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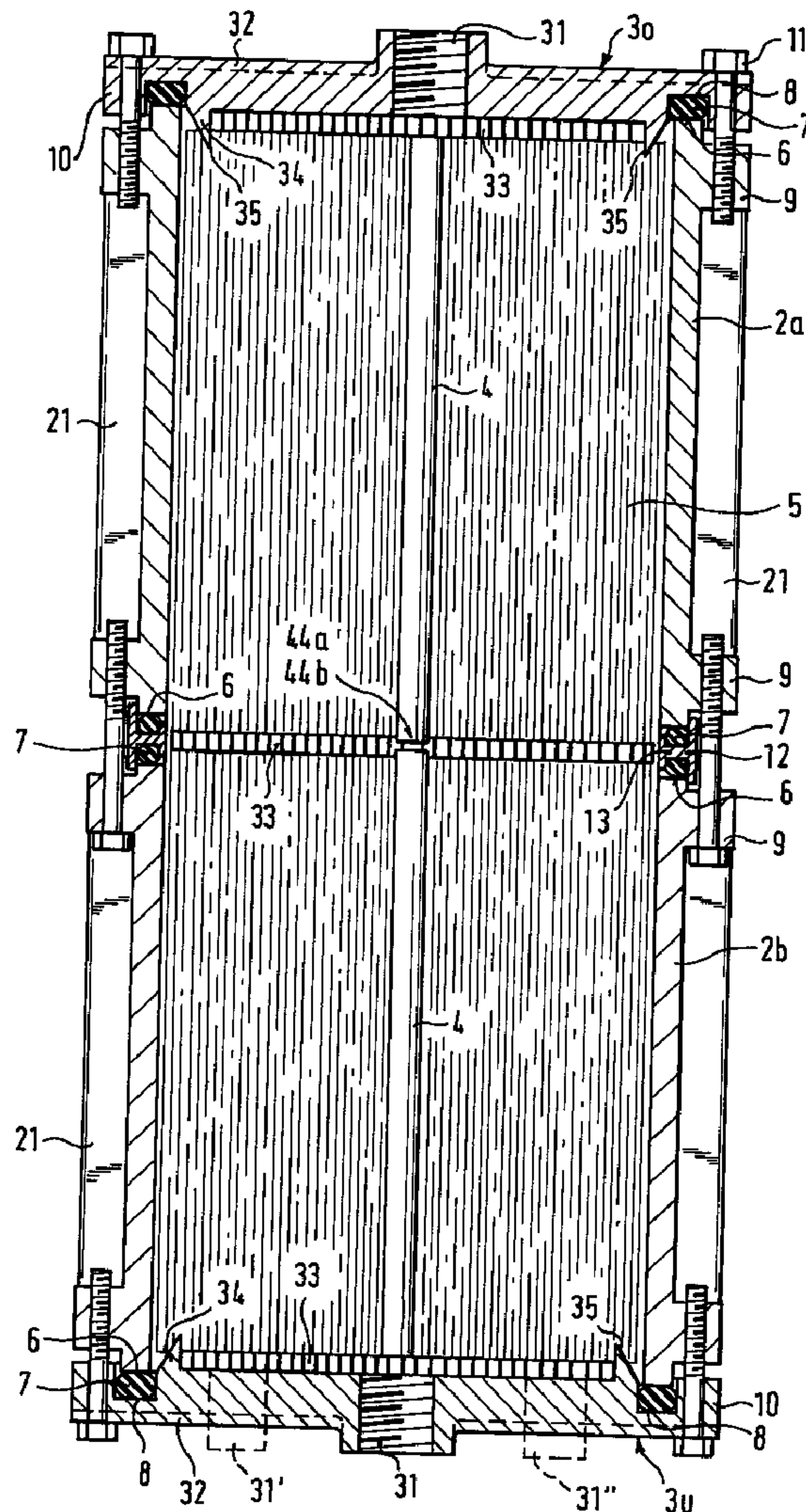
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(54) **FILTRE A HUILE POUR MOTEURS A COMBUSTION INTERNE**

(54) **AN OIL FILTER FOR INTERNAL COMBUSTION ENGINES**



(57) The present invention relates to an oil filter (1) for internal combustion engines, which is preferably used in a secondary oil circuit in addition to a conventional oil filter. The oil filter comprises a filter housing (2a, 2b, 3o, 3u) in which a filter element (5) that consists of a roll of absorbant paper that is wound about a rod (4) is installed. In order to simplify production and inventory management, the present invention proposes that the oil filter be configured as a set of elements that comprises the body sections (2a, 2b) and caps (3o, 3u) and a rod (4) with the rolled filter element (5). The volume of the oil filter can be matched to a particular application by connecting a plurality of body sections (2a, 2b) with an appropriate number of rods (4).



ABSTRACT

The present invention relates to an oil filter (1) for internal combustion engines, which is preferably used in a secondary oil circuit in addition to a conventional oil filter. The oil filter comprises a filter housing (2a, 2b, 3o, 3u) in which a filter element (5) that consists of a roll of absorbant paper that is wound about a rod (4) is installed. In order to simplify production and inventory management, the present invention proposes that the oil filter be configured as a set of elements that comprises the body sections (2a, 2b) and caps (3o, 3u) and a rod (4) with the rolled filter element (5). The volume of the oil filter can be matched to a particular application by connecting a plurality of body sections (2a, 2b) with an appropriate number of rods (4).

Figure 1.

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The present invention relates to an oil filter for internal combustion engines, as set out in the defining portion of patent claim 1.

Internal combustion engines are fitted with oil filters that are normally flange-mounted onto the crank case of the engine. Such oil filters remove only some of the contaminants that are contained in the oil that circulates within the engine.

DE-PS 1 051 062 describes an oil filter in which the filter element is a roll of absorbant paper, e.g., toilet paper, that is installed on a central rod. Such oil filters act as fine filters and, in addition, can be arranged in a secondary path of the engine oil lubrication system, i.e., they can be used in addition to existing oil filters. This provides for significantly improved filtering action. Because of this fine filtering action, for all practical purposes, it is unnecessary to change the engine oil, and all that needs to be done is to replace the oil that has actually been used.

The principle underlying such oil filters has been widely developed. The oil flows through the paper filter element between an inlet and an outlet, in counter-flow, as in the above-mentioned patent specification or in accordance with EP-OS 262 596, or in a radial direction, as in the filters described in DE-PS 24 60 073 and DE-GM 87 00 995. Filters constructed in a

similar way are known and used for filtering fuels, and these work on the straight-through principle, so that the fuel flows through the wound-up filter element in an axial direction; see DE-OS 36 17 420.

In order to achieve almost complete fine filtering of the oil, the volume of the filter element must be matched to the total quantity of oil circulating within the engine, to the rate of flow, and to the oil pressure. The greater these values, the greater will be the volume of the filter element. For this reason, conventional oil filters have to be produced in various sizes, in order to provide a match to engines of various sizes. This makes both production and inventory management more costly.

It is the task of the present invention to describe an oil filter of simple construction that can be produced in a simple manner in various sizes.

According to the present invention, this task has been solved by the distinguishing features set out in patent claim 1.

Accordingly, the basic idea of the present invention is to provide such an oil filter as a set made up of only a few individual parts, namely, a body section, end caps, and an extensible rod that supports a rolled filter element, it being

possible to connect the body sections and the covers to form a closed filter housing.

The oil filter can operate on the straight-through principle, when the oil passes through the rolled filter element in an axial direction. In this case, the production units consist of a body section, a cover with a connector that serves as an inlet or an outlet, and an extensible rod produced, for example, from solid material, onto which the filter element is rolled. In addition, the counter-flow principle can also be used, in which the oil that is delivered to one cap first passes through the hollow rod and then through the filter element axially, in the opposite direction. In this instance, the production units are once again a wall section, one cap with an inlet and an outlet, an end cap, and a hollow rod that supports the rolled filter element. If the oil that is to be filtered is meant to flow radially through the filter element, then the hollow rod will be produced so as to incorporate the appropriate drillings.

The volume of the oil filter and the rolled filter element contained therein can be made larger very simply in that a plurality of body sections are connected to each other and a cap is used to cover off both ends. Connection of the individual parts is effected by interposing a seal that can be installed, for example, on a centering ring, possibly with the help with bolted or clamped connections. A plurality of rods with rolled

filter elements are installed in the filter housing. By this means, it is possible to influence the filter quality in that, for example, the filter elements can incorporate various pore diameters for coarse and fine filtering. To a very large extent, the danger of tracks forming [Roehrenbildung--Tr.] in the filter material has been eliminated.

10 In addition, it is also advantageous to incorporate cooling ribs in the body sections and, optionally, on the outer surfaces of the end caps, which will result in good thermal radiation and simultaneously cool the oil that passes through the oil filter.

20 In accordance with the present invention there is provided an oil filter for internal combustion engines which is composed of single parts of a kit, namely one or more identical wall portions which are each provided on their axially outer edges with a fitting surface, whereby several wall portions can be lined up axially with their opposing, corresponding fitting surfaces; two covers each having a fitting surface corresponding with the fitting surfaces of the wall portions and bearing the connections for admission and discharge of the oil; one or more filter packings each having a central core on which the filter packing is wound, whereby the cores can be lined up and interconnected by means of connecting attachments mounted on their ends, and whereby each filter packing with its core has a length corresponding substantially to the wall portion and a diameter corresponding to the inside diameter of the wall portion; sealing members to be inserted between the fitting surfaces of two parts lying

one on the other; and connecting means to be disposed in the area of the fitting surfaces for connecting wall portions with each other or covers and wall portions with each other via the fitting surfaces and the sealing members; whereby the oil filter has at least one wall portion, at least one filter packing and two covers, one filter packing being disposed in each wall portion, wall portion(s) and covers being connected by the connecting means and the seals to form a closed housing and, in the case of several lined up wall portions and packings, the cores of the latter likewise being interconnected by the connecting attachments.

