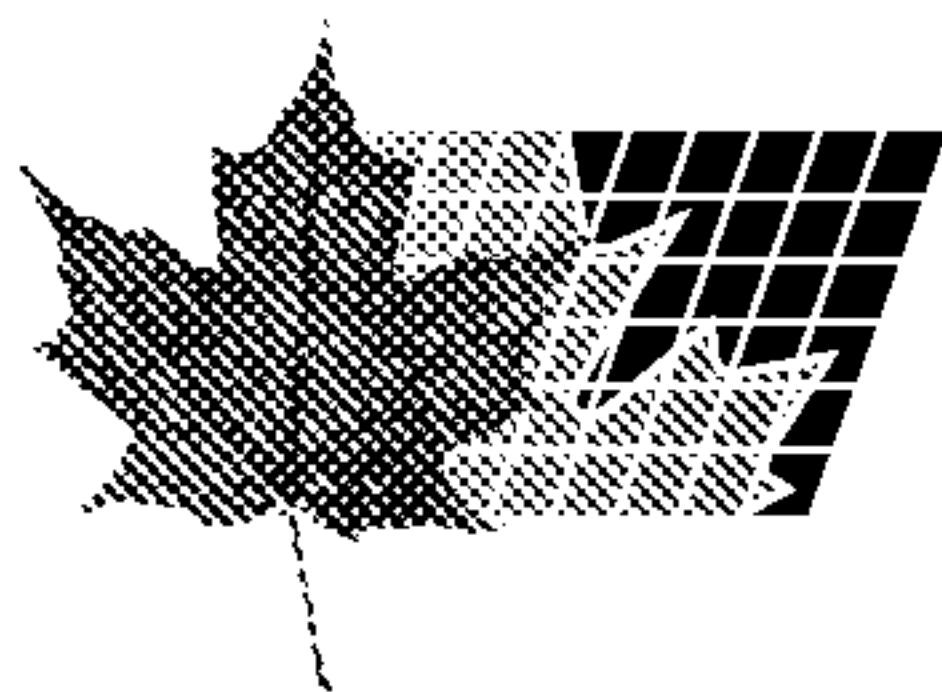




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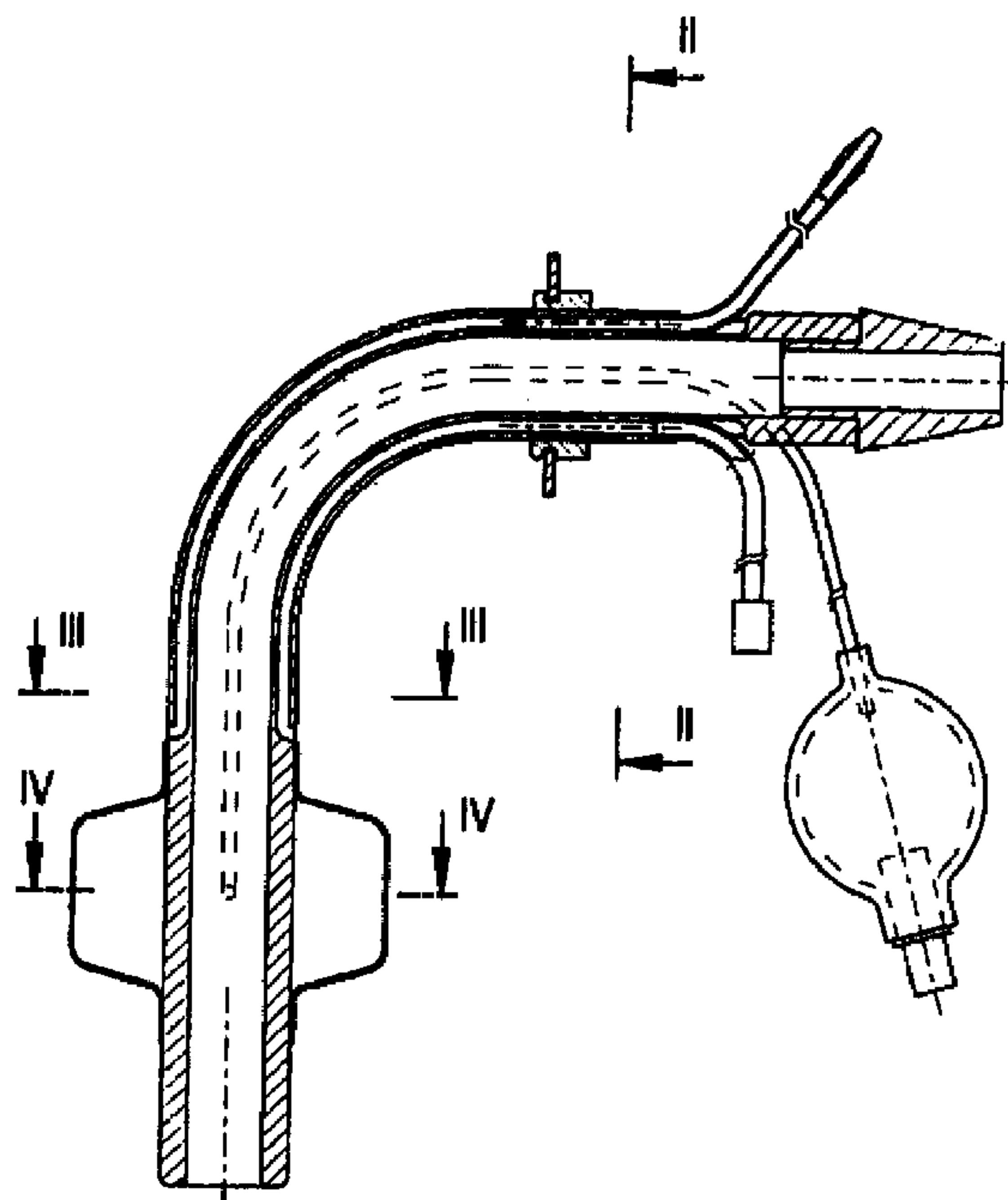
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(54) **TUBE ENDOTRACHEAL OU DE TRACHEOTOMIE**

(54) **ENDOTRACHEAL OR TRACHEOTOMY TUBE**



(57) Tube endotrachéal ou de trachéotomie dont la lumière centrale (2) sert à l'apport et à l'évacuation d'air. Ledit tube est doté d'un manchon étanche (3) gonflable entourant le tube (1), d'un tuyau (4) pour l'apport d'air sous pression dans le manchon (3), d'un tuyau d'aspiration (6) s'ouvrant du côté extérieur du tube en aval ou en amont du manchon (3) et d'un tuyau d'alimentation (7) débouchant du côté extérieur du tube (1), également en amont du manchon (3). Selon la présente invention, pour créer un tube endotrachéal ou de trachéotomie qui garantit une fonction d'aspiration sûre, c'est-à-dire avec lequel il est possible d'aspirer également de manière fiable du mucus visqueux ou des amas plus importants de mucus qui se sont éventuellement accumulés en amont du manchon dans les voies respiratoires du patient, la paroi (9) du tube (1) présente sur sa longueur une partie creuse (11) et plus épaisse dont l'espace creux interne forme le tuyau d'aspiration (6).

(57) The invention relates to an endotracheal or tracheotomy tube with a central lumen (2) for supplying and carrying off respiratory air. The tube comprises the following: an inflatable sealing cuff (3) which surrounds the tube (1); a pipe for supplying compressed air to the cuff (3); an aspiration duct (6) situated above or below the cuff (3) and ending outside the tube (1); and a supply pipe (7), which is also above the cuff (3) and ends outside the tube (1). The invention aims to create an endotracheal or tracheotomy tube which ensures safe tracheal aspiration, i.e. with which even viscous mucus or larger mucus lumps, which might have accumulated above the sealing cuff in a patient's trachea, can be reliably aspirated. To this end, the wall (9) of the tube (1) has a thickened hollow section (11) along a sector of its periphery, whose inner hollow space forms the aspiration duct.

