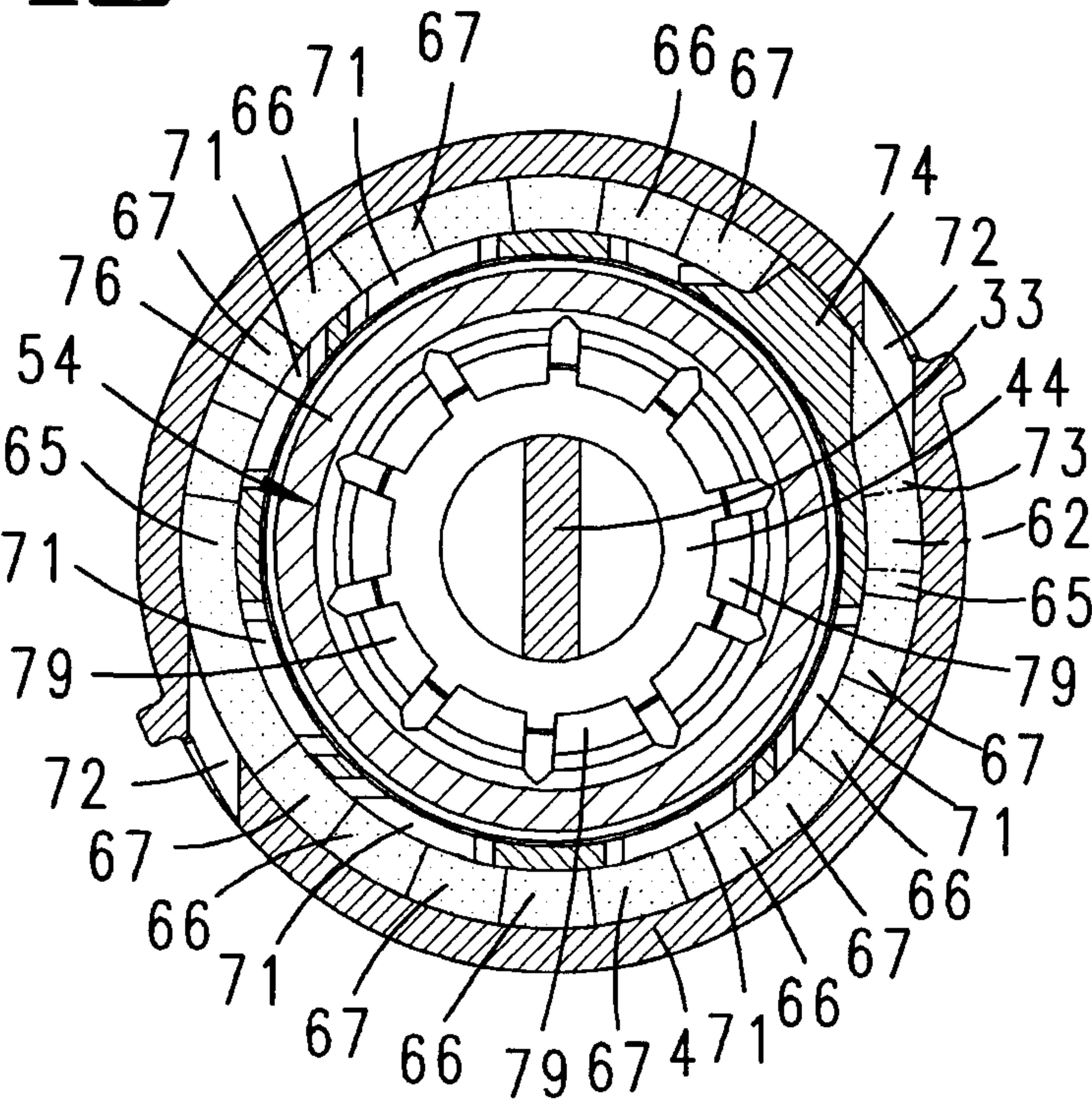


Fig. 19