Additional embodiments of the invention are described in the sub-claims.

The present invention is described in greater detail below on the basis of the embodiments shown in the drawings appended hereto. These drawings show the following:

Figure 1: a diagrammatic cross section through an oil filter according to the present invention, this consisting of two body sections, two identically configured caps, and two rods, each of which supports a rolled filter element;

Figure 2: a cross section through a body section of the oil filter as in figure 1;

Figure 3: a plan view of a cover of the oil filter as in figure 1;

Figures 4a to 4c: various configurations of rods for oil filters according to the present invention;

Figure 5: a cross section through a pressure valve for use in connectors used for oil filters according to the present invention;

Figure 6: a diagrammatic representation of an oil filter in which the body sections and the covers are connected to each other or together with the help of annular clamps;

Figure 7: a plan view of such an annular clamp;

Figure 8: a diagrammatic view of an oil filter in which the wall sections and the covers are connected to each other or together by means of bolted connections;

Figures 9a and 9b: a transverse section or plan view, respectively, of a centering ring that can be inserted between two body sections of an oil filter that are to be joined together;

Figures 10a, b, and c: a diagrammatic representation of connectors between an engine and an oil filter according to the present invention.

Figure 1 shows an oil filter 1 that comprises two cylindrical body sections 2a and 2b, an upper and a lower cap 3o or 3u, respectively, and two rods 4 that are of solid material, there being a filter element 5 of absorbant paper wound onto each such

rod. The cylindrical body sections incorporate seating surfaces 6 for a seal 7, e.g., an O-ring, on both of their opposing peripheral edges, the covers 3o and 3u incorporating similarly configured seating surfaces, for example, on the bottom of a groove 8.

The body sections 2a and 2b incorporate a plurality of flange lugs 9 at both of their ends, in this case three such flange lugs (see figure 3), with which the flange lugs 10 on the caps 3o and 3u are associated. The body sections 2a and 2b are joined together or to the caps 3o and 3u through these flange lugs 9 or 10, respectively, by means of bolts 11, with O-rings 7 interposed between them.

Instead of installing only an O-ring or another seal between the two body sections 2a and 2b, in order to simplify assembly, it can also be expedient to install a centering ring 12 between the body sections, this then enclosing the two body sections on their outer periphery, and incorporating a T-piece that extends radially inwards, O-rings 7 or other seals being installed on both sides of this, on which the seating surfaces 6 of the two body sections 2a and 2b then rest. This O-annular clamp is shown clearly in figures 9a and 9b.

The identically configured body sections 2a and 2b incorporate cooling ribs 21 that are distributed about their periphery and

these extend to the whole axial length of the body sections. Additional connectors 22 that incorporate a hollow T-cross section 23 are provided at least on their upper and lower edges, and the oil filter can be secured to a corresponding T-bar or T-bar section on the vehicle body with these. The oil filter can be slid along this T-bar during installation.

The two identically configured caps 3o and 3u each incorporate a central screw connector 31 that serves as an inlet or outlet for the oil that is to be filtered. In addition, as is shown by the dashed line in figure 1, an air bleed 31' can also be incorporated. The outer side of the cap 3o, 3u incorporates radial cooling ribs 32. A distance piece 33, for example, a metal net or an appropriate pattern of ribbing is installed on the inner side of the caps.

On the one hand, this distance piece serves to keep a specific distance between the inner opening of the screw connector 31 and the rod 4 and, on the other, to distribute the oil that enters through the screw connector 31 over the whole surface of the filter element 5, or else to provide a path for the oil that leaves the overall surface of the filter element 5 to the screw connector. On the inner side of the cover 3o, 3u there is also a circular flange 34 close to the inside periphery of the body casings 2a and 2b. The tapered edge 35 of this flange, which is, for example, of triangular cross section, fits into the rolled

filter element 5. Any leakage of unfiltered oil between the outer wall of the filter element and the inner wall of the body casing is interrupted by this flange, so that the leakage oil still has to flow through the filter element before it can leave the oil filter. However, such leakage is, for all practical purposes, precluded, since the filter element lies tightly against the inner wall of the body sections.

The filter element 5 of absorbant paper is rolled around the rod 4, which thus fills all of the space between the rod and the inner wall of the body sections. A plurality of such rods can be connected to each other; in the case of the oil filter shown in figure 1 there are two such rods, and an additional distance piece 33 can be installed between two filter elements in the area where the body sections are connected to each other.

Figure 4a shows a rod 4a that is of plastic, for example. At one end, the rod 4a incorporates an insertion hole 41a, and, at the other end, an insertion peg 42a. Thus, two rods can be joined to each other through a push connection 44a. In figure 4b, a screw connection 44b serves to lengthen the rods 4b with the rolled filter elements, each rod 4b incorporating a thread 41b at one end, and a threaded peg 42b at the other end.

Figure 4c shows two hollow rods 4c, each of which has a thread 41c and a threaded peg 42c, these being connected together by

means of a screw connection 44c. Such hollow rods are used if the oil filter is not intended to operate on the straight-through principle as in figure 1, but according to the counter-flow principle. The oil then flows from the central inlet 31 through the hollow rod down to the opposite end of the oil filter, which is closed off at this point by a cap. The oil then flows in an axial direction over the distance piece or distributor of this end cap and back through the filter element 5, is stopped in the distance piece or distributor 33 of the lower cap, and there diverted to an outlet. This outlet is shown by means of the dashed line in figure 1 and is numbered 31". The hollow rod 4c can also incorporate drillings 45 (only indicated herein) along its whole length, through which the oil that is to be filtered flows out radially into the filter element.

Figure 5 shows a pressure valve 51 that can be screwed into the screw connector 31 of an oil filter. This pressure relief valve incorporates a ball 52 as the valve body and this is supported by a spring and retained by a ring 54. The spring 53 is so dimensioned that the oil can only flow into the oil filter in the direction indicated by the arrow once a specific pressure has been reached. This pressure valve serves essentially to ensure that when the oil filter that has been described is installed in a secondary oil path, it is fully supplied with oil that flows from the main engine-lubrication system when the engine is started. Optionally, this pressure valve can also be used as a

pressure relief valve, for example, by appropriate matching of the cross section of the continuous drillings, so as to ensure that oil is not forced through the oil filter at an excessive pressure.

Figure 6 shows the connection of body sections and end caps of an oil filter, by means of annular clamps 61. On their outer peripheral edges, these body sections and covers incorporate a bead 62 or a circular flange. An O-ring 7 or an annular washer 7' is inserted between the flanges of the body sections that abutt against each other. The outer edges of the beads are enclosed by a spring band 63 that is connected rigidly to an annular clamp housing 64. Between the annular clamp housing 64 and the outer curved end of the spring band there is a plurality of metal rods 65 arranged about the periphery of the annular ring. This ensures that the spring band 63 cannot be deformed outwards. The annular ring can be closed in the usual manner with a screwed joint 66 or a clip. The sprung metal rods that lie securely between the ends of the spring band and the inner periphery of the annular clamp housing 64 when the annular clamp is closed ensure great application force on the body casings or their beads, without any essential deformation forces being transferred. This ensures a tight connection even at high oil pressures.

Figure 8 shows a part of an oil filter with two body sections 2a and 2b and an upper cap 30. The body sections incorporate threads 71 on their outer edges and the interior thread of a lip 72 of the cap 30 fits in this thread. The two body sections 2a and 2b are connected to each other by means of a threaded ring 73 that fits into the threads of the adjoining body sections 71. An O-ring is installed between the body sections in the area of this screwed joint. It is also possible to prefabricate the body sections with the filter element so that when a filter element is renewed, the body section with the used filter element is removed and replaced by a new part. It is also possible to prefabricate an oil filter from body sections, caps, and a filter element and when the filter element is renewed, replace the whole filter unit. When such prefabricated filter cartridges with a large filtering volume are required, it is necessary to incorporate a plurality of complete filters in series.

If the oil filters described heretofore are used on the straight-through principle, it is not necessary that the filter element contain a rod. The filter element is, for example, of pressed material such as to ensure that no bypass channels or leakage channels exist in it.

In order to connect the oil filter described heretofore in a secondary path to an engine, the connector elements 81, 82, and 83 as shown in figures 10a, b, and c are provided. The connector

81 is screwed into the engine block with a threaded connector 84 in place of the oil pressure gauge sender unit. A central drilling 85 leads to an internal receiving drilling 86 in which a thread 87 of the connector element 83 is screwed, with the connector element 82 being interposed between them. The connector element 83 has a central drilling 88 from which a transverse drilling 90 branches off in a step 89; when the three connector elements 81, 82, and 83 are screwed together, the connector 82 is located in the area of the step 89. Then, oil can be tapped off from the transverse drilling 90 into a drilling 91 of the connector that leads to the above-described oil filter.

Then, the existing oil pressure gauge sender unit is screwed into an internal drilling 92 in the connector 83.

