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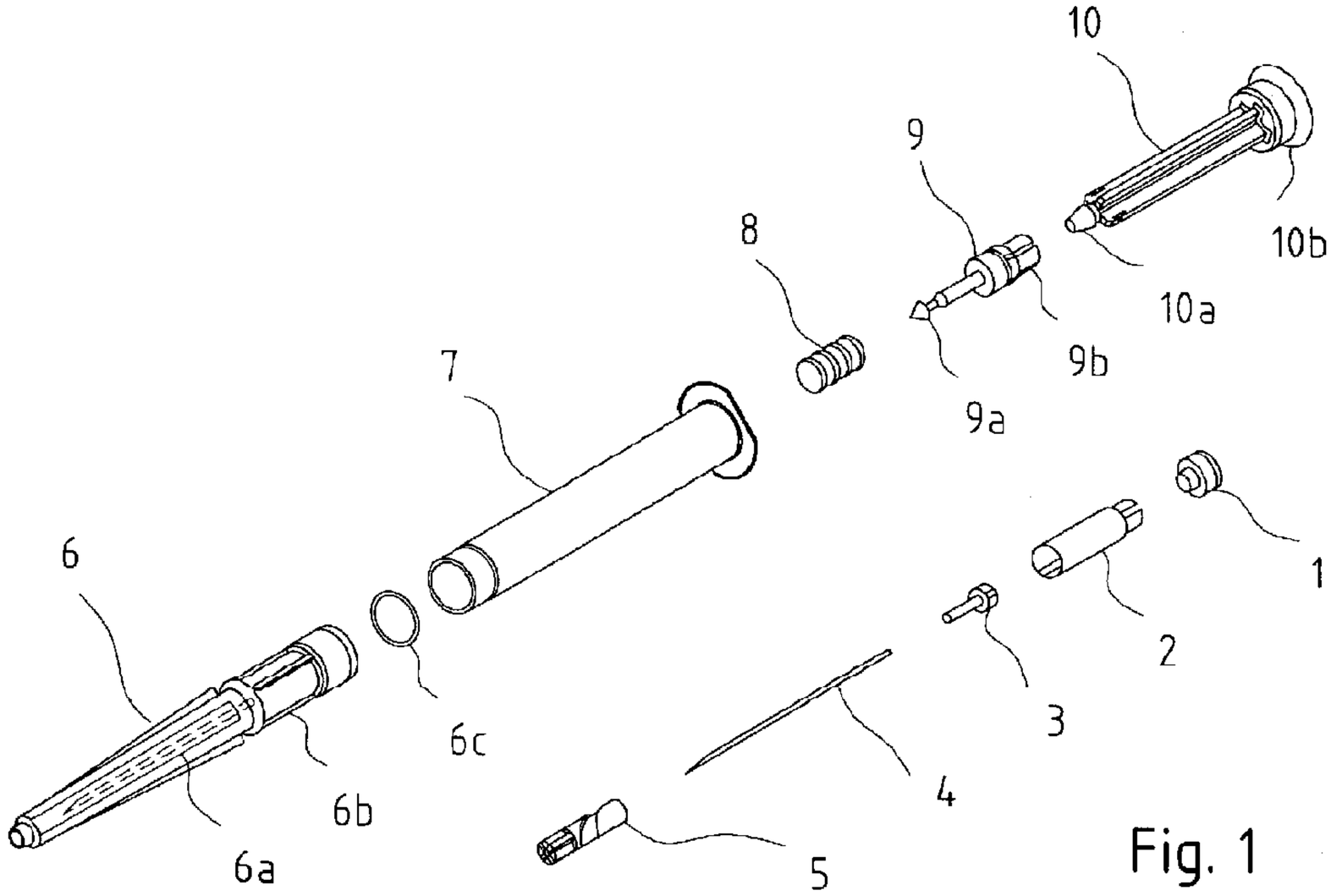

Fig. 1

(57) Abrégé/Abstract:
An injection syringe, comprising a syringe cylinder, a plunger rod that is inserted therein and connected to a stopper by way of a coupling part, and a module that is provided in the proximal end of the syringe cylinder and comprises a cannula (4), which is mounted in a cannula holder (3) received in a guiding sleeve, and further a sealing insert (1) for the fluid-tight closure of the proximal end of the syringe cylinder and a protective cap for protecting the cannula (4), wherein the protective cap on the inner circumference has ribs extending in the axial direction, which engage in corresponding grooves of the driving part (5) for a rotary drive thereof, and wherein in the sealing insert (1) a hollow space is formed, which is closed on the proximal side and on the distal side transitions into an opening, by way of which a tip of the coupling part can be coupled to the hollow space.

ABSTRACT

An injection syringe, comprising a syringe cylinder, a plunger rod that is inserted therein and connected to a stopper by way of a coupling part, and a module that is provided in the proximal end of the syringe cylinder and comprises a cannula (4), which is mounted in a cannula holder (3) received in a guiding sleeve, and further a sealing insert (1) for the fluid-tight closure of the proximal end of the syringe cylinder and a protective cap for protecting the cannula (4), wherein the protective cap on the inner circumference has ribs extending in the axial direction, which engage in corresponding grooves of the driving part (5) for a rotary drive thereof, and wherein in the sealing insert (1) a hollow space is formed, which is closed on the proximal side and on the distal side transitions into an opening, by way of which a tip of the coupling part can be coupled to the hollow space.

