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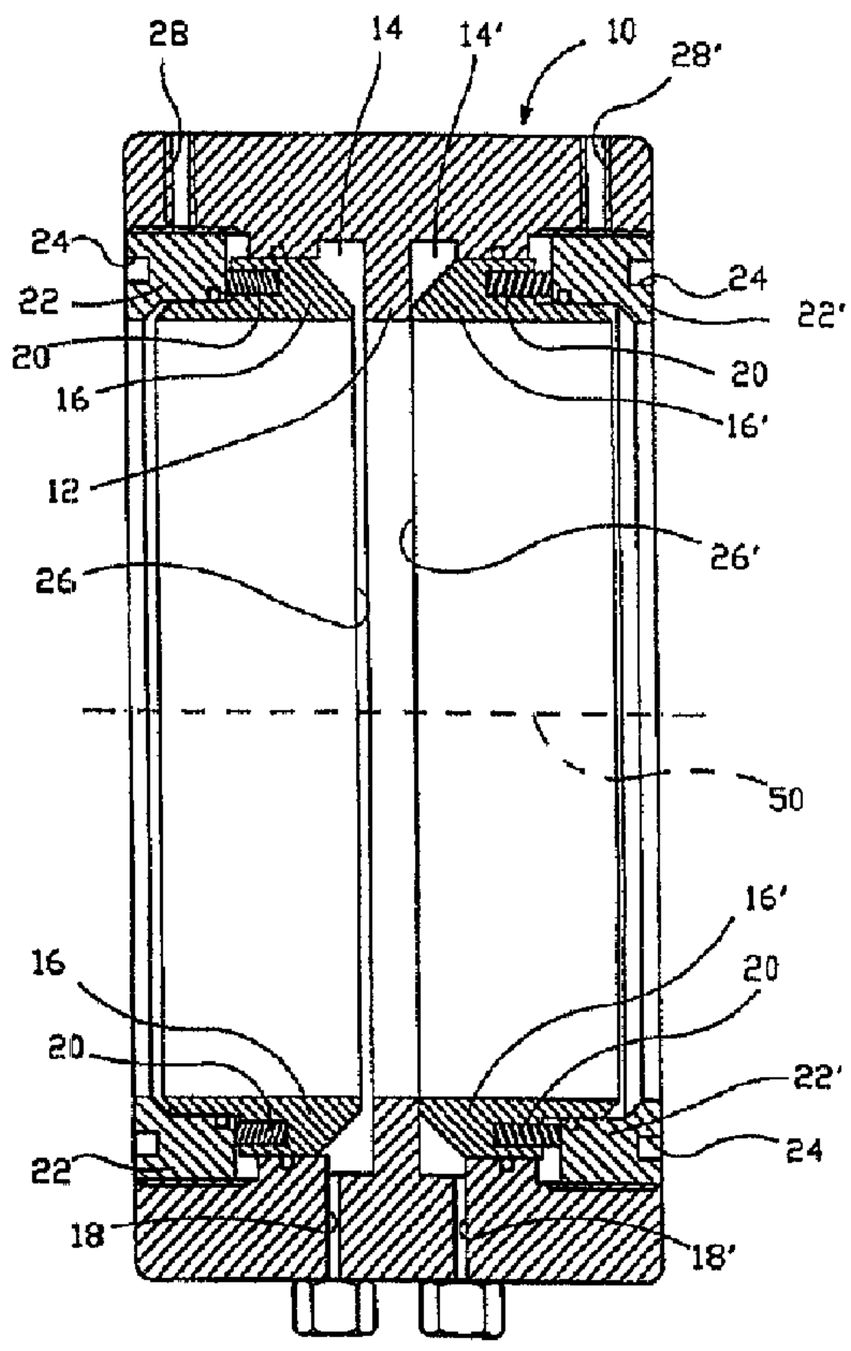
(54) **APPAREIL DE NETTOYAGE ET GRAISSAGE DES FILETS EN PARTICULIER DE TIGES DE FORAGE**

(54) **CLEANING AND LUBRICATING DEVICE FOR THREADS, ESPECIALLY FOR DRILL PIPES**



(57) L'invention porte sur un appareil de nettoyage et de graissage de filets comportant un dispositif de lavage sous haute pression (16, 18, 20, 22, 24, 12) des filets intérieurs et extérieurs des raccords d'extrémité de tiges de forage, et un mécanisme (16', 18', 20', 22', 24', 12) appliquant de la graisse sous pression sur lesdits filets. Le corps principal (10) de la tête d'injection présente deux chambres annulaires séparées (14, 14') amenant respectivement le liquide de nettoyage sous pression, et la graisse sous pression. Pour permettre un nettoyage

(57) An account has been made for a thread cleaning and lubricating device in the form of a high pressure washing device (16, 18, 20, 22, 24, 12) for cleaning external/internal threads of pipe end couplings, and equipped with a mechanism (16', 18', 20, 22', 24, 12) for applying fat under pressure on said threads. A nozzle head's main body (10) is formed with two separate annuli (14, 14') for the supply of cleaning liquid under high pressure or thread-fat under pressure, respectively. In order to arrange the conditions for a uniform cleaning

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uniforme de la totalité des filets et une application régulière de la graisse, et simplifier et faciliter le centrage des douilles d'extrémité des tiges et des extrémités des tarauds par rapport à l'axe (50) du corps et de la tête d'injection (10) chacune des chambres annulaires (14, 14') présente une fente de décharge circulaire sur 360° (26, 26').

process across the entire thread portion and an even application of thread-fat, and for simplifying and facilitating the centring of respective pipe end's socket/tap end in relation to the axis (50) of the nozzle head/body (10), each annulus (14, 14') has a 360° encircling discharge slot opening (26, 26').