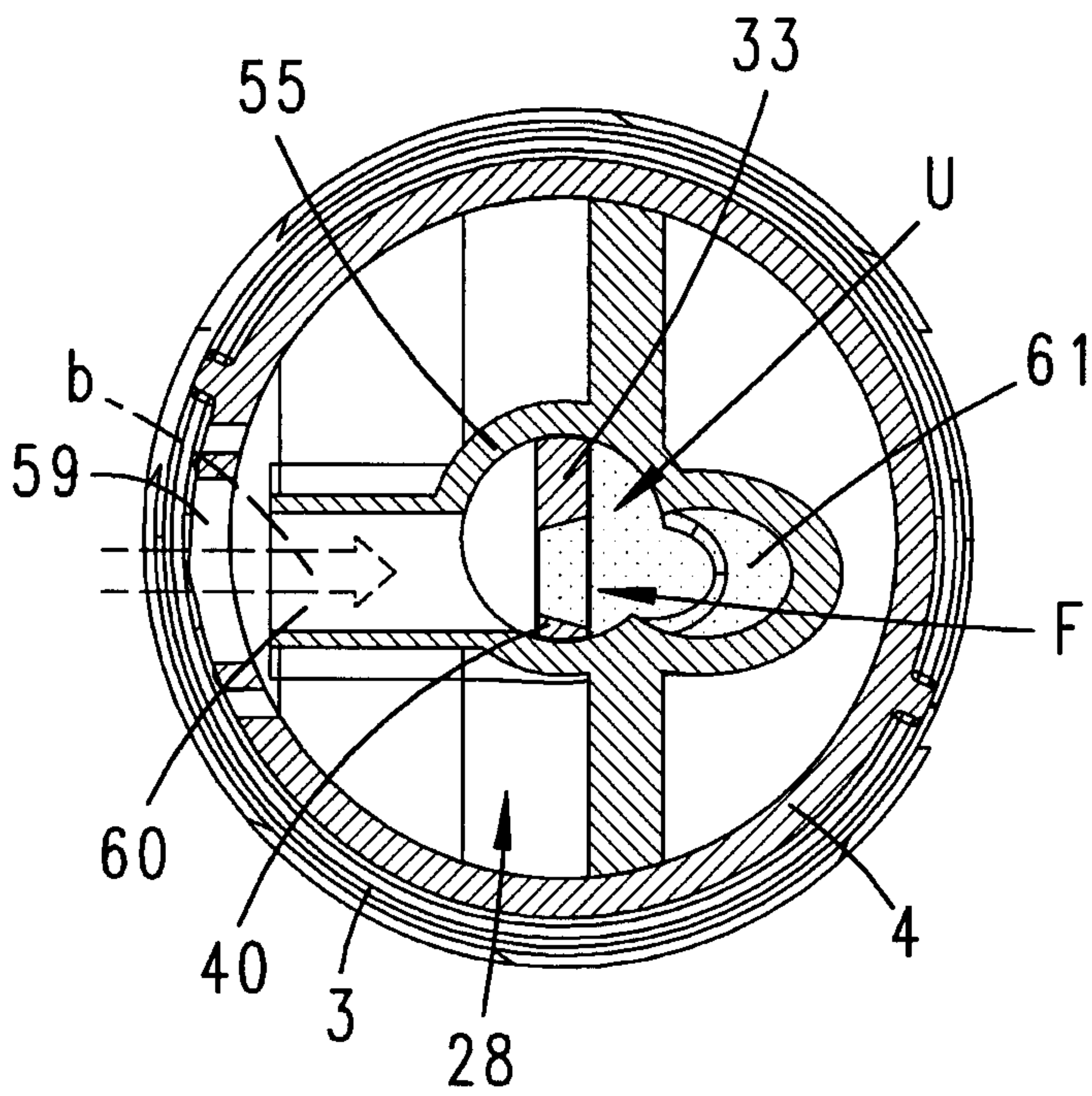


Fig. 20