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THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE
PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. An oil filter for internal combustion engines which
is composed of single parts of a kit, namely

one or more identical wall portions which are each
provided on their axially outer edges with a fitting surface,
whereby several wall portions can be lined up axially with
their opposing, corresponding fitting surfaces;

two covers each having a fitting surface corresponding
with the fitting surfaces of the wall portions and bearing the
connections for admission and discharge of the oil;

one or more filter packings each having a central core on
which the filter packing is wound, whereby the cores can be
lined up and interconnected by means of connecting attachments
mounted on their ends, and whereby each filter packing with
its core has a length corresponding substantially to the wall
portion and a diameter corresponding to the inside diameter of
the wall portion;

sealing members to be inserted between the fitting
surfaces of two parts lying one on the other;

and connecting means to be disposed in the area of the
fitting surfaces for connecting wall portions with each other
or covers and wall portions with each other via the fitting
surfaces and the sealing members;

whereby the oil filter has at least one wall portion, at
least one filter packing and two covers, one filter packing
being disposed in each wall portion, wall portion(s) and

covers being connected by the connecting means and the seals to form a closed housing and, in the case of several lined up wall portions and packings, the cores of the latter likewise being interconnected by the connecting attachments.

2. The oil filter of claim 1, characterized in that at least the wall portions have cooling ribs on their periphery.

3. The oil filter of claim 1 or 2, characterized in that the covers are provided on their surface with cooling ribs.

4. The oil filter of any of the above claims, characterized in that the connecting means are screw connections.

5. The oil filter of any of claims 1 to 3, characterized in that the connecting means are each clamping rings that engage about flanges or raised edges of the wall portions or covers.

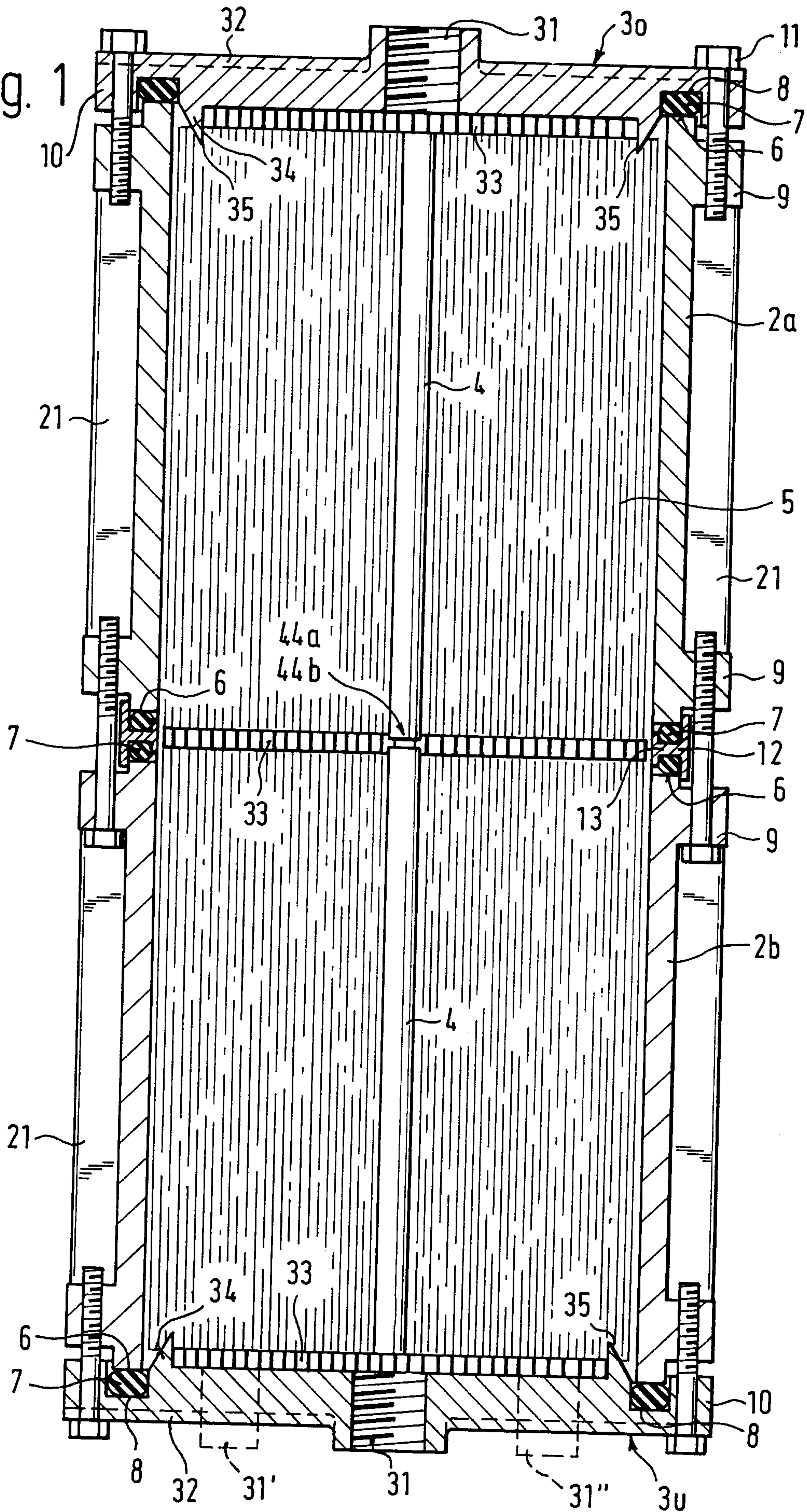
6. The oil filter of claim 1, characterized in that the core is a core rod made of solid material on which the filter packing consisting of a roll of absorbent paper is slipped.

7. The oil filter of claim 1, characterized in that the core is a hollow rod on which the filter packing as a roll of absorbent paper is slipped.

8. The oil filter of claim 6 or 7, characterized in that the covers have on their inner surfaces a circumferential, axially aligned bar which engages the filter packing in the area of the outer edge thereof.
9. The oil filter of any of claims 1 through 8, characterized in that connections for admission and discharge of the oil and optionally for venting the oil filter are disposed in the covers.
10. The oil filter of claim 9, characterized in that the connections are screw connections.
11. The oil filter of claim 9 or 10, characterized in that a pressure valve can be inserted in at least one of the connections.
12. The oil filter of any of claims 1 through 11, characterized in that a centering ring can be inserted between two meeting wall portions which surrounds the wall portions on the outer periphery and which bears at least one sealing member lying against the fitting surfaces of the wall portions.
13. The oil filter of claim 12, characterized in that the centering ring has a radially inward directed T-rod with sealing members situated on each side.