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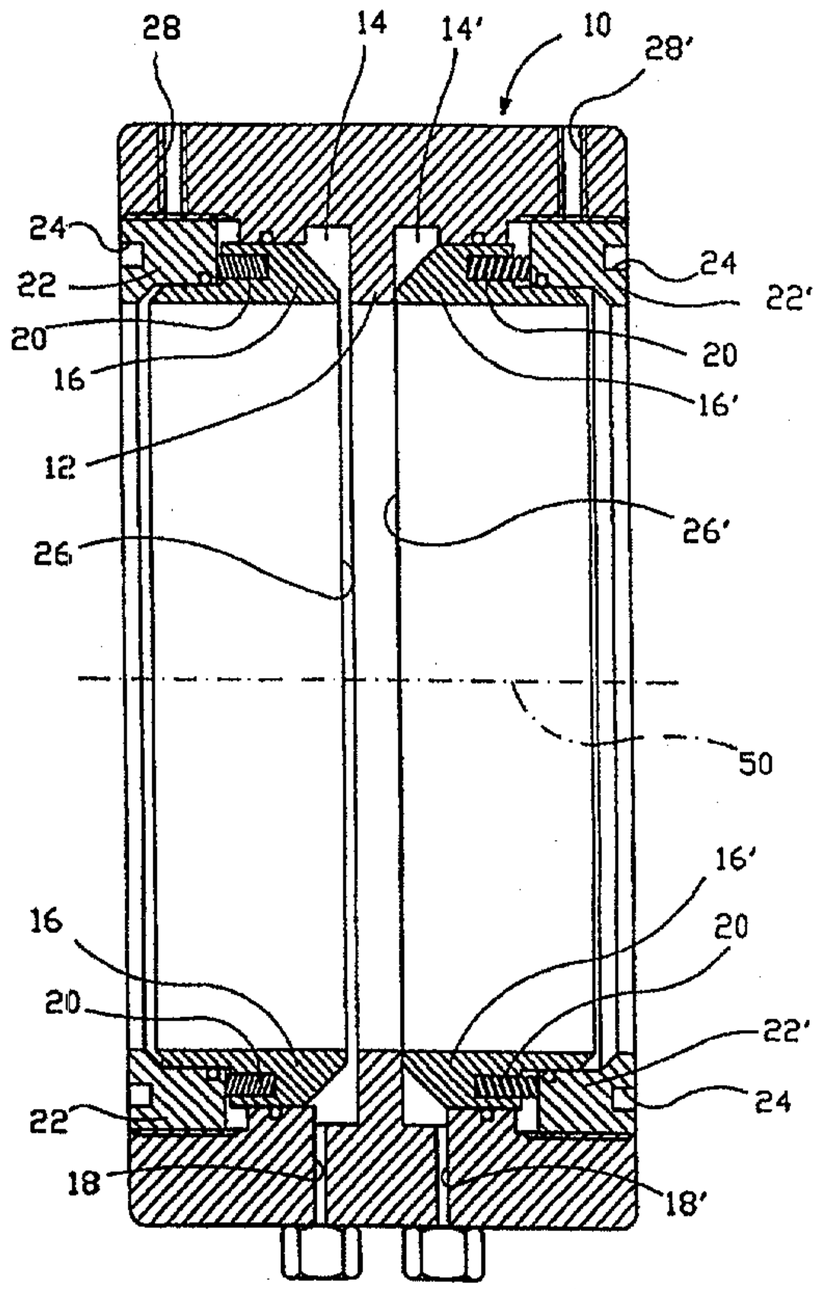
(54) **Title:** CLEANING AND LUBRICATING DEVICE FOR THREADS, ESPECIALLY FOR DRILL PIPES

(57) **Abstract**

An account has been made for a thread cleaning and lubricating device in the form of a high pressure washing device (16, 18, 20, 22, 24, 12) for cleaning external/internal threads of pipe end couplings, and equipped with a mechanism (16', 18', 20, 22', 24, 12) for applying fat under pressure on said threads. A nozzle head's main body (10) is formed with two separate annuli (14, 14') for the supply of cleaning liquid under high pressure or thread–fat under pressure, respectively. In order to arrange the conditions for a uniform cleaning process across the entire thread portion and an even application of thread–fat, and for simplifying and facilitating the centring of respective pipe end's socket/tap end in relation to the axis (50) of the nozzle head/body (10), each annulus (14, 14') has a 360° encircling discharge slot opening (26, 26').



CLEANING AND LUBRICATING DEVICE FOR THREADS, ESPECIALLY FOR DRILL PIPES

The present invention relates to a cleaning and lubricating device for threads, especially for cleaning a threaded portion of tap and socket ends on drill pipes and casings, and wherein water or other cleaning liquid can be used as cleaning agent, and wherein thread fat is used as lubricating agent.

The state of the art is represented by i.a. Norwegian patent specification No. 179,920 as well as U.S. patent specifications Nos. 5,653,819 and 5,157,802.

Norwegian patent specification No. 179,920 shows a device having driven rotary nozzles. The rotative property, the mounting and support as well as the need for motive force of these known nozzles complicate this known device and make it more expensive. This device is exclusively built up for the purpose of applying thread fat.

U.S. patent specification No. 5,653,819 deals with a device for cleaning threads of drill pipes. The device comprises circumferentially distributed nozzles spraying fluids toward the threads. Here, a plurality of nozzles are used, placed along an annular path, and this annular row of nozzles is capable of cleaning both external threads (on the tap end) and internal threads (within the socket end). The total spraying capacity of the nozzles is relatively difficult to change and adjust. This patent specification is exclusively occupied with cleaning of threads, and the known device is not adapted for the application of thread fat.

U.S. patent specification No. 5,157,802 deals with a similar device wherein centring of the cleaning heads has been effected in relation to the threaded portion to be cleaned. This known device does not comprise any lubricating means.

According to the present invention, one has i.a. aimed at avoiding rotary mounting of the nozzle head and forced rotation thereof, and one has also intended to obtain simplified adjustment of the fluid flow amount per time unit, simultaneously as this flow should be brought to cessation for one fluid (e.g. thread fat) when the other fluid (e.g. water, water steam or another fluid in liquid or steam form) is being sprayed out under a high pressure during a first high pressure washing operation. For the cleaning and lubrication of external threads on the drill pipe's tap end, the nozzle apertures should point radially inwardly and, for a corresponding treatment of internal threads within a socker end, the nozzle apertures should point radially outwardly. This readjustment is to be carried out by means of simple modifying encroachments on the constructive building up of one embodiment, without deviating from the fundamental principles of

the invention. Equipped with radially inwardly directed nozzle apertures or with radially outwardly directed nozzle apertures, the cleaning and lubricating device in accordance with the invention is a constructively and functionally simpler accessory, facilitating and simplifying the individual working operations as well as securing that they become carried out with optimum efficiency, simultaneously as favourable conditions have been offered in order to exclude stoppage during use.