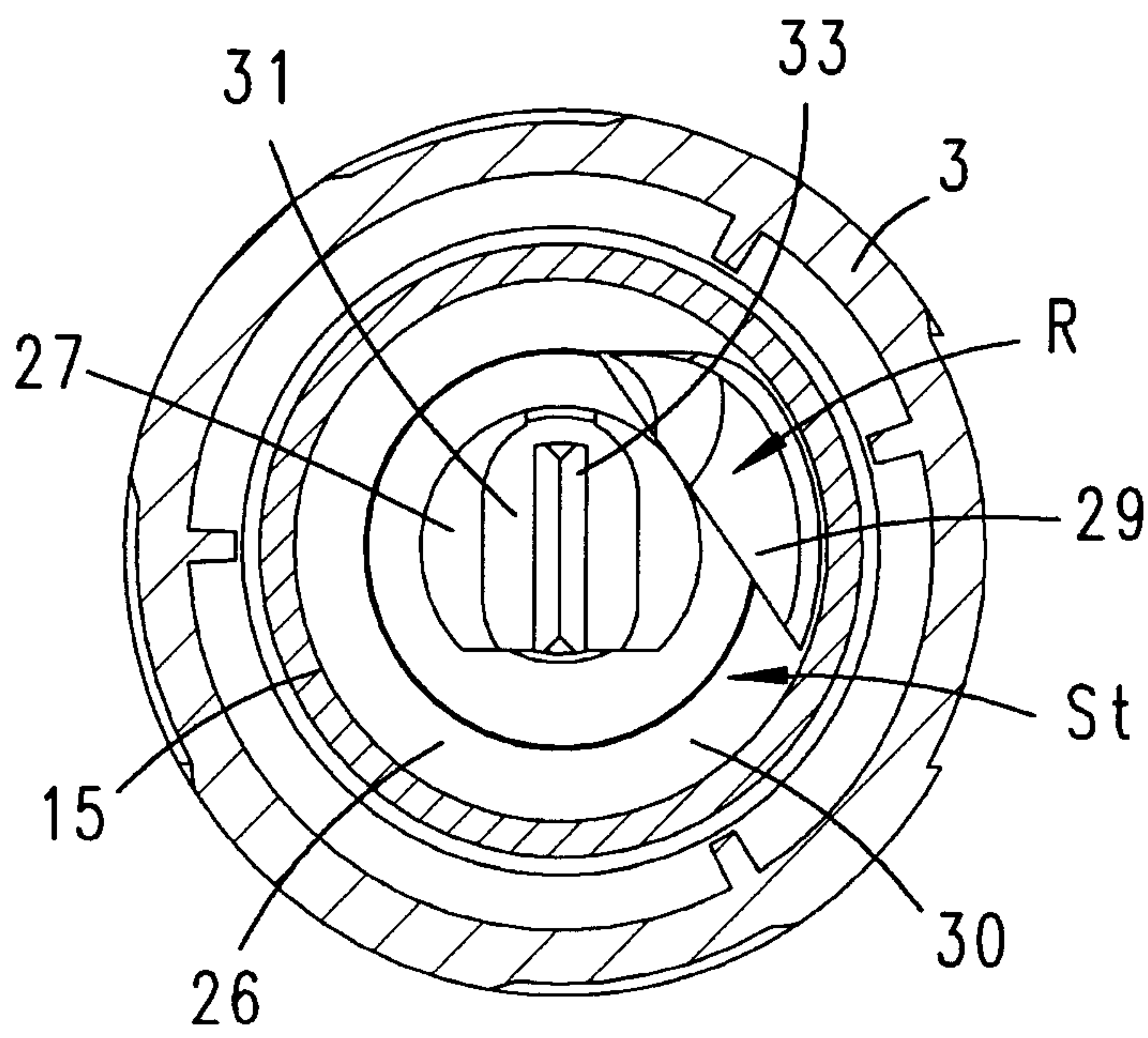


Fig. 22

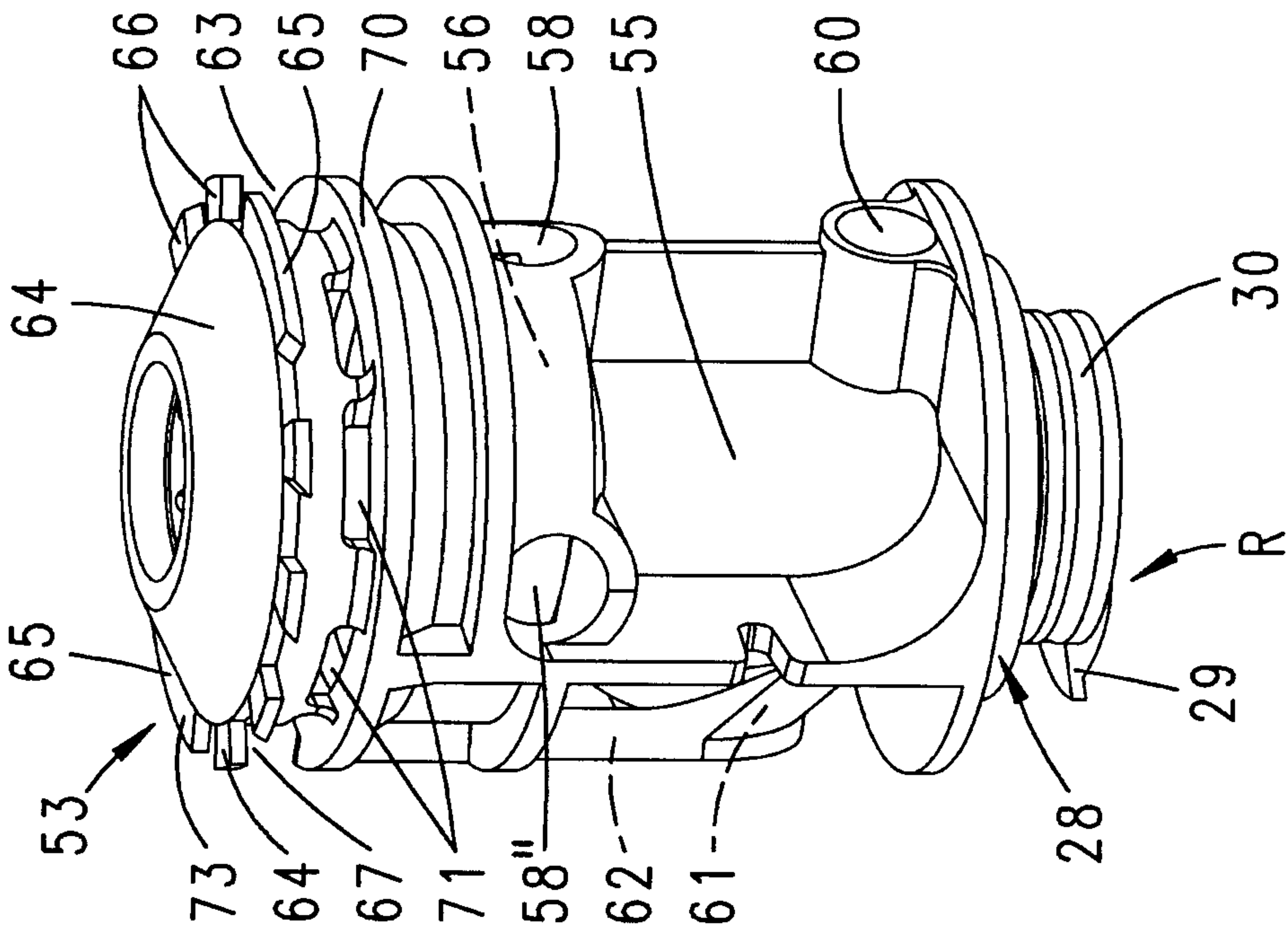
