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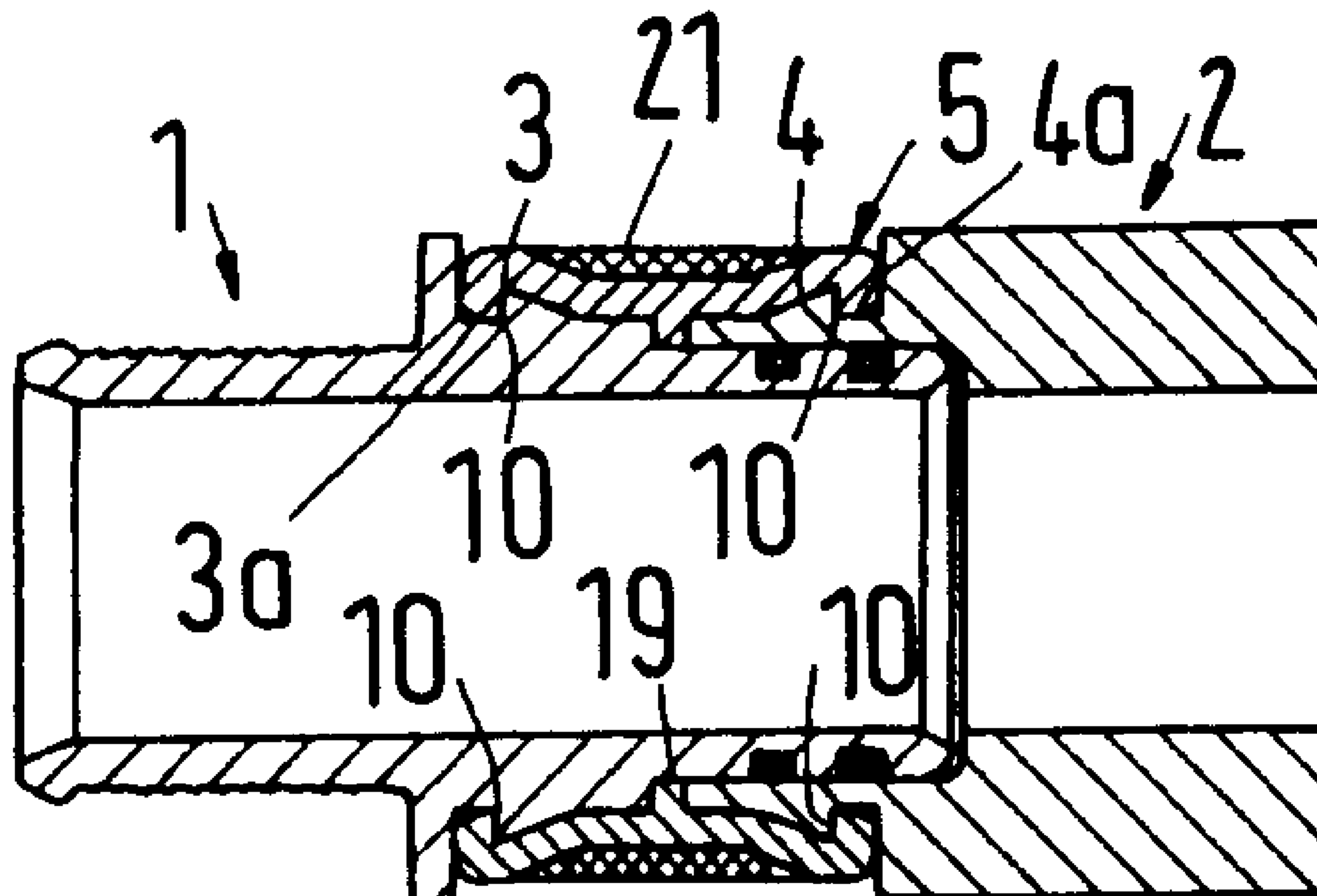
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(54) Title: CONNECTION SYSTEM WITH COAXIAL END SECTIONS OF TWO FLUID LINES THAT ARE TO BE JOINED



(57) Abrégé/Abstract:

The present invention relates to a connection system with coaxial end sections (1, 2) of two fluid lines that are to be connected, which on each end section (1, 2) have an encircling retaining rib (3, 4), with a sleeve (5) that incorporates an axial slot (6), a flexible joint (7) that is disposed opposite the (6) slot, and on its inner side catches (10) to snap behind the retaining ribs (3, 4) in grooves (3a, 4a), the joint being so elastically flexible that it forces the parts of the sleeve that are adjacent to the slot toward one another. In order to simplify manipulation during the coupling process and permit greater freedom of choice in the selection of materials in a connection system of this type, the end sections (1, 2) can be introduced into the sleeve (5) axially, when the slot (6) has been expanded elastically by the retaining ribs (3, 4) sliding beneath the catches (10) to the point that they snap behind the catches (10), the width of the catches (10) corresponding to the width of the grooves (3a, 4a). In this solution, the connection system can be manipulated as simply as a plug-in type coupling in order to connect the end sections (1, 2) of the fluid lines. In addition, the sleeve (5) can be pre-installed on one of the end sections.

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The present invention relates to a connection system with coaxial end sections (1, 2) of two fluid lines that are to be connected, which on each end section (1, 2) have an encircling retaining rib (3, 4), with a sleeve (5) that incorporates an axial slot (6), a flexible joint (7) that is disposed opposite the (6) slot, and on its inner side catches (10) to snap behind the retaining ribs (3, 4) in grooves (3a, 4a), the joint being so elastically flexible that it forces the parts of the sleeve that are adjacent to the slot toward one another.

In order to simplify manipulation during the coupling process and permit greater freedom of choice in the selection of materials in a connection system of this type, the end sections (1, 2) can be introduced into the sleeve (5) axially, when the slot (6) has been expanded elastically by the retaining ribs (3, 4) sliding beneath the catches (10) to the point that they snap behind the catches (10), the width of the catches (10) corresponding to the width of the grooves (3a, 4a).

In this solution, the connection system can be manipulated as simply as a plug-in type coupling in order to connect the end sections (1, 2) of the fluid lines. In addition, the sleeve (5) can be pre-installed on one of the end sections.

Figure 6

Connection System with Coaxial End Sections of Two Fluid Lines that are to be Joined

The present invention relates to a connection system with coaxial end sections of two fluid lines that are to be connected, which on each end section have an encircling retaining rib, and with a sleeve that incorporates an axial slot, a flexible joint that is disposed opposite the slot, and on its inner side catches to snap behind the retaining ribs, in grooves behind said retaining ribs, the joint being so elastically flexible that it forces the parts of the sleeve that are adjacent to the slot toward one another.

In a connection system of this kind, the sleeve is set radially on to the retaining ribs of the end sections by making its slot wider. However, unlike the case with a plug-in type of coupling, the end sections cannot be inserted radially into the sleeve, for when this is done the catches, which are formed as flanges on the ends of the sleeve, are displaced so far in the axial direction in the groove behind the one retaining rib that the other catch lies on this retaining rib and there is no more free space between the catches to accommodate the other retaining rib.

Known connection systems with a sleeve, e.g., the ones described in DE 198 18 562 C1 or DE 198 00 283 C1, a so-called "profile clamp," are used to connect pipes that have at their ends retaining ribs in the form of flanges, the faces of which that are remote from the ends being conical. The sleeve is of steel sheet. In order to form the catches, the edges around its opening are curved inward at an angle of less than 90°, and this matches the cone angle of the flange at the ends of the pipe. The slit in the sleeve can be bridged over by a stop fastener or a hinge fastener. The joint that is opposite the slot is formed in the area of a break in the turned-over conical edges of the sleeve in the manner of a "film joint" or by another joint catch. When the pipes are connected, the sleeve with the opened fastener (or with opened fasteners) is placed around the flange of the pipes and the or each fastener is closed once again. When this is done, the turned-over edges of the sleeve lie on the conical faces of the pipe flange so that the pipe ends are drawn together. It is true that in the embodiment with the "film joint"(DE 198 18 562 C1) the steel sheet

of the sleeve is flexible in the area of the joint, but it exerts no radial clamping force on the pipes. The clamping force depends solely on the tightening force of the fastener or fasteners. For this reason, a connection system with a sleeve in the form of a profile clamp is not suitable as a plug-in coupling that is easy to close, in which the pipe ends need only be inserted axially into the sleeve and, on insertion, the catches snap behind the retaining ribs on the pipes in order to make the connection. The material of the sleeve is confined exclusively to metal. Production of the sleeve with a snap fastener that is formed in one piece with the sleeve requires costly stamping and bending tools. Production of the sleeve requires that it be configured and assembled.

In the case of a plug-in coupling as is described in EP 1 378 701 A1, the sleeve is of an elastic plastic in the form of two oval rings that are connected by two diametrically opposed bars. The insides of the rings are provided with stop tabs. When the pipe ends are inserted into the rings, the rings are expanded elastically by retaining ribs on the end sections of the pipes until stop pads of the rings snap behind retaining ribs. In the coupled state, there is clearance between the ring areas with the smaller radius of curvature and the pipes, and this enables the rings to be pressed together radially so as to be uncoupled. The material used for this sleeve is restricted to plastics. A costly forming tool is required to manufacture the coupling. Because of the wide spaces between the bars and the uncoupling clearance between the rings and the pipes it is possible for the end sections of the pipes that are introduced into the sleeve to become soiled, and this can make repeated coupling and uncoupling more difficult.

It is the objective of the present invention to describe a connection system of the type described in the introduction hereto that is simpler to manipulate and permits greater freedom of choice with respect to the materials that are used.

According to the present invention, this objective has been achieved in that the end sections can be introduced axially into the sleeve during elastic expansion of the slot, by the retaining ribs sliding beneath the catches until they snap into position behind the catches, the axial width of the catches matching the width of the grooves.

Given this solution, the connection system can be manipulated as easily as a plug-in coupling in order to join the end sections of the fluid lines. In addition, the sleeve can be pre-installed on one of the end sections. The sleeve can be manufactured either from metal or from plastic.

If plastic is used to manufacture the sleeve, the catches can be stop projections that are molded onto the inner side of the sleeve and project in its peripheral direction, their radius of curvature being smaller than the radius of curvature of the retaining ribs on the end sections of the fluid lines.

In order to permit the retaining ribs of the end sections to slide easily beneath the catches of the sleeve, the face of the stop projections on the front end of the end sections (as viewed in the direction of the insertion) can incorporate an inclined face for the retaining rib from that is disposed on the particular end section.

As an alternative to moulding the catches on a sleeve that is of plastic, the catches can be such that they incorporate rods of at least one of the materials metal and plastic and are secured in the wall of the sleeve by their ends so that they extend transversely to the axial direction of the sleeve. This makes it possible to cut the sleeve from a longer pipe that is of plastic or metal.

Thus it is possible that the parts of the sleeve that are adjacent to the slot be configured as half shells that are connected by the joint.

The joint can be of spring steel or plastic.

In particular, the joint can incorporate (at least) one leaf spring that is disposed in a channel of the half shells. A leaf spring can be produced simply so as to have a high degree of flexural resistance and thus a correspondingly high level of spring force so as to exert their required clamping force on the end sections of the fluid line.

It is preferred that steps be taken to ensure that the curvature of the spring matches the curvature of the half shells; that the half shells are of thermoplastic; and that the leaf spring is injection coated by the plastic used for the half shells. This forming entails the advantage that the spring is installed securely in the hard shells and is protected against corrosion.

As an alternative, the curvature of the leaf spring can be the same as the curvature of the half shells, the hard shells can be of thermoplastic, and the channel can be preformed in the half shells and the leaf spring inserted into the channel. This means that the half shells and the leaf spring can be produced independently of each other by different manufacturers before being joined.

The channel can also be closed all around in the same way as the leaf spring is injection coated.

Alternatively, the channel can be formed as a groove within which the leaf spring is secured. For example, the leaf spring can be cemented securely in the groove or can be positively fitted therein, e.g., by means of screws or mushroom-head studs that snap into holes in the leaf spring.

However, it is preferred that the walls of the groove be undercut so that the leaf spring can snap into said groove. The configuration of the groove and the assembly of the leaf spring in the groove can be effected very simply.

Furthermore, the joint that is of plastic can be joined to the half shells by at least one of the joining methods such as fusion, positively, or by being formed in one piece with them.

It is also possible that at least part of the joint form part of at least one elastic ring that encircles the sleeve and leaves at least a section of the slot that accommodates a

spreading tool uncovered. In the case of this or each ring, this can be a flexible band or a coil spring, the ends of which are joined together. Each of the sections of the slot left uncovered by the ring or rings can be used to introduce a spreader tool in order to open the coupling.

Alternatively, or in addition to the uncovered section or sections, at least one of the edges of the slot can incorporate at least one recess for the introduction of a spreading tool.

In addition, on the inside, the sleeve can have a stop rib for the end sections, said stop rib extending in the peripheral direction. This stop rib makes it possible to centre the end sections axially when they are introduced into the sleeve.

It is also advantageous if the stop rib be formed from an elastomer sealing material and secured all the way round on the sleeve. The stop rib then simultaneously performs the function of the seal between the pipes, so that the sleeve does not come into contact with the potentially aggressive fluid passing through the fluid lines.

It is also possible that behind each retaining rib, on its side that is remote from the unattached ends of the coupled end sections, there be a lobe with inclined faces that projects radially at a height that corresponds to the radial height of the retaining ribs and which is diametrically opposite the joint (relative to the longitudinal midline axis of the sleeve), and the catches lie on both sides of the or each lobe in the coupled state.

It is also advantageous if an additional lobe be disposed so as to be diametrically opposite the first lobe in relation to the longitudinal midline axis.

In this connection system, after the sleeve has been simply rotated manually about the longitudinal midline axis of the sleeve relative to the end sections of the fluid lines to the point that the ends of the catches that lie spaced apart in the peripheral direction slide radially outwards over one face of one or both faces of each or every lobe while expanding the sleeve, including the ring or a joint, and the radially innermost edges of the

catches are seated on the or every lobe, both end sections or only one end section can be withdrawn axially from the sleeve. This eliminates the need for an uncoupling tool and for the use of tools and also eliminates the need for the cutouts that are provided to accommodate an uncoupling tool.

Alternatively, it is also possible that an expander that rests on supports in the parts of the sleeve that are adjacent to the slot be supported so as to be movable in the slot in the sleeve, and the slot can be expanded by moving the expander to the point that at least one of the end sections can be withdrawn from the sleeve. In this configuration, it is only necessary to move the expander to make the slot wider in order to uncouple the end sections, thus rendering the use of a spreader tool unnecessary.

In addition, the expander can have two plates that are connected by a post that passes through the slot; of these, one plate is on the outside of the sleeve and the other plate is on the inside of the sleeve. An expander configured in this way is simple to manufacture.

It can also be ensured that the expander can be moved along the slot, and that one of the two plates is wedge-shaped and its inclined, converging edges each lie on one of the supports. Given this configuration, the sleeve can be made wider by simply moving the expander.

In detail, in this configuration, provision can be made such that the supports are formed by the edges of depressions that are formed in the sleeve wall on both sides of the slot and converge at the same angle as the wedge angle of the inclined edges of the wedge-shaped plate.

Additionally, the expander travel can be limited by stops that in each instance determine the maximal and the minimal expansion of the sleeve by the expander. This entails the advantage that the expander can simultaneously serve to indicate correct assembly: if it is located in the end section that determines the minimal expansion of the sleeve this can be taken as an indication of a correctly made connection.

As an alternative to configuring the expander as a slide, the post that joins the plates can be in the form of an eccentric that is supported so as to be able to rotate in the slot within the sleeve, and the plate on the outside of the sleeve can be provided with a polygonal depression to accommodate a turning tool. In this configuration of the expander, the sleeve can be made wider by simply rotating the expander with a screwdriver e.g., with the depression configured as a rectangular slot.

The present invention and improvements to it will be described in greater detail below on the basis of preferred embodiments that are shown in the drawings appended hereto.