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Fig. 1



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S. J. H. J. J.*

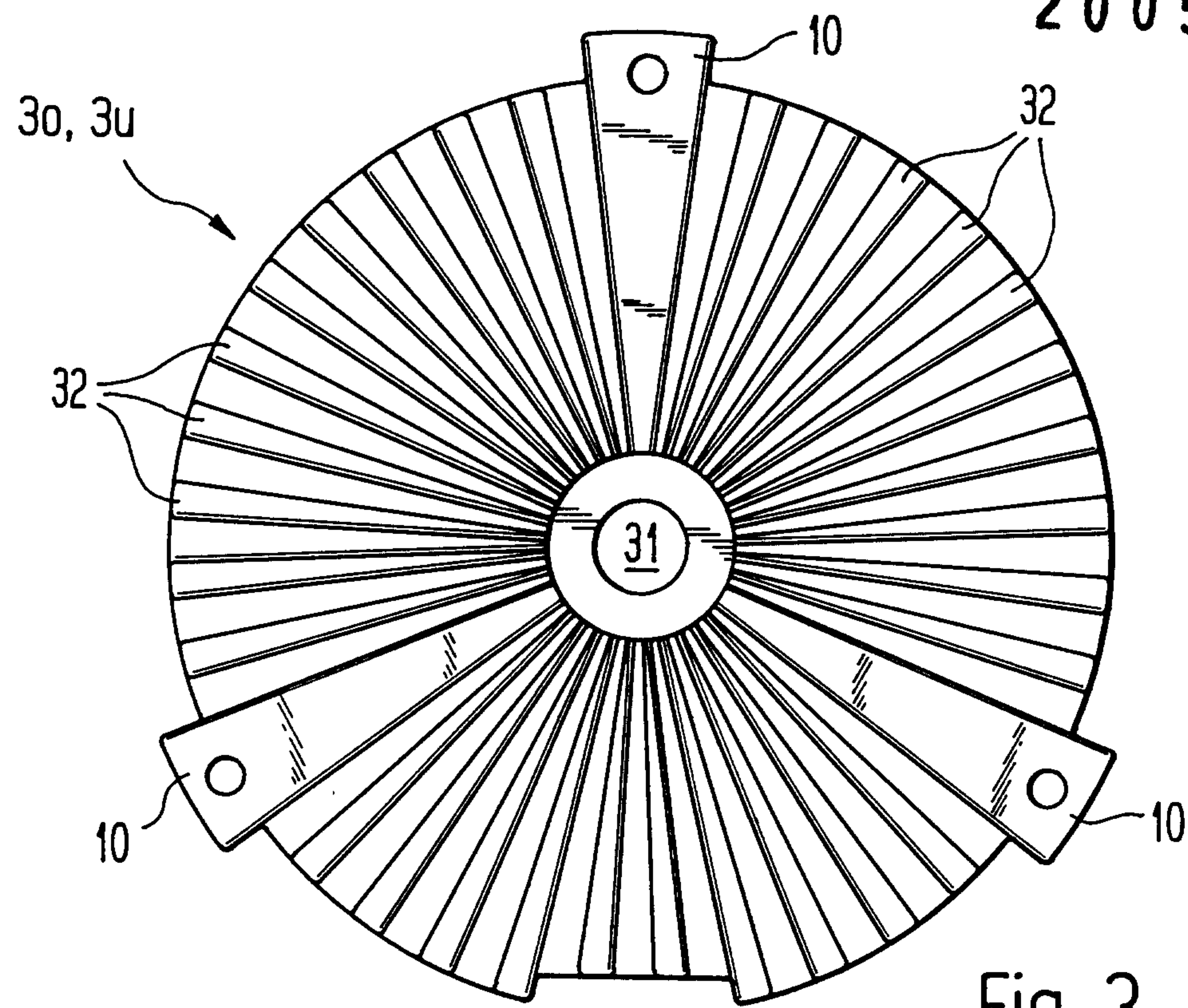


Fig. 3

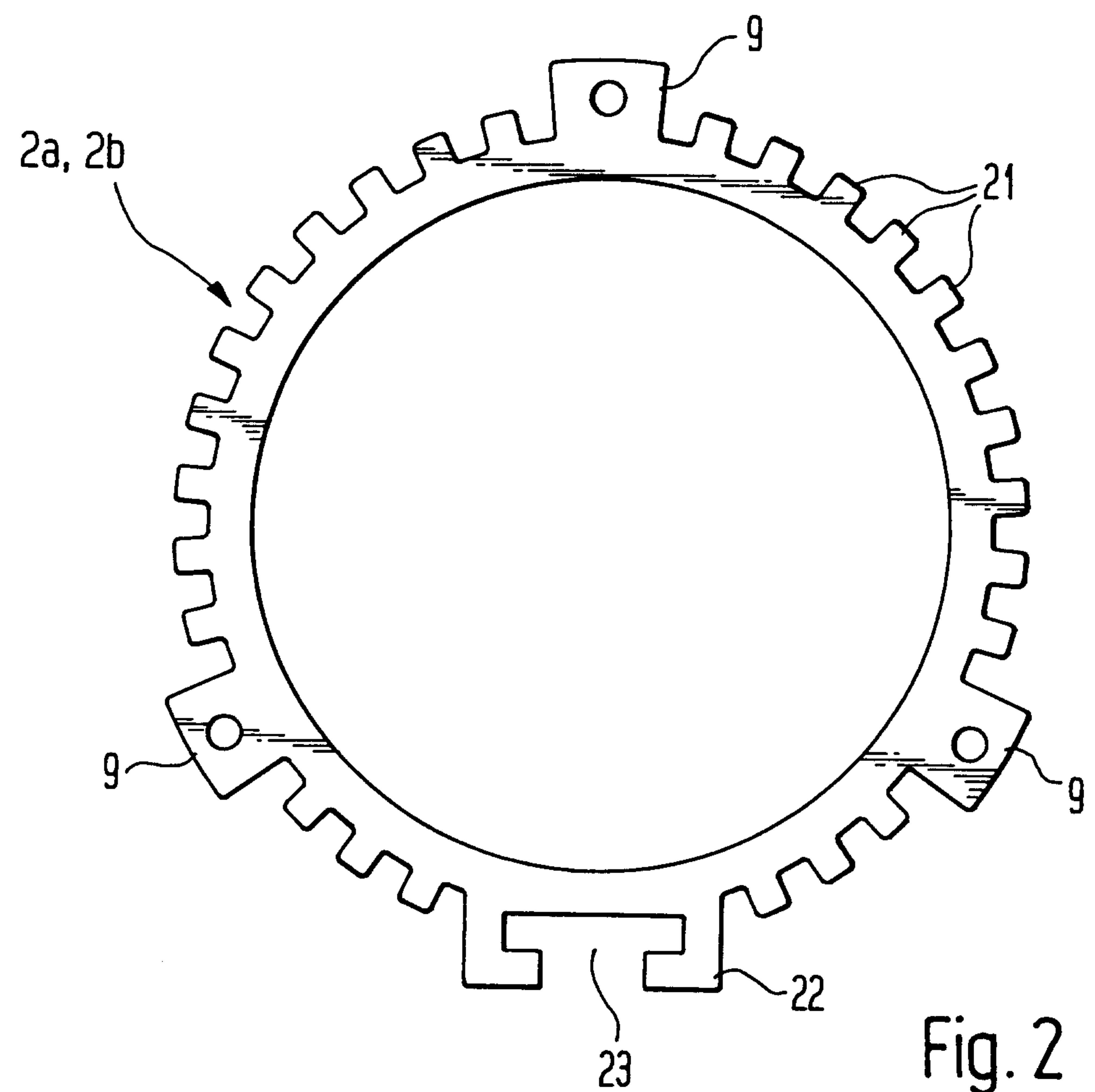


Fig. 2

Fig. 4a

Fig. 4b

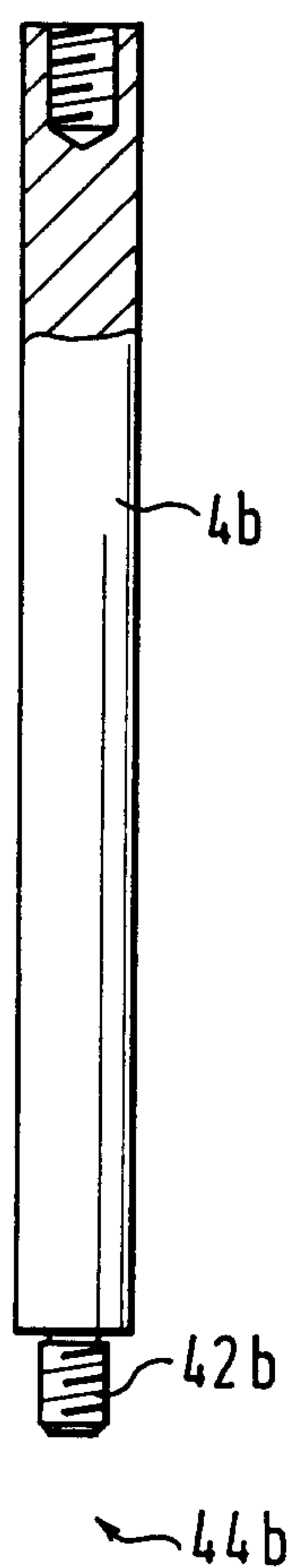
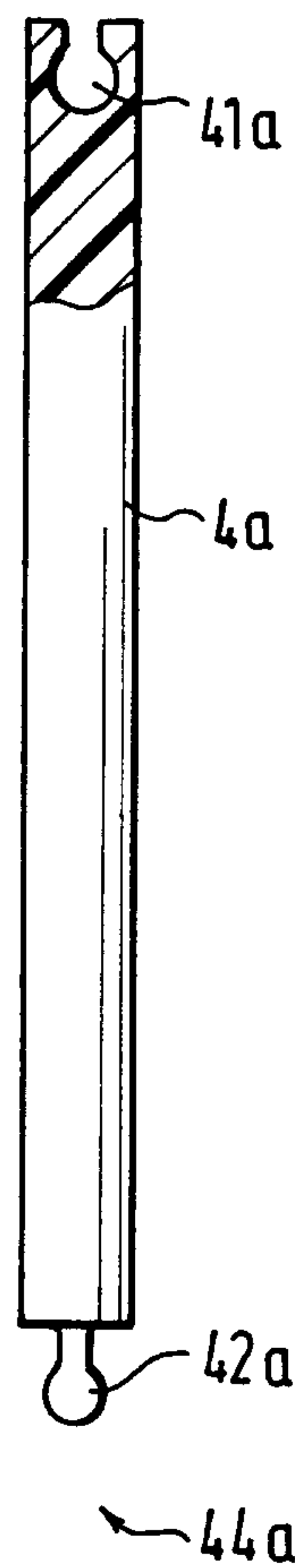