Injection syringe

The invention relates to an injection syringe comprising a syringe cylinder, a plunger rod that is inserted therein and connected to a stopper by way of a coupling part, and a module that is provided in the proximal end of the syringe cylinder and comprises a cannula, which is mounted in a cannula holder received in a guiding sleeve, and further a sealing insert for the fluid-tight closure of the proximal end of the syringe cylinder and a protective cap for protecting the cannula, wherein the protective cap has on the inner circumference ribs extending in the axial direction, which engage in corresponding grooves of the guiding sleeve for a rotary drive thereof.

In the present description, the directions "proximal" and "distal" are defined as viewed from the side of the patient. An injection syringe with an originality closure, that is to say with a protective cap which can be removed only by rotating and connects the cannula to the syringe cylinder by the rotating, is known from WO 03/057289 Al. A disadvantage of this construction is that after the syringe has been used, the cannula is unprotected, which on the one hand means a risk of injury and on the other hand causes the unwanted dispersal of residues of the medicament out of the syringe cylinder. WO 2007/112470 Al discloses an injection syringe comprising a syringe head which can be displaced into the syringe cylinder. Immediately after the syringe has been used, the plunger rod couples to the syringe head and allows this to be drawn into the syringe cylinder. The disadvantage of this design is that the cannula, which is firmly connected to the syringe cylinder, is provided only with a conventional protective cap. Unintentional jolts on the plunger rod of the syringe before its use can lead to the medicament entering into the cannula and emerging from it in an uncontrolled manner.

Injection syringes are also known which either are provided with an originality closure or have syringe heads which can be guided into the syringe cylinder after the injection by withdrawing the plunger rod. A combination of the known constructions is not possible. WO 1997 49444 A and WO 1996 03171 disclose originality closures which are mounted on syringe cylinders which become slimmer at the proximal end both in outer circumference and on the inner circumference and thus form a channel for liquid.

DE 29 821 609 Ul discloses an injection syringe comprising a syringe head which can be drawn into the syringe cylinder. Providing this head with a known originality closure cannot lead to a solution, because the syringe head insert with a cannula described there could be connected to the syringe cylinder neither in a manner stable to tilting nor in a rotation-proof manner and therefore could not ensure safe handling. WO 1991 00092 Al and EP 1 514 566 Al disclose means for coupling the plunger rod and syringe head with the cannula. These syringe heads do not have originality closures, because essential parts of them are made of a sealing material to which no parts of an originality closure can be connected. US 2005 0 277 880 Al and US 5 256 151 disclose syringe heads which can be coupled, of which the means for holding the cannula are too complex to be supplemented with an originality closure. US 5 078 698 discloses an injection syringe with retractable protective claws which release the cannula. Syringes of this type have the disadvantage that the cannula is permanently connected to the syringe cylinder and cannot be covered again sufficiently tightly by the claws after the injection.

The object of the present invention is to avoid the disadvantages of injection syringes without an originality closure and injection syringes without a syringe head which can be drawn into the syringe cylinder, and to provide an injection syringe of the type described in the introduction which both connects the cannula and the syringe cylinder to one another only on removal of the protective cap, and renders it possible to displace the syringe head together with the cannula into the cylinder after use. The invention is distinguished in that in the sealing insert a hollow space is formed, which is closed on the proximal side and on the distal side transitions into an opening, by way of which a tip of the coupling part can be coupled to the hollow space.

The sealing insert is constructed such that it both has a hollow space by way of which it can be coupled to the plunger rod and thus can be displaced into the syringe cylinder, and is closed by a wall on its proximal side. This wall ensures the sealing of the syringe cylinder until the injection syringe is used. To use the injection syringe, the wall is punctured with the distal end of the cannula, as a result of which the required connection between the volume of the syringe cylinder and the cannula is established. When the injection is completed, the cylinder stopper and the sealing insert couple to one another. On withdrawal of the cylinder stopper by way of the plunger rod, the sealing insert and the guiding sleeve firmly connected to it are moved into the syringe cylinder. The guiding sleeve thereby takes with it the module

of cannula, cannula holder and driving part. By this construction, the injection syringe described requires fewer components and is therefore simpler to produce and safer to handle than an injection syringe which, for example according to US 6 613 016 B1, is connected to an originality closure according to, for example, WO 1997 49444 A.

A preferred embodiment of the invention is distinguished in that the sealing insert is constructed at the proximal end of the syringe cylinder such that the guiding sleeve can be inserted firmly into the sealing insert, for example by way of a coaxial, annular coupling. Furthermore, in the sealing insert a hollow space is formed, which is open towards the inside of the syringe cylinder, so that the tip of the plunger rod can engage in the hollow space after the injection operation. The sealing insert is closed on the proximal side, the wall to the hollow space of the sealing insert being constructed as a membrane, so that on the one hand the inside of the syringe cylinder is closed tight, and on the other hand the pointed distal end of the cannula can puncture this membrane. The one-piece construction of the sealing insert with these properties renders possible a short design of the syringe head and is inexpensive and safe.

The cannula is held axially symmetrically by a cannula holder inserted in the guiding sleeve such that it can be displaced by sliding axially in a straight line. Before operation of the originality closure, by way of which the protective cap is rotated and the cannula holder together with the cannula is moved in the direction of the sealing insert, the distal end of the cannula ends before this sealing insert. In order to puncture the membrane of the sealing insert during this operation, the distal end of the cannula is sharpened by way of an angled cut, for example by a method with anticoring.

In an alternative embodiment, a filter attachment and a filter between the cannula and the filter attachment are arranged at the distal end of the cannula, the filter being held over the opening of the cannula and/or the opening of the cannula holder by way of the filter attachment. The distal side of the filter attachment has an angled cut in order to puncture the sealing insert.