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(21) Internationales Aktenzeichen: PCT/DE98/02341 (22) Internationales Anmeldedatum: 8. August 1998 (08.08.98) (30) Prioritätsdaten: 197 34 821.1 12. August 1997 (12.08.97) DE (71) Anmelder (für alle Bestimmungsstaaten ausser US): TRACOE GESELLSCHAFT FÜR MEDIZINISCHE BEDARFSGEGENSTÄNDE MBH [DE/DE]; Martin-Behaim-Strasse 12, D-63263 Neu-Isenburg (DE). (72) Erfinder; und (75) Erfinder/Anmelder (nur für US): WALDECK, Franz [DE/DE]; Breslauer Strasse 4, D-55268 Nieder-Olm (DE). (74) Anwälte: WEBER, D. usw.; Gustav-Freytag-Strasse 25, Postfach 61 45, D-65051 Wiesbaden (DE).		(81) Bestimmungsstaaten: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DK, EE, ES, FI, GB, GE, GH, GM, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO Patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), eurasisches Patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), europäisches Patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI Patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Veröffentlicht <i>Mit internationalem Recherchenbericht.</i> <i>Vor Ablauf der für Änderungen der Ansprüche zugelassenen Frist; Veröffentlichung wird wiederholt falls Änderungen eintreffen.</i>	
(54) Title: ENDOTRACHEAL OR TRACHEOTOMY TUBE (54) Bezeichnung: ENDOTRACHEAL- ODER TRACHEOTOMIETUBUS (57) Abstract The invention relates to an endotracheal or tracheotomy tube with a central lumen (2) for supplying and carrying off respiratory air. The tube comprises the following: an inflatable sealing cuff (3) which surrounds the tube (1); a pipe for supplying compressed air to the cuff (3); an aspiration duct (6) situated above or below the cuff (3) and ending outside the tube (1); and a supply pipe (7), which is also above the cuff (3) and ends outside the tube (1). The invention aims to create an endotracheal or tracheotomy tube which ensures safe tracheal aspiration, i.e. with which even viscous mucus or larger mucus lumps, which might have accumulated above the sealing cuff in a patient's trachea, can be reliably aspirated. To this end, the wall (9) of the tube (1) has a thickened hollow section (11) along a sector of its periphery, whose inner hollow space forms the aspiration duct.			
(57) Zusammenfassung Die vorliegende Erfindung betrifft einen Endotracheal- oder Tracheotomietubus, dessen zentrales Lumen (2) der Zu- und Abfuhr von Atemluft dient, mit einer den Tubus (1) umfassenden, aufblasbaren Dichtmanschette (3), einer Leitung (4) für die Druckluftversorgung der Manschette (3), einer oberhalb oder unterhalb der Manschette (3) sich zur Außenseite des Tubus (1) öffnenden Absaugleitung (6) und einer ebenfalls oberhalb der Manschette (3) zur Außenseite des Tubus (1) mündenden Zuführleitung (7). Um einen Endotracheal- oder Tracheotomietubus zu schaffen, welcher eine sichere Absaugfunktion gewährleistet, d.h. mit welchem auch zähflüssiger Schleim oder größere Schleimpfropfen, die sich möglicherweise oberhalb der Manschette in der Luftröhre eines Patienten angesammelt haben, zuverlässig abgesaugt werden können, wird erfindungsgemäß vorgeschlagen, daß die Wand (9) des Tubus (1) einem Sektorbereich entlang ihres Umfanges einen verdickten, hohlen Abschnitt (11) aufweist, dessen innerer Hohlraum die Absaugleitung (6) bildet.			

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Endotracheal or tracheotomy tube

The invention relates to an endotracheal or tracheotomy tube whose central lumen serves for the feed and discharge of respiration air, comprising a sealing cuff which embraces the tube, a conduit for the pressure air supply to the cuff, a suction conduit which opens above the cuff to the outside of the tube, and a feed conduit which opens to the outside of the tube above the cuff.

A corresponding endotracheal tube is known from US patent No 5 582 167. In the known endotracheal tube, in addition to the actual tube which defines the lumen for respiration or artificial respiration, there is also a further hose which surrounds the tube and which comprises a thin-walled flexible material. That casing hose is of an inside diameter which is between 1 and 8 mm larger than corresponds to the outside diameter of the actual respiration tube, while disposed in the proximity of the cuff is the smaller-diameter end of the enclosing hose so that formed between the outside wall of the tube and the inside of the casing hose is an annular passage which terminates closely above the cuff and which serves for suction removal of secretion and the like. Provided in the lower region of the tube, that is to say directly above the cuff, for that purpose, are spacers for the casing hose while no corresponding support devices are provided in the upper further parts.

A serious disadvantage of such a configuration of an endotracheal or tracheotomy tube lies in the flexibility of the outer casing hose. As a reduced pressure obtains in the suction removal operation between the outside wall of the actual tube and the casing hose, there is a high level of risk that the outer flexible casing hose collapses and comes to bear

against the outside wall of the tube. It will be appreciated that the annular passage provided between the outside wall of the tube and the inside wall of the outer casing hose can then not perform the intended suction removal function. Even the spacers provided in the lower region and directly above the cuff, between the tube and the casing hose, can at
5 best slightly alleviate that problem but they cannot totally eliminate it.

In addition the annular gap between the tube and the outer casing hose may be of a total cross-section which is sufficient in principle, but that annular gap is extremely small so that mucus blockages cannot be sucked away or can be sucked away only with difficulty and they relatively
10 easily block the narrow gap between the tube and the casing hose.

The purpose of the suction removal operation above the cuff is in particular to suck away and remove as completely as possible, fluid which accumulates there and which contains bacteria and other pathogens which, in the moist and warm medium which prevails in the trachea,
15 otherwise find an excellent nutrient medium, so that the patient who has been intubated or who has a tracheotomy cannula as far as possible does not suffer any infection of the bronchial tubes or the lungs.

If however the suction removal operation is only inadequately implemented by virtue of the collapse of the outer casing hose, then the
20 protection from infection that is the aim of the suction removal operation is also only very incomplete.

In comparison with that state of the art, the object of the present invention is to provide an endotracheal or tracheotomy tube which ensures a reliable suction removal function, that is to say with which even
25 viscous mucus or relatively large clots of mucus which have possibly accumulated above the cuff in the trachea of a patient can be reliably removed by suction.

That object is attained in that in a sector of its periphery the wall of the tube has a thickened hollow portion whose cavity defines a suction
30 passage.

Insofar therefore as the suction passage is integrated into the wall of the tube, for which purpose of course that wall portion also has to be thickened to achieve a sufficient suction removal cross-section, that arrangement gives a relatively stable suction passage which does not
5 readily suffer deformation and thus does not collapse and whose minimum diameter can easily be larger than the minimum width of a passage which surrounds the tube in an annular configuration.

Admittedly, the thickening of a wall portion in a sector (with respect to the peripheral direction) of the tube is at the expense of the cross-
10 section of the lumen, but that reduction in the lumen cross-section can be kept comparatively low, of the order of magnitude of for example 10%, in which respect the diameter of the suction passage can still be substantially larger than the width of an annular gap extending around the tube. If desired, in order to restore the full lumen cross-section, it is possible to
15 slightly increase the outside diameter and therewith also the lumen diameter of the tube. In that case, a reduction in the lumen cross-section by virtue of the thickened wall portion by for example about 10% is already completely compensated by an increase in diameter of the lumen and the tube overall by only about 3 - 4%. In contrast, based on a
20 predetermined lumen cross-section, the outside diameter of a tube has to be increased by 20% if the width of a gap between an outer casing hose and the outside wall of the tube is not to exceed a tenth of the lumen diameter.

A preferred embodiment of the invention is one in which the sector
25 of the thickened wall portion includes less than 120° and preferably less than 90° of the periphery of the tube (as viewed in cross-section).

The minimum diameter of the suction passage should be at least 1.5 mm, preferably at least 2 mm. In that respect, for example with a tube outside diameter of 12 mm and a normal tube wall thickness-outside
30 the thickened region of about 1 mm, it is readily possible to dispose a suction passage of a minimum diameter of 3 mm in a thickened wall

portion which extends over a sector of less than 90°, in which case the free lumen cross-section is only reduced by 10%. If, in such an embodiment, there is a wish to have the full lumen cross-section (in comparison with a tube without a suction passage), it is only necessary, while retaining the wall thickness of 1 mm, to increase the outside diameter of the tube to for example 12.4 mm, while retaining a circular suction passage of a diameter of 3 mm. The thickened wall portion, incorporating the suction passage, can then be of a maximum thickness of between 3.5 and 4 mm; in that case admittedly, for the suction passage itself, short wall portions which are possibly only between 0.2 and 0.5 mm in thickness are formed at the outside and the inside of the tube, but those short wall portions very quickly blend into thicker wall portions of the tube and thus do not harm the stability of the tube overall.

Optionally the cross-section of the suction passage can be circular but it can also be of an oval or elliptical configuration, wherein in the latter case the ratio of the long to the short axis of the elliptical cross-section should if possible not fall below a value of between 2 and 3 because otherwise either the minimum diameter in the form of the short axis of the elliptical cross-section becomes too small or the proportion of the suction passage and thus the thickened wall portion in relation to the total cross-section of the tube becomes too great. Otherwise however an elliptical cross-section for the suction passage can be the optimum way of attaining the object of the invention, in terms of maximum use of the available cross-section with at the same time stability and flexibility of the tube and its wall portions.