Fig. 4c

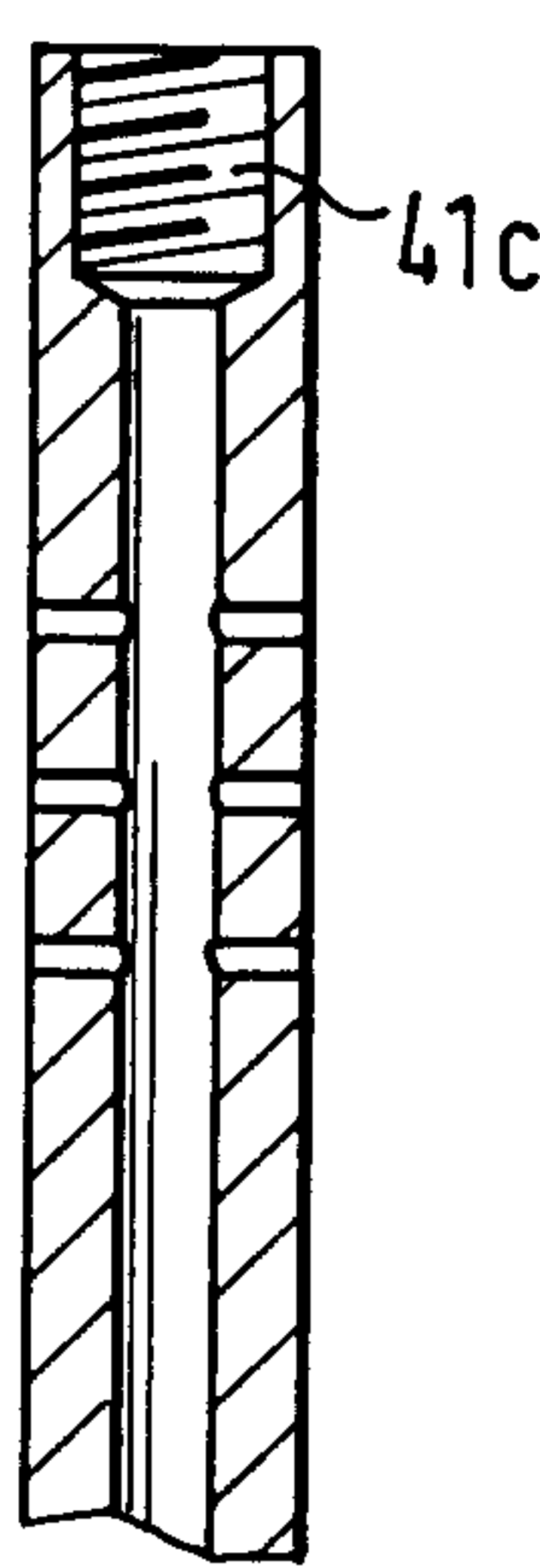
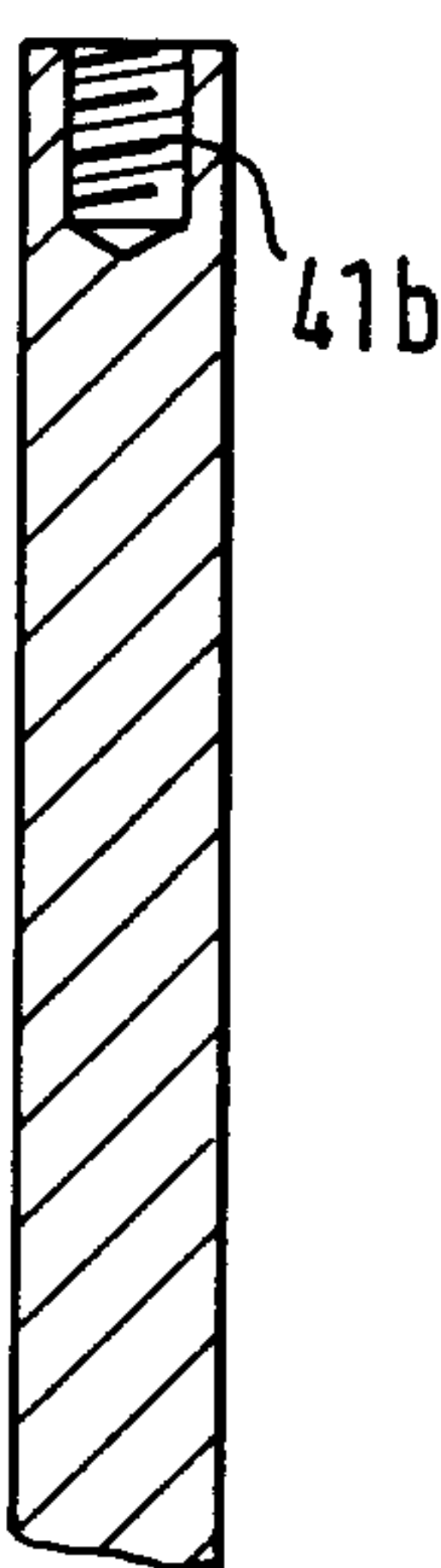
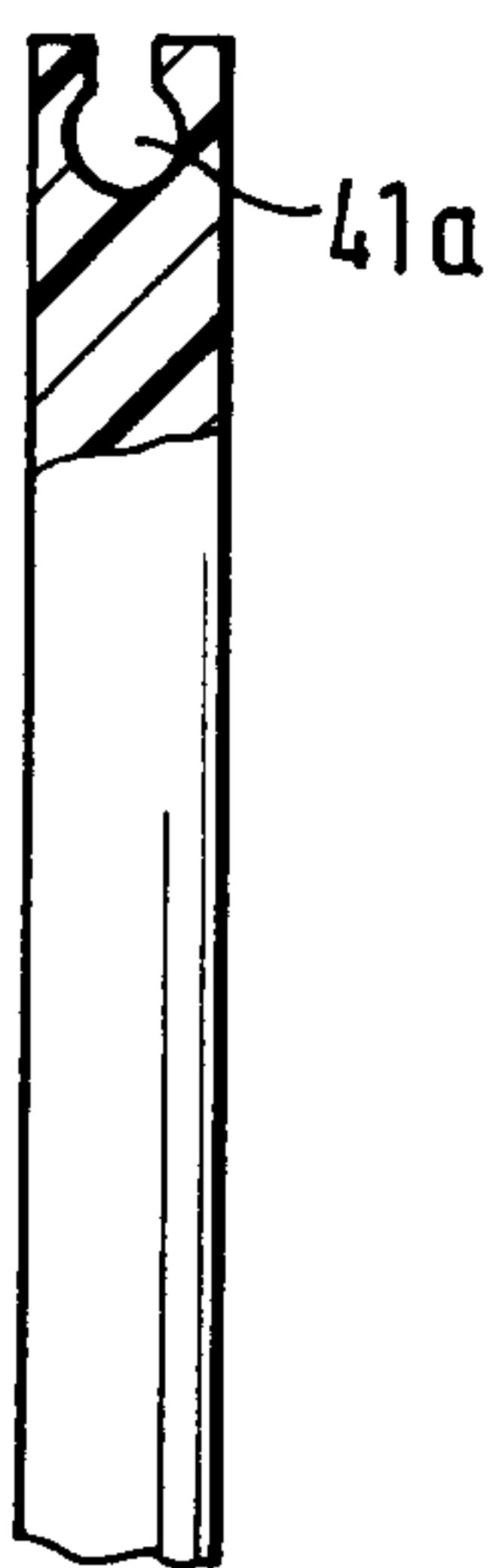
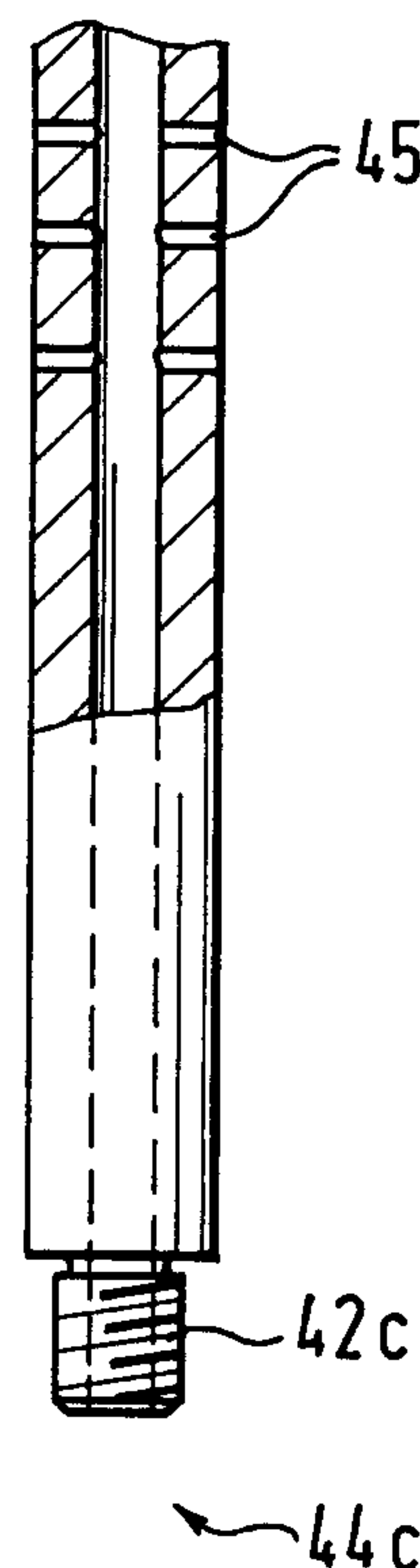