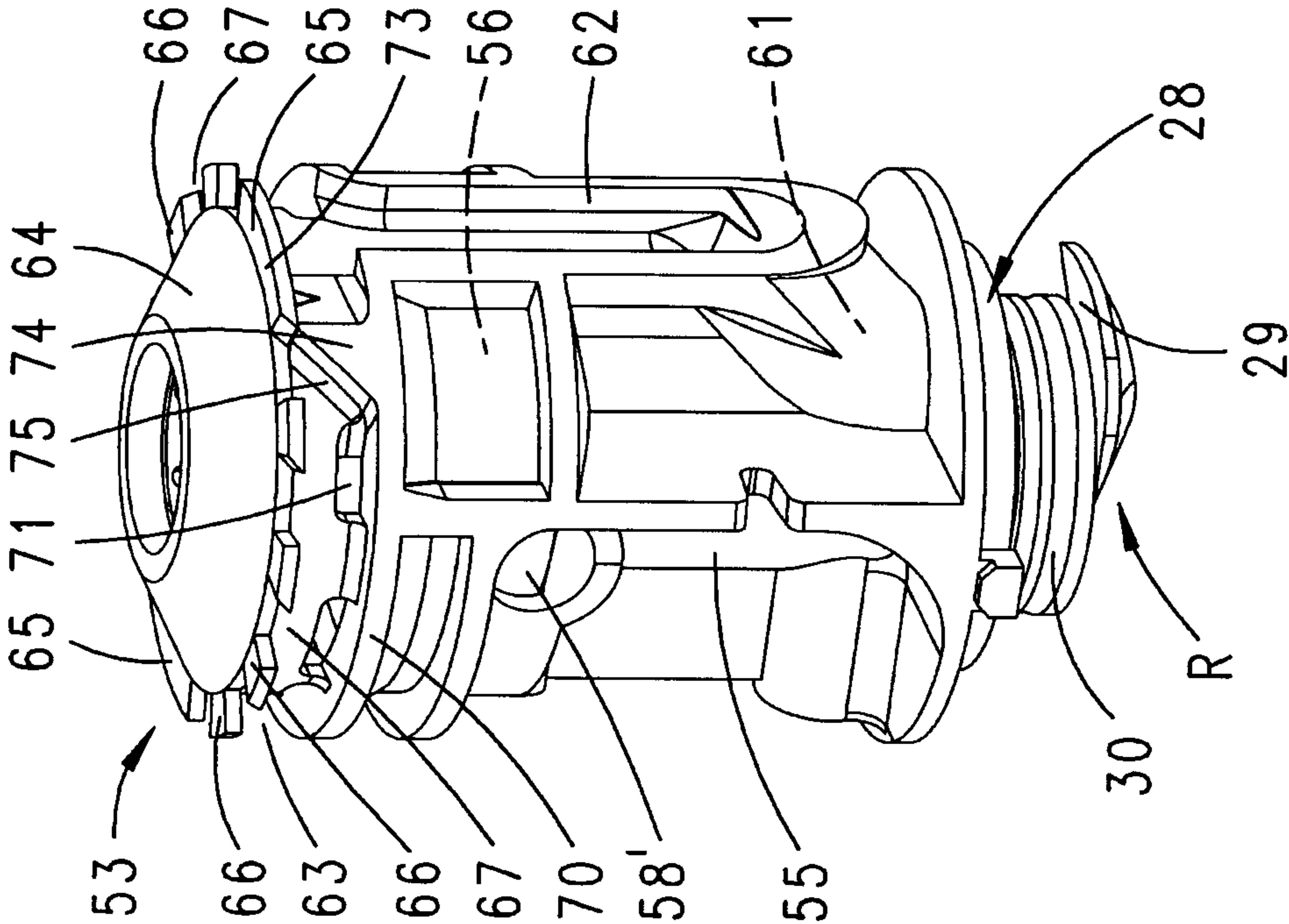