These drawings show the following:

- Figure 1: a perspective view of a first embodiment of the present invention;
- Figure 2: one end section,
- Figure 3: and the other end section of two fluid lines that are to be connected by means of the sleeve shown in Figure 1, in perspective;
- Figure 4: an end view of the sleeve shown in Figure 1;
- Figure 5: the axial cross-section V-V shown in Figure 4 through of the sleeve as in Figure 1;
- Figure 6: an axial cross-section through a second embodiment of a connection system according to the present invention, with the end sections of two fluid lines that the are to be connected by the connection system inserted into the sleeve;
- Figure 7: a perspective view of the sleeve as in Figure 6, at enlarged scale;
- Figure 8: the axial cross-section VIII-VIII of the sleeve as in Figure 7, at enlarged scale;
- Figure 9: the cross section IX-IX in Figure 8;
- Figure 10: the cross-section X-X in Figure 8;
- Figure 11: the cross-section XI-XI in Figure 8;
- Figure 12: a perspective view of one half shell of the sleeve for the connection system as shown in Figure 6 to Figure 11;

- Figure 13: a cross section through a variation of the sleeve shown in Figure 1;
- Figure 14: the cross section XIV-XIV of the sleeve shown in Figure 13;
- Figure 15: a further variation of the sleeve shown in Figure 1, in cross section;
- Figure 16: A further variation of the sleeve shown in Figure 1, in cross section;
- Figure 17: a further variation of the sleeve shown in Figure 1, in cross section;
- Figure 18: a variation of the sleeve shown in Figure 15, in cross section;
- Figure 19: a further variation of the sleeve shown in Figure 1 in cross section;
- Figure 20: a further variation of the sleeve shown in Figure 1, in cross section;
- Figure 21: a further variation of the sleeve shown in Figure 1, in cross section
- Figure 22: a cross section through a first end section, modified somewhat as compared to the first end section shown on the left-hand side in Figure 6, perpendicular to its longitudinal direction, immediately behind the retaining rib shown on the left-hand side in Figure 6, as viewed in the direction of the end of the first end section introduced into the second end section;
- Figure 23: a perspective view of a further variation of the sleeve shown in Figure 1;
- Figure 24: a cross section through the middle of the sleeve shown in Figure 23;
- Figure 25: plan view of an expander of a sleeve for the connection system according to the present invention, modified as compared to the expander shown in Figures 23 and 24;
- Figure 26: a side view of the expander shown in Figure 25;
- Figure 27: the cross section XXVII-XXVII shown in Figure 6.

The coupling that is shown in Figures 1, 4, and 5, is used to connect the end sections 1 and 2 of two fluid lines; each of said end sections 1, 2 incorporates an encircling retaining rib 3, 4, respectively, and each can be secured to one of the end sections 1 and 2 or made in one piece with this. At least one of the fluid lines can be separate or can be configured as part of a fluid-line installation; one of the end sections 1 and 2 can also be configured as a connector fitting of such a fluid-line installation.

The connection system incorporates a sleeve 5 that is of fibre reinforced or unreinforced thermoplastic. This plastic can be at least one of the following materials: PA, PPS, POM, PP, PE, PET, PBT, PEN, or PBN. Alternatively, the sleeve 5 can be of a duroplast, e.g., phenolic resin.

The sleeve 5 is closed all around as far as a slot 6 that extends axially across the greater part of the length of the sleeve 5. One edge of the slot incorporates a cut-back section that is approximately U-shape, in which the other edge of the slot 6 fits. Alternatively, the slot 6 can extend across the whole axial length of the sleeve 5.

Approximately diametrically opposite the slot 6, the sleeve 5 incorporates a joint 7 that is so elastically flexible that it forces the parts 8--that in this instance are in the form of half shells that are adjacent to the slot 6--radially toward one another and thereby clamps the end sections 1 and 2 once the sections 1 and 2 have been introduced axially into the sleeve 5. The joint 7 is formed by a part of a leaf spring 9 that is opposite the slot 6, and this is cast into place in the plastic of the part 8 or else is injection coated by this and extends axially over the major part of a length of sleeve 5 and over less than 90° in the peripheral direction of the sleeve 5 in each part 8 of sleeve of 5, although it can extend for more than 90° in each part. The material of the spring 5 consists of spring steel of very high flexural strength.

In addition, the sleeve 5 has on its inner side catches 10 that are in the form of flat steel rods; two catches 10 lie opposite each other on both sides of the slot 6 and of the joint 7, as is shown in Figure 5. The ends of the catches 10 are secured in continuous holes 11 in the parts 8, e.g., in snap-in seating by means of undercut areas in the holes 11 and in the ends of the catches 10. At the same time, the catches 10 engage in grooves in the inner side of the sleeve 5 (Figure 5). These extend over less than 90° of the periphery of the parts 8. In addition, the catches 10 can be formed from wire or plastic with catch hooks at the ends. When the end sections 1 and 2 are introduced into the sleeve 5 in order to connect the fluid lines, the retaining ribs 3 and 4, the foremost edges of which are conical, can slide beneath the catches 10; the slot 6 and thereby the sleeve 5 are

elastically widened, until they snap into position behind the catches 10 and the catches 10 snap into the grooves 3a, 4a (see Figures 2, 3, and 6), when the parts 8 lie securely on the end sections 1 and 2 so that the connection can withstand an axial tensile force of at least 500 Newton. The width of the grooves 3a, 4a matches the actual width of the catches 10, so that the sleeve 5 can be preinstalled on one of the end sections 1, 2. Instead of the retaining ribs 3 and 4 having conical sides 12, or in addition to this, the catches 10 can have inclined faces on their radially innermost edges, and this makes it simpler to insert the end sections 1 and 2.

In order to uncouple the end sections 1 and 2, the sleeve 5 can be widened against the spring force of the joint 7 by means of spreader pliers inserted into the slot 6, until the distance between the opposing catches 10 is greater, at least at the one end of the sleeve 5, than the outside diameter of at least the retaining rib 3 or 4 when that is engaged behind the catches 10 at one end of the sleeve. In order to simplify insertion of the spreader tool into the slot 6, in both the edges of the parts 8 that define the slot 6 there are opposing cutouts in the vicinity of one end of the sleeve 5. The cutouts 13 and 14 provided in the vicinity of the sleeve end entail the advantage that if desired only the one or the other end of the sleeve need be made wider in order to withdraw only one section 1 or 2 from the sleeve 5. As an alternative, only one cutout 13 or 14 can be formed in only one edge of the slot 6.

In order to make the sleeve 5 wider at both ends simultaneously, only one cutout 13, 14 need be made, or only one cutout need be made in the one edge of the slot 6 at the axial mid-point of the sleeve 5.

At its ends, the inner side of the sleeve 15 also incorporates diametrically opposed grooves 15 and 16 that are of different widths and the axial ribs 17 and 18, which are of corresponding width, fit on the end sections 1 and 2,. Because of this, it is possible to connect the end sections 1 and 2 only in a predetermined angular position relative to one another, and secure them against any reciprocal twisting. At the same time, the ribs 17 and 18 provide a visual indication of a completed coupling if they are inserted completely

into the grooves 15 and 16.

Additionally, each of the parts 8 of the sleeve 5 are provided with a rib 19 at the axial midpoint, so that the whole of the sleeve 5 is provided with an encircling rib 19 that serves as a stop for the unattached ends of the end sections 1 and 2, for axially centering said end sections 1 and 2. This function can, however, be performed by the grooves 15, 16 and the ribs 17, 18 or the conical faces 20 on which the faces 12 of the end sections 1 and 2 lie behind the catches 10, so that the ribs 19 can be eliminated. However, the ribs 19 could be of an elastomer sealing material and be secured the inner side of the sleeve 5 or on the parts 8, e.g., by moulding or adhesion, so that they simultaneously seal the end sections 1, 2 against one another. This entails the advantage that for all practical purposes the sleeve 5 does not come into contact with the potentially corrosive fluid that passes through of the fluid lines or their end sections 12.

The sleeve 5 can be manufactured by using simple moulding tools and its parts 8 can be manufactured in the same moulding tool if the slot 6 is rectilinear and continuous in the axial direction. The leaf spring 9 can be moulded in place at the same time as the sleeve 5 is being formed. The end sections 1 and 2 can be connected very simply in that they are plugged into the sleeve 5. Uncoupling can also be effected by simply spreading the sleeve 5 and withdrawing at least one end section 1 or 2 from the sleeve. The configuration and manipulation of a lock is thus made unnecessary.

Essentially, the second embodiment of the connection system, shown in Figures 6 to 12, differs from the first embodiment as described below, with the same reference numbers being used for the components of both embodiments that largely corresponds to one another. For this reason, not all the components of the connection system shown in Figures 6 to 12 will be described in detail again.

The sleeve 5 is surrounded by a flexible rubber ring 21 that is of a thermoplastic elastomer, e.g., PP, EPDM, or TEEE, or a vulcanized rubber or silicon rubber, the material of the ring 21 being injection molded around the sleeve 5.

The ring 21 holds the two half-shell parts 8 together and at the same time forms the joint 7 with a rib that extends radially inward into the sleeve 5 on the side of the sleeve 5 that is opposite the slot 6.

The cutouts 13 and 14 are located at the axial midpoint of the sleeve 5 in projections 23, 24 of the parts 8. These projections 23, 24 are not covered by the ring 21. The joint 7 and an additional rib 25 of the ring 21 within the slot 6 also serve to seal the slot 6 and the gap opposite the slot 6 that is located between the opposing edges of the parts 8 so as to prevent the ingress of dirt and moisture into the connection system.

Alternatively, in place of the one ring 21, two rings cut from an elastomer or flexible rubber hose can each be slid onto the sleeve 5 from one end and the other of the sleeve 5. A further alternative is such that the materials of the parts 8, which can again be of the same material as the sleeve 5 in the first embodiment, and/or of the ring 21, are so selected or modified that on being injection molded they form a fused or cemented connection, e.g., only an adhesive connection. The parts 8 can, however, be of a metal, preferably steel.

The catches 10 are moulded on to the parts 8 of the sleeve 5 and incorporate an inclined face 26 for the retaining ribs 3 and 4 of the end sections 1 and 2. If the sleeve 5 is made from metal, the catches 10 can also be of metal or plastic and connected to the parts 8 by adhesion or by screws, or in the snap-in seat.

When they are coupled, as in Figure 6, the end sections 1 and 2 are plugged into one another and sealed off from each other by means of sealing rings, as is shown in the drawing. As an alternative, as is shown for the first embodiment, the ribs 19 against which the end sections 1, 2 lie, on the one hand with an encircling step-down of the end sections 1 and, on the other hand, with the unattached end of the in section 2, can be of sealing material so that the sleeve 5 does not come into contact with the fluid.

Figure 13 shows a modification of the sleeve 5 as in Figure 1, in cross section through the axial mid point of the sleeve 5, and Figure 14 shows the cross section XIV-XIV of Figure 13. Here, the cutouts 13 and 14 of the sleeve 5 are located at the axial midpoint of the sleeve 5, and the width of the leaf spring 9 extends only over less than half the length of the sleeve 5. The catches 10 are formed as relatively flat encircling ribs at the ends of the sleeve 5 and are of the same material as the sleeve 5. On the outer periphery there are encircling grooves 27 that save material. The joint 7 that is formed by the leaf spring 9 is exposed on the outside in a narrow section 28 that extends across almost the whole axial length of the sleeve 5 and on both sides of the gap that is defined by the edges of the parts 8 on the side of the sleeve that is opposite the slot 6. The section 28 can, however, also extend across the whole axial length of the sleeve 5. It permits the largely unhindered bending of the leaf spring 9 and thus the spreading of the sleeve 5 around the joint 7, in particular if the area 28 extends across almost the whole axial length of the sleeve 5.

Figure 15 shows a further variation of the sleeve 5 as in Figure 1, and this differs from Figure 13 and Figure 14 only in that the leaf spring 9 extends over more than 180° and less than 360° of the periphery of the sleeve 5.

The version that is shown in Figure 16 differs from that shown in Figure 15 only in that the gap between the edges of the parts 8 that are opposite the slot 6 is filled with a strip 29 that extends axially across the whole length of the sleeve 5, and in the area 28 of the leaf spring 9 that is exposed in the variation shown in Figure 15, said strip 29 being of an elastomer plastic that is fused to these edges. Because of this, on the one hand, the end sections 1 and 2 that are introduced into the sleeve 5 are protected against the ingress of dirt and, on the other hand, the spring 9 that in this case is of spring steel is protected against corrosion.

The variation that is shown in Figure 17 differs from that shown in Figure 15 in that the leaf spring snaps into a channel that is in the form of a groove with undercut walls and is located on the outer periphery of the sleeve 5, while its ends which, turned inward, are introduced into axial slots in the outer side of the sleeve 5. In addition, studs 30 that are

formed in the bottom of the groove are pressed firmly into holes in the leaf spring 9 or are formed with mushroom-shaped heads that snap into such holes.

The variation shown in Figure 18 differs from that shown in Figure 15 only in that the slot 6 is bridged over by a catch 31 in the form of a latch that is molded or welded on flexibly at one end on the sleeve 5, or is connected with this through a positive-engagement joint and its other end is provided with a hook that snaps into position behind a corresponding hook that is molded or welded onto the sleeve 5.

Essentially, the variation shown in Figure 19 differs from the foregoing in that the joint 7 is formed only by an elastomer strip 32 that extends across the whole axial length of the sleeve 5 and is joined by fusion, e.g., by a fused joint, to the edges of the parts 8 in the gap between the edges that is opposite the slot 6. In addition, the sleeve 5 has stiffening ribs 33 on its periphery, of which on each part 8 at least two can be arranged parallel and adjacent to each other in the axial direction of the sleeve 5.

Essentially, the sleeve 5 that is shown in Figure 20 differs from the foregoing in that the joint 7 is formed in one piece with the sleeve 5 and projects radially over the periphery of the sleeve 5. Once again, the sleeve 5 consists of a least one of the plastics referred to in connection with the first embodiment, the material for this and the thickness of the joint 7 being so selected that the joint 7 has essentially the same characteristics as the joint 7 referred to in the first embodiment. In order to save material, the sleeve 5 incorporates depressed areas 34 and 35, the walls of which that are arranged one behind the other simultaneously acting as stiffening ribs.

Figure 21 shows a variation of the sleeve shown in Figure 20 in which the joint 7 does not project beyond the periphery of the sleeve 5 and extends over a greater peripheral angle of the sleeve 5.

A further variation can be such that in the case of all the sleeves 5, they incorporate a lock corresponding to the latch 31 shown in Figure 18. Furthermore, the sleeve 5 that is

shown in Figure 19 and Figure 20 can, as an alternative, be of metal.

Figure 22 shows a cross section through an end section 1 that is modified somewhat as compared to the end section shown in Figure 16; the cross section is perpendicular to its longitudinal direction, directly behind the retaining rib 3 within the grooves 3a, as viewed in the direction of the end of the end section 1 that is inserted into the other end section 2. As is shown in Figure 22, the rib 18 shown in Figure 2 has been omitted. In place of this, two lobes that are diametrically opposite each other within the groove 3a extend radially outwards to a height that matches the height of the retaining rib 3. These lobes 36 have inclined faces 37 at their ends that are remote from each other in the peripheral direction of the end sections 1. The other end section 2, shown in Figure 6, is similarly provided with lobes that correspond to lobes 36 behind its retaining rib for in the groove 4a. The rib 7 that is shown in Figure 3 has also been omitted from this end section.

When of the end sections 1 and 2 are coupled together, the catches 10 of the sleeve 5 engage in the sections of the annular groove between the lobes 36.

Once the sleeve 5 has been simply rotated manually about the longitudinal midline axis of the sleeve relative to the end sections 1 and 2, to the point that the ends of the catches 10 that are remote from each other in the peripheral direction slide radially outwards over the faces 37 of the lobes 36 as the sleeve 5, including the ring 21 or joint 7, grows wider and the radially innermost edges of the catches 10 are seated on the lobes 36, the end sections 1 and 2, or only one of these end sections, can be withdrawn axially out of the sleeve 5.

In principle, it is also possible to provide only one lobe 36 behind each retaining rib 3, 4, said lobe being more or less diametrically opposite the joint 7 or the gap that incorporates the joint 7, relative to the longitudinal mid-line axis of the end sections 1, 2.

In the modified version of the sleeve as shown in Figure 1, which is shown in Figures 23 and 24, there is an expander 38 in the slot 6 of the sleeve 5. This rests on stops 39 on the

parts 8 of the sleeve 5 that are adjacent to the slot 6 so as to be movable. By moving the expander 38, the slot 6 can be made wide enough that the least one of the end sections can be withdrawn from the sleeve 5.

The expander 38 incorporates two plates 41, 42 that are connected by a post 40 that passes through the slot 6; of these, one plate is on the outside of the sleeve 5 and the other plate is on the underside of said sleeve 5.

The expander 38 can be moved along the slot 6. One of the two plates 41, 42, in this instance the plate 41, is in the form of a truncated wedge and its edges that converge toward one another each rest on a stop 39.

The stops 39 are formed by depressions 43 in the walls of the sleeve on both sides of the slot 6, and they converge at the same angle as the wedge angle of the inclined edges of the wedge-shaped plate 41.

Movement of the expander 38 is limited by end stops 44, 45 that determine the maximal and the minimal expansion of the sleeve 5 by the expander 38. In the position on the end stop 44 that determines the maximal expansion of the sleeve 5, the expander can snap behind steps 46 in the stops 39 formed by the edges of the depressions 43.

The upper side of the expander is scored or grooved to make it easier to move; if it is moved manually from the position on the end stop 45 that is shown, which determines the minimal expansion, into the position on the end stop 44, the sleeve 5 is made wider to the point that the catches 10 snap out from behind the grooves 3a, 4a behind the retaining ribs 3, 4, and the end sections 1, 2 can be withdrawn from the sleeve 5 so as to release the connection with the fluid lines that are connected to the end sections 1, 2. In the position on the ends stop 44, the plate 41 snaps into position behind the stops 46 so that the expander 38 need not be held in place during the uncoupling process. The position of the expander 38 on the end stop 45 that the shown can simultaneously serve as an indication that the end sections that are inserted into the sleeve 5, and thus the fluid lines

themselves, are correctly connected. The expander 38 thus forms a so-called assembly indicator.