It advantageous if the outer circumference of the guiding sleeve is equal to the inner circumference of the proximal end of the syringe cylinder or the inner circumference of the

distal end of the protective cap or both, since the guiding sleeve is then held axially symmetrically in a tilt-proof manner.

The essentially tubular protective cap has a radial predetermined breaking point which breaks when the protective cap is rotated, so that the outer section of the protective cap can be removed and the inner section remains firmly connected to the syringe cylinder. The firm connection of the distal section of the protective cap to the syringe cylinder is rendered possible by this section being pushed over a substantial part of its length over the syringe cylinder and, for example, lying against it with a positive fit and/or being latched by way of a corresponding annular bead on the syringe cylinder.

In order to connect the syringe cylinder quickly and easily to the protective cap in the production process and at the same time to effect a tight connection between the two, the distal section of the protective cap has an annular grove on the inside, in which a sealing ring is arranged.

In order to be able to withdraw the cannula completely into the syringe cylinder after the injection operation, the module of the of the injection head, minus the dimension from the proximal end of the syringe cylinder to the distal front face of the sealing insert, is, in the axial direction, shorter than or equal to the stroke of the plunger rod.

So that the tip of the coupling part can be inserted into the cylinder stopper and can puncture it during operation of the syringe, the cylinder stopper has a pocket hole, the base of which is thin.

Since the coupling part is to release the plunger rod after the module of the syringe head has been withdrawn into the syringe cylinder, the distal end of the coupling part transitions into holding claws, in which the plunger rod can be engaged and uncoupled by way of a coupling head.

The syringe cylinder has at the distal end an annular bead on the inside, so that the coupling part strikes against this when the plunger rod is withdrawn, and when pulled further the plunger rod uncouples from the coupling part.

For final closing of the syringe cylinder with the cannula inside, the distal end of the plunger rod is constructed as an end sleeve, the internal diameter of which corresponds to the external diameter of the proximal end of the section of the protective cap firmly connected to the syringe cylinder. In this manner, the uncoupled plunger rod serves as a plug for the syringe cylinder.

The invention is explained in more detail in the following with the aid of an example shown in the drawings. In these: Fig. 1 shows an illustration of the individual parts of the injection syringe, Fig. 2 shows a longitudinal section through the syringe head, Fig. 3 shows a longitudinal section through the entire syringe before use, Fig. 4 shows a longitudinal section through the entire syringe after connection of the cannula to the syringe cylinder, Fig. 5 shows a longitudinal section through the entire syringe after removal of the protective cap, Fig. 6 shows a longitudinal section through the entire syringe with the cylinder stopper punctured, Fig. 7 shows a longitudinal section through the entire syringe after the injection, Fig. 8 shows a longitudinal section through the entire syringe after drawing in the cannula, Fig. 9 shows a longitudinal section through the entire syringe after closing the syringe cylinder, and Fig. 10 shows a longitudinal section through the syringe head.

According to Fig. 1, the injection syringe has a syringe cylinder 7, on the proximal end of which is arranged a module of a sealing insert 1, a guiding sleeve 2 firmly connected to this and with cannula holder 3 arranged therein such that it can be displaced by sliding, cannula 4 and driving part 5 which can be displaced by rotating. The proximal end of the assembled syringe is closed with a protective cap 6 mounted on the syringe cylinder 7 such that it provides a seal by way of a sealing ring 6c. At the distal end of the syringe cylinder 7 is arranged a module of a cylinder stopper 8 and coupling part 9 inserted therein and plunger rod 10.

Fig. 3 shows the assembled and drawn out syringe, which contains a liquid medicament 11 in the syringe cylinder 7. The protective cap 6 has not yet moved and the cannula 4 is not yet connected to the syringe cylinder. The coupling part 9 is inserted into a pocket hole 8a which has a base 8b.

In Fig. 4, a proximal section 6a of the protective cap 6 is rotated, as a result of which its connection to a distal section 6b of the protective cap is broken, and the cannula 4 is moved

in a straight line by way of the cannula holder 3 and the driving part 5 towards the sealing insert 1 and punctures this without generating particles. After removal of the proximal section 6a of the protective cap 6, as shown in Fig. 5, the injection syringe is ready for use. According to Fig. 6, when the plunger rod 10 is pressed on, the tip 9a of the coupling part 9 punctures the base 8a of the cylinder stopper 8, again without generating particles. The cylinder stopper 8 then moves in the direction of the sealing insert 1, as a result of which the medicament emerges from the injection syringe through the cannula 4.

Fig. 7 shows the injection syringe after the injection. The cylinder stopper 8 is mounted on the sealing insert 1, and the tip 9a of the coupling part 9 engages in the sealing insert 1. Fig. 2 shows that, for this purpose, the sealing insert has a hollow space 1a, which has on its distal end an opening 1b, the diameter of which is smaller than the diameter of the hollow space 1a.

Fig. 8 shows how the module of the syringe head is drawn into the syringe cylinder 7. The plunger rod 10 is pulled and the coupling part 9, together with the sealing insert 1 and the guiding sleeve 2 firmly connected to this, moves into the chamber of the syringe cylinder 7. As a result, the cannula holder 3 with the cannula 4 and the driving part 5 are also guided into the syringe cylinder 7. The connection between the sealing insert 1 and guiding sleeve 2 is achieved, as shown in Fig. 2, by the two being inserted into one another and firmly coupled in by way of a coaxial annular groove. Fig. 8 furthermore shows that the coupling part 9 is mounted on an annular bead 12 during withdrawal, so that, when pulled further, the plunger rod 10 uncouples from the coupling part 9.