Fig. 5

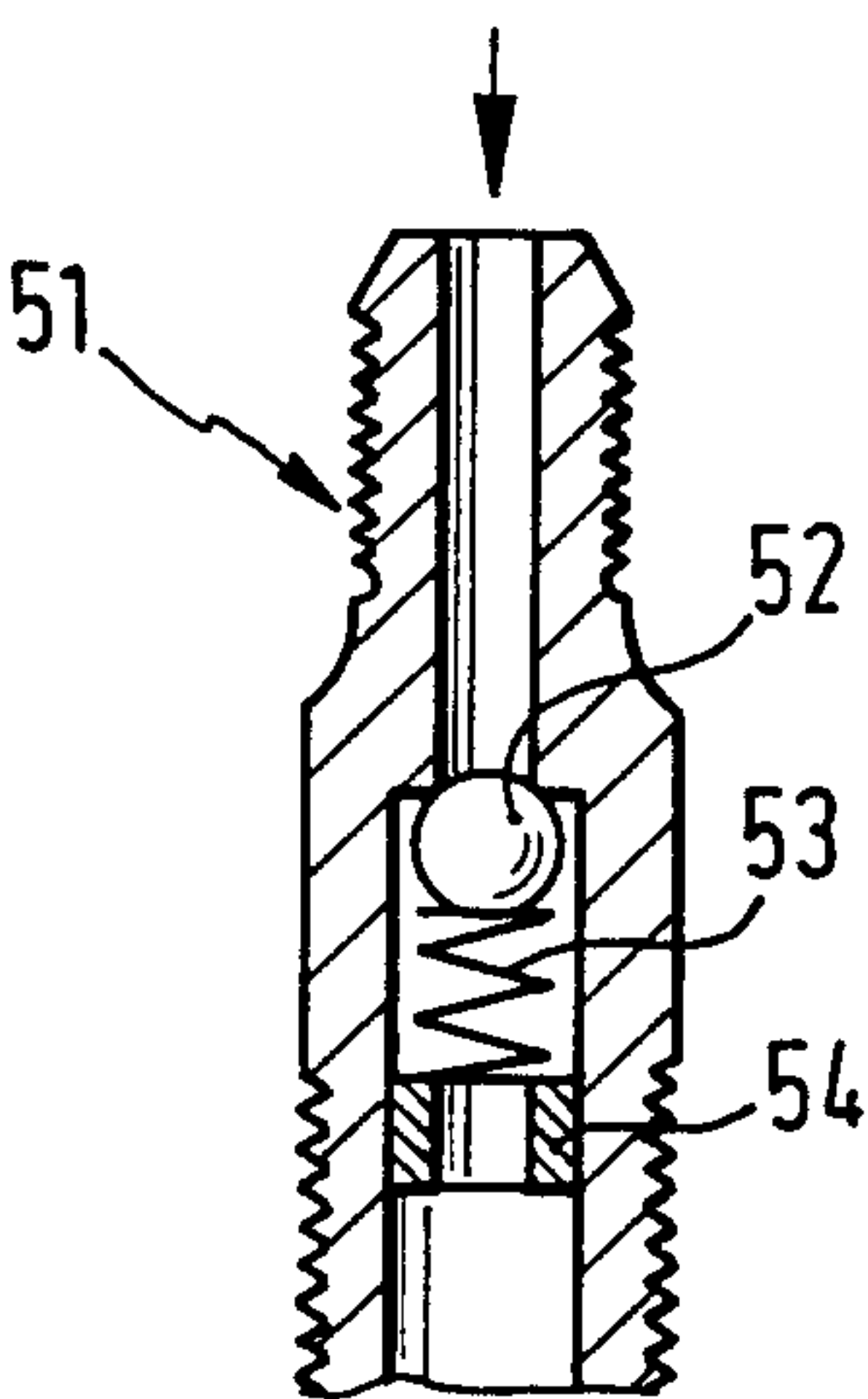


Fig. 6

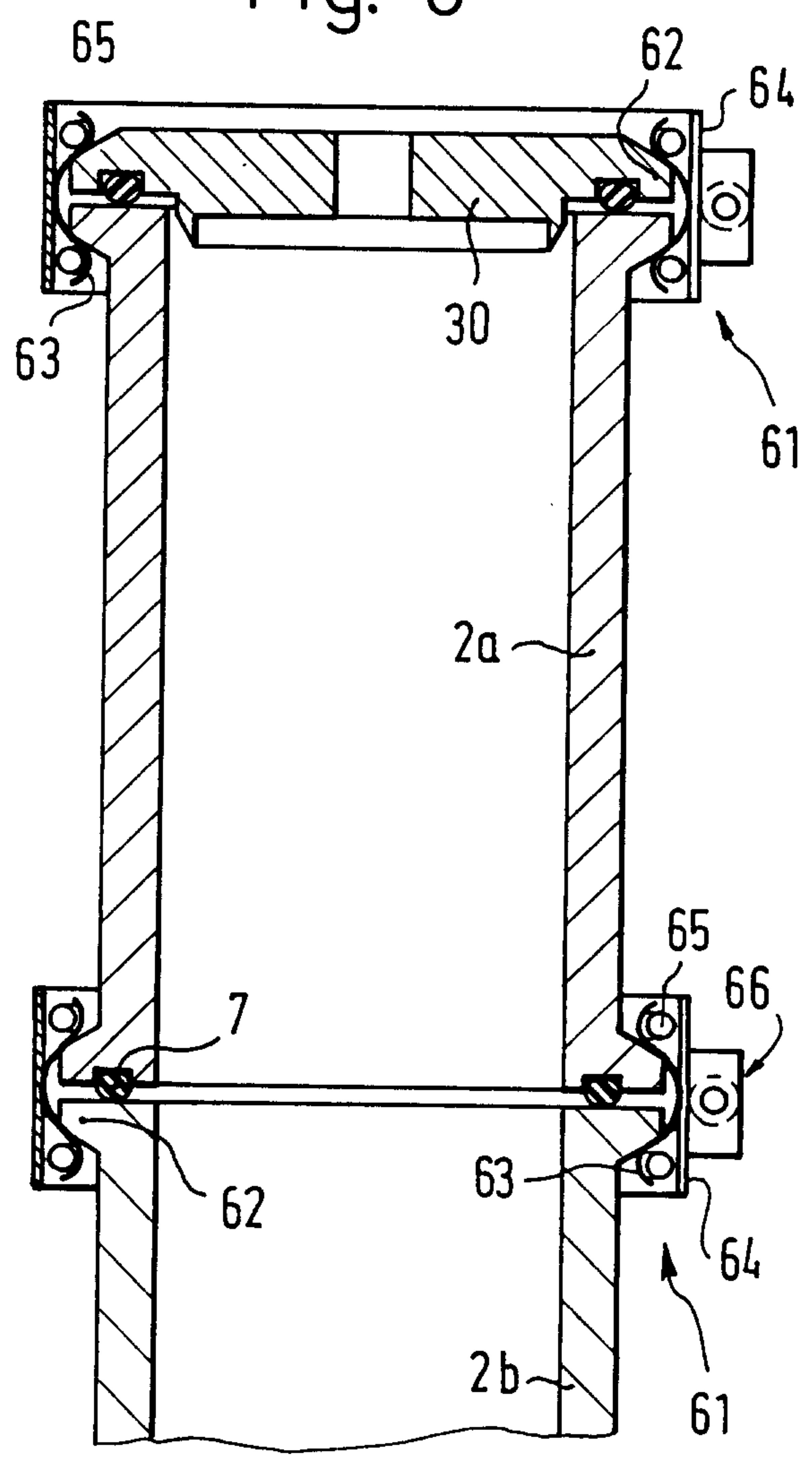


Fig. 8

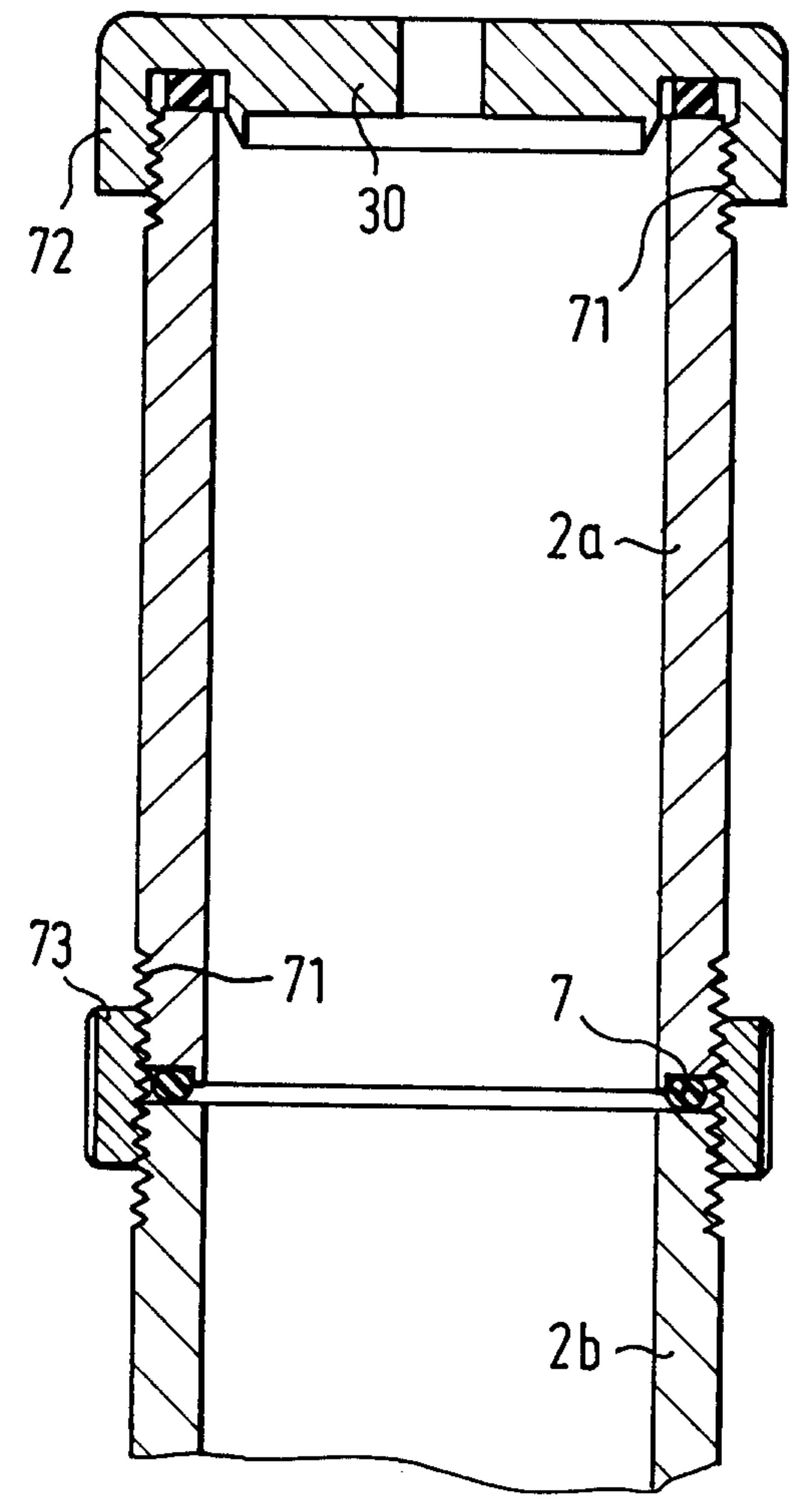