Instead of the expander 38 that is shown in Figures 23 and 24, the expander 47 that is shown in Figures 25 to 27 can be used. This is supported so as to be able to rotate in the slot 6 of the sleeve 5, with a post 50 that joins two parallel plates 48 and 49. The plate 48 is on the outer side of the sleeve 5 and the plate 49 is on the inner side of the sleeve 5. However, they can also be supported in flat, semicircular depressions in the outer side or the inner side of the sleeve 5 that define the slot 6. The post 50 is flat and is curved on its narrow ends, one half of the post 50 forming an eccentric 51 or 52. In this expander 47, each of the edges of the slot 6 serves as a support for the post 50. In the closed position of the sleeve 50, in which the end sections 1, 2 are coupled, the flat sides of the post 50 rest on the edges of the slot 6. The outer plate 48 incorporates a polygonal depression 53, in this instance a rectangular slot, that accommodates a turning tool such as a screw driver. By using the turning tool that is introduced into the depression 53, the slot 6 and thus the sleeve 5 can be expanded until the eccentrics 51, 52 rest on the edges of the slot 6. In this expanded state, at least one of the end sections 1 or 2 can be withdrawn from the sleeve 5. In principle, only one of the eccentric 51, 52 would be required to make the slot 5 wider, given a sufficiently large space between its curvature and the axis of rotation of the post 50. This expander 47 also serves as an assembly indicator, since the coupling state can be determined by the angular position of the depression 53.

Patent Claims

1. Connection system with coaxial end sections (1, 2) of two fluid lines that are to be joined, which on each end section (1, 2) are provided with an encircling retaining rib (3, 4), with a sleeve (5) that incorporates an axial slot (6), a flexible joint (7) that is opposite the slot (6), and on its inner side catches (10) that snap behind the retaining ribs (3, 4) in grooves (3a, 4a) behind the retaining ribs (3, 4), the joint being so elastically flexible that it forces the parts (8) of the sleeve (5) that are opposite the slot (6) that are adjacent to each other radially toward one another, characterized in that the end sections (1, 2) can be introduced into the sleeve (5) as the slot (6) is elastically widened by sliding the retaining ribs (3, 4) out of the way, beneath the catches (10), until they snap into position behind the catches (10), the axial width of the catches (10) matching the width of the grooves (3a, 4a).
2. Connection system as defined in Claim 1, characterized in that the catches (10) are catch projections moulded onto the inner side of the sleeve (5) and extend in the peripheral direction of the sleeve (5), the radius of curvature of these being smaller than that of the retaining ribs (3, 4) on the end sections (1, 2) of the fluid lines.
3. Connection system as defined in Claim 2, characterized in that the faces (26) of the catch projections that are next to the front end of the end sections (1, 2), as viewed in the direction of insertion, incorporate an inclined face for the retaining ribs (3, 4) that are on the particular end section (1, 2).
4. Connection system as defined in Claim 1, characterized in that the catches (10) incorporate rods of at least one of the materials metal or plastics, the ends of these rods extending transversely to the axial direction of the sleeve (5) and being secured in the wall of the sleeve (5).

5. Connection system as defined in one of the Claims 1 to 4, characterized in that the parts (8) of the sleeve (5) adjacent to the slot (6) are formed as half shells that are joined by the joint (7).
6. Connection system as defined in Claim 5, characterized in that the joint (7) is of one of the materials spring steel and plastic.
7. Connection system as defined in Claim 6, characterized in that the joint (7) incorporates (at least) one leaf spring (9) disposed in a channel of the half shells (8).
8. Connection system as defined in Claim 7, characterized in that the leaf spring (9) has a curvature that matches the curvature of the half shells (8); in that the half shells (8) are of thermoplastic; and in that the leaf spring (9) is extrusion-coated by the plastic of the half shells.
9. Connection system as defined in Claim 7, characterized in that the leaf spring (9) has a curvature that matches the curvature of the half shells (8); in that the half shells (8) are of thermoplastic; and in that the channel is preformed in the half shells (8) and the leaf spring (9) is inserted into the channel.
10. Connection system as defined in Claim 9, characterized in that the channel is enclosed all around.
11. Connection system as defined in Claim 9, characterized in that the channel is in the form of a groove within which the leaf spring (9) is secured.
12. Connection system as defined in Claim 11, characterized in that the walls of the groove are undercut so that the leaf spring (90) can snap into the groove.
13. Connection system as defined in Claim 7, characterized in that the joint (7) that

incorporates plastic is connected to the half shells (8) by at least one of the connection types fusion, interlocking, or one-piece construction.

14. Connection system as defined in one of the Claims 1 to 6, characterized in that at least one part of the joint (7) forms at least one part of at least one flexible ring (21) that surrounds the sleeve (5), said ring leaving exposed at least a section of the slot (6) that facilitates the introduction of a spreading tool
15. Connection system as defined in one of the Claims 1 to 14, characterized in that at least one of the edges of the slot (6) incorporates at least one recess (13; 14) for the introduction of a spreading tool.
16. Connection system as defined in one of the Claims 1 to 15, characterized in that the sleeve (5) has on the inside a stop rib (19) for the end sections (1, 2), said stop rib (19) extending in the peripheral direction.
17. Connection system as defined in Claim 16, characterized in that the stop rib is of an elastomer material and is secured all around on the sleeve (5).
18. Connection system as defined in one of the Claims 1 to 17, characterized in that behind each retaining rib, on the side that is remote from the unattached ends of the end sections (1, 2), there is a lobe (36) with sloping faces (37) that projects radially at a height that corresponds to the radial height of the retaining catches (3, 4), said lobe being opposite the joint (7) relative to the longitudinal mid-line axis of the sleeve (5) and in the coupled state the catches (10) lying on both sides of the or each lobe (36).
19. Connection system as defined in Claim 18, characterized in that there is an additional lobe (36) diametrically opposite the first lobe (36) described heretofore, relative to the longitudinal mid-line axis.

20. Connection system as defined in one of the Claims 1 to 17, characterized in that within the slot (6) of the sleeve (5) an expander (38; 47) is supported so as to be movable on supports (39) of the parts (8) of the sleeve (5) adjacent to the slot (6), the slot (6) being expandable by moving the expander (38; 47) so far that at least one end of the end sections (1, 2) can be withdrawn from the sleeve (5).
21. Connection system as defined in Claim 20, characterized in that the expander (38; 47) incorporates two plates (41, 42; 48, 49) that are connected by a post (40; 50) that passes through a slot (6), one plate (41; 48) being on the outside of the sleeve (5) and the other plate being on the inside of the sleeve (5).
22. Connection system as defined in Claim 21, characterized in that the expander (38) can be moved along the slot (6); and in that one of the two plates (41, 42) is wedge shaped, and lies with each of its converging edges on a support (39).
23. Connection system as defined in Claim 22, characterized in that the supports (39) are formed by the edges of depressions (43) formed in the wall of the sleeve on both sides of the slot (6), said edges converging at the same angle as the wedge angle formed by the inclined edges of the wedge-shaped plate (41).
24. Connection system as defined in Claim 22 or Claim 23, characterized in that the travel of the expander (38) is limited by end stops (44, 45) that in each instance determine the maximal and the minimal expansion of the sleeve (5) by the expander (38).
25. Connection system as defined in Claim 21, characterized in that the expander (38) can snap in the position on the end stop (44) that determines the maximal expansion of the sleeve (5).
26. Connection system as defined in Claim 21, characterized in that the post (50) that joins the plates (44, 45) is configured as an eccentric (51; 52) and is supported in

the sleeve (5) so as to be able to rotate; and in that the plate (48) that lies on the outside of the sleeve (5) incorporates a polygonal depression (52) to accommodate a turning tool.