Desirably, in the preferred embodiment of the invention the suction and feed conduits are provided on diametrically opposite sides of the tube. The suction opening or mouth of the suction passage at the distal end thereof is preferably immediately above the edge of the cuff.

The mouth opening of the feed passage which is preferably provided for the feed of a rinsing or flushing and/or disinfecting fluid or for

medicaments can also be provided at the same axial level, that is to say relatively closely above the upper edge of the cuff, but it can also be displaced axially upwardly.

5 In that respect the cross-section of the suction passage is substantially larger than the cross-section of the feed conduit and is for example between five and fifteen times the latter. The cross-section of the suction passage is in turn between 5 and 15% of the lumen of the tube.

10 Desirably both the feed conduit and also the pressure air supply conduit for the cuff are integrated into the wall of the tube. As the two last-mentioned conduits must only be of a relatively small cross-section for in one case air and another gas are supplied for inflating the cuff and in the other case it is possible to use a flushing or rinsing fluid of low viscosity, those passages or conduits of a typical diameter of the order of
15 magnitude of between 0.5 and 0.8 mm can be readily integrated into the tube wall which does not need necessarily to be thickened for that purpose. Optionally however, in a similar fashion to the thickened portion for the suction conduit, the tube wall can also be thickened somewhat in the region of the feed conduit for rinsing or flushing fluid or in the region
20 of the pressure supply conduit for the cuff, even if to a considerably lesser extent than in the case of the suction conduit.

In accordance with a further embodiment of the present invention it is provided that there is an additional suction passage which opens in the proximity of the distal end of the tube, more specifically on the other side
25 of the cuff. By way of that additional suction passage it is then possible to suck away fluid or secretion from the trachea of the patient, which still accumulates beneath the cuff or on the side of the cuff that is remote from the outer adapter connection of the tube.

This suction passage is also preferably integrated into the wall of
30 the tube, more specifically if possible in the proximity of the first suction passage which opens above the cuff and if possible also in the same

thickened wall portion. In that respect, one of the two suction passages could possibly also be a suction passage which is separately secured by adhesive on the outside wall of the tube.

In addition it is also desirable if the mouth openings of the suction
5 passage or the suction passages have a device for keeping the mouth
openings clear and free, such as for example one or more bars or the like
which are possible also arranged in a cross configuration and which
project somewhat from the passage opening and which thus can
admittedly come into contact with the wall of the trachea but at the same
10 time hold the trachea wall at a spacing from the mouth opening or
passage opening in such a way that there is still access to the passage at
least past the bars or the like. Alternatively it would also be possible to
provide a projecting sieve cover at the mouth of the suction passage or
passages.

15 Further advantages, features and possible uses of the present
invention are apparent from the following description of a preferred
embodiment and the accompanying drawings in which:

Figure 1 is a view in longitudinal section through a tracheotomy
cannula according to the invention,

20 Figure 2 is a view in cross-section through a tracheotomy cannula
with a section taken along line II-II in Figure 1,

Figure 3 is a view in cross-section through a tracheotomy cannula
with a section taken along line III-III in Figure 1,

25 Figure 4 is a view in cross-section through a tracheotomy cannula
with a section taken along line IV-IV in Figure 1,

Figure 5 is a view in longitudinal section through a further
embodiment of the tracheotomy cannula according to the invention,

Figure 6 is a view in cross-section through a tracheotomy cannula
as shown in Figure 5 with a section taken along line VI-VI in Figure 5,

30 Figure 7 is a view in cross-section through a tracheotomy cannula
as shown in Figure 5 with a section taken along line VII-VII in Figure 5,

Figure 8 is a view in cross-section through a tracheotomy cannula as shown in Figure 5, with a section taken along line VIII-VIII in Figure 5,

Figure 9 is a view in cross-section through a tracheotomy cannula as shown in Figure 5 with a section taken along line IX-IX in Figure 5, and

5 Figure 10 is a view in cross-section through a tracheotomy cannula according to the state of the art.

The views in the Figures are only partly true to scale and in this respect do not represent limitations, even if in practice some of the illustrated aspects can certainly be identically adopted even in the relative
10 dimensions.

Referring to Figure 1, shown therein is a tracheotomy tube or a tracheotomy cannula which is generally identified by reference numeral 10 and which is intended for insertion through the neck of a patient into the trachea thereof, after a suitable operative cut. The tracheotomy cannula
15 comprises a tube 1, a so-called shield plate 12 which bears against the neck of the patient and thereby defines the position of the cannula, a sealing cuff 3 and a standardised adapter 20 at the intake end of the cannula for connection to an artificial respiration or anaesthetic apparatus. The lower portion of the cannula 10 with the cuff 3 is disposed in the
20 trachea of a patient, generally beneath the larynx and the vocal cords. Upon insertion of the cannula the cuff 3 is in a non-inflated condition of bearing closely against the tube 1 and it is then inflated by way of a conduit 4 and the outer connection 5 thereof to a slightly increased pressure of typically 15 - 20 mm Hg in order to form a seal and a fixing for
25 the tube in the patient trachea. An endotracheal tube differs from such a tracheotomy cannula essentially only in that it is substantially longer and does not have the shield plate 12 as an endotracheal tube is generally introduced into the trachea through the mouth or the nose of a patient.

A valve and a pressure regulating or monitoring system for the cuff
30 3 are represented in Figure 1 by the balloon 18 and elements connected thereto. A problem which arises with prolonged intubations and when

tracheotomy cannulae are inserted is often that fluid and mucus accumulate in the trachea of a patient immediately above the cuff 3 and outside the tube 1 and, by virtue of the moist warm climate which necessarily obtains in that region, form an ideal nutrient medium for bacteria and other pathogens. Under some circumstances they can also go past the cuff 3 due to fluctuations in pressure in the cuff 3 or due to movements on the part of the patient or however when the tube is taken out in the meantime they can penetrate into the bronchial tubes and the lungs of the patient and thereby often cause severe complications such as lung inflammations and other illnesses by which a large proportion of patients who are intubated over a relatively long period of time are affected for example after operations.

In order to eliminate or alleviate that problem, integrated into the tube 1 shown in Figure 1 is a suction passage 6, with an outer suction connection 16 and an inner suction opening 8, which makes the communication from the outside environment of the tube 1 to the suction passage 6, directly above the cuff. Mucus and fluid which accumulate in the trachea above the cuff 3 can be readily sucked away and removed through the suction passage 6, and thereby the bacteria and other germs contained therein are also removed therewith and considerably reduced in terms of the number thereof, and the major part of the nutrient medium which is otherwise present there is also taken away from the remaining pathogens so that the number and density of the germs in that region is comparatively low and the immune system even of a weakened patient can provide a defence against those remaining germs.

In addition, the longitudinal section of Figure 1 also shows a flushing or rinsing passage 7 with an outer connection 17 and an inner opening 9 which also opens to the outside of the tube 1. A fluid can be sprayed through that passage 7 into the region surrounding the tube above the cuff 3, and that sprayed-in fluid is then also sucked away again through the opening 8 and the suction passage 6. In that way the

number of pathogens in that region can be still further considerably reduced and in addition it is possible for antibiotics or substances which have a bactericidal effect to be added to the rinsing or flushing fluid in order thus to kill off any germs which may be present or to prevent them from multiplying. The combination of flushing and suction removal can thus considerably reduce the health risk to the patient. In that respect moreover it is also possible for the opening 9 of the flushing or rinsing passage 7 to be caused to open somewhat further up than the suction removal opening, if for example it is desirable for the flushing or rinsing fluid to be caused to act on a somewhat longer portion above the cuff 3 and around the tube 1. The suction removal operation can also be effected in time-displaced relationship with the feed of the flushing or rinsing fluid, by a procedure in which for example firstly the mucus or fluid present is sucked away through the opening 8, then flushing or rinsing fluid is supplied through the inner conduit 7 and possibly also sucked away at the same time, in which case then the suction removal operation can also be interrupted in order to allow the level of the flushing or rinsing fluid to rise to a desired level so that a larger region of the trachea is cleaned and cleared of pathogens or the concentration thereof is considerably reduced in that region. Medicaments which are absorbed in that region by the way of the trachea and thus pass into the patient bloodstream can also be supplied through the flushing or rinsing passage 7.

In a particular embodiment of the invention, as shown in Figures 5 through 8, besides the suction passage 6, there is also a second suction passage 6' which opens beneath the cuff and in the cannula at the distal end. Preferably then the suction passage 6' is integrated into the tube wall while the original suction passage 6 which is still present and which opens above the cuff is optionally also integrated into the tube wall or is glued onto the tube wall on the outside thereof.