Fig. 9 shows that the plunger rod 10 can be mounted on the proximal opening of the syringe cylinder 7, which is formed, for example, by the distal section 6b of the protective cap 6, and closes this.

According to Fig. 10, in an alternative embodiment the distal end of the cannula 4 can have a straight cut instead of an angled cut, the tip which punctures the sealing insert 1 being provided by a filter attachment 13 which holds a filter 14 at the distal end of the module of cannula 4 and cannula holder 3. This alternative embodiment has the advantage of having a particle filter downstream of all components where particles can enter into the medicament during preparation and during the injection.

Claims:

1. Injection syringe comprising a syringe cylinder (7), a plunger rod (10) that is inserted therein and connected to a stopper (8) by way of a coupling part (9), and a module that is provided in the proximal end of the syringe cylinder (7) and comprises a cannula (4), which is mounted in a cannula holder (3) received in a guiding sleeve (2), and further a sealing insert (1) for the fluid-tight closure of the proximal end of the syringe cylinder (7) and a protective cap (6) for protecting the cannula (4), wherein the protective cap has on the inner circumference ribs extending in the axial direction, which engage in corresponding grooves of the driving part (5) for a rotary drive thereof, characterised in that in the sealing insert (1) a hollow space (1a) is formed, which is closed on the proximal side and on the distal side transitions into an opening (1b), by way of which a tip (9a) of the coupling part (9) can be coupled to the hollow space (1a).

2. Injection syringe according to claim 1, characterised in that the proximal front face of the sealing insert (1) and the distal front face of the guiding sleeve (2) are constructed axially symmetrically and can be inserted firmly into one another.

3. Injection syringe according to claim 1 or 2, characterised in that the cannula (4) ends at its distal end before the closed proximal side of the sealing insert (1), and in that the distal end of the cannula (4), as is known per se, has an angled cut.

4. Injection syringe according to claim 1 or 2, characterised in that a filter attachment (13) is arranged at the distal end of the cannula (4), a filter (14) being provided between the cannula (4) and filter attachment (13) and being held by the filter attachment (13) over the opening of the cannula (4) and/or the opening of the cannula holder (3), and in that the distal side of the filter attachment (13) has an angled cut.

5. Injection syringe according to one of claims 1 to 4, characterised in that the outer circumference of the guiding sleeve (2) is equal to the inner circumference of the proximal end of the syringe cylinder (7) and/or the inner circumference of the distal end of the protective cap (6), in order to hold the guiding sleeve (2) axially symmetrically in a tilt-proof manner.

6. Injection syringe according to one of claims 1 to 5, characterised in that the protective cap (6), as is known per se, is formed by two essentially tubular sections (6a, 6b) lying one after the other, which are connected to one another by way of a predetermined breaking point.

7. Injection syringe according to claim 6, characterised in that the distal section (6b) of the protective cap (6) is pushed along a substantial part of its length over the proximal end of the syringe cylinder (7) and, as is known per se, is firmly connected to this.

8. Injection syringe according to one of claims 6 or 7, characterised in that the distal section (6b) of the protective cap (6) has an annular groove on the inside, in which a sealing ring (6c) is arranged by way of which a tight connection can be established between the distal section (6b) of the protective cap (6) and proximal end of the syringe cylinder (7).

9. Injection syringe according to one of claims 1 to 8, characterised in that the module of the of the cannula (4), cannula holder (3), driving part (5), guiding sleeve (2) and sealing insert (1) inserted into one another, minus the dimension from the proximal end of the syringe cylinder (7) to the distal front face of the sealing insert (1), is shorter than or equal to the stroke of the plunger rod (10) in the axial direction.

10. Injection syringe according to one of claims 1 to 9, characterised in that the coupling part (9), as is known per se, is inserted by means of the tip (9a) into a cylinder stopper (8), the cylinder stopper (8) having a corresponding pocket hole (8a), the base (8b) of which can be punctured by the tip (9a).

11. Injection syringe according to one of claims 1 to 10, characterised in that the coupling part (9) transitions at the distal end, as is known per se, into holding claws (9b), in which a coupling head (10a) of the plunger rod (10) is engaged.

12. Injection syringe according to one of claims 1 to 11, characterised in that the syringe cylinder (7), as is known *per se*, has an annular bead (12) on the inside.

13. Injection syringe according to one of claims 1 to 12, characterised in that the distal end of the plunger rod (10), as is known per se, has an end sleeve (10b), the internal

diameter of which corresponds to the external diameter of the proximal end of the section (6b) of the protective cap (6) firmly connected to the syringe cylinder (7).