Fig. 2

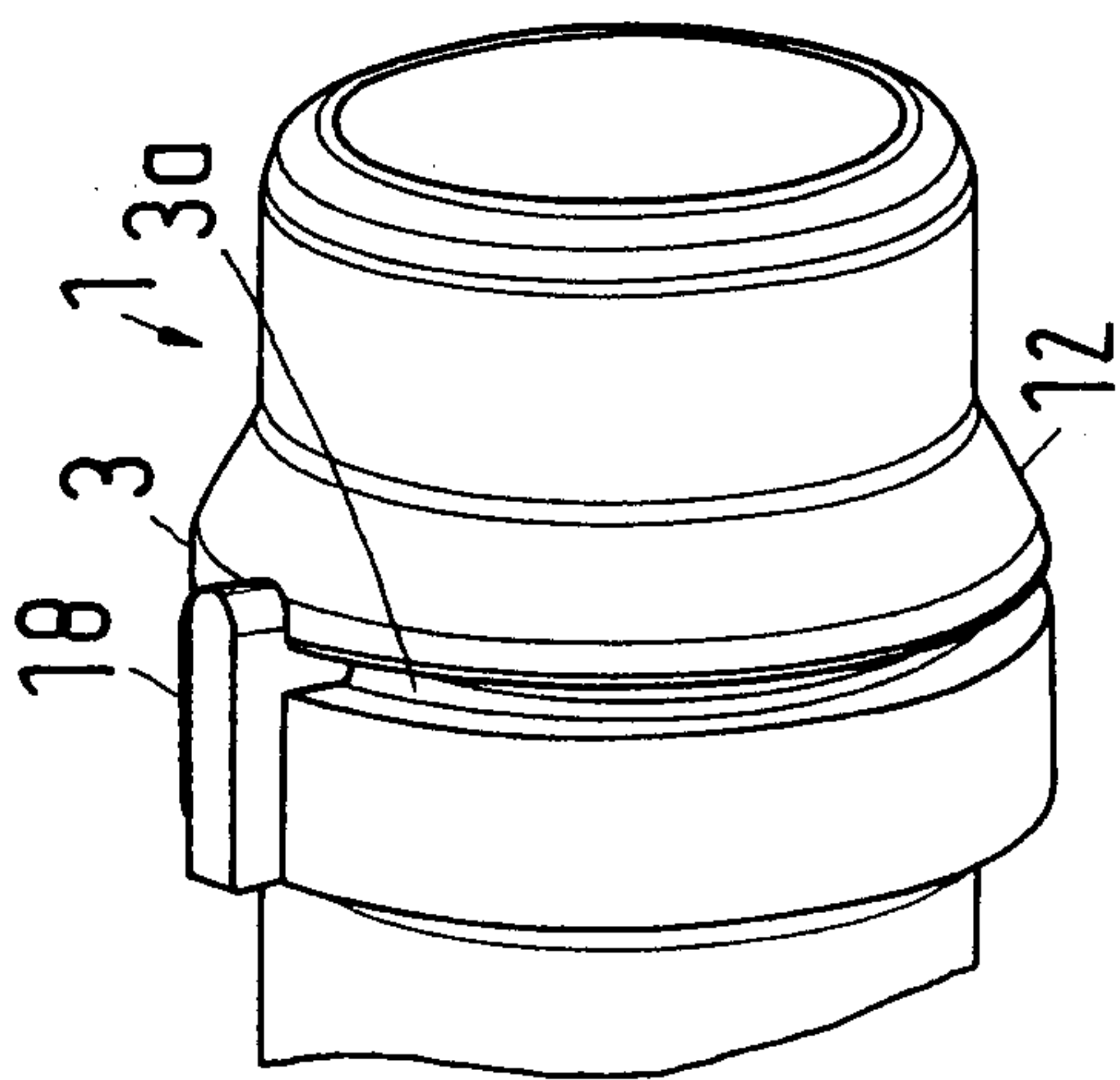


Fig. 1

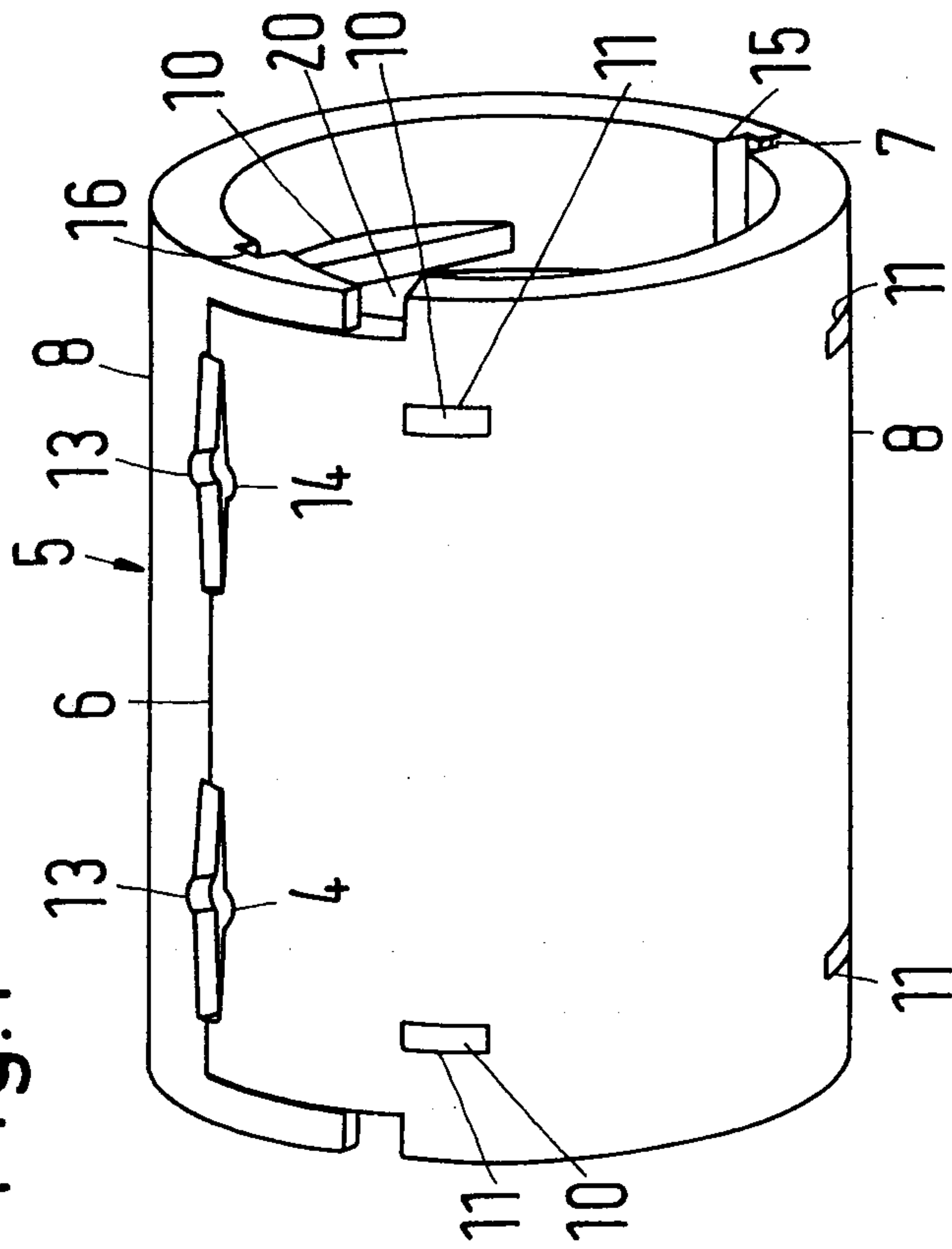


Fig. 3

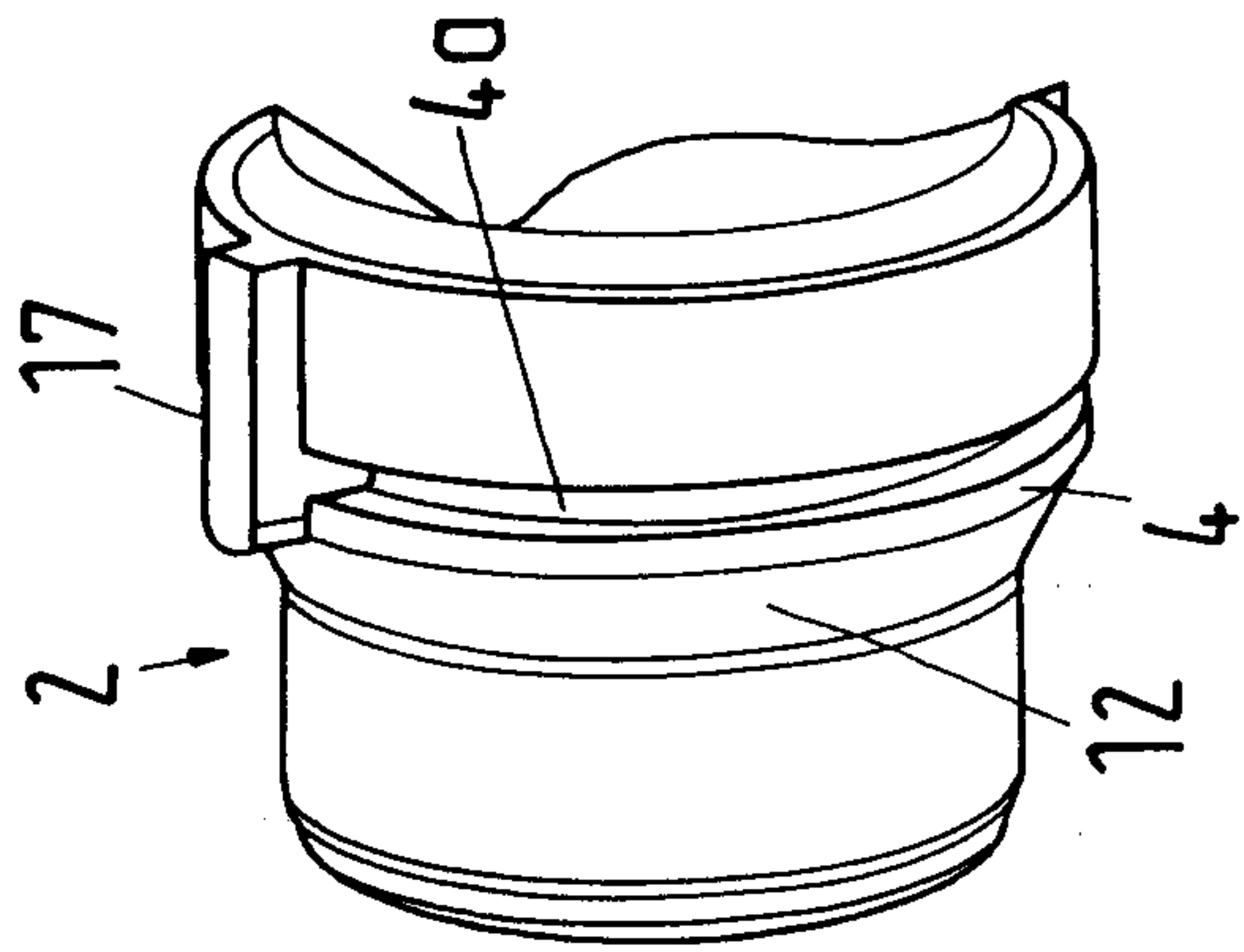
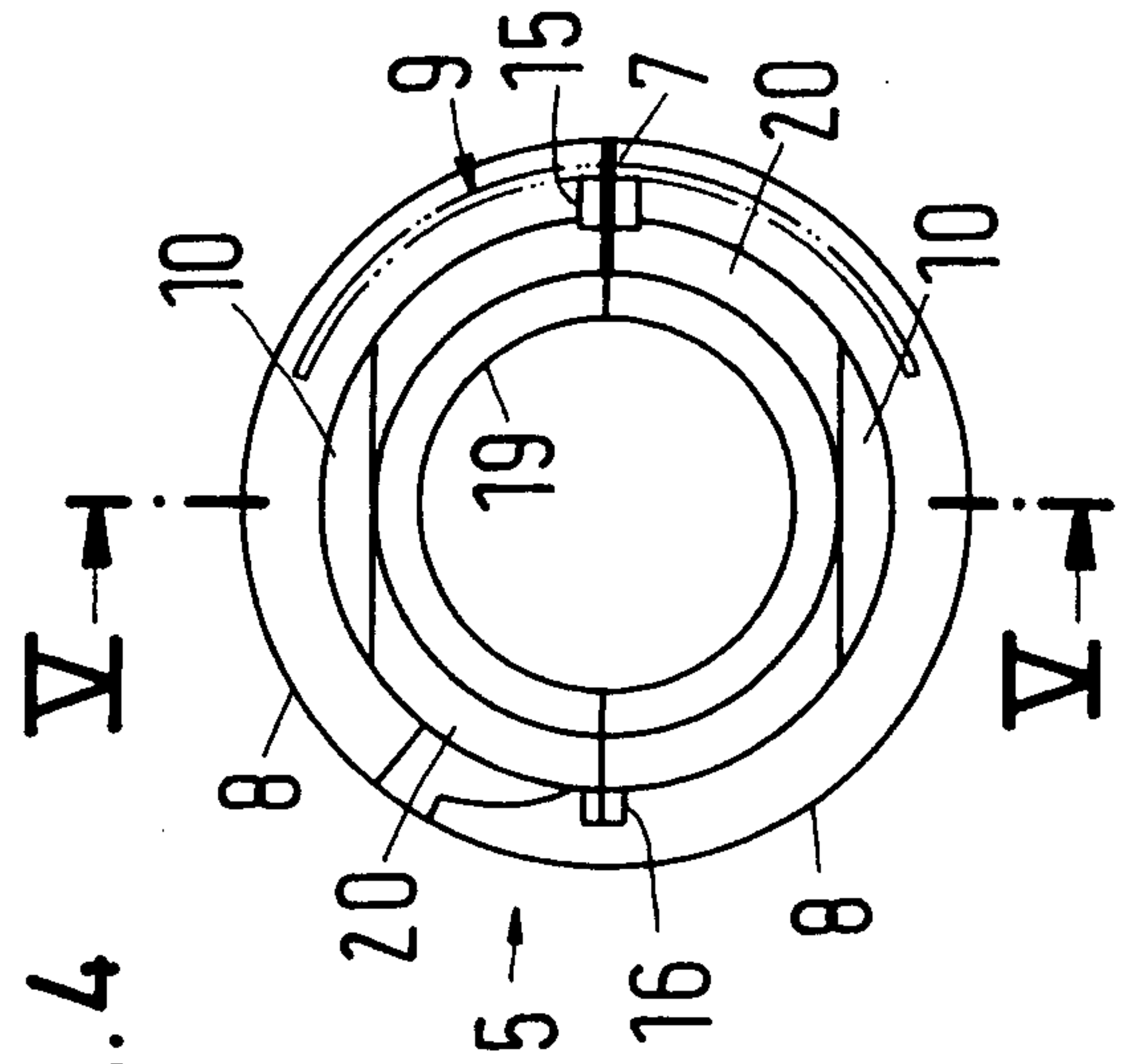


Fig. 4



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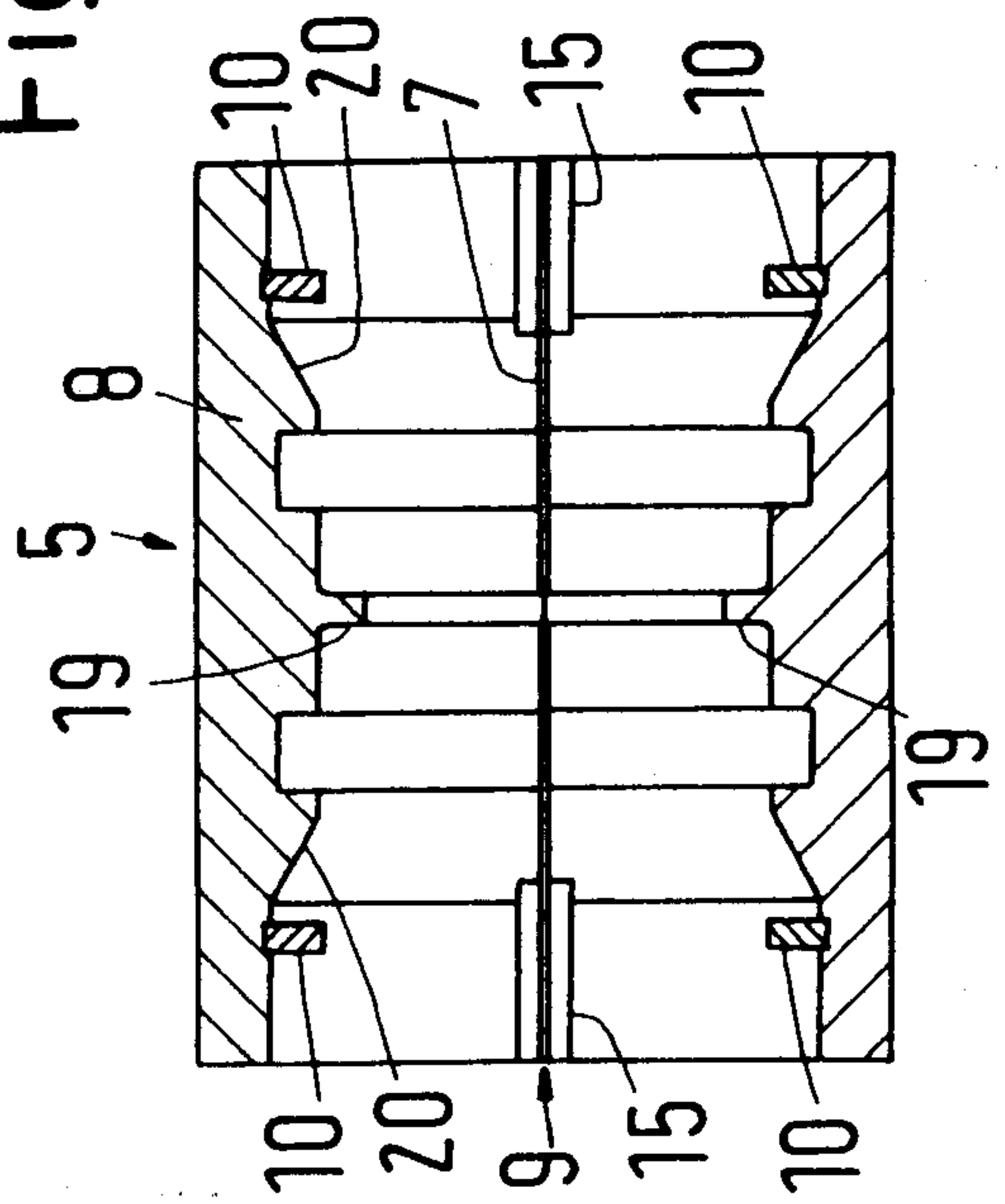