Said objects are realized by means of a cleaning and lubricating device distinguishing itself through the features as defined in the characterizing part of claim 1.

The cleaning and lubricating device according to the invention has two, preferably parallel, annular, preferably circular nozzle apertures. A first nozzle aperture for feeding out cleaning fluid under high pressure and a second nozzle aperture for feeding out thread fat, both nozzle apertures extending themselves 360° around the axis of the nozzle head and, in their entire extent, either are directed radially inwardly in order to treat external threads or radially outwardly in order to treat internal threads, said two nozzle apertures individually being adapted to be opened, closed and adjusted in degree of opening.

The cleaning or lubrication, respectively, of the threads takes place in that a relative, rectilinear, centrally controlled displacement movement is established between the device's nozzle head with the two annular nozzle apertures and the threaded drill pipe end portion to be cleaned and lubricated, in the course of which the apertures of the nozzle head effects an optimum unitary treatment, 360° in the cir-

cumferential direction, first with the nozzle aperture for the cleaning agent under high pressure in an open condition, while the other nozzle aperture is closed and, thereupon, with the nozzle aperture for the thread fat under pressure in an open condition, while the water-spraying nozzle aperture is closed.

Thus, the two thread treating operations, cleaning and application of fat, are carried out by means of one and the same, simple tool or accessory, immediately following each other; this being advantageous because the thread fat, thus, is applied on recently cleaned threads.

The device of the invention exhibits simple adjusting possibilities in order to adjust the degree of feeding out of the cleaning liquid or of the thread fat, respectively.

According to known technique, the threads on the pipe ends are cleaned and lubricated before the pipe is run down into the bore hole, i.e. that extra time lapse when drill pipes are to be run down into the bore hole. Additionally, this cleaning and lubricating work often is carried out by means of high pressure washing apparatus, whereupon thread fat is applied manually. When such drill pipes are withdrawn from the bore hole again through so-called "tripping" (tripping in/tripping out of drill string), the threads are no longer treated; the drill pipes then being transferred directly to storage in finger board in the derrick, where they are exposed to wind and weather.

By using a cleaning and lubricating apparatus according to the invention, the drill pipes are ready to be treated upon leaving the bore hole and to be displaced by means of a pipe

handling apparatus. Then, time is available to position the drill pipe with respect to the device of the invention, cleaning the threads thereof and lubricating them with thread fat, before the pipe handling apparatus displaces the pipe further to said finger board.

As it takes more time to pull a pipe up from the bore hole than it takes to swing it away by means of the pipe handling apparatus, this cleaning and lubricating operation carried out by the present device does not delay the sequence pulling the drill string out from the bore hole.

Additional advantages and features of the device according to the invention are further explained in the following, reference being made to accompanying drawings, illustrating examples of preferred embodiments, and wherein:

Figure 1 is an axial section through a nozzle head of the invention, equipped with supply and discharge device for two fluids, cleaning liquid and thread fat, and where both discharge openings are closed;

Figure 2 is an axial section corresponding to figure 1, wherein one annular, radially inwardly directed discharge opening is open, while the other discharge opening which is identical in shape, design and orientation, is closed;

Figure 3 shows the nozzle head in perspective view, disposed on a vertical support column and connected with supply hoses for fluid, and wherein an externally threaded pipe tap end is inserted into a circumferential ring formed by the main body of the nozzle head;

Figure 4 shows the nozzle head, etc., in figure 3 in perspective as seen from the opposite side; two further pipes having externally threaded tap ends are awaiting treatment of their threads;

Figure 5 shows in side elevational view/vertical section a nozzle head in accordance with the invention in connection with a centring means adapted to centre a pipe tap end having external threads in relation to the annular nozzle body, and wherein an upwardly conically tapering centring head is supported by the upper end of a telescopic pipe device;

Figure 6 shows the conical centring head in centring engagement in the bore of the pipe tap end;

Figure 7 shows a further telescopic pipe carrying the nozzle head and an upwardly open housing surrounding the latter, in a continued condition, the nozzle being placed concentrically around the suspended, externally threaded pipe tap end;

Figure 8 shows a nozzle head wherein fluid discharge openings are directed radially outwardly, for washing and, thereupon, lubrication of internal threads in an upwardly directed pipe socket end;

Figures 9 - 12 show perspective views of a pipe handle apparatus to be used in the thread cleaning and lubrication, and illustrate four operational steps following one after the other, wherein

Figure 9 shows the pipe handling apparatus immediately after it has caught a pipe section screwed loose from a pipe

string, the pipe section being ready to be swung around the vertical axis of the handling apparatus;

Figure 10 shows said pipe section swung into position and lowered down within a cleaning and lubrication device for the tap end of the pipe section, a corresponding device for cleaning and lubricating the socket end of the pipe section being situated coaxially with the first-mentioned, underlying device, placed at the top of the pipe handling apparatus at a vertical distance from the underlying device which insignificantly exceeds the length of the pipe section;

Figure 11 shows the pipe section raised with its upper socket end in cleaning/lubricating engagement with the upper device; and

Figure 12 shows a situation where the pipe section's end coupling threads are cleaned and lubricated, and where the pipe handling apparatus is swung into position away from the devices uppermost and lowermost, in order to suspend the pipe section in a finger board, from which two pipe sections already have been suspended, and which only has been shown in perspective partial view.

First, reference is made to figures 1 and 2 which, in an axial section, show how a cleaning and lubricating device has been built up constructively according to the invention.

The substantially annular body 10 of the nozzle head is internally formed with two parallel 360° circumferential grooves 14 and 14', symmetrically placed in respect of a central, radially inwardly directed, annular portion 12, said grooves 14 and 14', moreover, each being defined by an axi-

ally displaceable nozzle ring 16 and 16', so that each of the internal circumferential grooves 14 and 14' exhibits a trapezoidal cross-section, the longest of the parallel sides being positioned at the central, radially inwardly directed annular portion 12. To each of these internal circumferential grooves 14, 14' passes a gate 18 and a gate 18', respectively, for the supply of cleaning liquid under pressure and thread fat under pressure, respectively.