Fig. 21



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Fig. 23

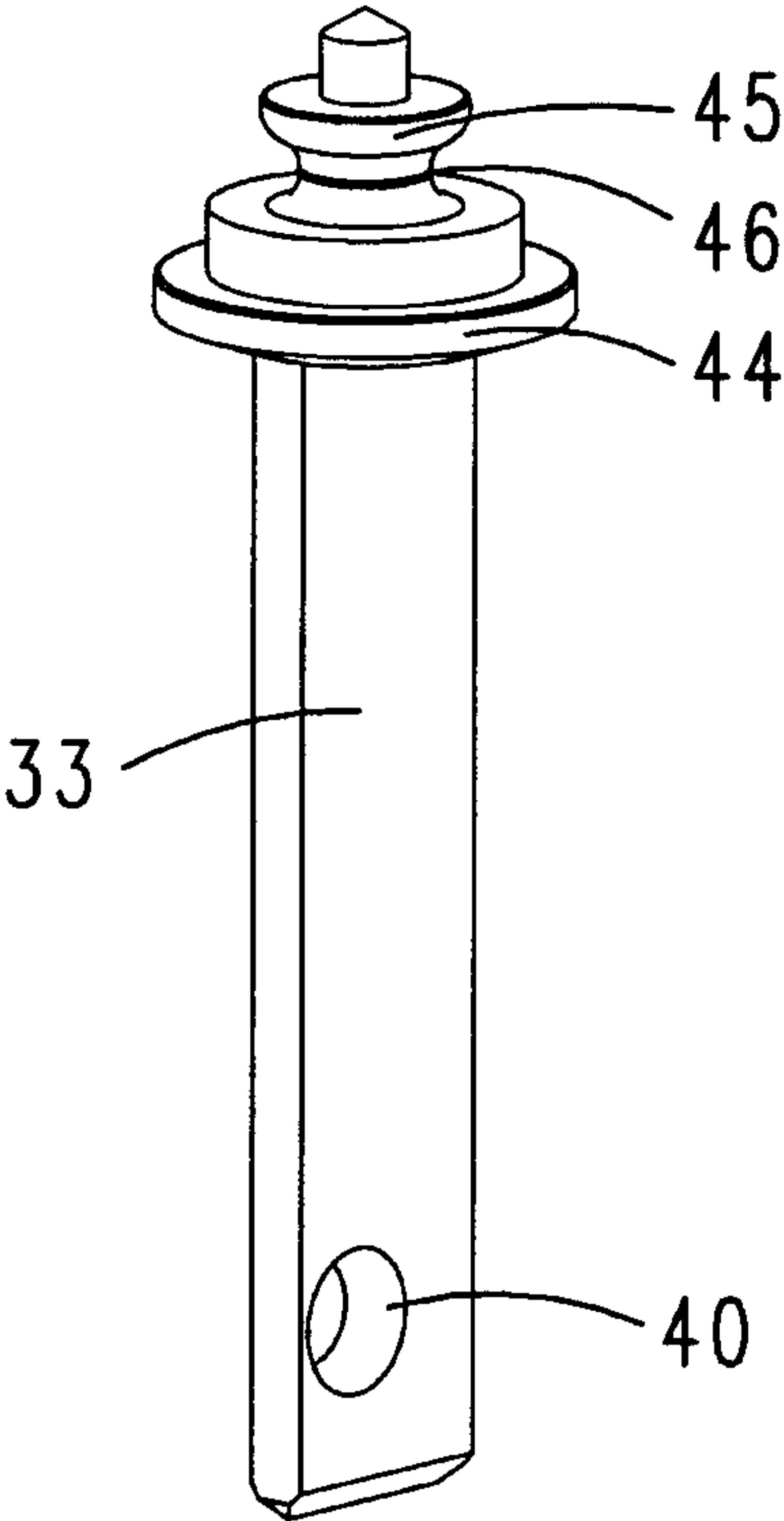