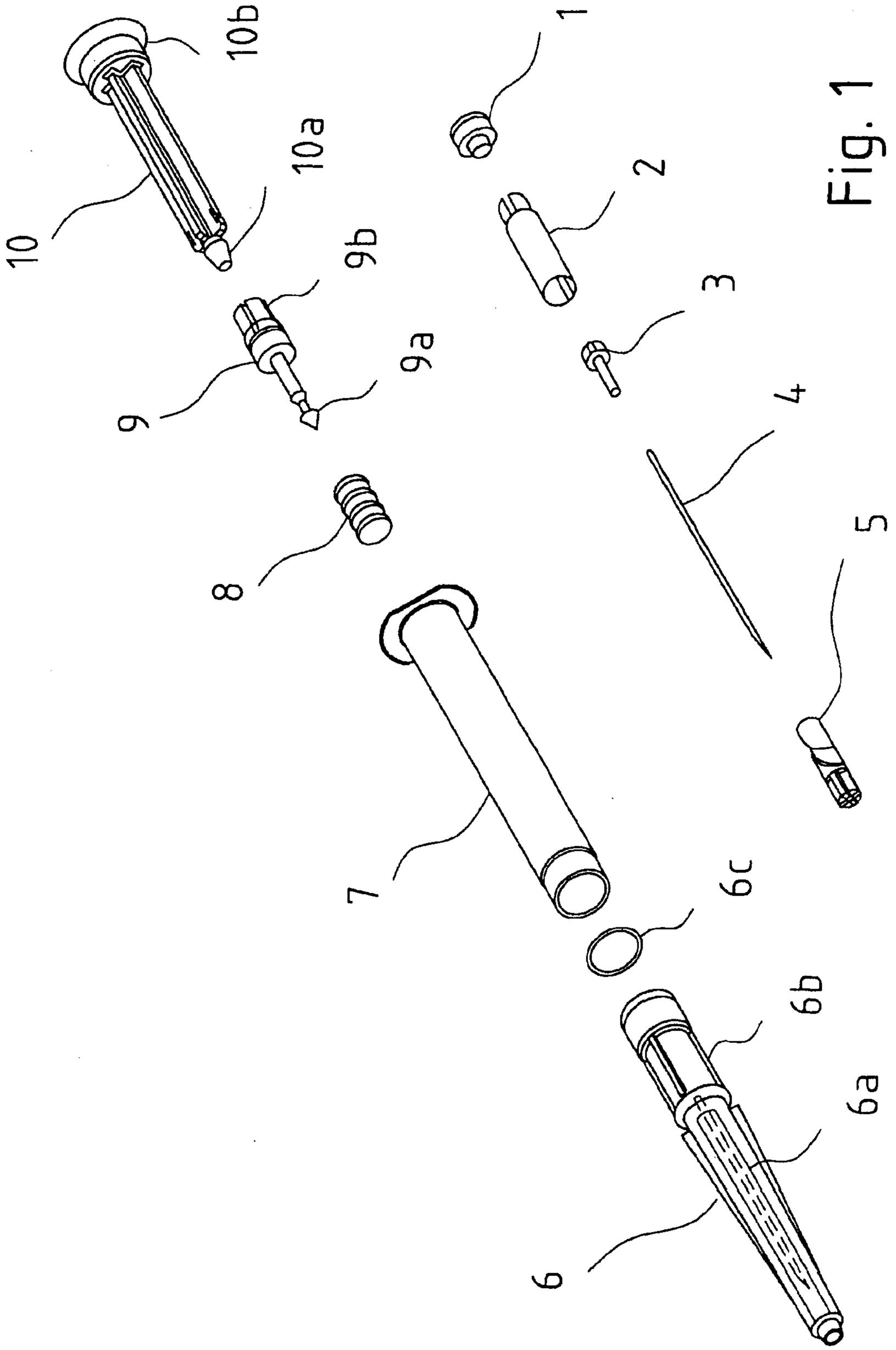

Fig. 1

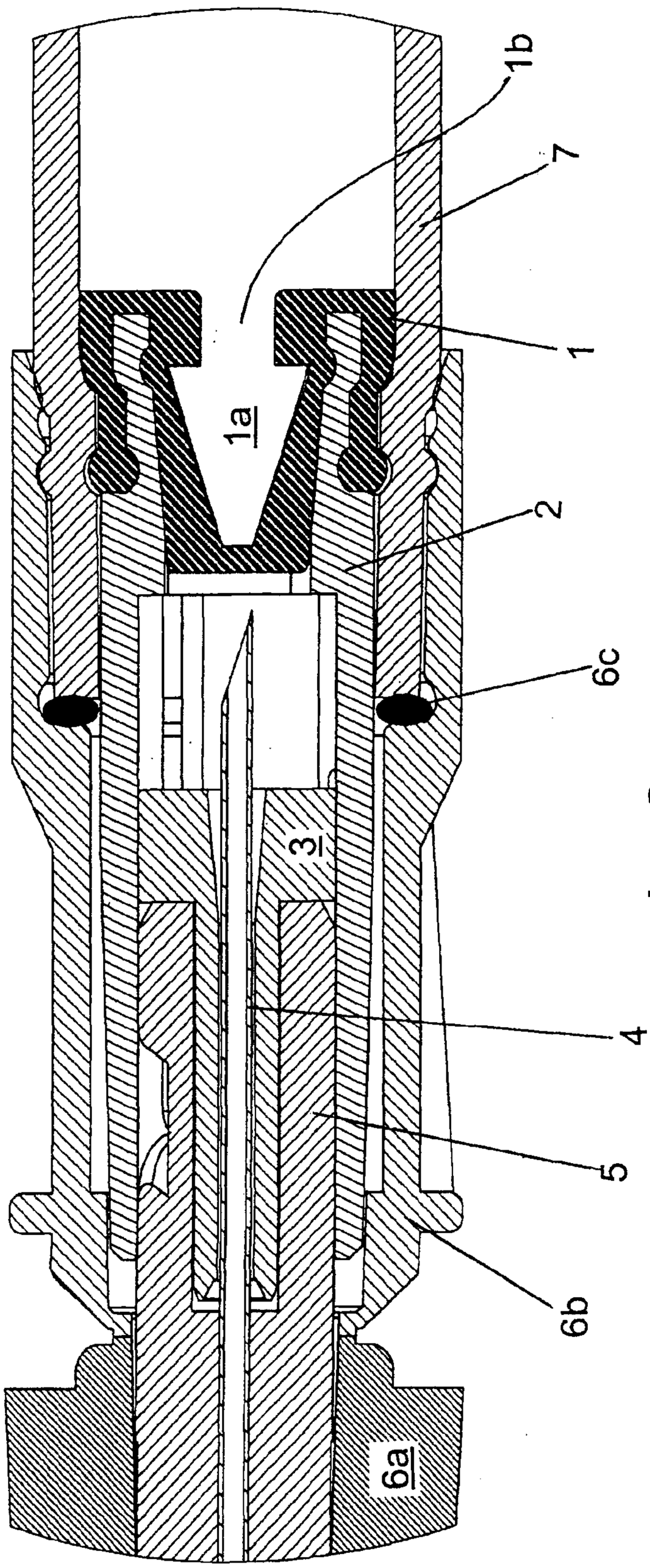

Fig. 2

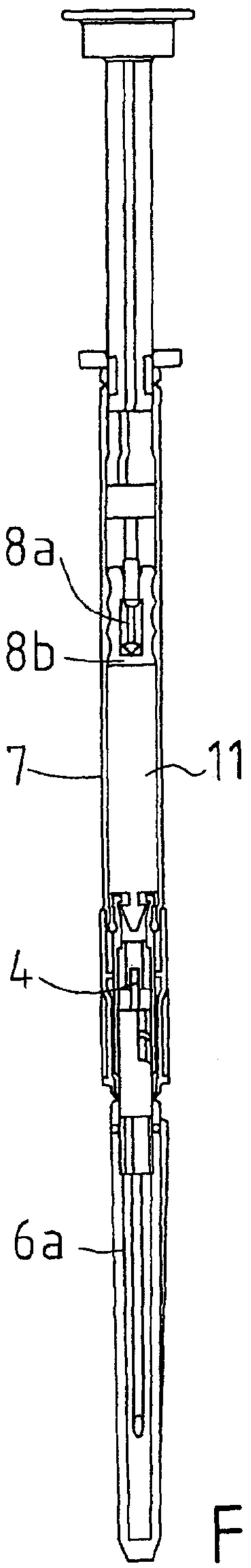