In the axially directed, annular grooves in the nozzle rings 16, 16', small screw springs 20 are disposed, said springs with the outer end thereof resting against the end face of a nut 22, 22' assigned to each of the nozzle rings 16, 16". Each nut 22, 22' is formed with a notch 24 or similar catching means for a tool (not shown) for screwing the nut in question 22 or 22', respectively, in or out, so that one through turning the nut 22 or 22', respectively, can adjust the width of the discharge opening slot 26, 26' upon the application of cleaning liquid or thread fat, respectively.

Diametrally to the fluid supply gates 18 and 18', the nozzle head body's wall is formed with radially directed, internal bores 28, 28' for set screws (not shown) which are tightened in order to lock a set nut 22 or 22', respectively. Of course, the respective set screw must be somewhat unscrewed before the nut 22, 22' belonging thereto is set for adjusting the discharge slot opening.

According to figure 3, the nozzle head's annular body 10 is mounted on top of a vertical support column 30. The reference numerals 32 and 32' denote fluid supply pipelines/hoses coupled to the gates 18 and 18', respectively.

A pipe, e.g. a drill pipe, 34 having an end connector 36 formed with an externally threaded pipe tap end 38, is positioned in a centred condition within the nozzle head which, as shown specifically in figure 2, is formed with radially inwardly directed discharge opening slots for pressurized fluid for cleaning and lubrication of external pipe threads. First, the nozzle head 10 is passed along the threaded portion 38 during the application of cleaning liquid through the discharge opening 26, whereupon the nozzle head 10 is returned across the threaded portion 38 during application of thread fat through the discharge opening 26'. When cleaning liquid/thread fat is not supplied to the circumferential grooves 14 and 14', respectively, the springs 20 will urge the nozzle ring 16 and 16', respectively, against the annular portion 12 and, thus, close the discharge opening in question.

Figure 4 shows the device of figure 3 and illustrates additionally two further drill pipes 34' and 34" to be treated. Thus, a relative displacement possibility between the nozzle head 10 and respective drill pipes 34, 34', 34" must be provided.

In figure 5, the main body 10 of the nozzle head is supported at the top of a bracket 40 disposed on the bottom of an upwardly open, case-shaped housing 42 centrically supported by a vertical telescopic pipe 44, surrounding a vertically displaceable piston rod 46 incorporated in a centring mechanism between the nozzle head and the externally threaded pipe tap end 38 and which, to this end, carries an upwardly conically tapering centring head 48. The drill pipe 34 is then suspended with its downwardly conically tapering pipe tap end 38 above the nozzle head 10 in the initial position thereof,

figure 5. The drill pipe 34 is positioned by means of a pipe handling apparatus, not shown.

According to figure 6, the centring head 48 is brought into centring engagement in the pipe tap end upon upwardly directed displacement of the piston rod 46. The common axis of the centred externally thread pipe tap and the nozzle head 10 is designated at 50.

In order to cause the annular nozzle head 10 to surround and move along the pipe tap end 38 in order to treat the threads thereof through high-pressure-rinsing them and, thereupon, provide them with thread fat through the radially inwardly directed opening slots 26 and 26', respectively, the telescopic pipe 44 is now raised as shown in figure 7.

33 indicates an outlet tube for cleaning liquid.

In figure 8, a nozzle head embodiment is shown, where the discharge slot openings are directed radially outwardly in order to enable high-pressure-rinsing and subsequent lubrication of pipe threads with thread fat under pressure at internal threads within pipe sockets 52. A centring head 54 having a forward, downwardly conically tapering guiding portion 54' having a common longitudinal axis 56 with the nozzle head 10 has been inserted into the pipe bore of a drill pipe 34, the end socket 52 thereof pointing upwardly, in order to centre it in relation to the nozzle head 10. The centring head 54,54' is carried on the end of a vertically suspended piston rod 58 extendable and withdrawable in a cylinder 60 carrying a pipe 62 coaxially therewith and formed with two channels 64 and 64' each connected to a gate 66 and 66' for the supply of cleaning liquid and thread fat, respectively, and each lead-

ing to an annulus 68 and 68', respectively, (corresponding to 14 and 14' in figures 1 and 2) each assigned to a 360° encircling, closeable, openable discharge slot opening 70, 70' adjustable in respect of slot width.

Nozzle rings 16, 16', springs 20, nuts 22, 22' and central, radially inwardly directed, annular wall portion 12 are substantially as in previous embodiments, and equal and similar parts and members are each denoted at the same reference numeral and indications as before.

As mentioned, figures 9 - 12 show a pipe handling apparatus with which the cleaning and lubricating device according to the invention appropriately may be used.

The pipe handling apparatus generally denoted at reference numeral 72, comprises a vertical column-like support body 74 having a lower foot plate 76 resting on the bore deck 78, where the mousehole is indicated at 80. Up from the mousehole 80 projects an upper, socket-shaped end portion 34 of a pipe string (not visible) suspended from above and from which an overlying pipe section 34' has been unscrewed, hanging on pivotable arms 82, 82' through catchers 84, 84', the inner ends of the arms 82, 82' being disposed on slide pieces 86, 86' on the column-like support body 74 of the apparatus 72.

Such pipe handling apparatus 72 are known per se in general designs based on turnability about a vertical axis (the axis of the column 74) as well as raisability/lowerability.

In the derrick (not shown), laterally of the pipe handling apparatus, a so-called finger board 88 has been disposed, the

board being indicated in partial view only, and from which two pipe sections 34", 34‴ have been suspended.

The cleaning and lubricating device having the nozzle head for the tap end of the pipe section 34', is disposed on the drill floor 78 laterally of the foot plate 76 of the column 74, while the corresponding device having the nozzle head 10 for the socket end of the pipe section 34' is arranged, suspended from the upper end of the column 74.

In figure 10, the pipe section 34' is turned into position about the vertical axis of the column 74 as well as lowered into the lower device equipped with the nozzle head 10 for cleaning and lubricating the threads on the tap end of the pipe section 34'. Then, the upper device with its nozzle head 10 occupies an accurate coaxial position in respect of the lower cleaning and lubricating device so that, as soon as the tap end threads of the pipe section 34' have been cleaned and lubricated, only a rectilinear displacement movement is required for bringing the socket end into engagement with the upper nozzle head 10.