Fig. 24

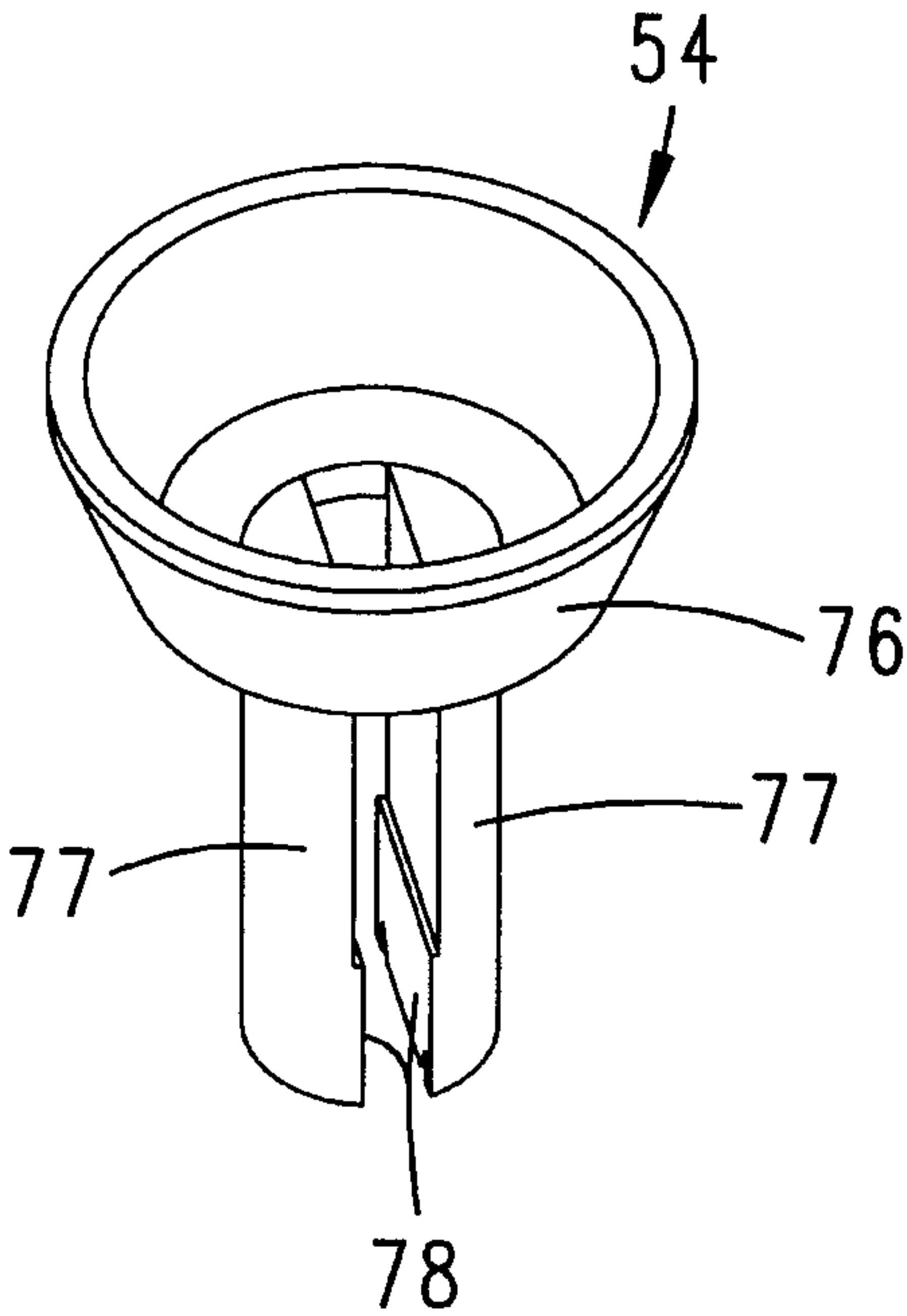


Fig. 25

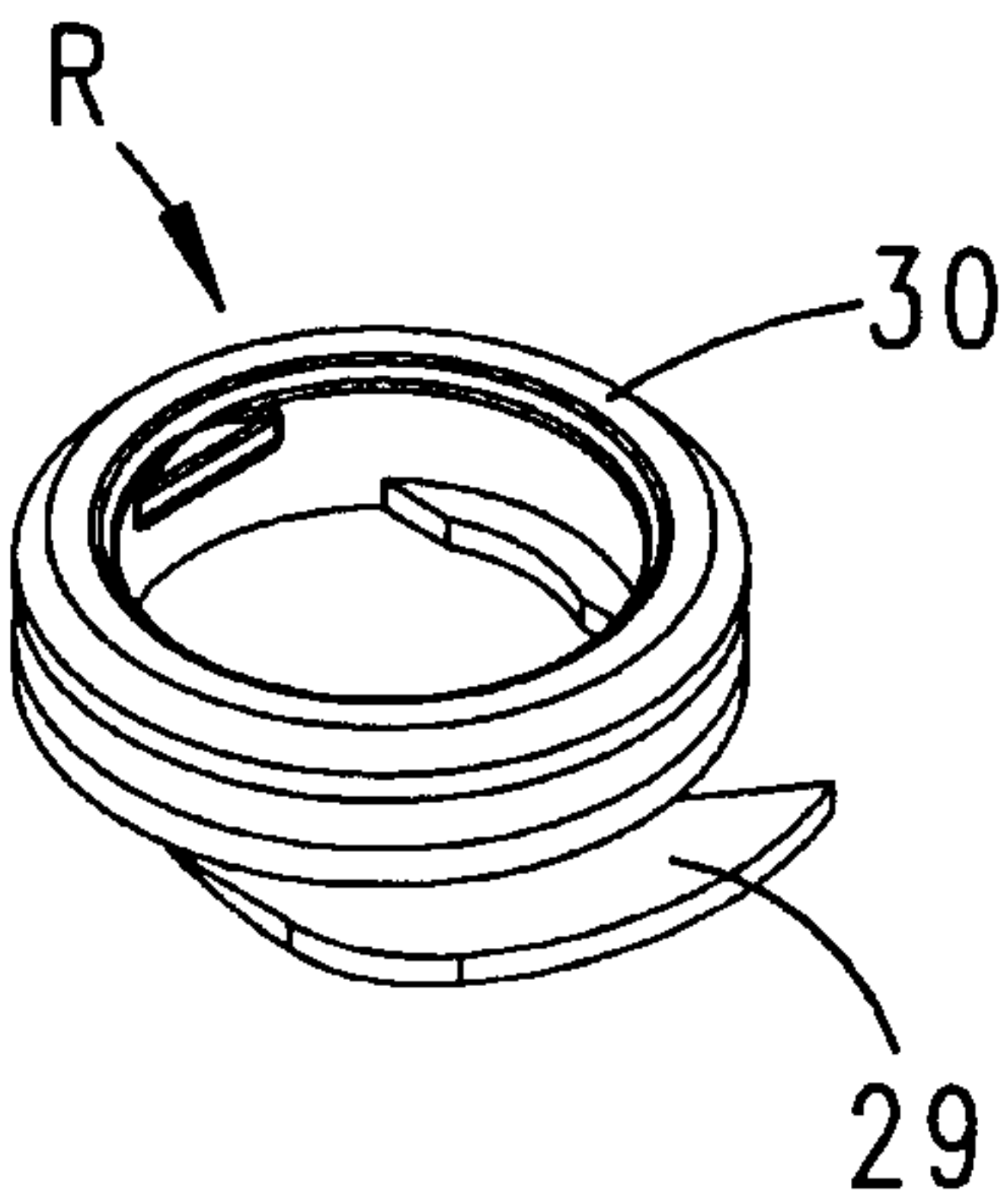