Fig. 3

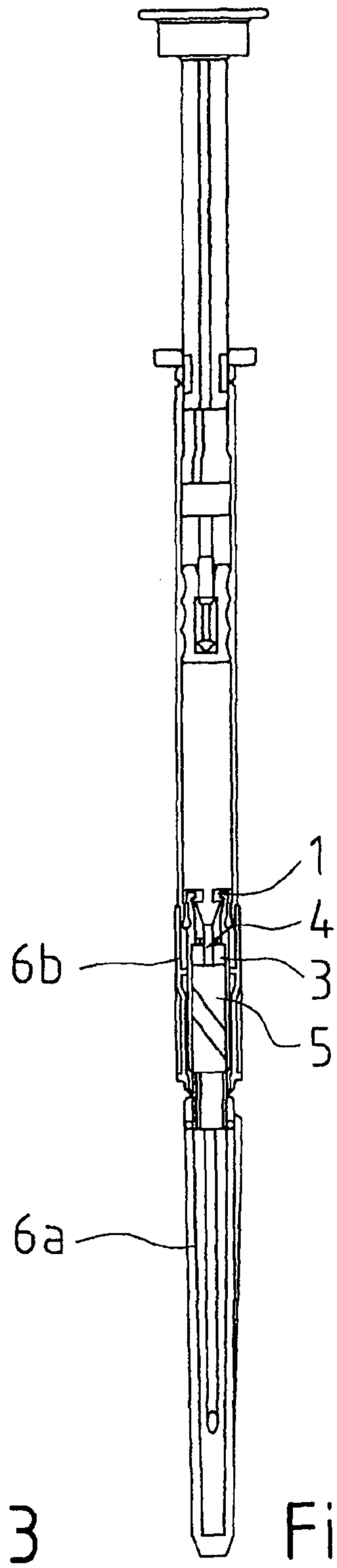

Fig. 4

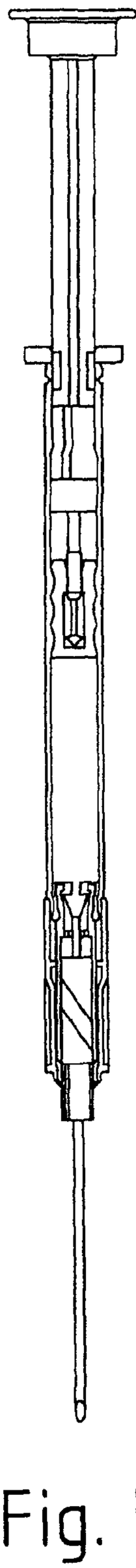

Fig. 5

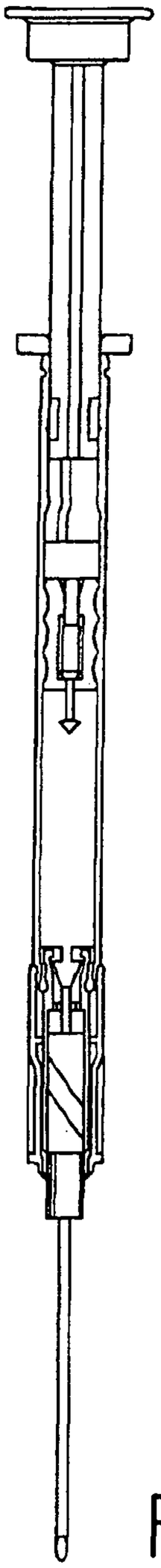