The passage 4 for pumping up or regulating the pressure in the cuff 3 can also be integrated like the flushing or rinsing passage into the wall of the tube 1, but it is displaced through 90° with respect to the two illustrated passages 7 and 6 and is therefore only indicated by broken lines in the views in Figures 1 and 5.

The patient breathes through the central lumen 2 of the tube 1 or experiences artificial respiration through the lumen 2 if his condition requires it. Depending on the respective situation of use involved the tube 1 is of widely different dimensions and in particular also different diameters as children for example require a substantially smaller tube and also a smaller lumen than for example physically large adults. It will be appreciated that it is essential that the central lumen 2 is of a sufficiently large cross-section so that the patient can breathe by himself without difficulty and without excessive efforts or however can be appropriately administered with artificial respiration. On the other hand however the specific anatomical factors in regard to a patient impose limits on the outside diameter of the tube 1 or 1'. In that respect it is essential that the arrangement and also the size of the cannulae 4, 6, 6' and 7 are so selected that, with a given lumen cross-section, the outside diameter of the tube does not become excessively large. In that respect however it is to be borne in mind that the mucus which can form in the trachea of a patient and which is sometimes rather viscous cannot readily be sucked away through small cross-sections which would then be excessively easily blocked.

As can be seen both with reference to the longitudinal section in Figure 1 but in particular with reference to the cross-section in Figure 2, the present invention provides a thickened wall portion 11 which is of a hollow configuration and has a passage 6 for suction removal, the cross-section thereof being sufficiently large to be able to suck away even viscous mucus or lumps of mucus which have formed in the trachea of a patient above the cuff 3. In specific terms, the suction passage 6 is of a

substantially circular or oval cross-section which in terms of order of magnitude constitutes about 10% of the cross-section of the lumen 2. As can be seen, the cross-section of the lumen 2 or 2' respectively is somewhat reduced by the thickened wall portion 11, but the reduction in the lumen cross-section in the cross-sectional ratios which are specifically shown in Figure 2 is only a few % with respect to a circular lumen cross-section of the same diameter but without the thickened wall portion 11. If however it is necessary to retain the full lumen cross-section which would be present without the thickened wall portion 11, it is sufficient to increase the size of the overall diameter of the tube 1 by about 3 - 4 % so that the inside diameter of the lumen 2 is also increased by 3 - 4 %, which results in an increase in the size of the lumen cross-section of the order of magnitude of 10 - 15 % so that then the cross-sectional component occupied by the thickened wall portion 11 is compensated by the slight increase in the size of the overall diameter. The flushing or rinsing passage 7 is disposed in diametrically opposite relationship to the suction passage 6 and is of a considerably smaller cross-section so that it has space within the normal wall thickness of the wall 13 of the tube 1, and likewise also the air pressure passage 4 for inflation of the cuff 3. The rinsing or flushing fluid can possibly be selected to be of suitably low viscosity and if necessary can also be infused or pressed in through the passage 7 under increased pressure so that it is sufficient if the passage 7 is of a diameter of the order of magnitude of 0.5 mm. A corresponding diameter is also readily sufficient for the pressure air passage 4. In contrast the reduced pressure which is to be produced in the suction removal operation is limited to the order of magnitude of the normal air pressure and the fluid or mucus which has possibly accumulated in the trachea of a patient above the cuff 3 is possibly of relatively high viscosity so that a correspondingly larger cross-section is required for the suction passage 6. In that respect the thickened wall portion 11 affords at the same time sufficient stability for the passage 6 so that the latter does not

in any way collapse at a pressure difference of the order of magnitude of 1 bar. By referring to the various cross-sectional views in Figures 2 - 4 and 6 - 9 showing sections in various axial positions of the tracheotomy tubes of the first and second embodiments respectively, it will be clearly seen to which axial positions the individual cannulae extend and how the cross-section of the individual cannulae behaves relative to each other and relative to the central lumen, even if, as already mentioned, the relative and absolute dimensions of the individual cannulae can certainly differ from those illustrated.

For comparison purposes, Figure 10 shows a view in cross-section of an endotracheal tube which is known from the state of the art and which in particular must be of the same outside diameter as the tube 1 or 1' as shown in Figures 1 - 9 of the present invention. In this case, a suction passage 26 is defined by an annular space which is defined outside the tube 21 by a casing hose or tubular casing 24. With such a casing hose 24 however, in the case of the suction removal operation, there is the danger that the casing tube 24 may collapse and come to bear against the wall of the tube 21 and thereby considerably reduce or even completely close off the cross-section of the passage 26. Admittedly, the overall cross-section of the suction passage 26 may even be larger than the overall cross-section of the suction passage 6, but the suction passage 26 is present only in the form of a narrow annular passage 26 whose width (in the radial direction) is only about a third of the diameter of the suction passage 6 so that viscous mucus can only be sucked away with a very great deal of difficulty through that passage 26. Spacers may admittedly serve to prevent the tubular casing or casing hose 24 from coming into contact with the outside wall of the tube 21, but this is successful only if the outer casing 24 comprises a sufficiently stiff material and even then the radial width of the annular gap 26 is still very small in relation to the diameter of the suction passage 6 shown in Figure 2.

The comparison with the state of the art shown in Figure 10 shows moreover that, in the case of the present invention, with a given outside diameter for the tube 1 or 1' respectively, the cross-section of the central lumen 2 is substantially larger than in the known state of the art.

5 Conversely, with the same cross-section for the central lumen 2 the outside diameter of the tube 1, 1' could be reduced in comparison with the tube 21 of the state of the art, in which case at the same time the capacity for suction removal would nonetheless be improved.

CLAIMS

1. An endotracheal or tracheotomy tube whose central lumen (2) serves for the feed and discharge of respiration air, comprising an inflatable sealing cuff (3) which embraces the tube (1), a conduit (4) for the pressure air supply to the cuff (3), a suction conduit (6) which opens above the cuff (3) to the outside of the tube (1), and a feed conduit (7) which also opens to the outside of the tube (1) above the cuff (3), characterised in that in a sector region along its periphery the wall (9) of the tube (1) has a thickened hollow portion (11) whose internal cavity forms the suction conduit (6).

2. An endotracheal or tracheotomy tube as set forth in claim 1 characterised in that the sector of the thickened wall portion (11), viewed in a cross-section of the tube, embraces less than 120°, preferably less than 90°.

3. An endotracheal or tracheotomy tube as set forth in claim 1 or claim 2 characterised in that the minimum diameter of the suction passage (6) is at least 1.5 mm, preferably at least 2 mm.

4. An endotracheal or tracheotomy tube as set forth in one of claims 1 through 3 characterised in that the suction passage (6) is of a substantially circular cross-section.

5. An endotracheal or tracheotomy tube as set forth in one of claims 1 through 3 characterised in that the suction passage (6) is of an oval or elliptical cross-section, wherein the ratio of long to short axis of the elliptical cross-section is preferably less than 2.

6. An endotracheal or tracheotomy tube as set forth in one of claims 1 through 5 characterised in that the mouth openings of the suction passage (6) and the feed passage (7) are provided on diametrically opposite sides of the tube (1).

6. ~~An endotracheal or tracheotomy tube as set forth in one of claims 1 through 5 characterised in that the mouth openings of the suction passage (6) and the feed passage (7) are provided on diametrically opposite sides of the tube (1).~~

7. An endotracheal or tracheotomy tube as set forth in one of claims 1 through 6 characterised in that the suction opening of the suction passage (6) is arranged directly at the upper edge of the cuff (3).

8. An endotracheal or tracheotomy tube as set forth in one of claims 1 through 7 characterised in that the mouth opening of the feed conduit is axially displaced with respect to the mouth opening of the suction passage (6).

9. An endotracheal or tracheotomy tube as set forth in one of claims 1 through 8 characterised in that both the pressure conduit (4) for the cuff (3) and also the feed conduit (7) are integrated into the wall (9) of the tube (1).

10. An endotracheal or tracheotomy tube as set forth in one of claims 1 through 9 characterised in that the cross-section of the suction passage (6) is very much larger than the cross-section of the feed conduit (7) and is at least between five and fifteen times the feed conduit cross-section.

11. An endotracheal or tracheotomy tube as set forth in one of claims 1 through 10 characterised in that the cross-section of the suction passage (6) is between 3% and 15% of the lumen cross-section.

12. A tracheotomy tube as set forth in one of claims 1 through 11 characterised in that connection portions (16, 17) for the suction passage

(6) and the feed passage (7) respectively open at the proximal end of the tube (1) in front of a shield plate (8) of the tracheotomy tube (10).