Fig. 26

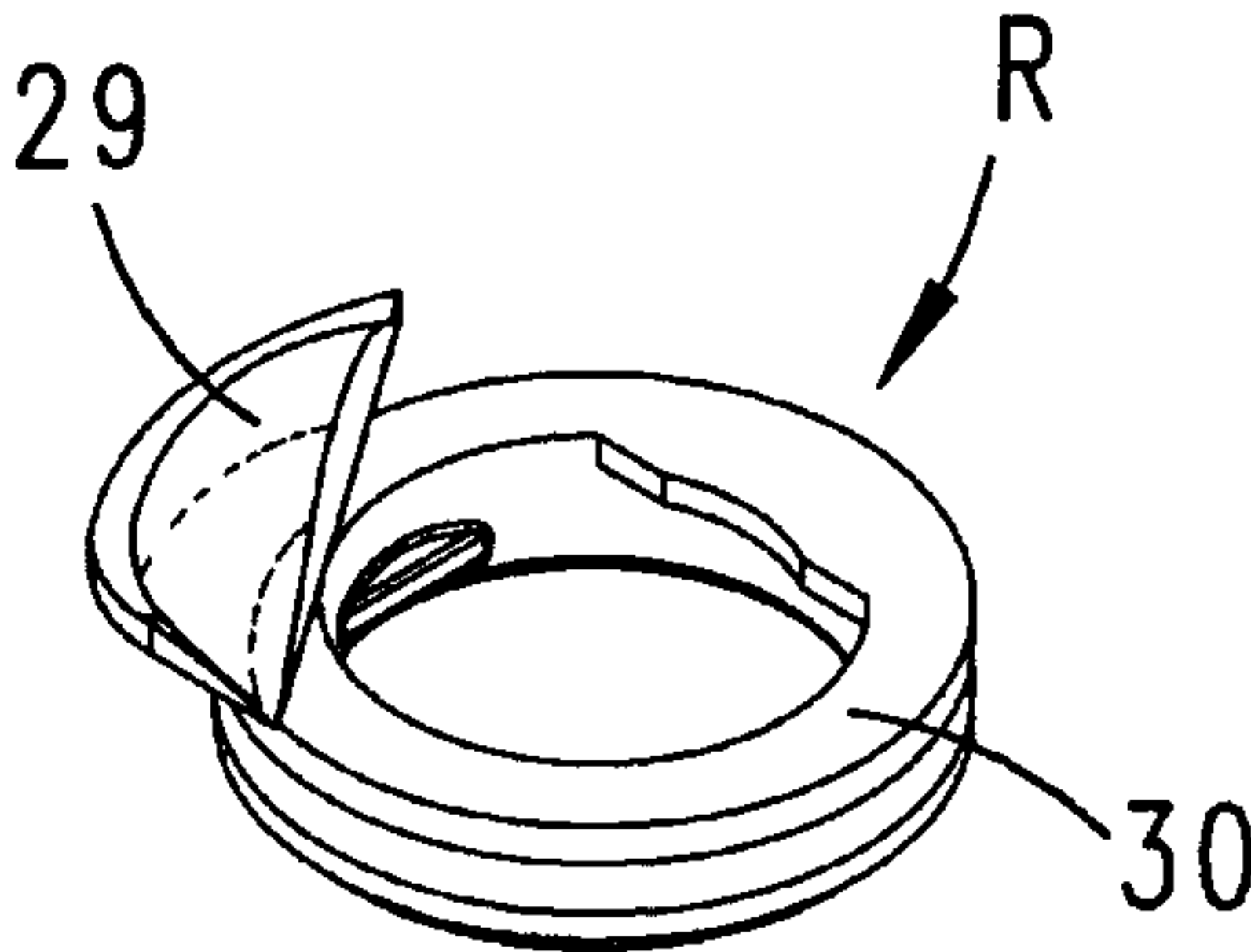
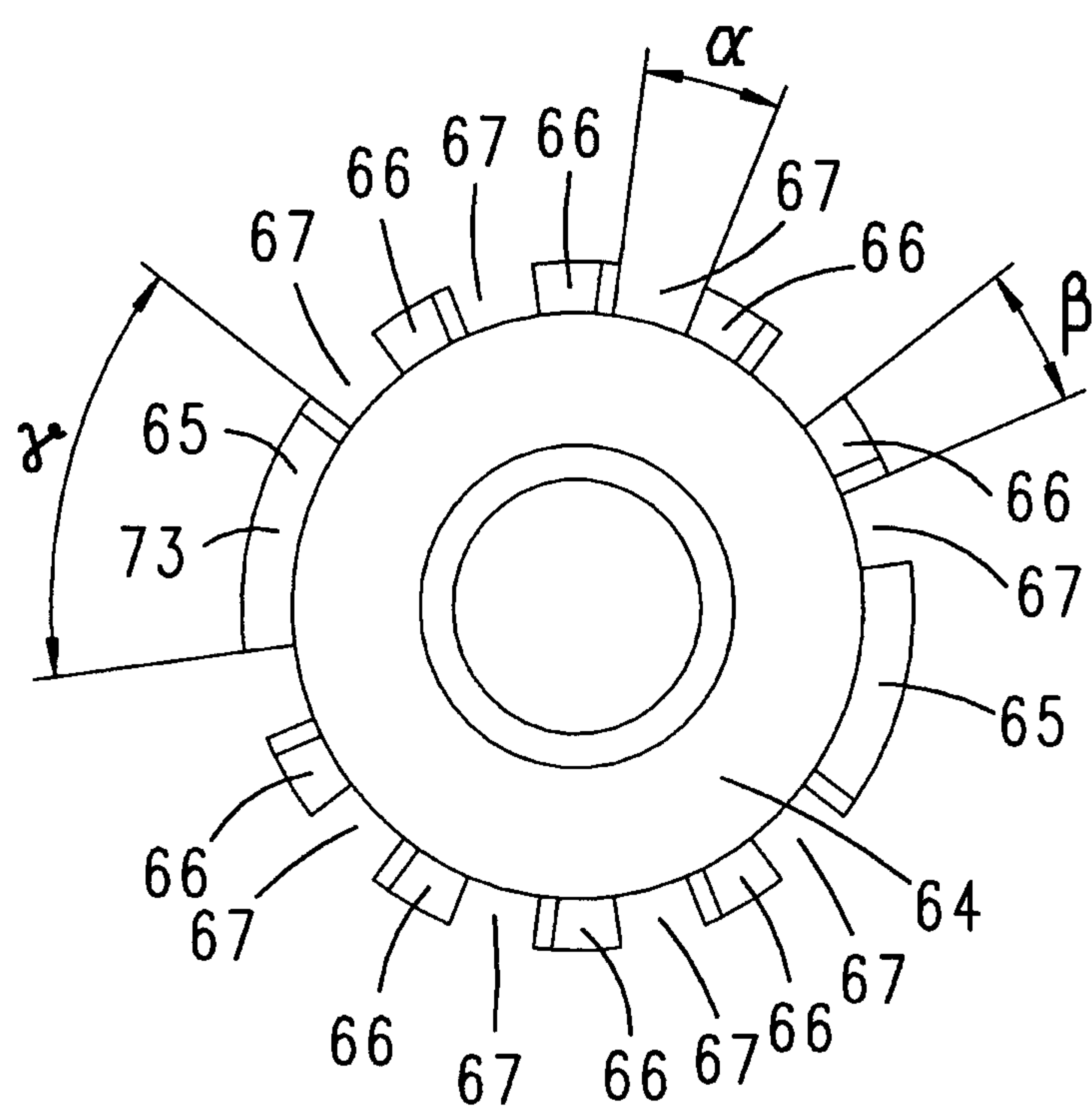