This position is shown in figure 11, while figure 12 shows the pipe handling apparatus 72 in a position where it is in the process of suspending the pipe section 34', which exhibits cleaned and lubricated end coupling threads, from the finger board 88.

Instead of lowering/raising the pipe section by means of the pipe handling apparatus 72 in order to allow that the pipe section comes into engagement with the cleaning and lubricating device, the lower device with its nozzle head 10 may be raised by means of telescopic tubes 44, and the upper device

with its nozzle head 10 may be lowered by means of the cylinder 60.

C l a i m s

1. A cleaning and lubricating device for threads, especially threads on pipes screwable together, such as drill pipes (34; 34'; 34") and casings, c h a r a c t e r i z e d i n that the cleaning and lubricating device comprises a nozzle head, the main body (10) thereof being formed with supply gates or channels (18, 18'), each leading into an internal annulus (14, 14') belonging thereto, for individual supply of treating fluid to the respective annulus (14, 14'), and that each annulus (14, 14') is assigned a 360° encircling, radially directed discharge slot opening (26, 26'; 70, 70').

2. A cleaning and lubricating device as set forth in claim 1, c h a r a c t e r i z e d i n that said discharge slot openings (70, 70') are directed radially outwardly, in order to clean and lubricate internal threads in a socket-shaped pipe portion (52) surrounding the nozzle head (10).

3. A cleaning and lubricating device as set forth in claim 1, c h a r a c t e r i z e d i n that said discharge slot openings (26, 26') are directed radially inwardly for cleaning and lubricating external threads on a pipe tap portion (38) formed on a pipe end and surrounded by the nozzle body (10), which is shaped substantially annularly and exhibits a large, through-going, axially directed aperture.

4. A cleaning and lubricating device as set forth in claim 1, 2 or 3, c h a r a c t e r i z e d i n that each

discharge slot opening (26, 26'; 70, 70') is defined between an internal, 360° encircling portion (12) of the main body of the nozzle head (10) and an axially displaceable nozzle ring (16, 16') movable between a closed position in which the respective nozzle ring (16, 16') rests sealingly against a land face on said internal, 360θ encircling portion (12) of the nozzle body (10), and adjustable open positions, where a circumferential portion of respective nozzle ring (16, 16') is positioned at a larger or smaller distance from said land face on the internal portion (12) of the nozzle body (10).

5. A cleaning and lubricating device as set forth in claim 4, characterized in that each nozzle ring (16, 16') is spring-loaded (20) in the axial direction and assigned an operating means, e.g. an adjusting nut (22, 22') screwable axially to and fro along threads formed internally in the nozzle body (10), for displacing the nozzle ring (16, 16') belonging thereto upon the screwing of the nut (22, 22') axially into or out from the nozzle body (10).

6. A cleaning and lubricating device as set forth in claim 5, characterized in that each nut is assigned a locking means, e.g. a set screw, disposed in a threaded bore (28, 28') formed in the nozzle body (10), in order to lock the nut (22, 22') in an adjusted position.

7. A cleaning and lubricating device as set forth in any one of the preceding claims 1 - 6, and assigned a centring device (44,46,48; 54,54',58,60) for centring a pipe's (34; 34'; 34") end coupling (socket 52/tap end 38) in re-

lation to the axis (56; 50) of the cleaning and lubricating device, c h a r a c t e r i z e d i n that the centring device carries a centring head (48; 54,54') having a conically tapering outer portion, shaped, designed and adapted to be inserted guidingly into the bore of the pipe end coupling (52; 38), thus centring the pipe end coupling in relation to the axis (56; 50) of the cleaning and lubricating device, so that a pipe socket (52) is caused to surround the nozzle head concentrically prior to treatment, while an externally threaded pipe tap end coupling (38) is brought to be concentrically surrounded by the nozzle head; in both cases upon a relative axially directed displacement movement between socket/pipe tap end on the one hand and the nozzle head (10) on the other hand.

8. A cleaning and lubricating device as set forth in claim 7, c h a r a c t e r i z e d i n that the centring head (48; 54,54') sits on the end of a lengthenable/shortenable displacing device such as a telescopic pipe assembly or the like, for lineary, axially directed displacement in the direction of the axis (50; 56) of the nozzle head/body (10).

9. A cleaning and lubricating device as set forth in claim 8, c h a r a c t e r i z e d i n that the centring head (48) sits on the end of an axially displaceable piston rod, an inner telescopic pipe (46) or similar, linearly displaceable member, concentrically surrounded by an axially displaceable telescopic pipe, cylinder for the piston rod or the like (44).

10. A cleaning and lubricating device as set forth in claim 9, characterized in that said axially displaceable telescopic pipe or cylinder (44) for said piston rod (46), at the upper end thereof is securely connected to an upwardly open, case-/bowl-shaped housing (42) in which the nozzle head/body (10) is stationarily placed.

11. A cleaning and lubricating device as set forth in any one of the preceding claims, characterized in that such a device (10) for cleaning and lubricating a pipe section's (34') socket end is suspended from the top of a pipe handling apparatus (72) provided with pivotable arms (82, 82') having catchers (84, 84') for such a pipe section (34'), and wherein, preferably coaxially below the socket thread cleaning and lubricating device (10) suspended from the top of the pipe handling apparatus, is placed on the rigfloor (78) a corresponding device (10) for the tap end of the pipe section (34').