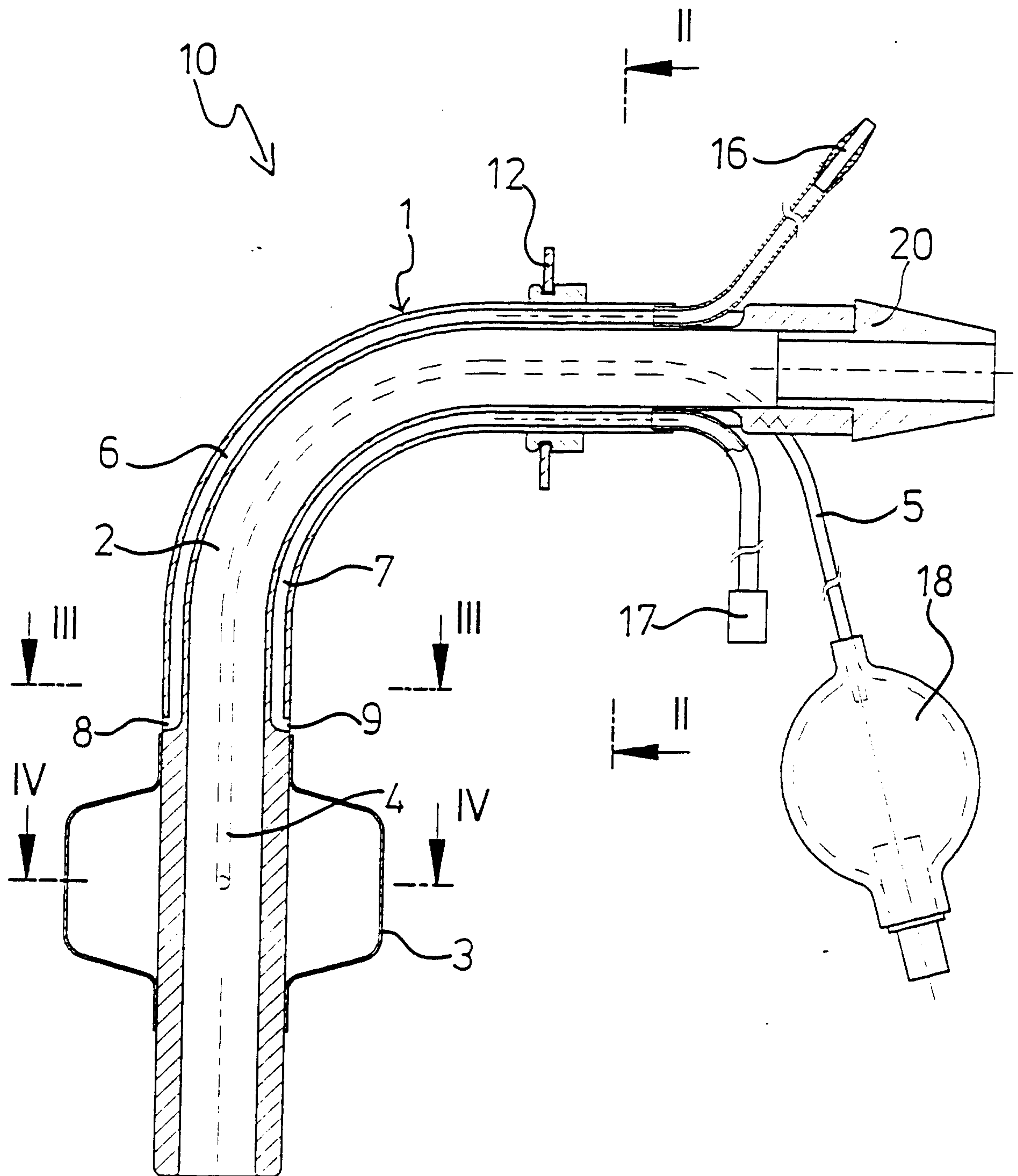
13. A tracheotomy tube as set forth in one of claims 1 through 12 characterised in that there is provided an additional suction passage (6') which opens in the proximity of the distal end of the tube (1') beyond the cuff (2).

14. A tracheotomy tube as set forth in claim 13 characterised in that the additional suction passage (6') is integrated into the wall of the tube while the suction passage (6) which opens above the cuff is glued onto the outside wall of the tube.

15. A tracheotomy tube as set forth in one of claims 1 through 14 characterised in that the mouth opening of the suction passage (6) or the suction passages (6, 6') has a means for keeping the passage opening free.