Fig.6

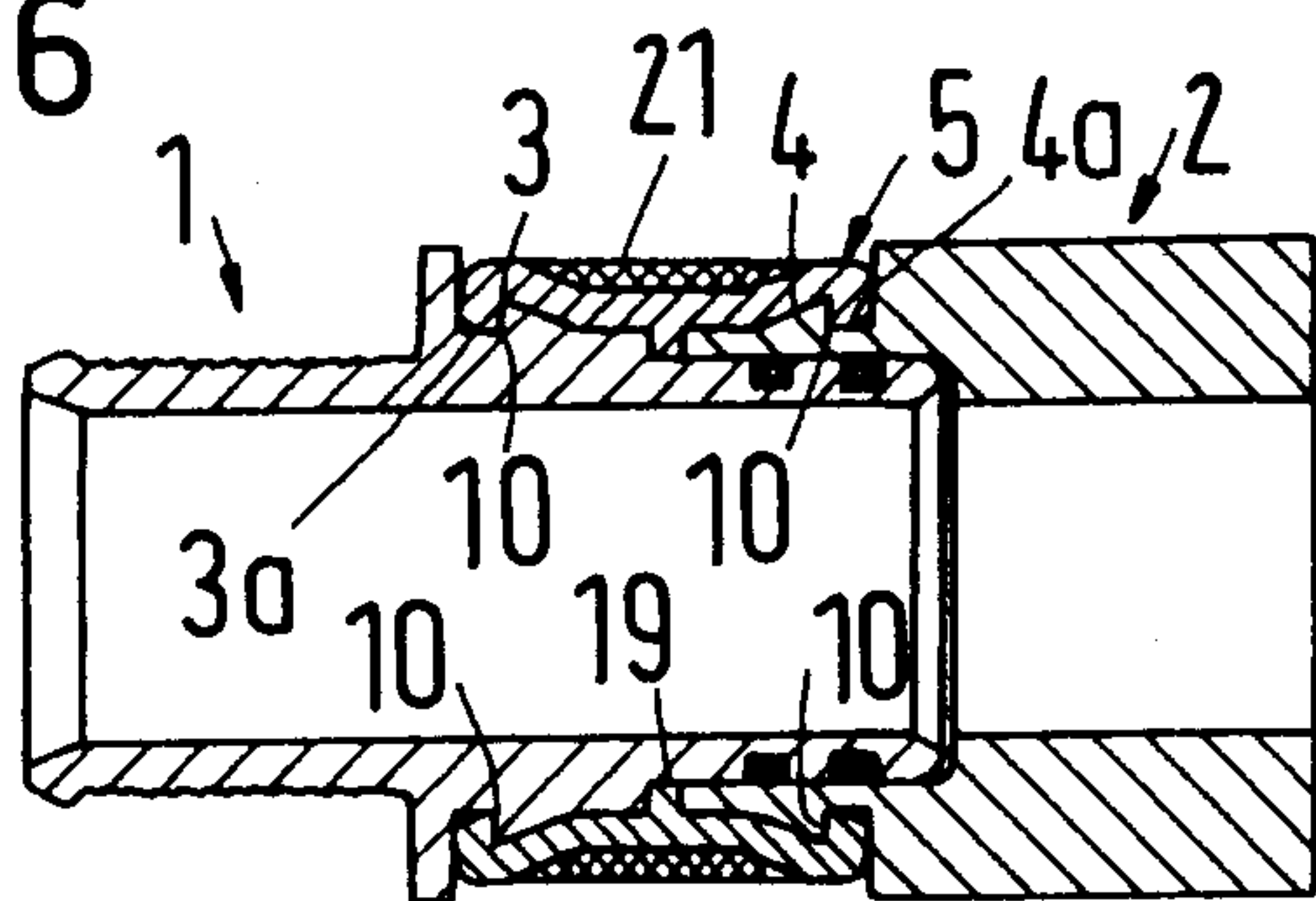


Fig.7

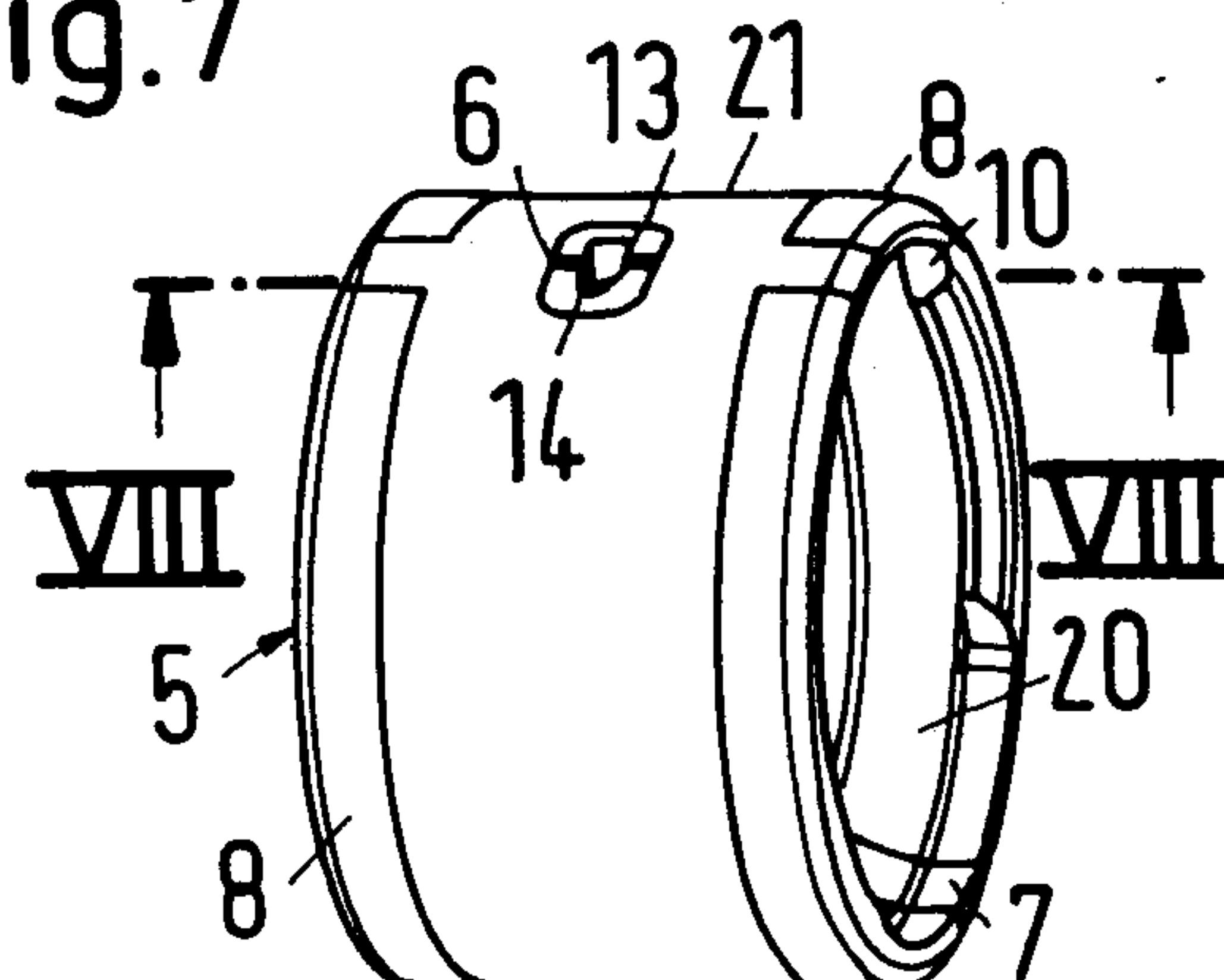


Fig.8

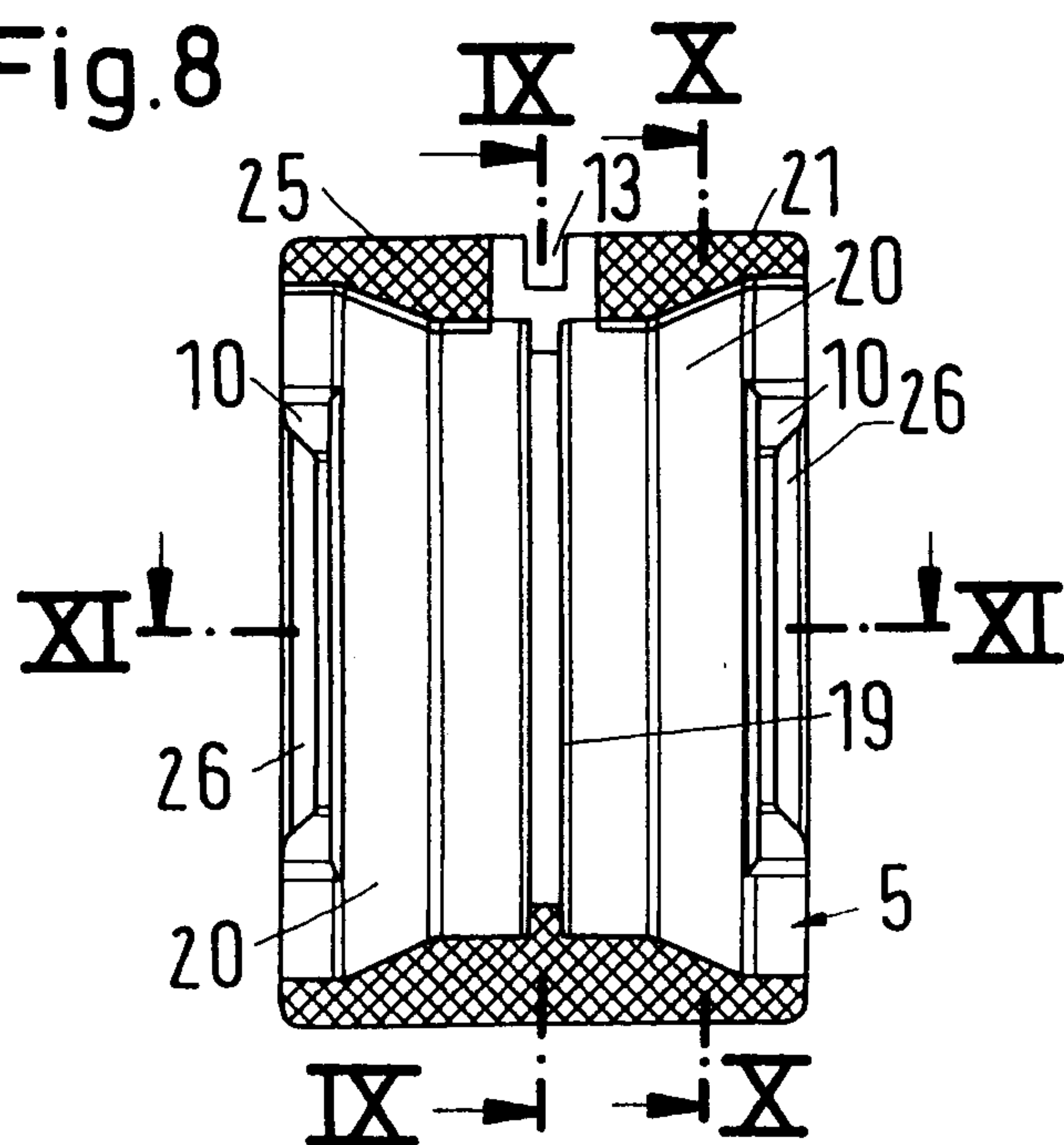


Fig.9

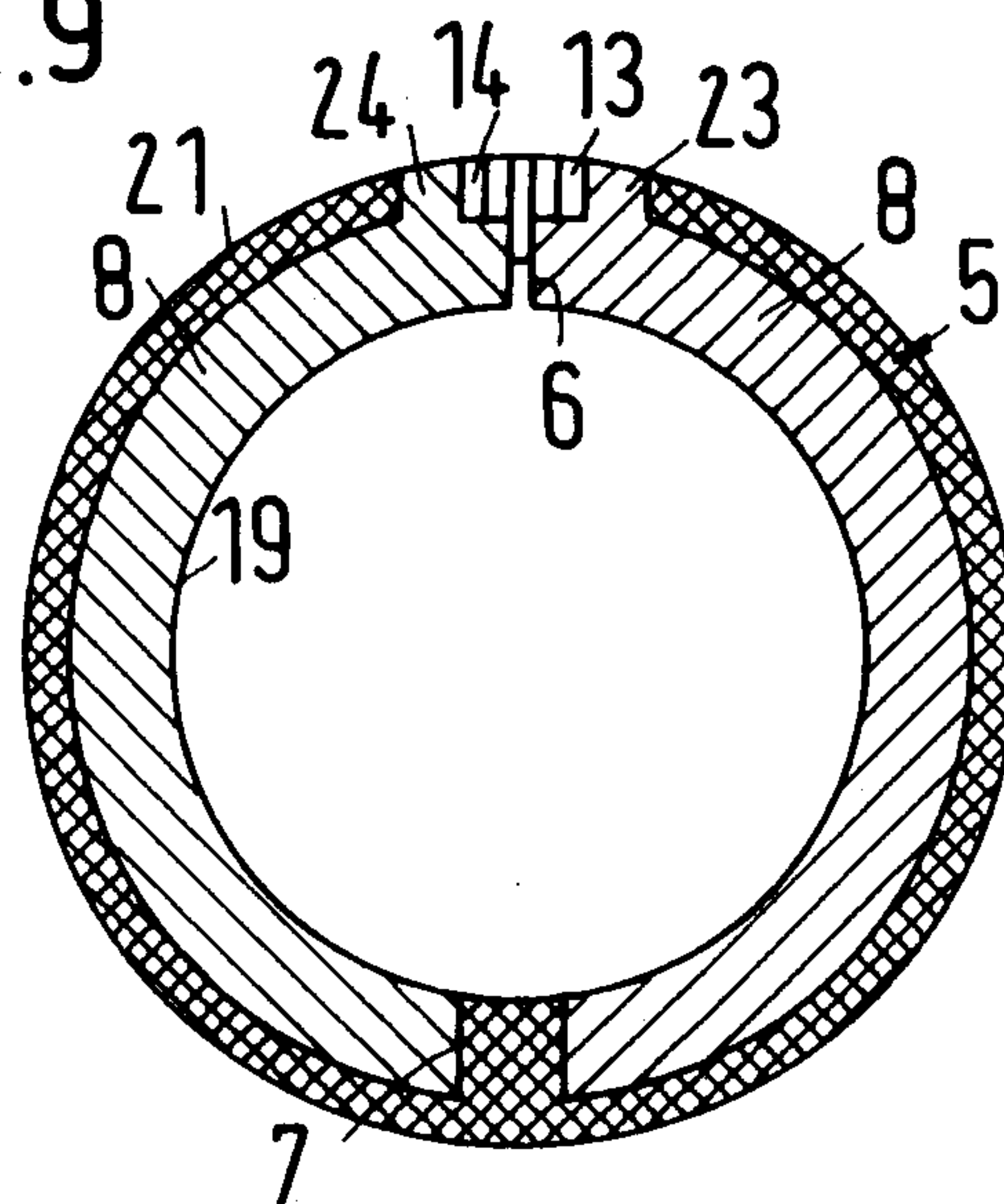


Fig.10

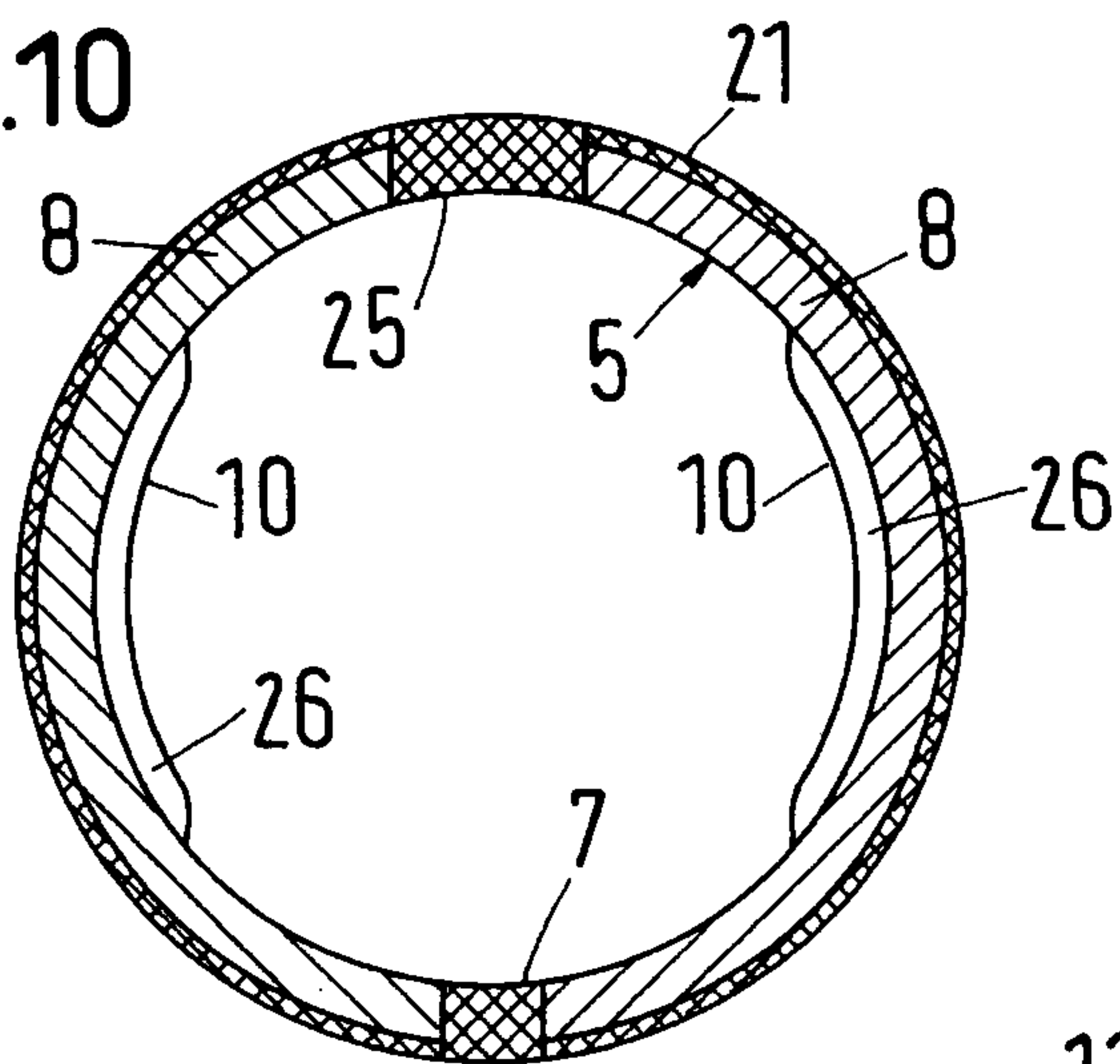


Fig.11

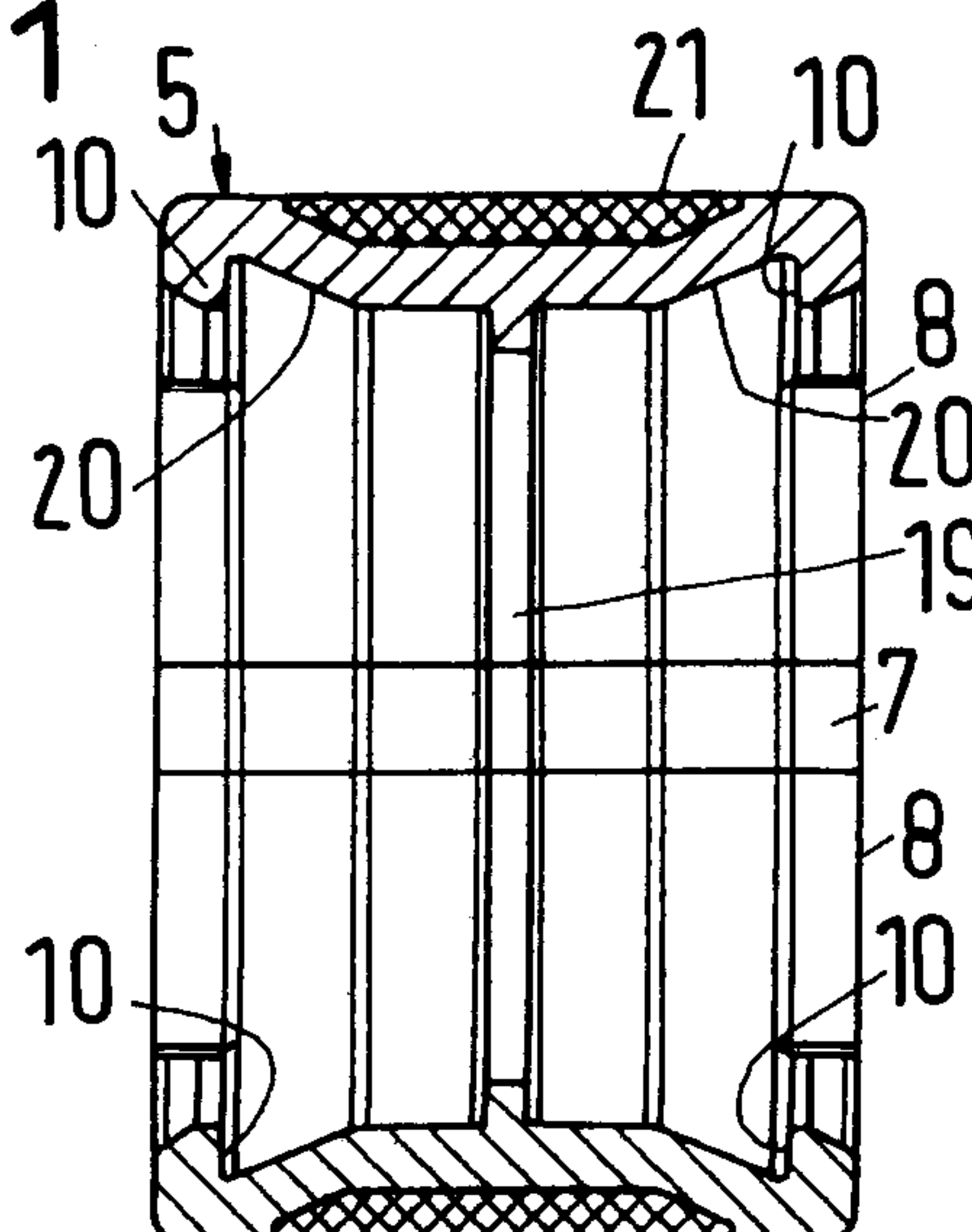
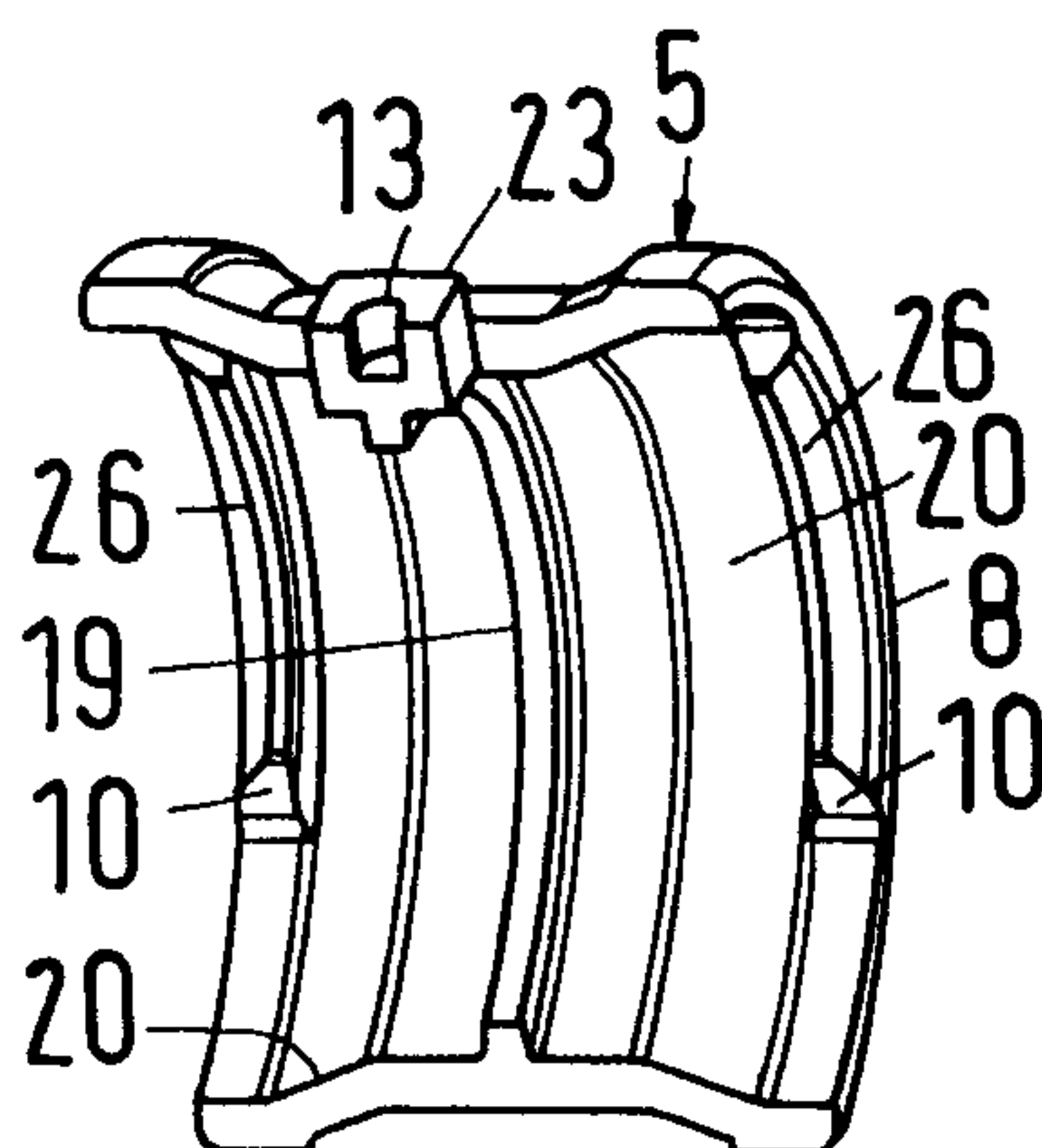