Fig. 6

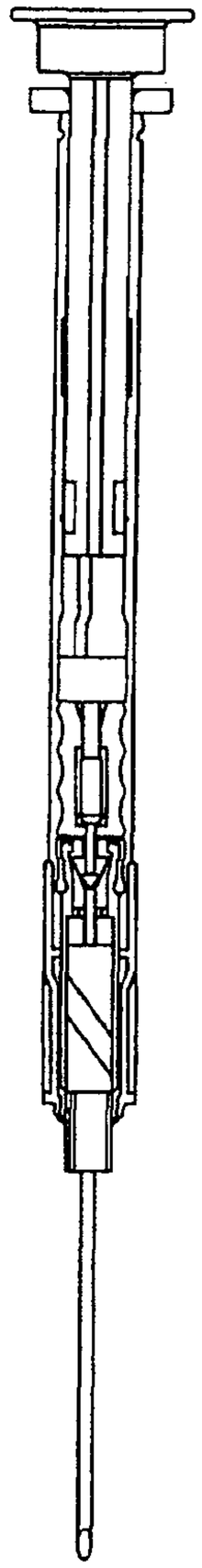

Fig. 7

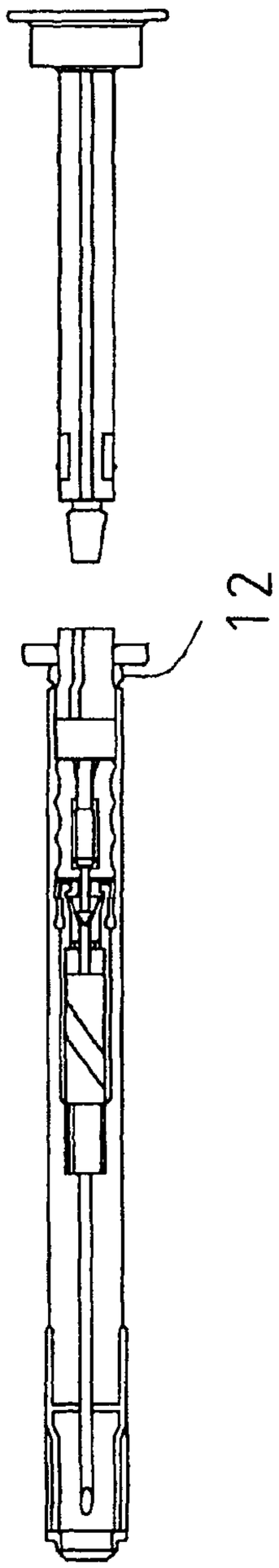

Fig. 8