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Fig. 1



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Fig. 2

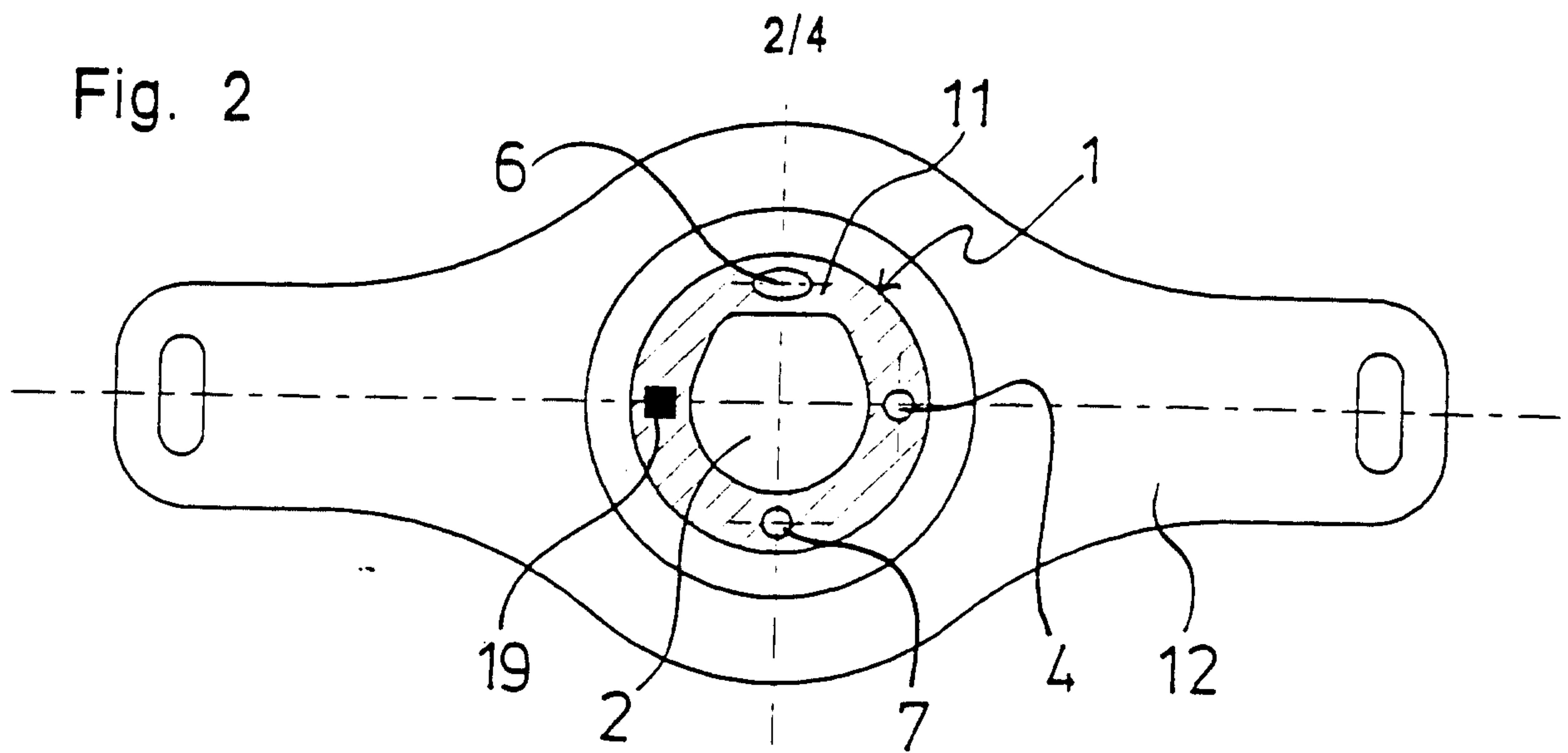


Fig. 3

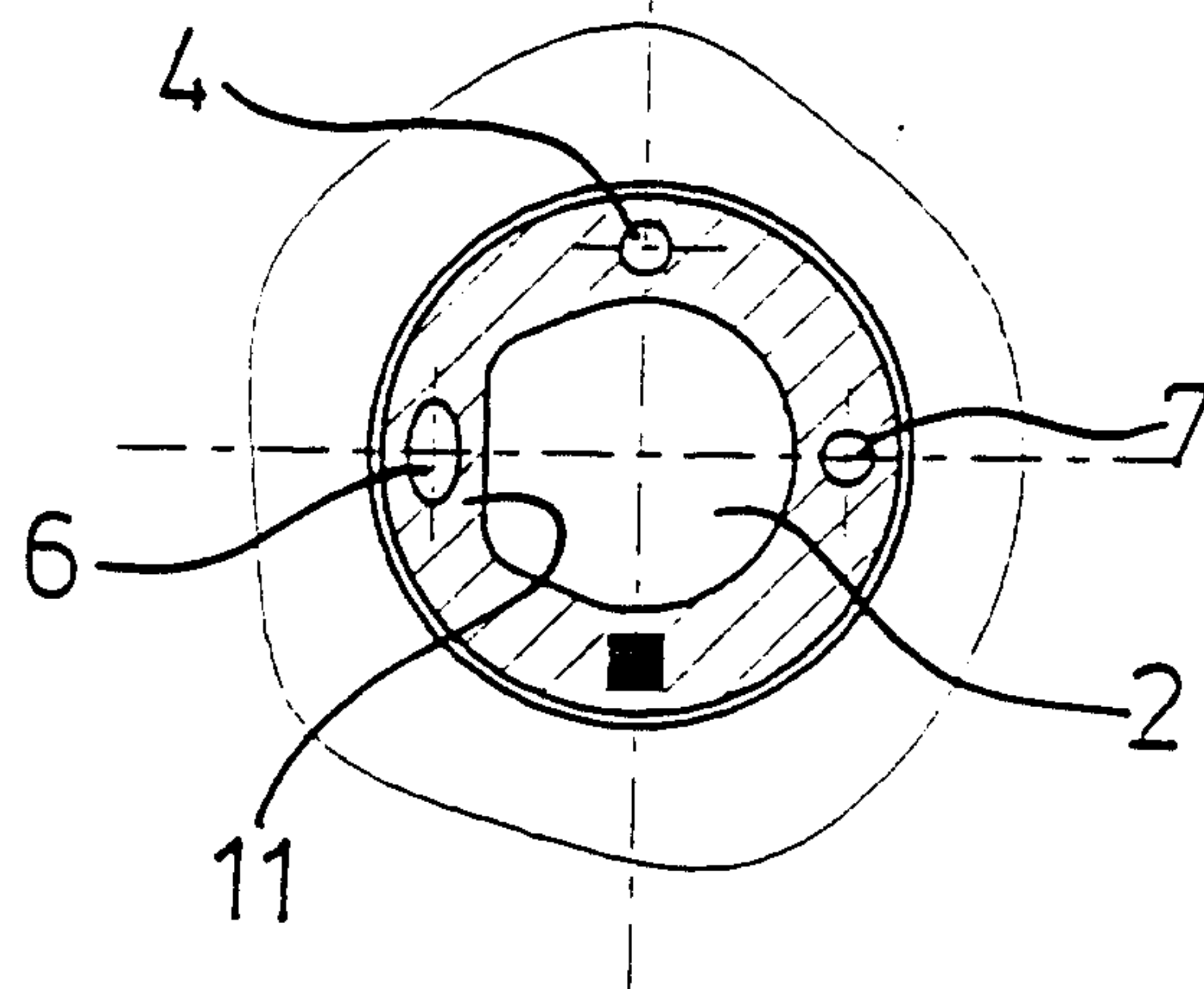
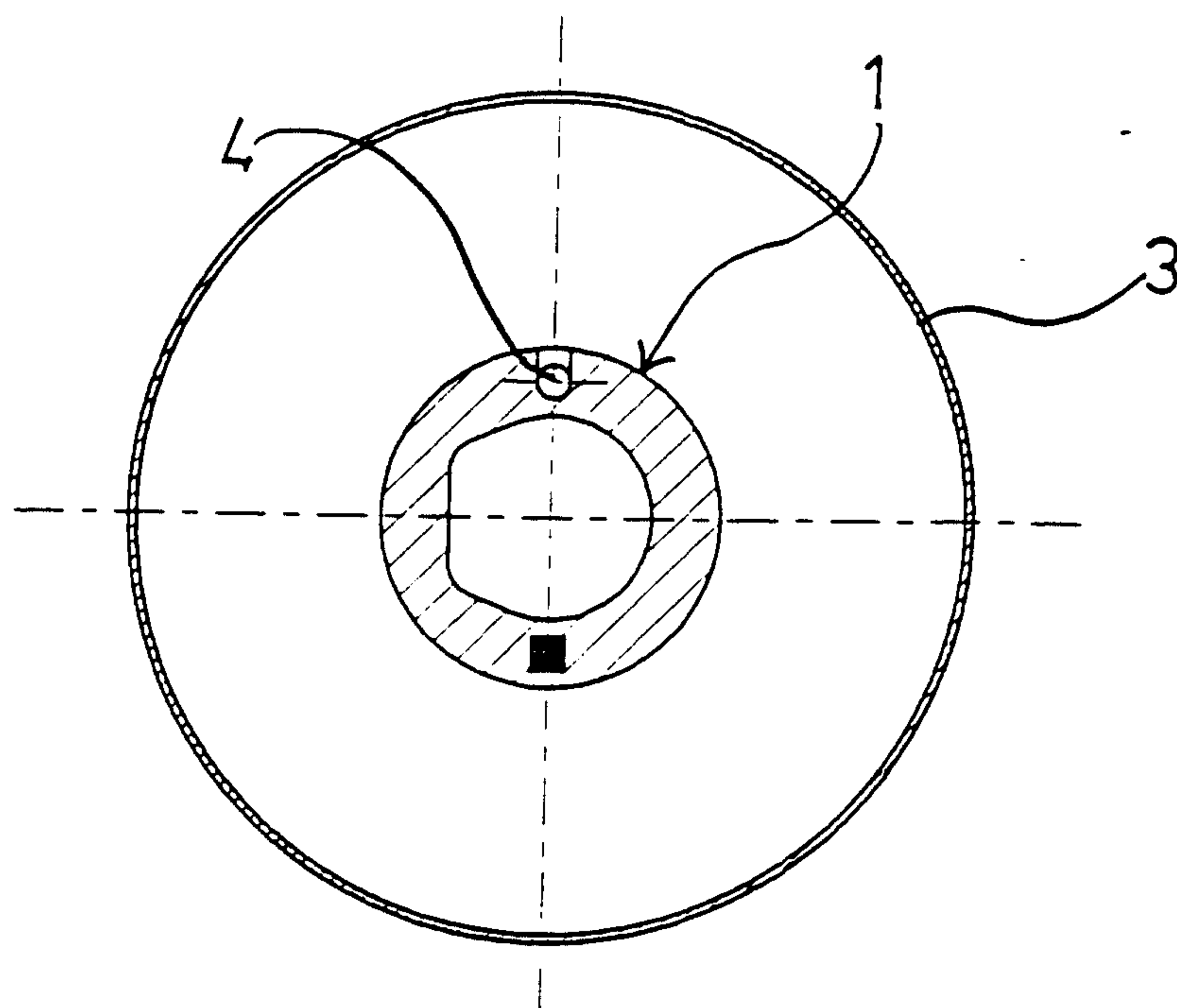