Fig.12



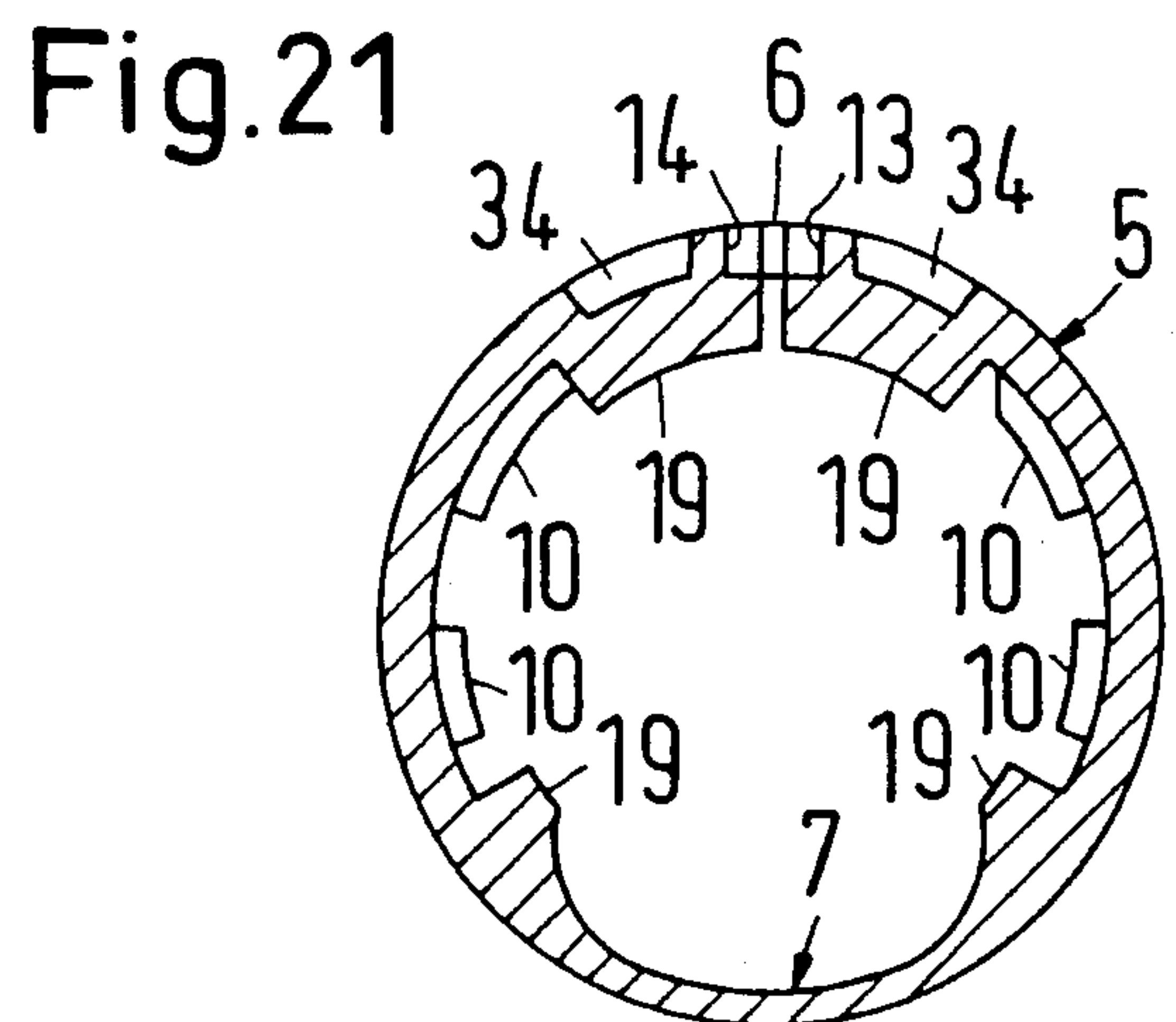
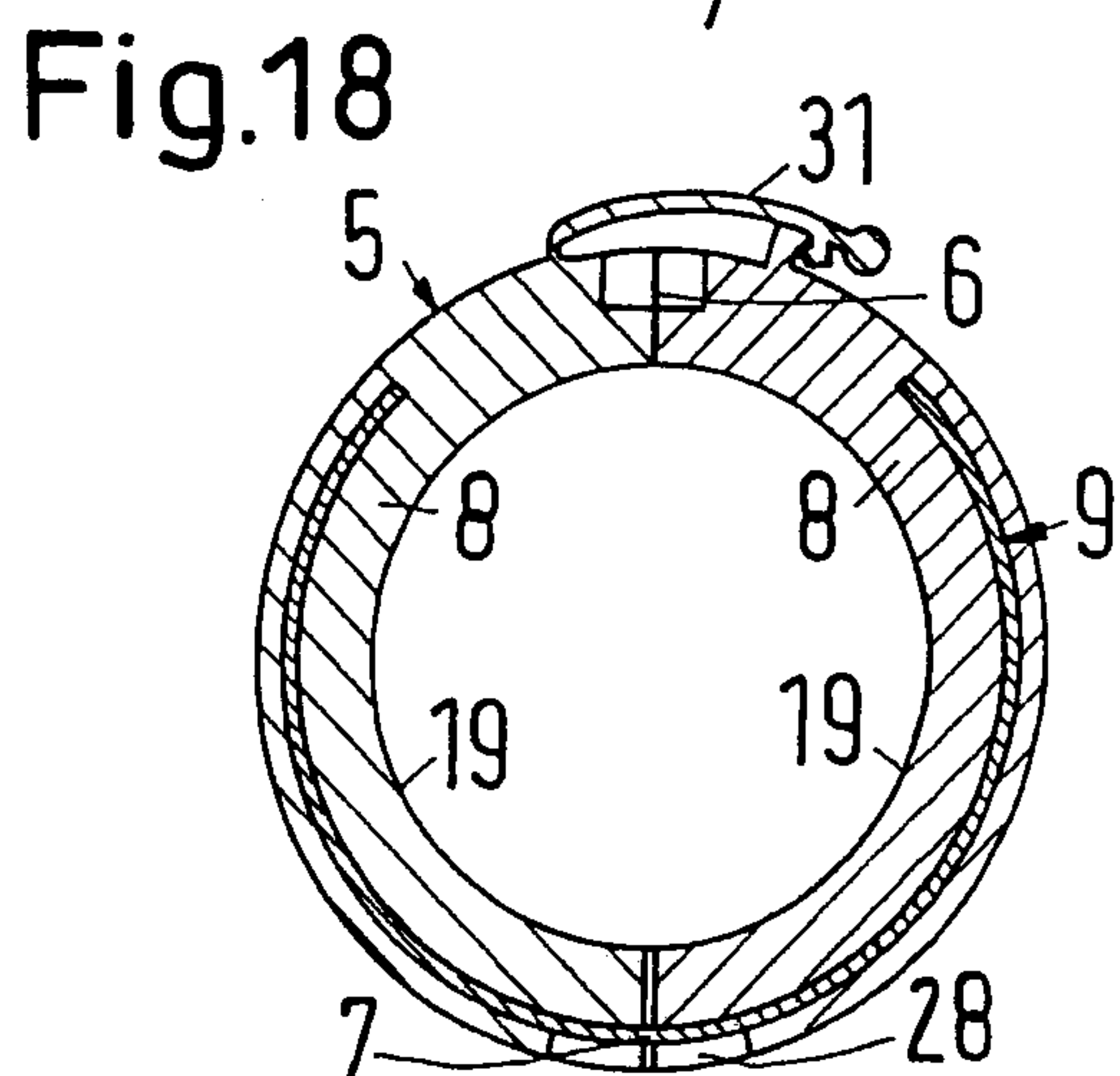
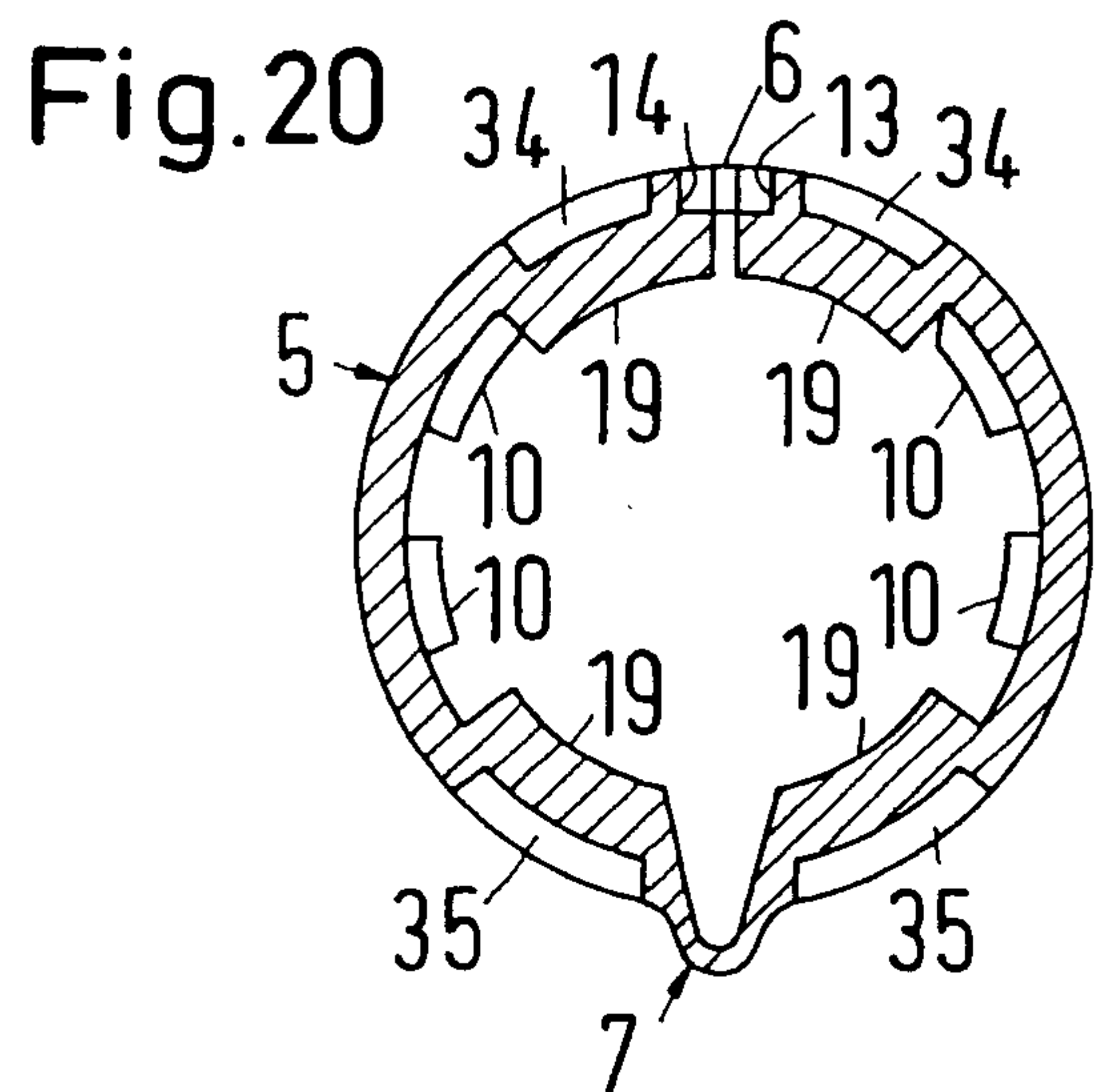
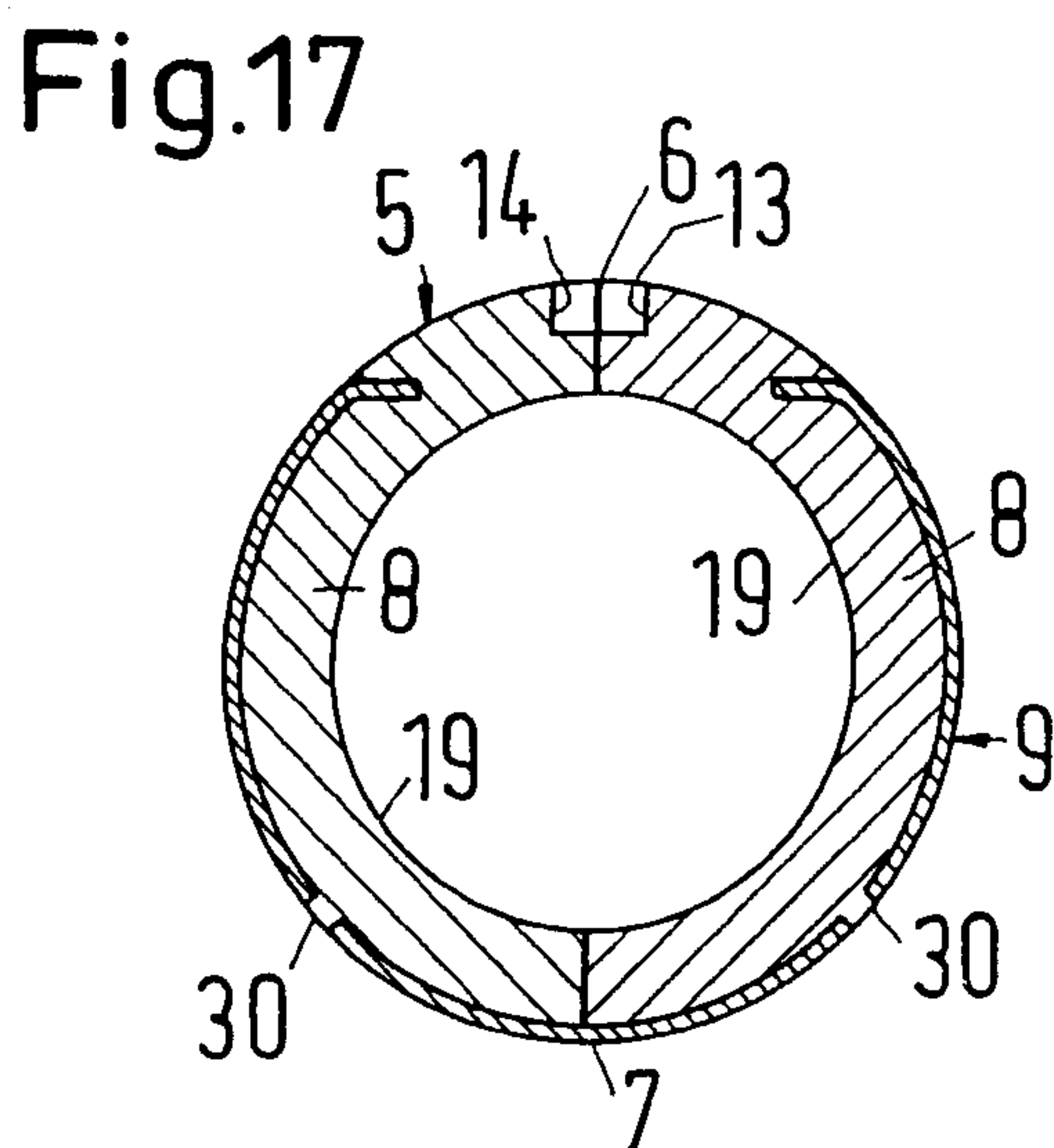