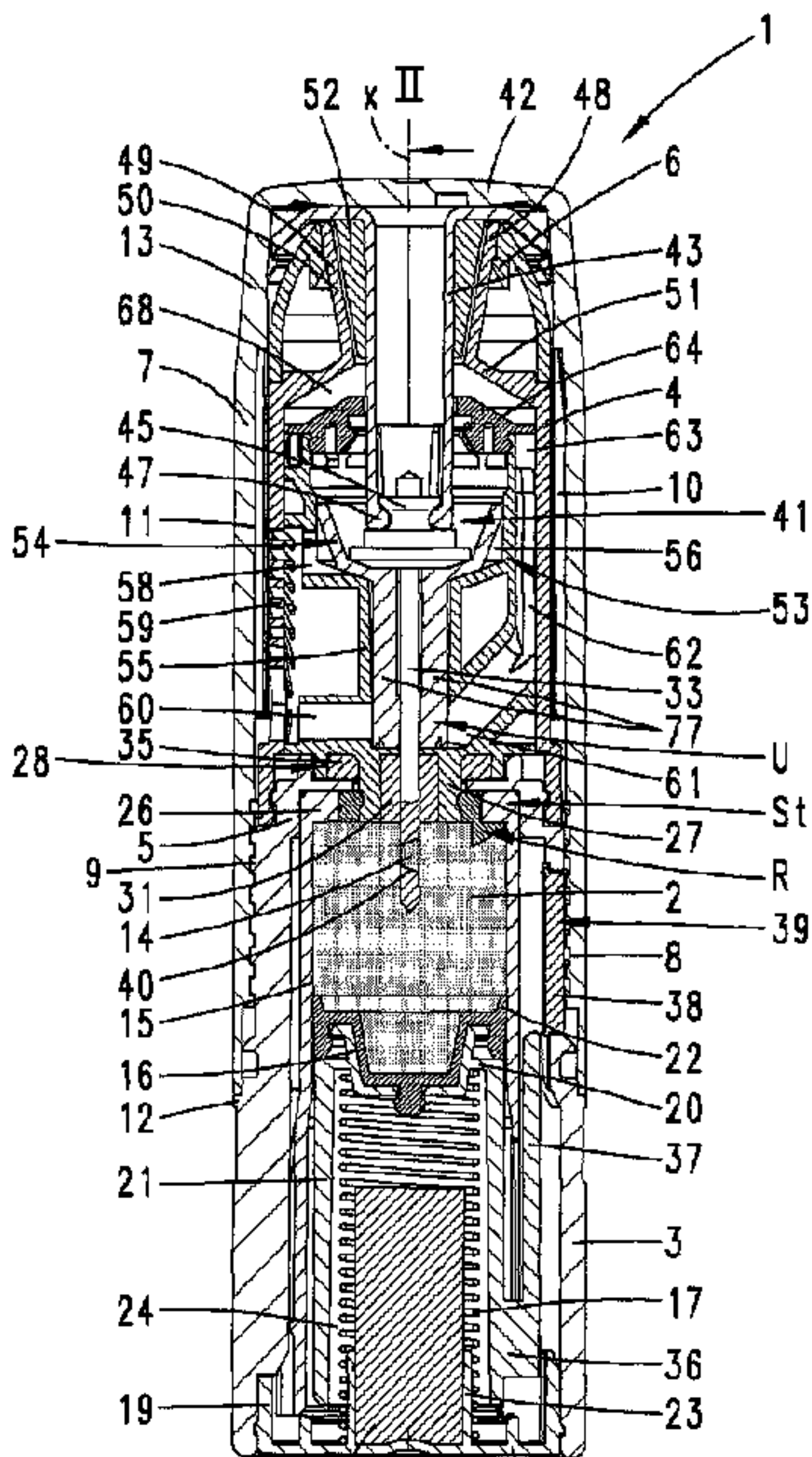


Fig. 27





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