Fig. 4



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Fig. 5

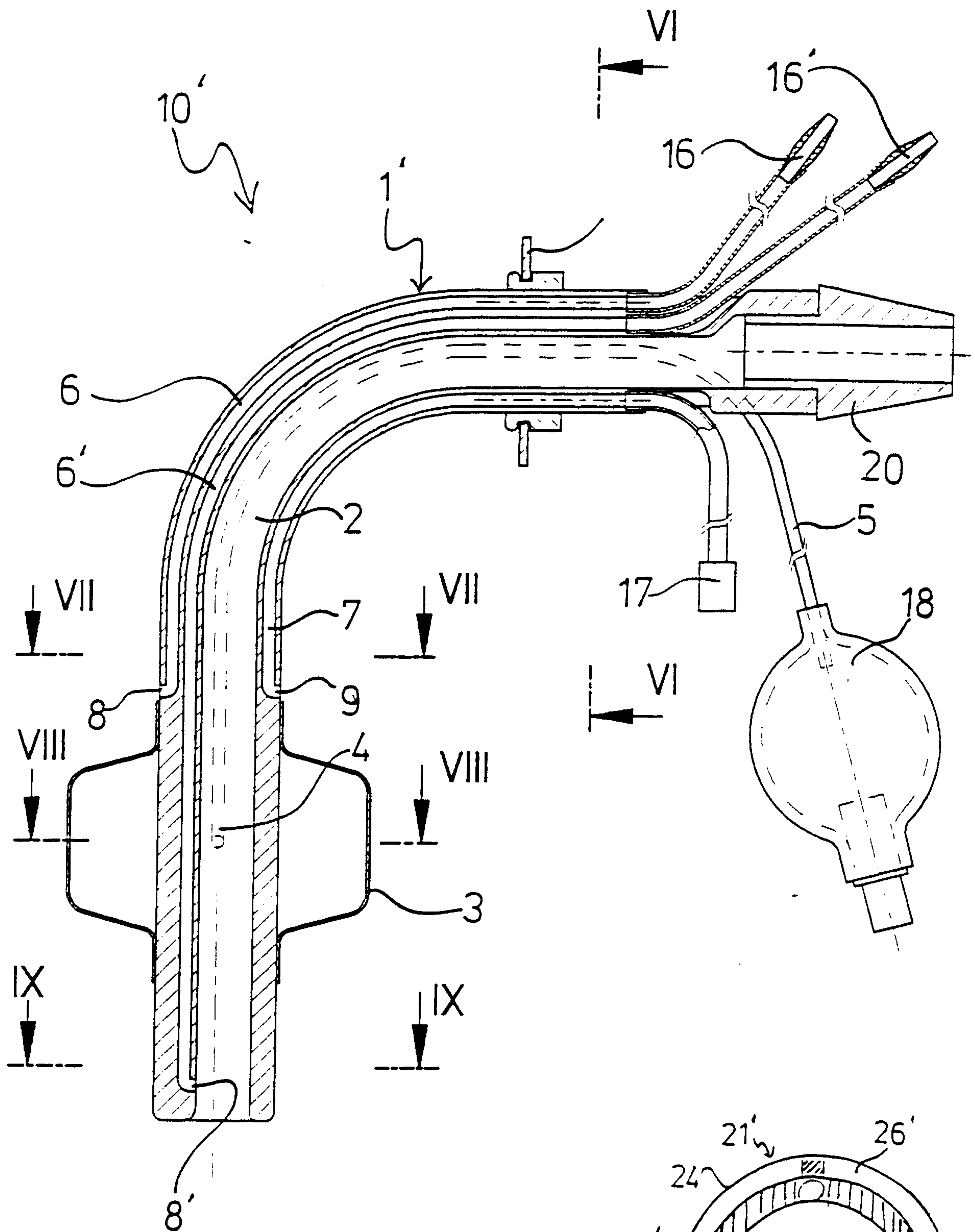


Fig. 10

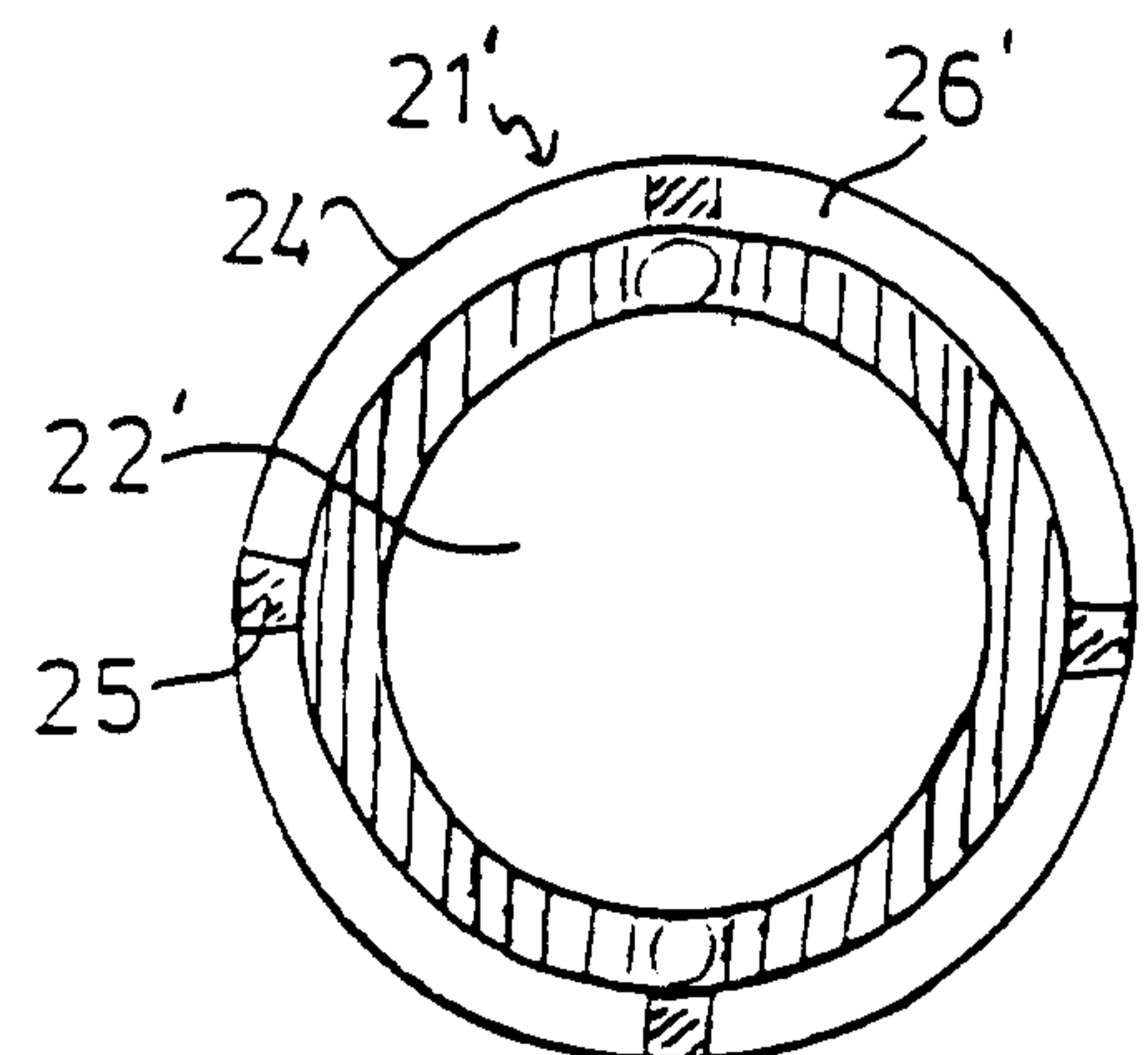