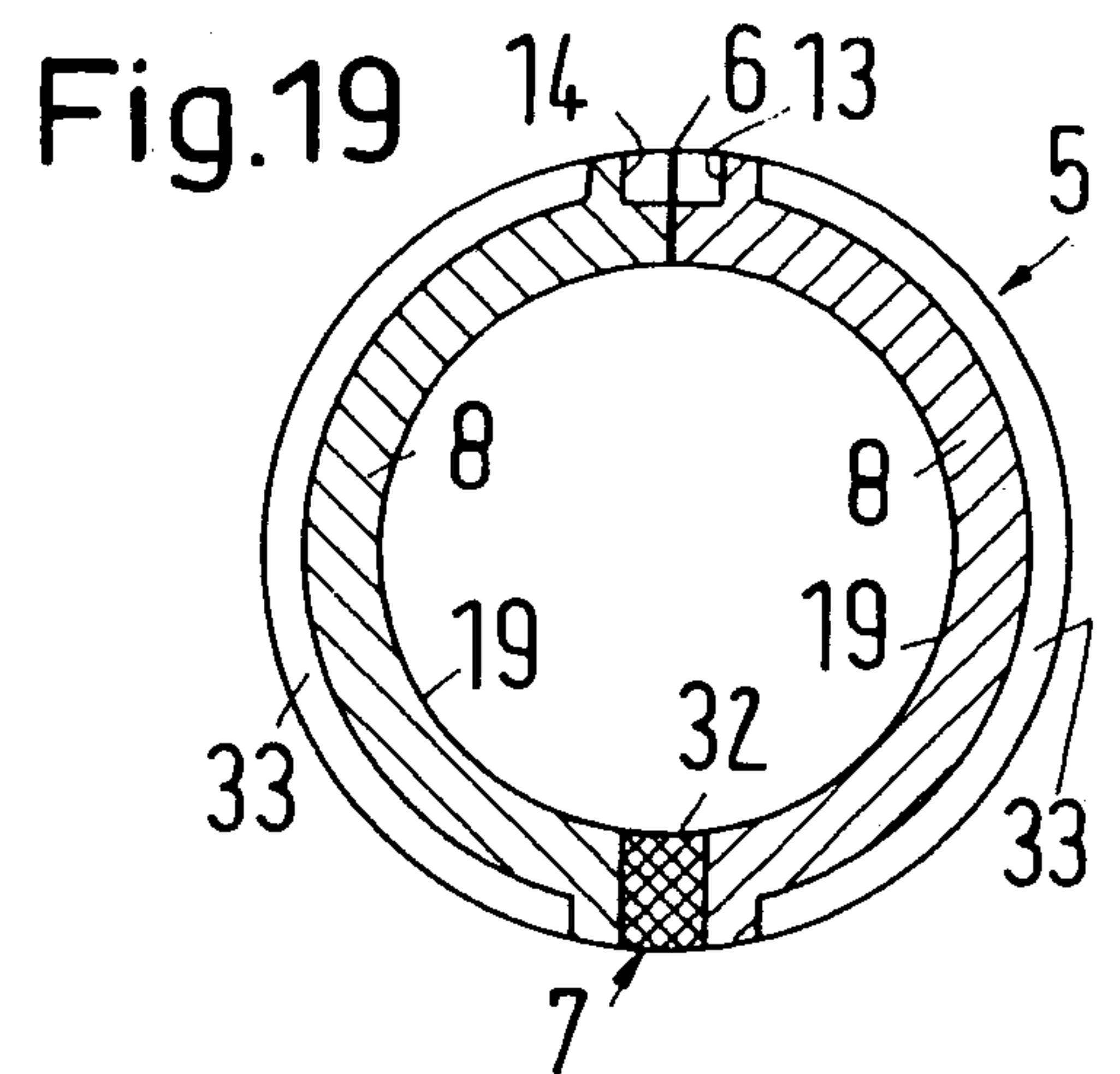
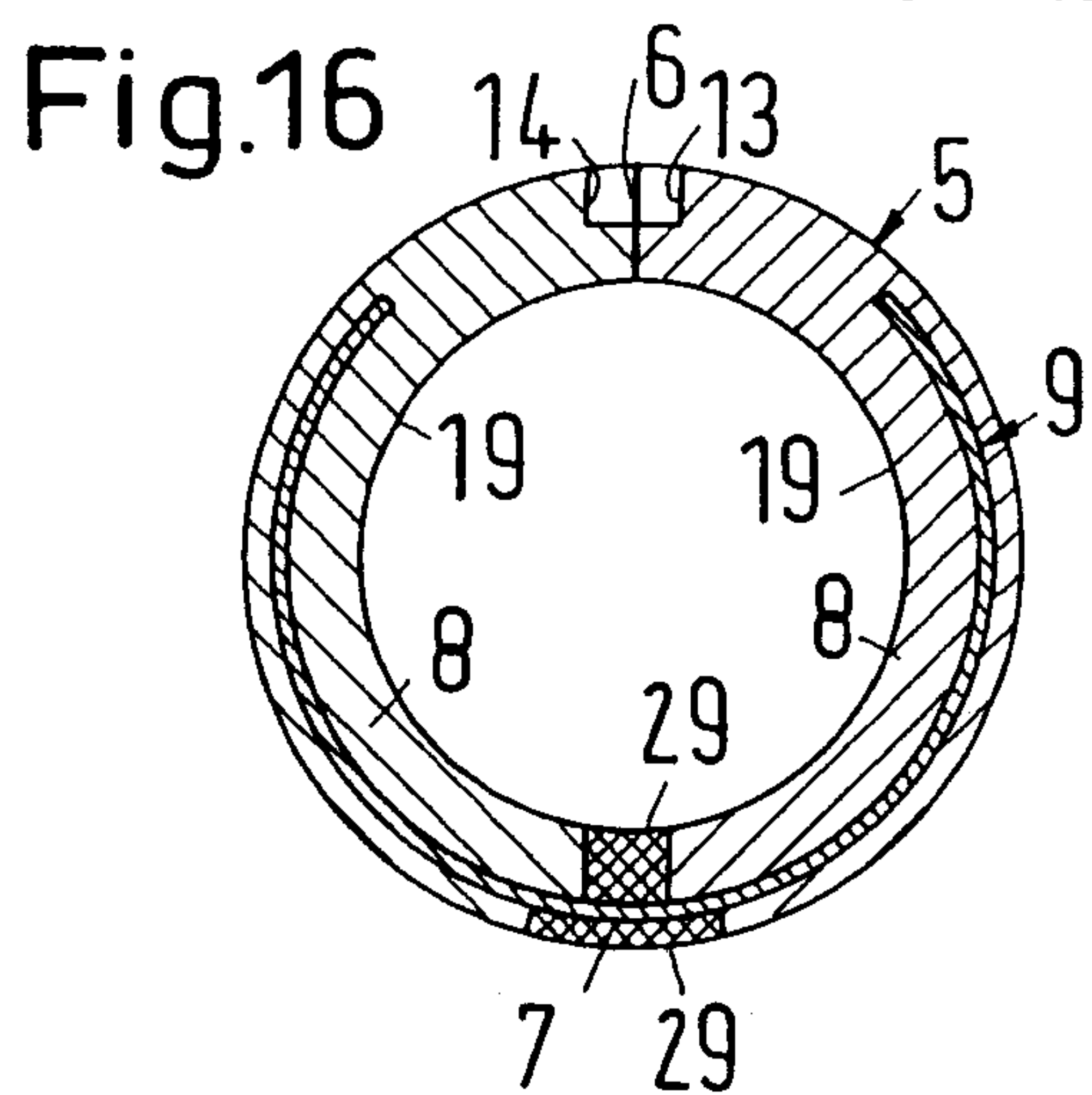
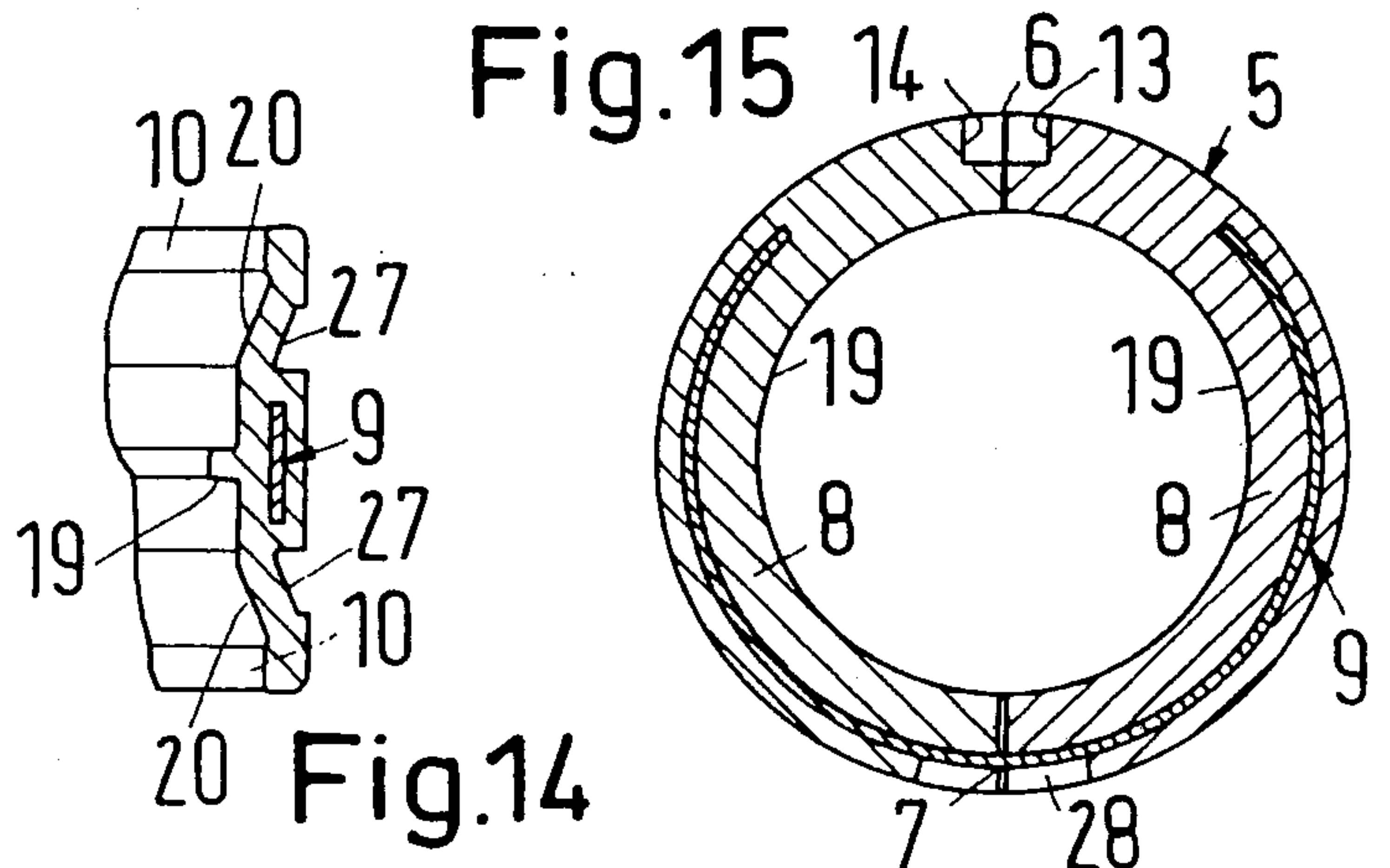
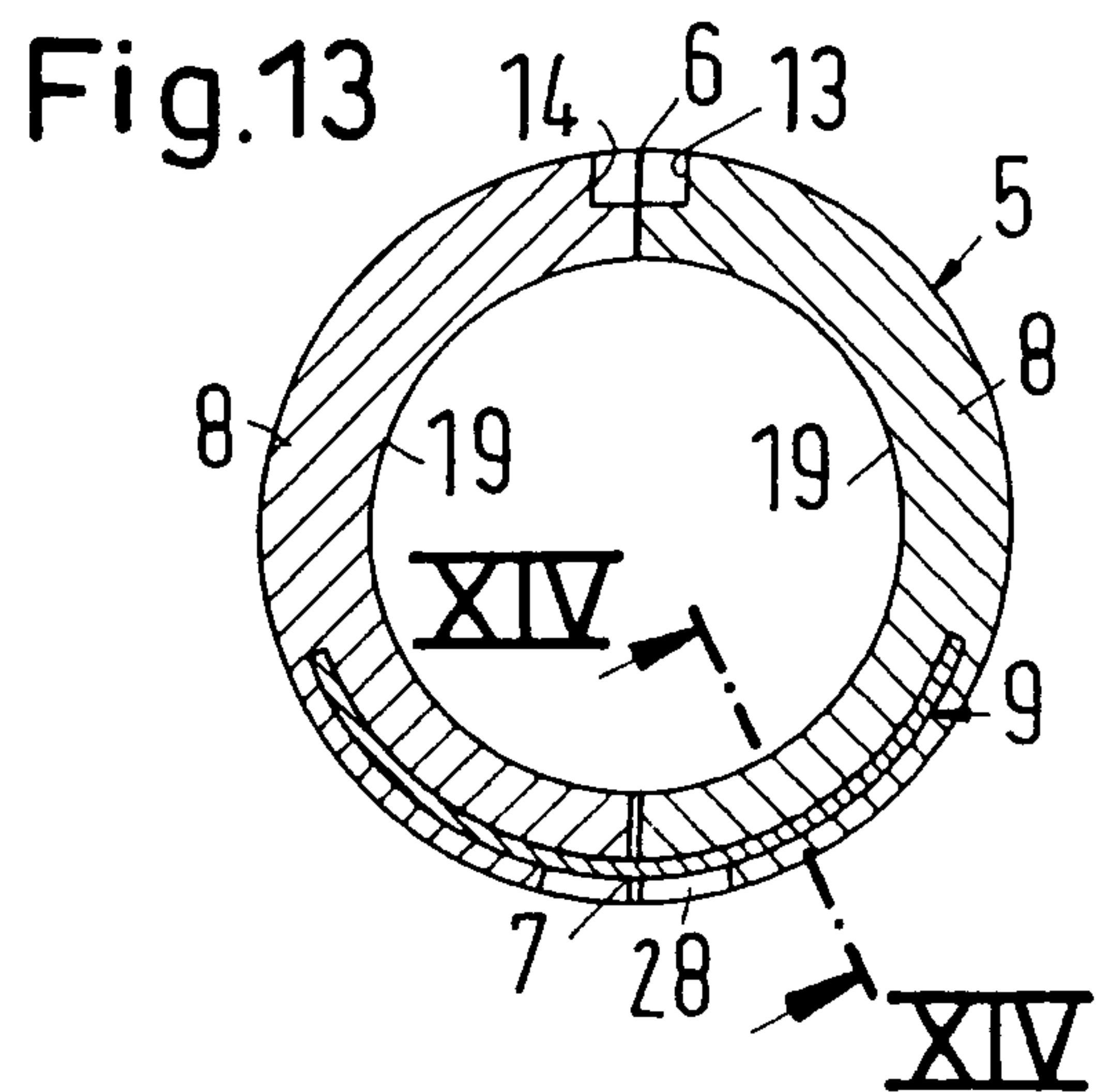