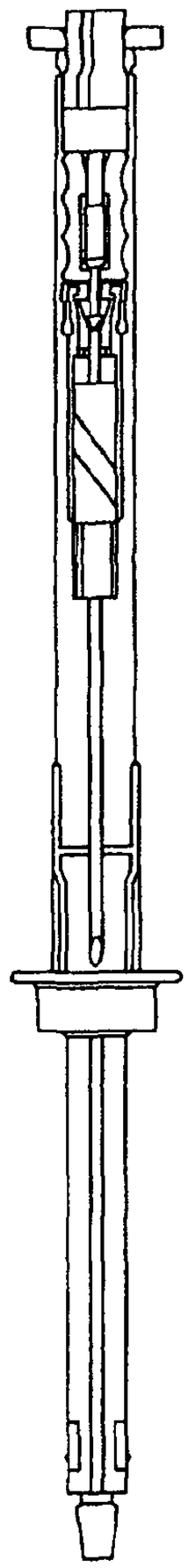

Fig. 9

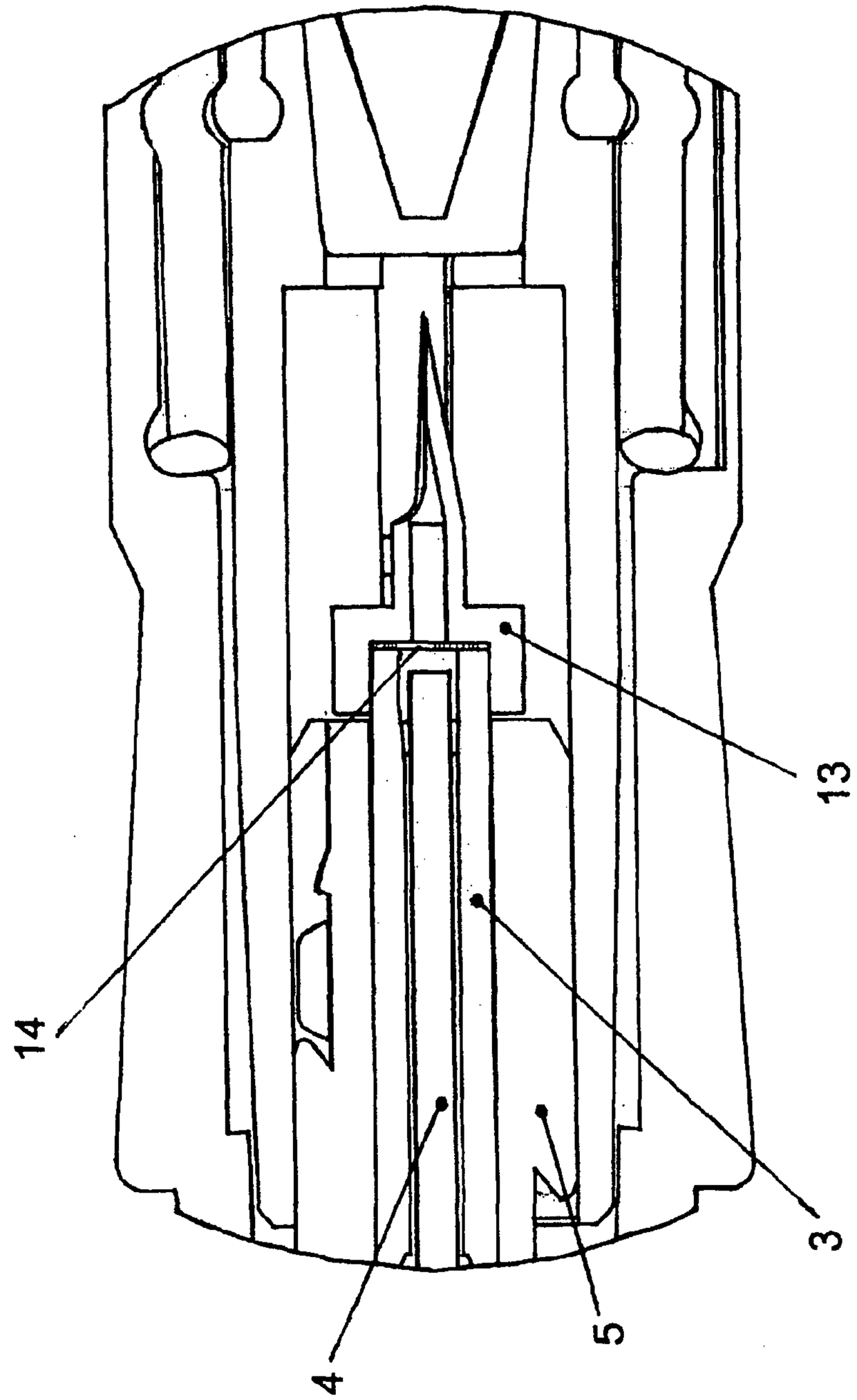

Fig. 10

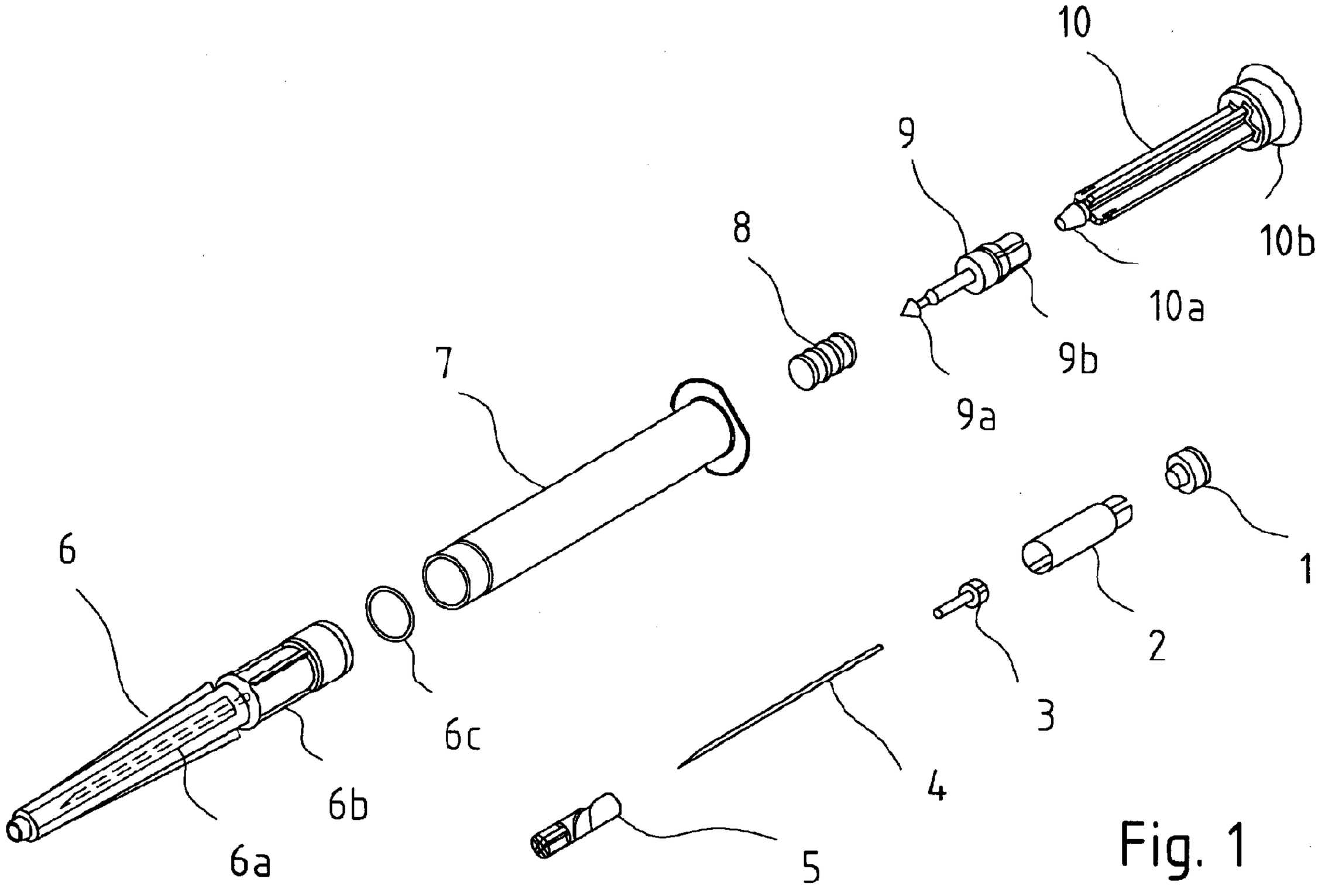

Fig. 1