Fig. 6

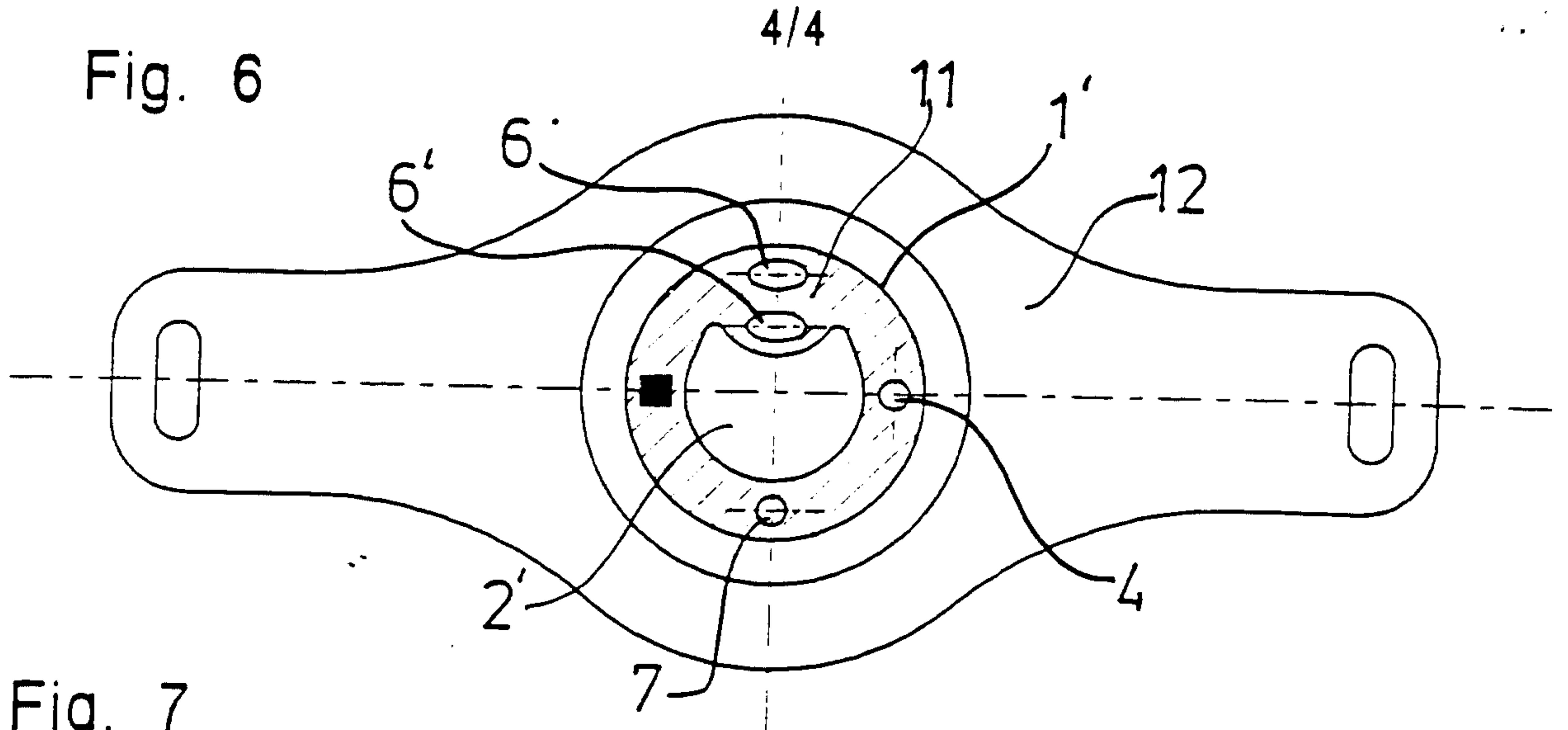


Fig. 7

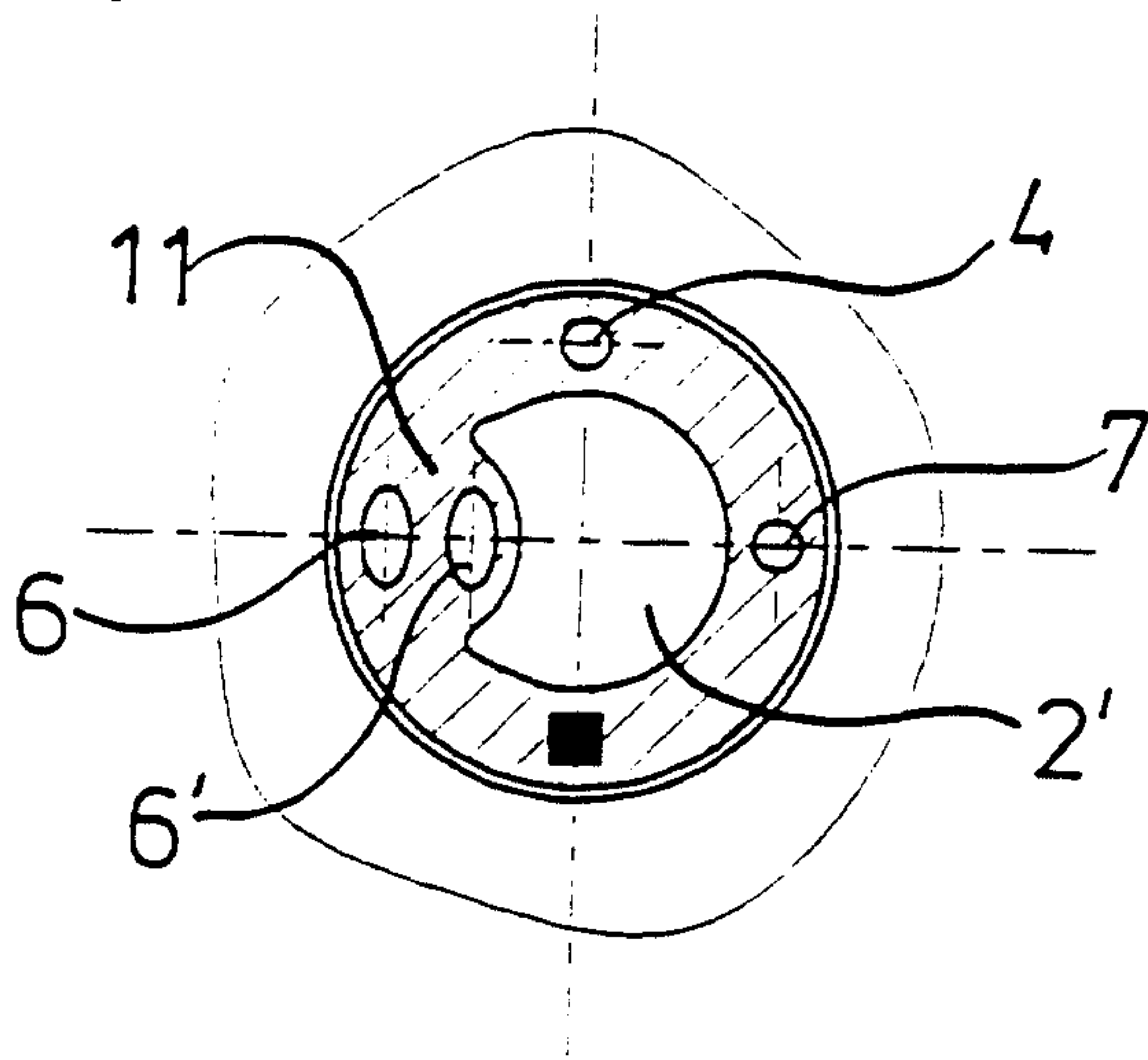


Fig. 9

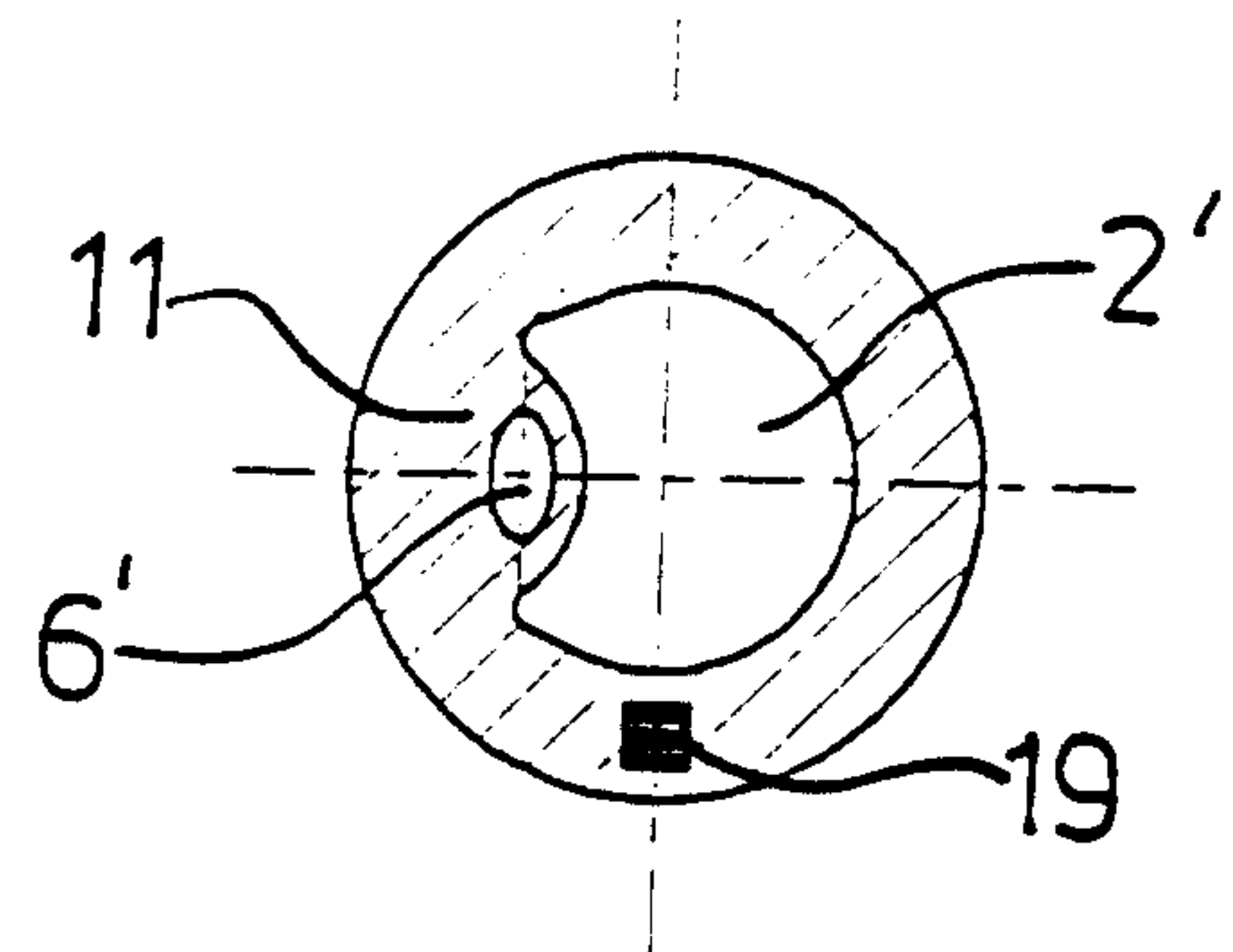


Fig. 8