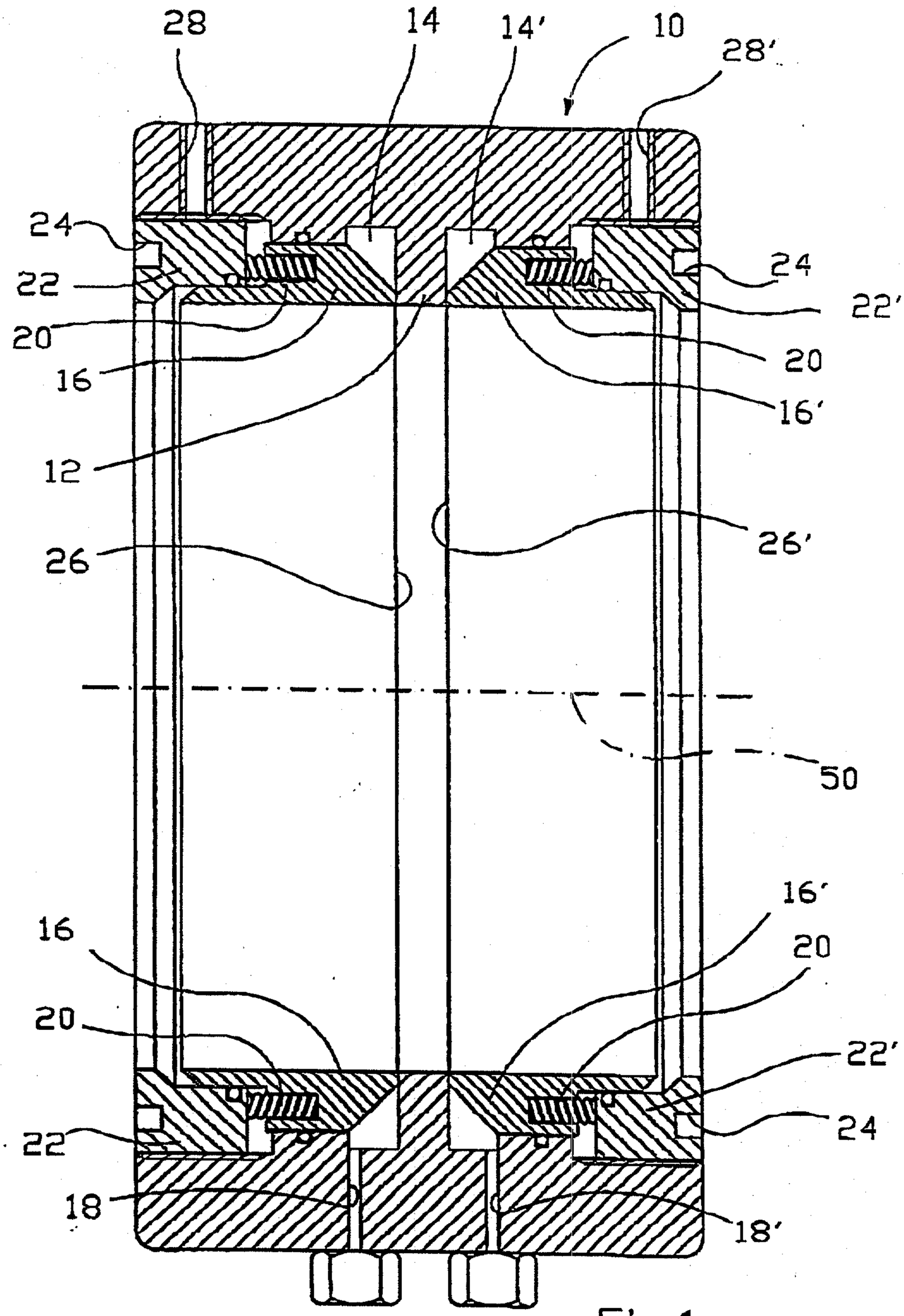

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Fig.1

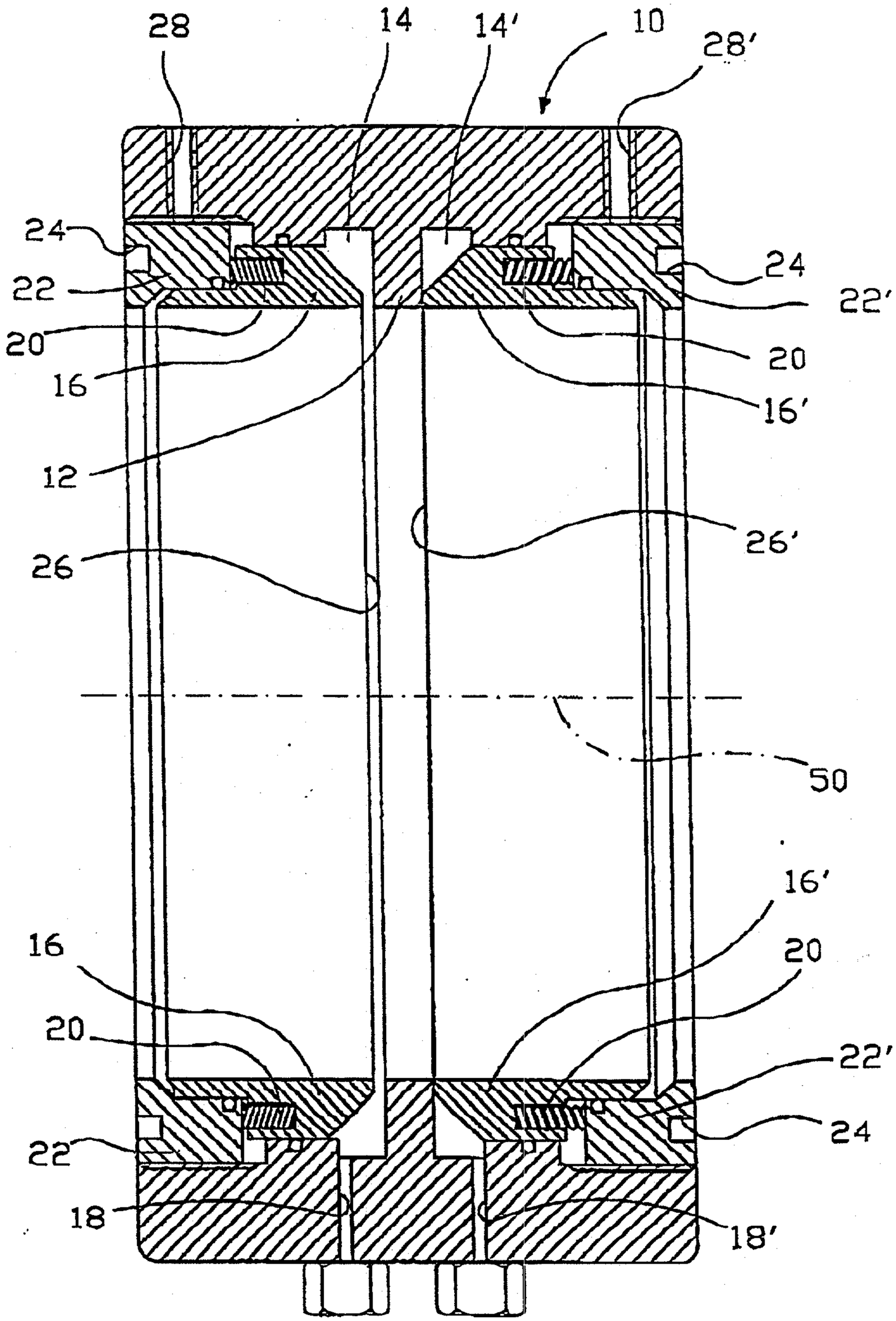
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Fig. 2