Fig.22

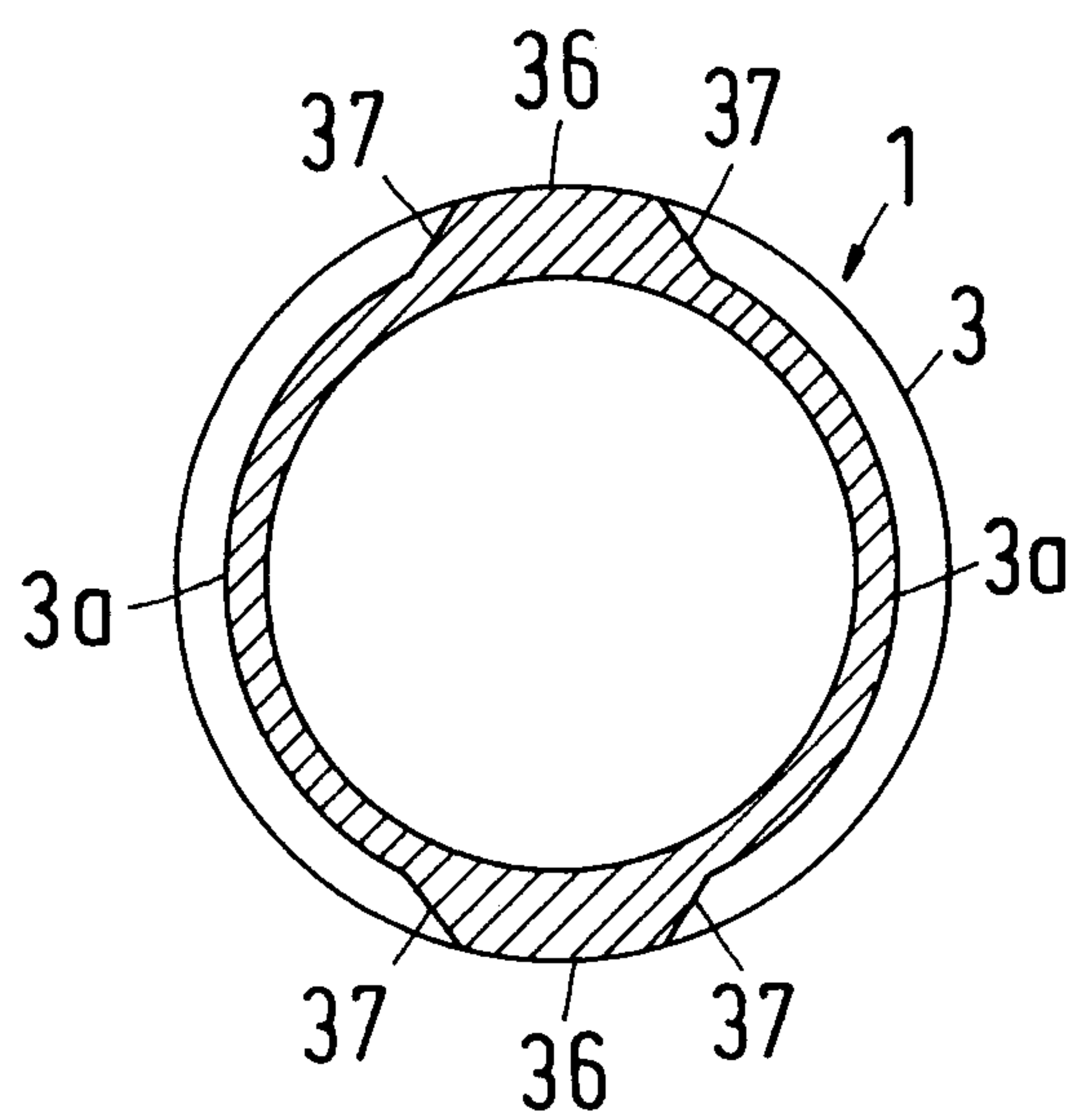


Fig.23

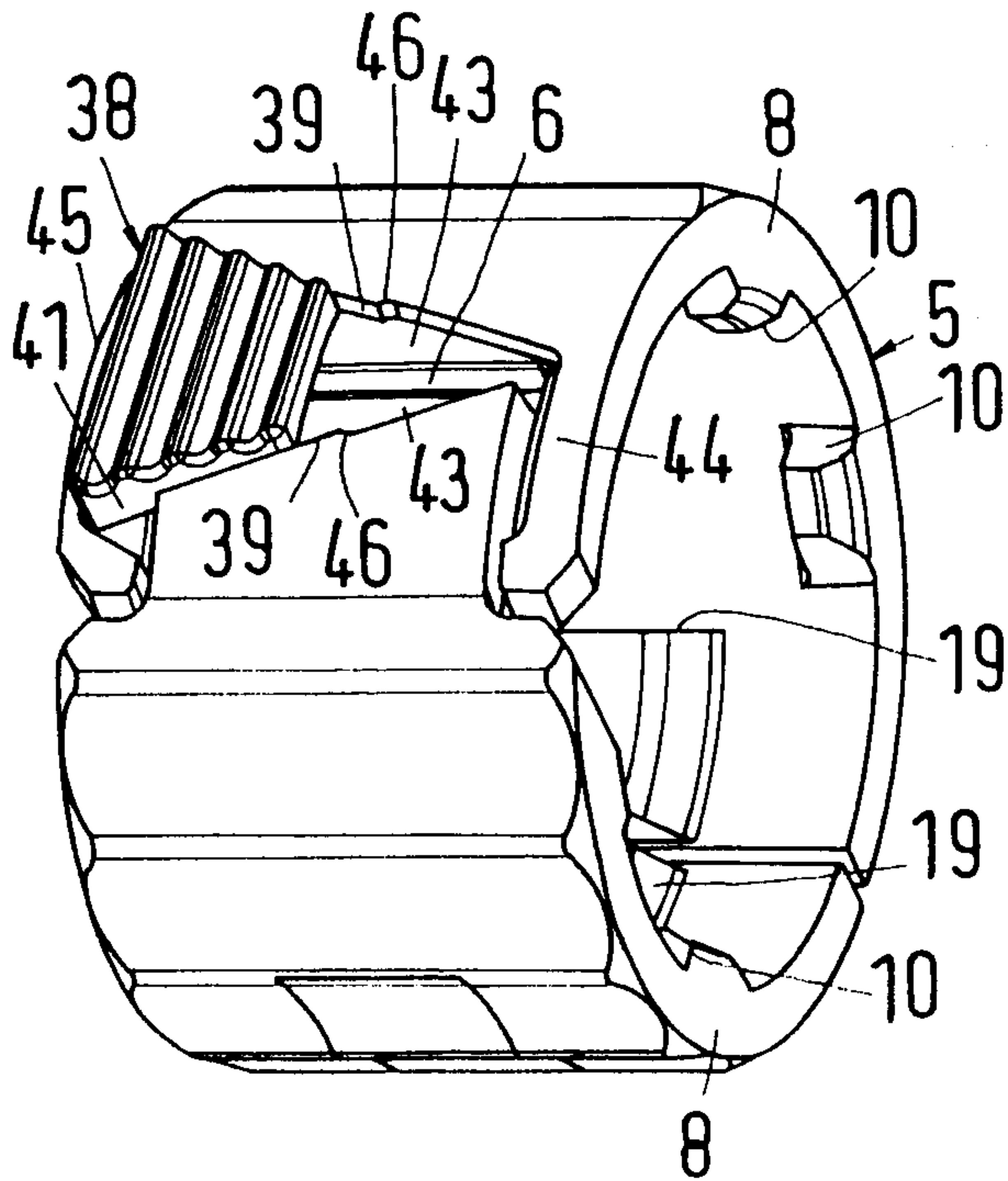


Fig.24

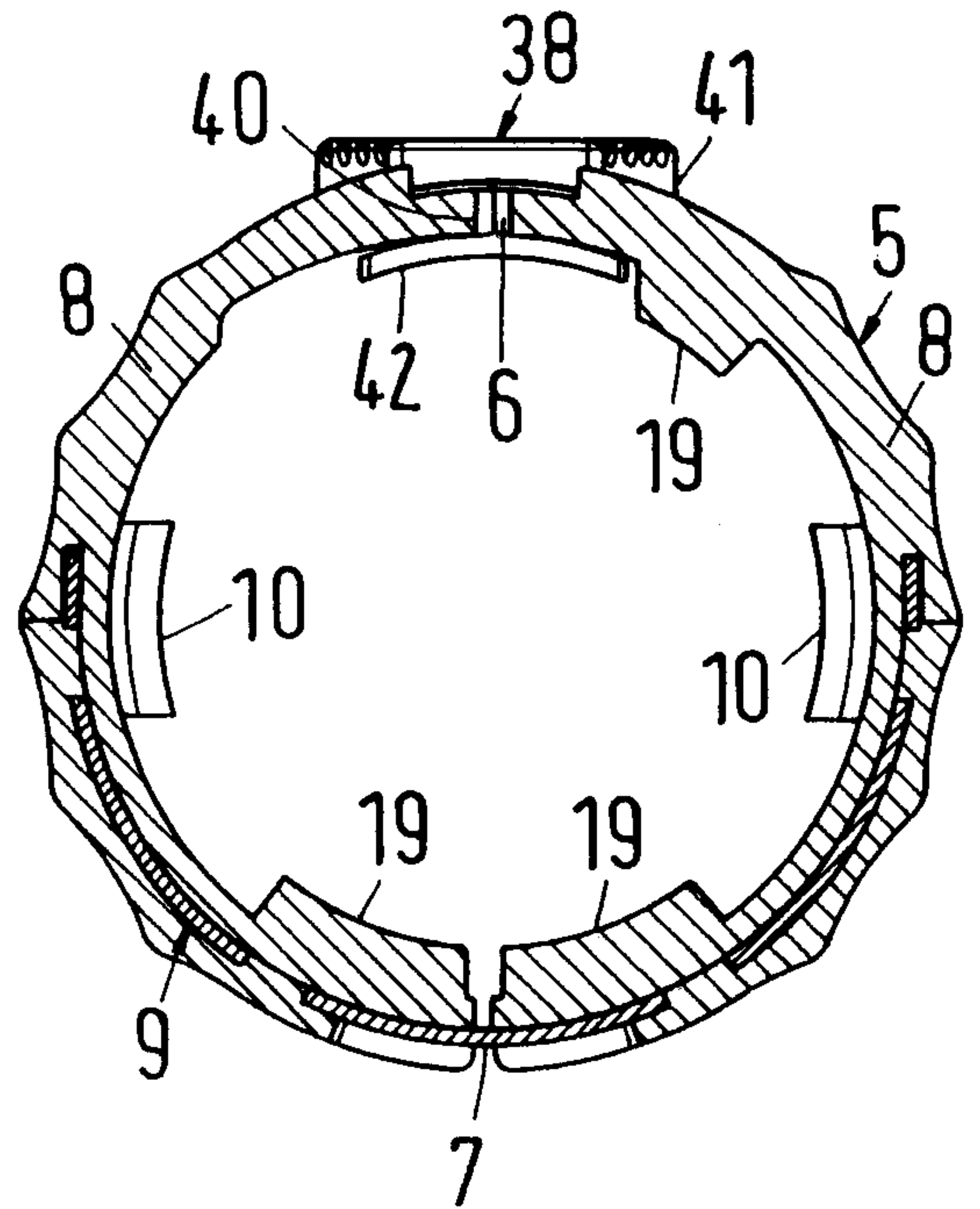


Fig. 25

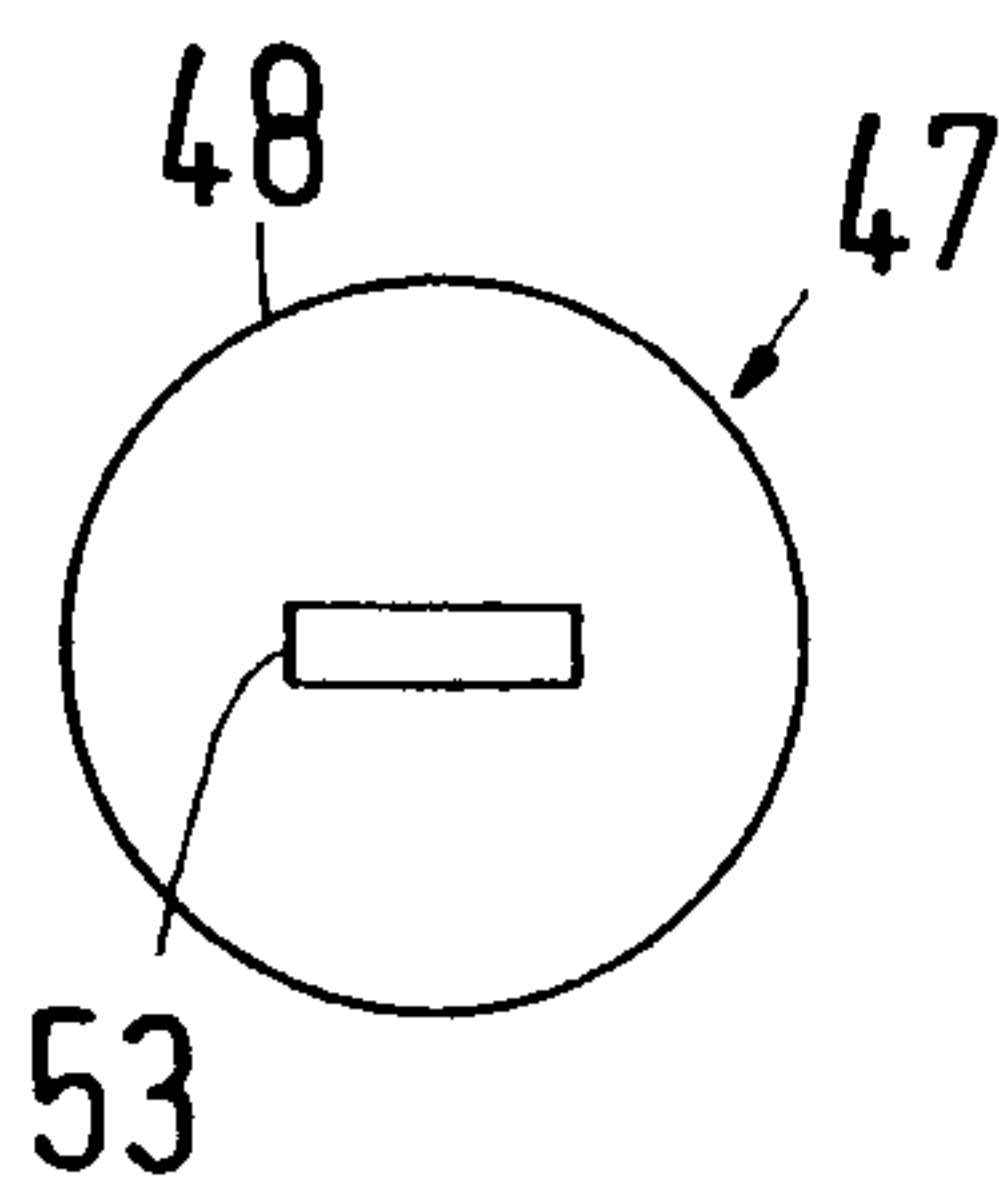


Fig.26

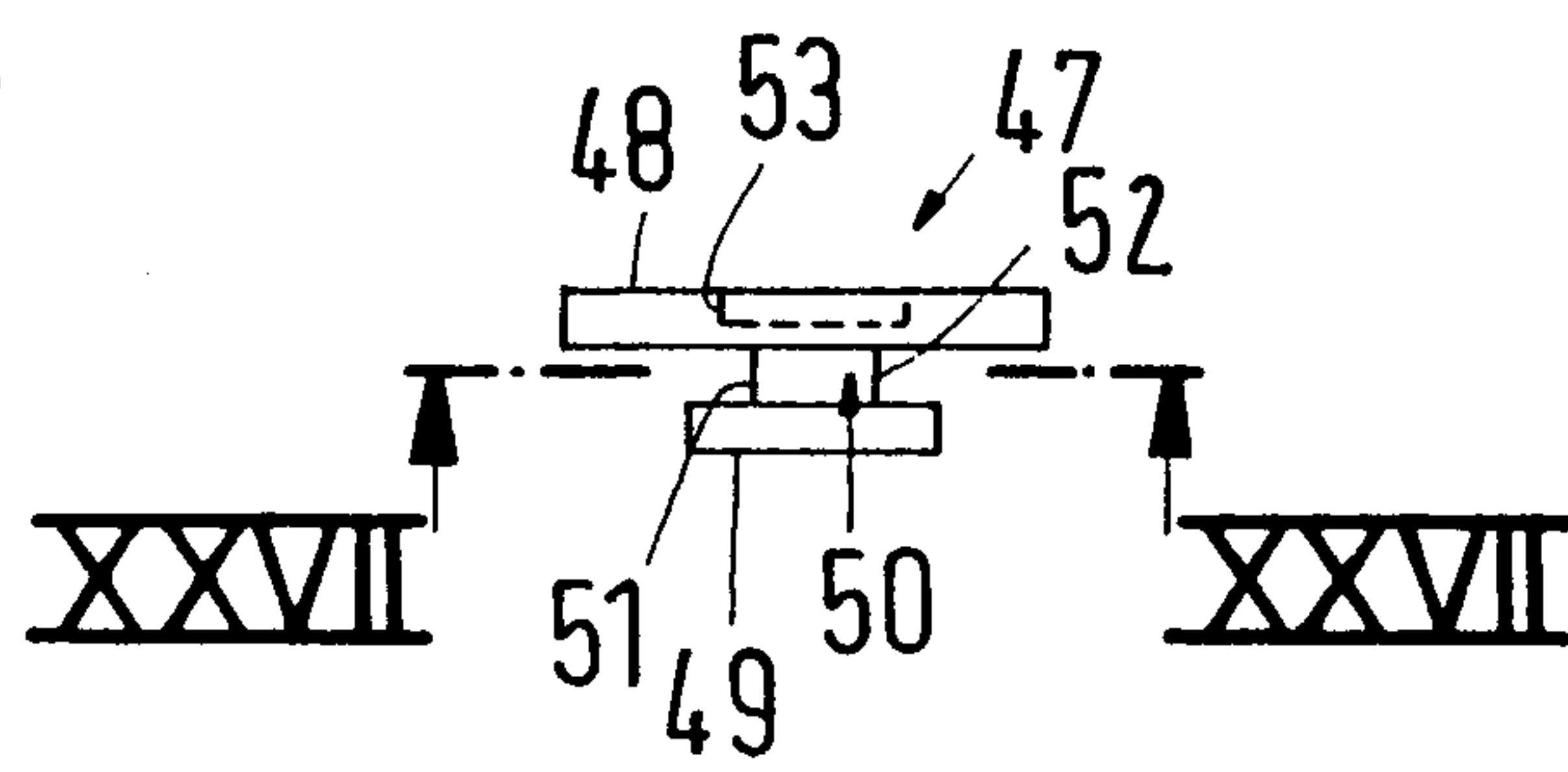


Fig.27