Fig. 7

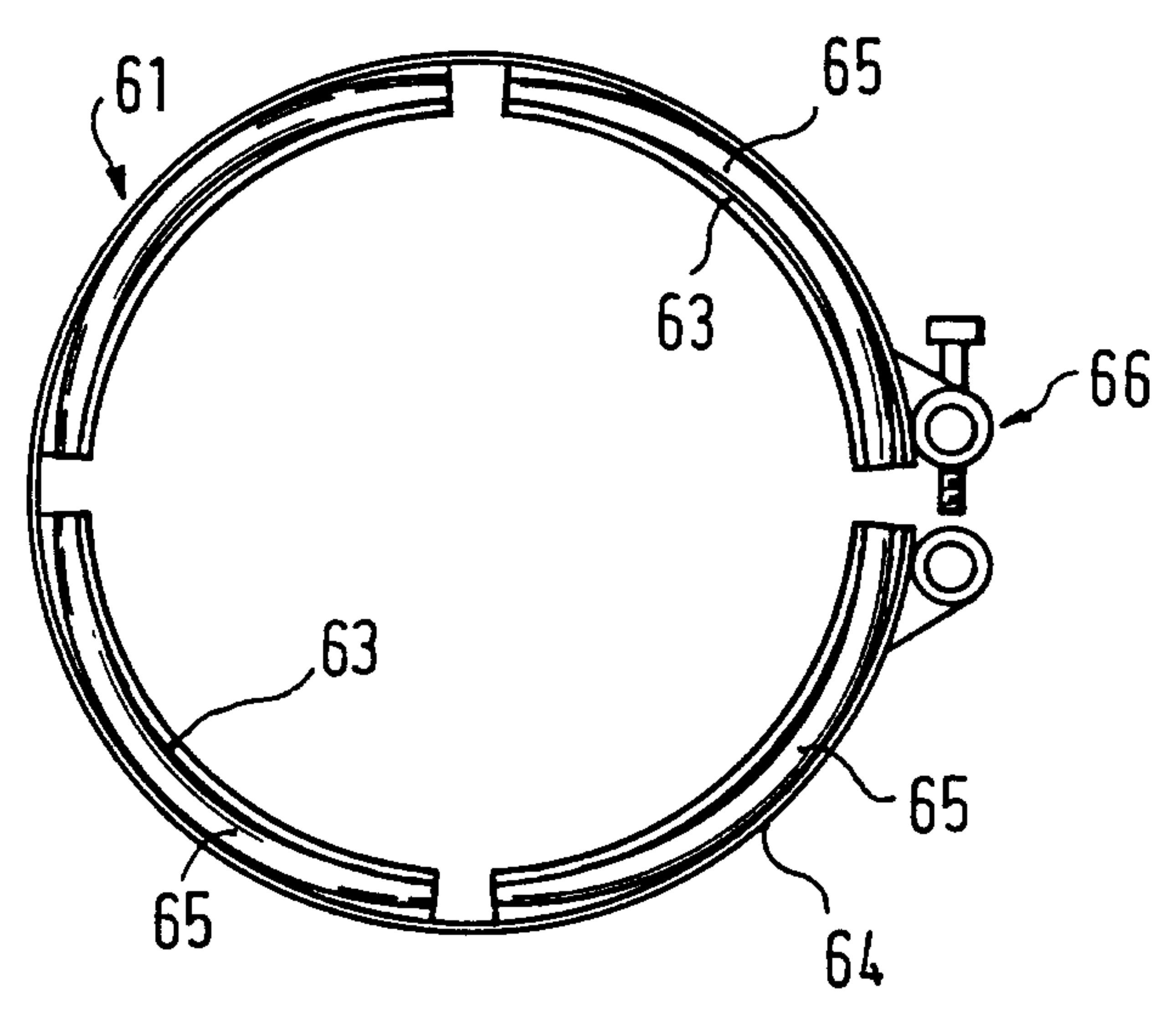


Fig. 9a

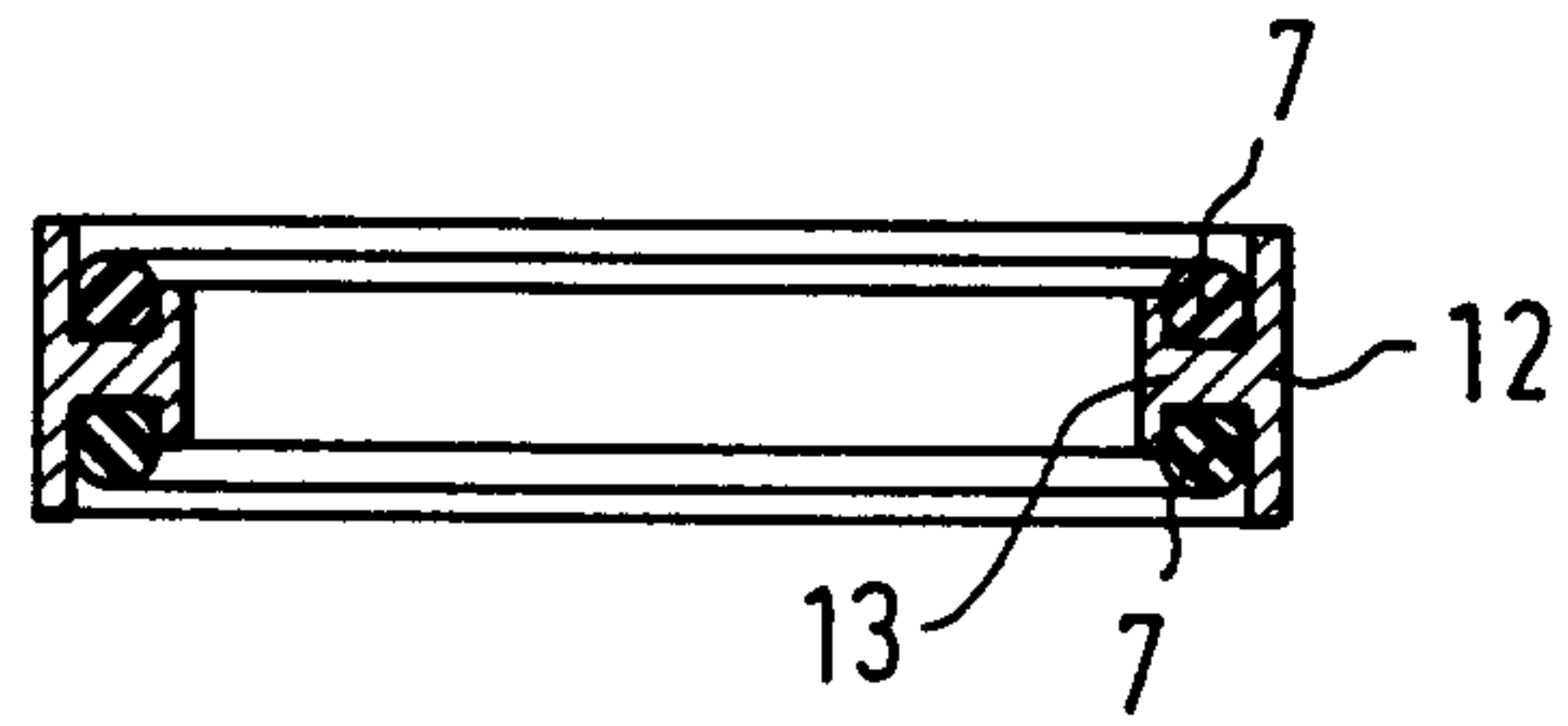


Fig. 9b