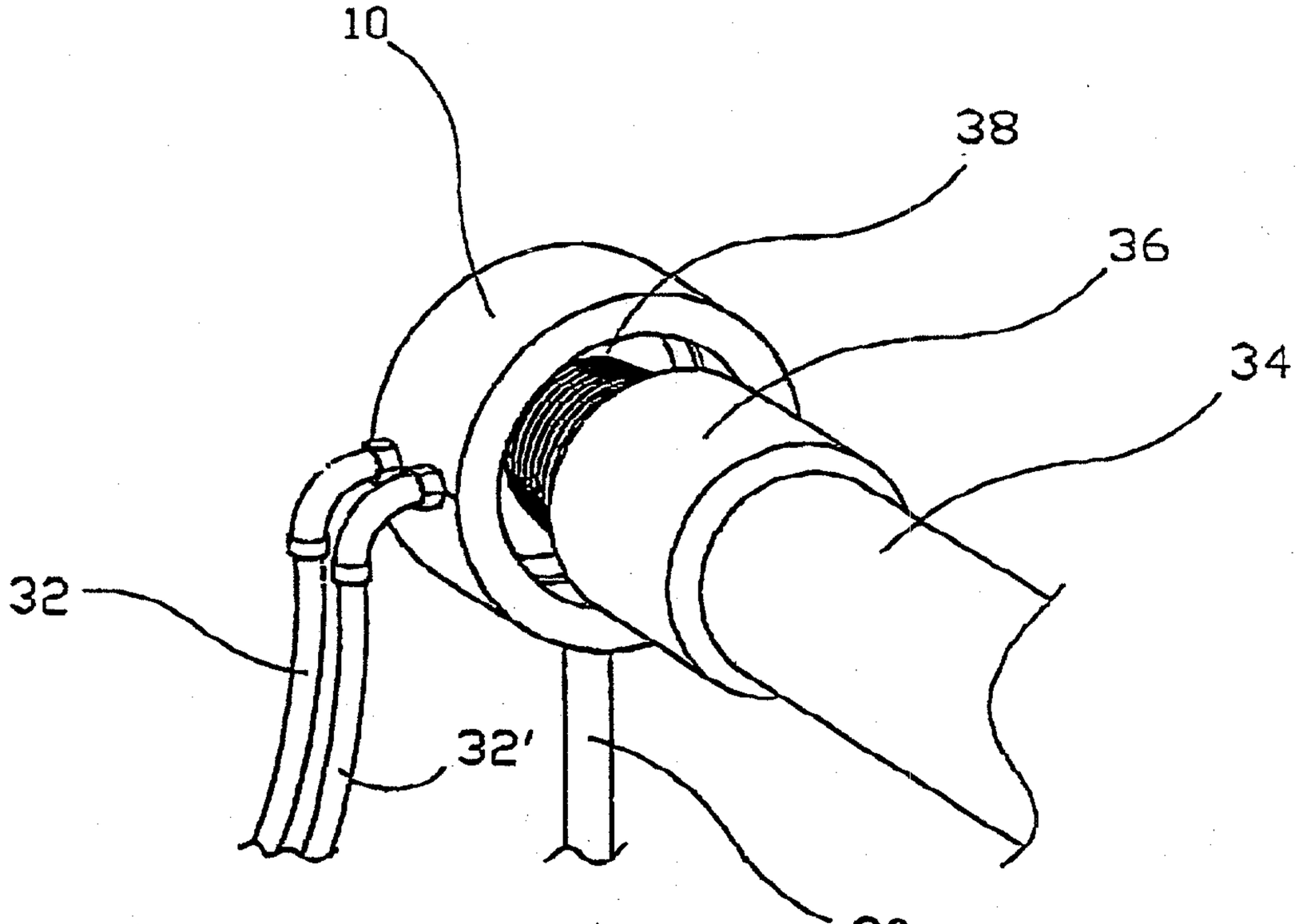


Fig. 3

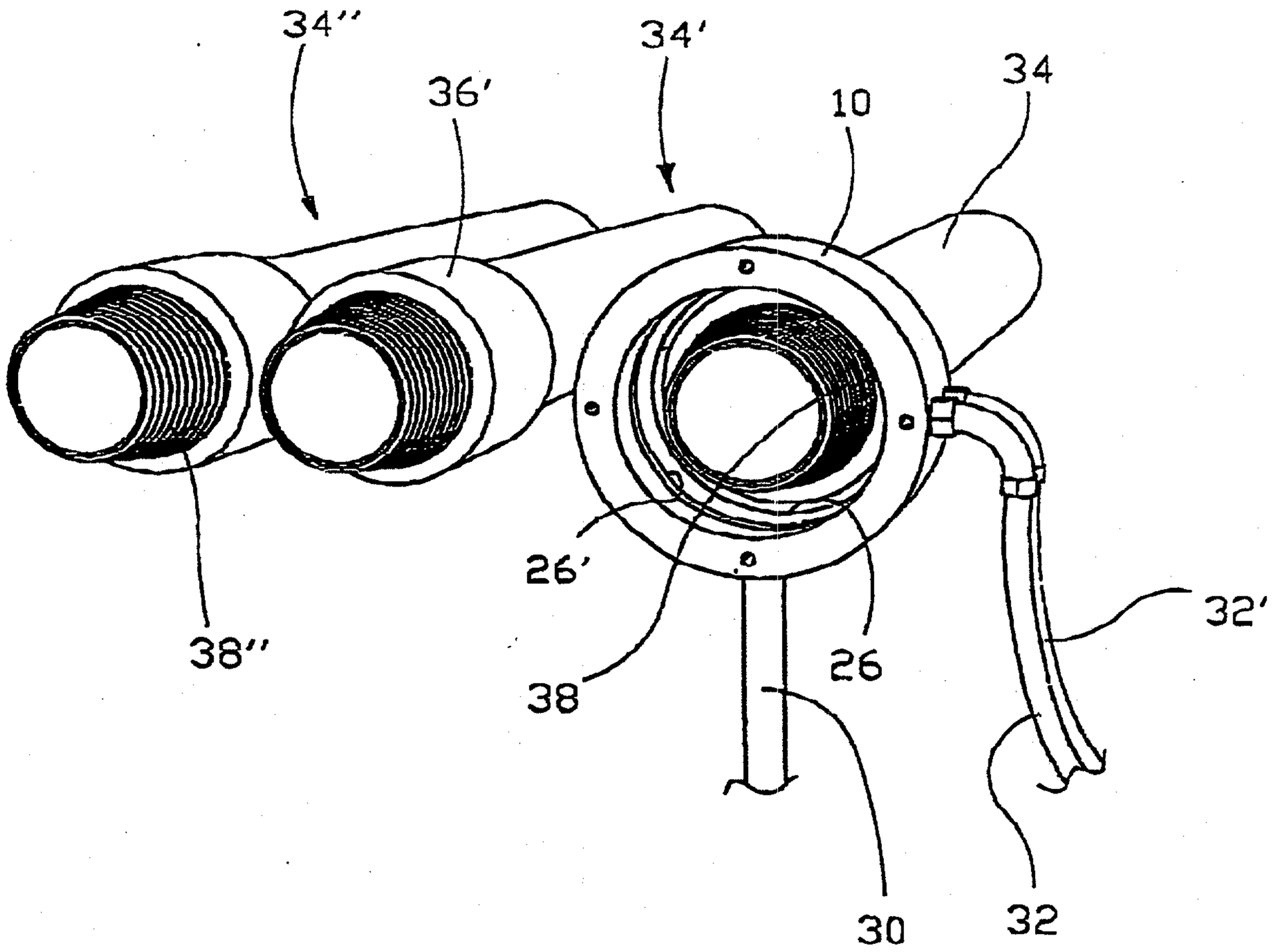