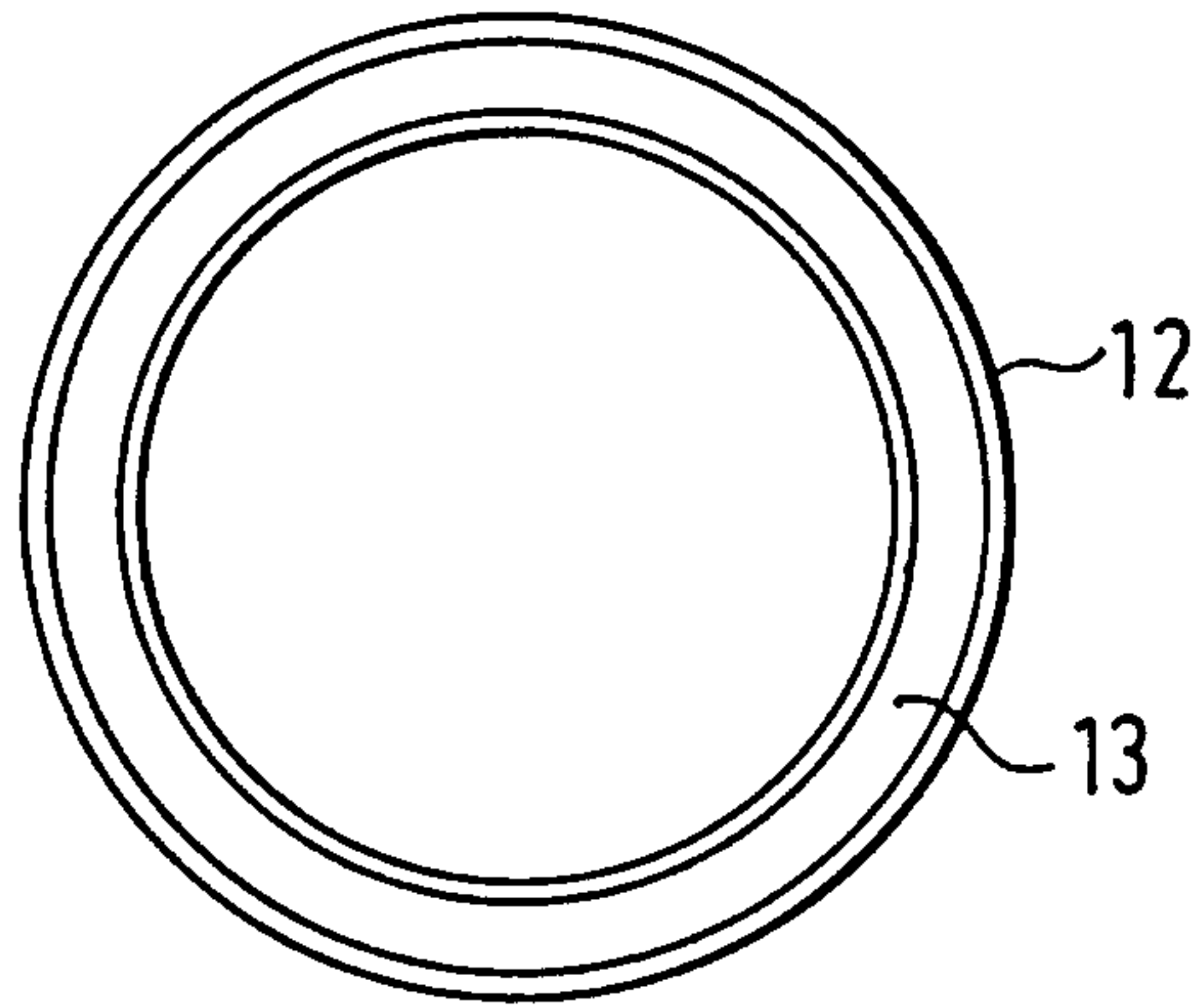


Fig. 10a

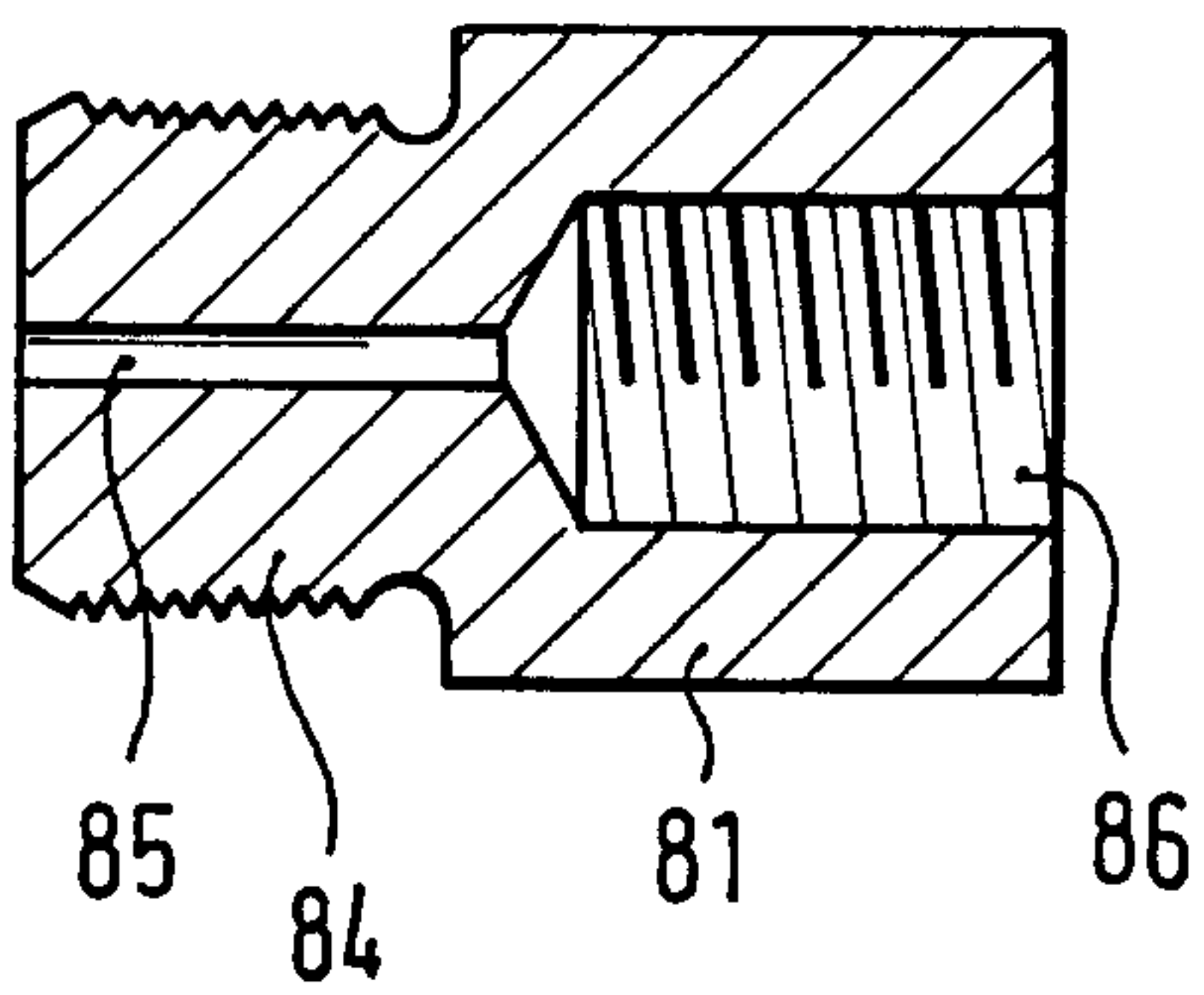


Fig. 10b

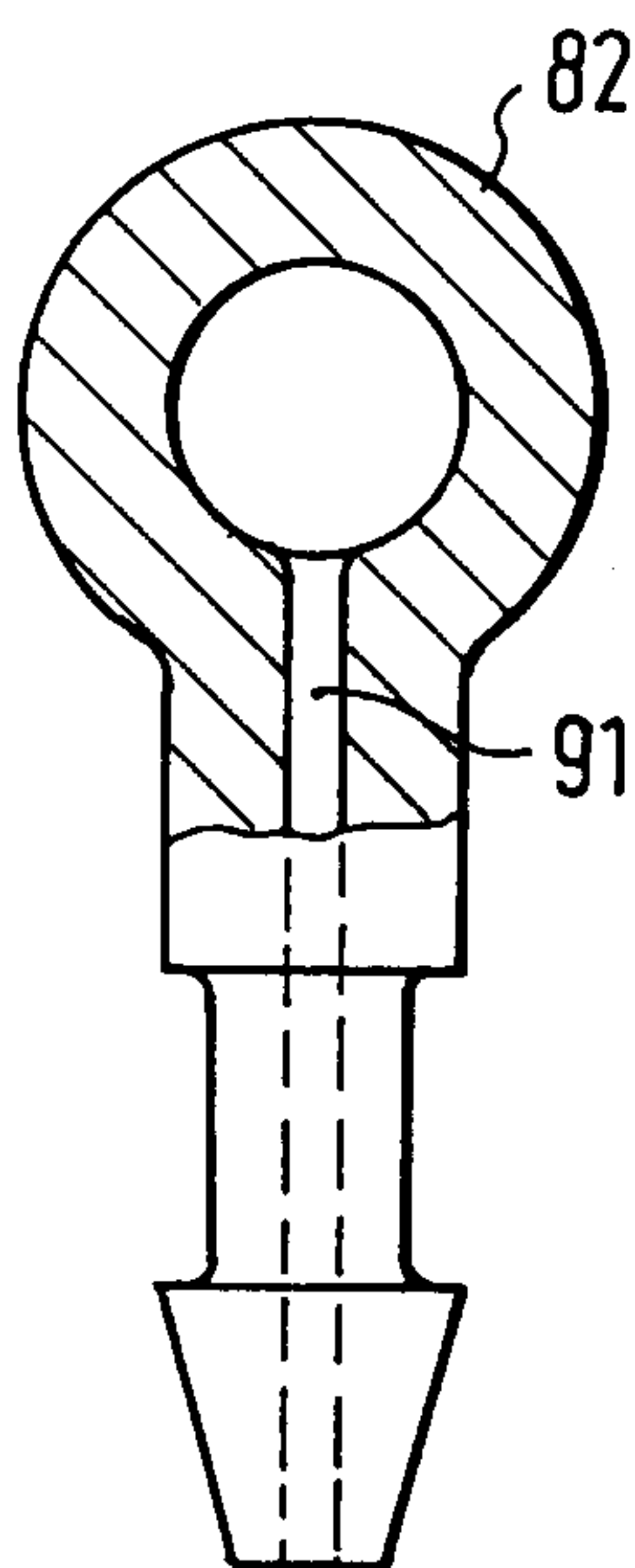


Fig. 10c