Fig. 4

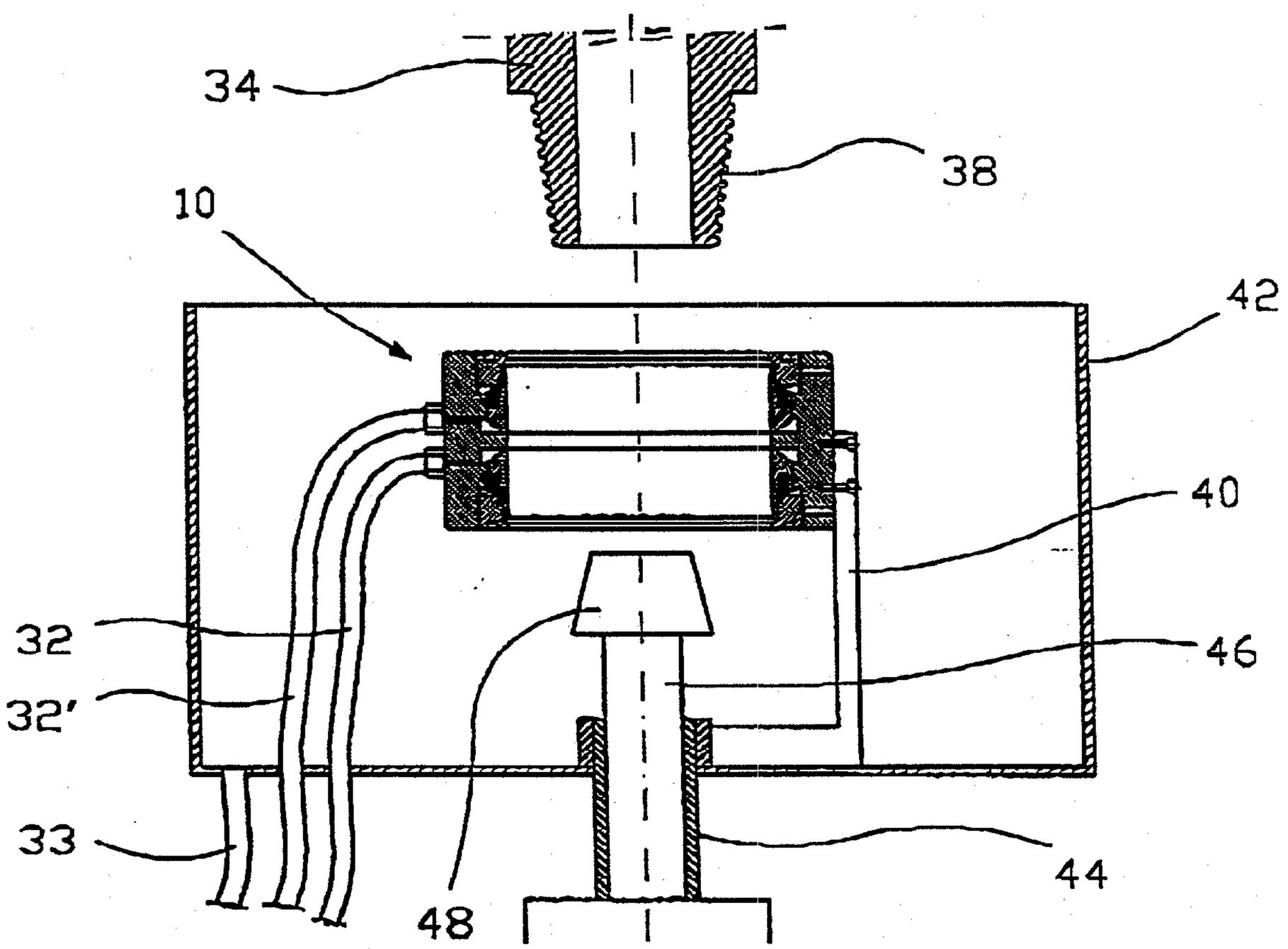


Fig. 5

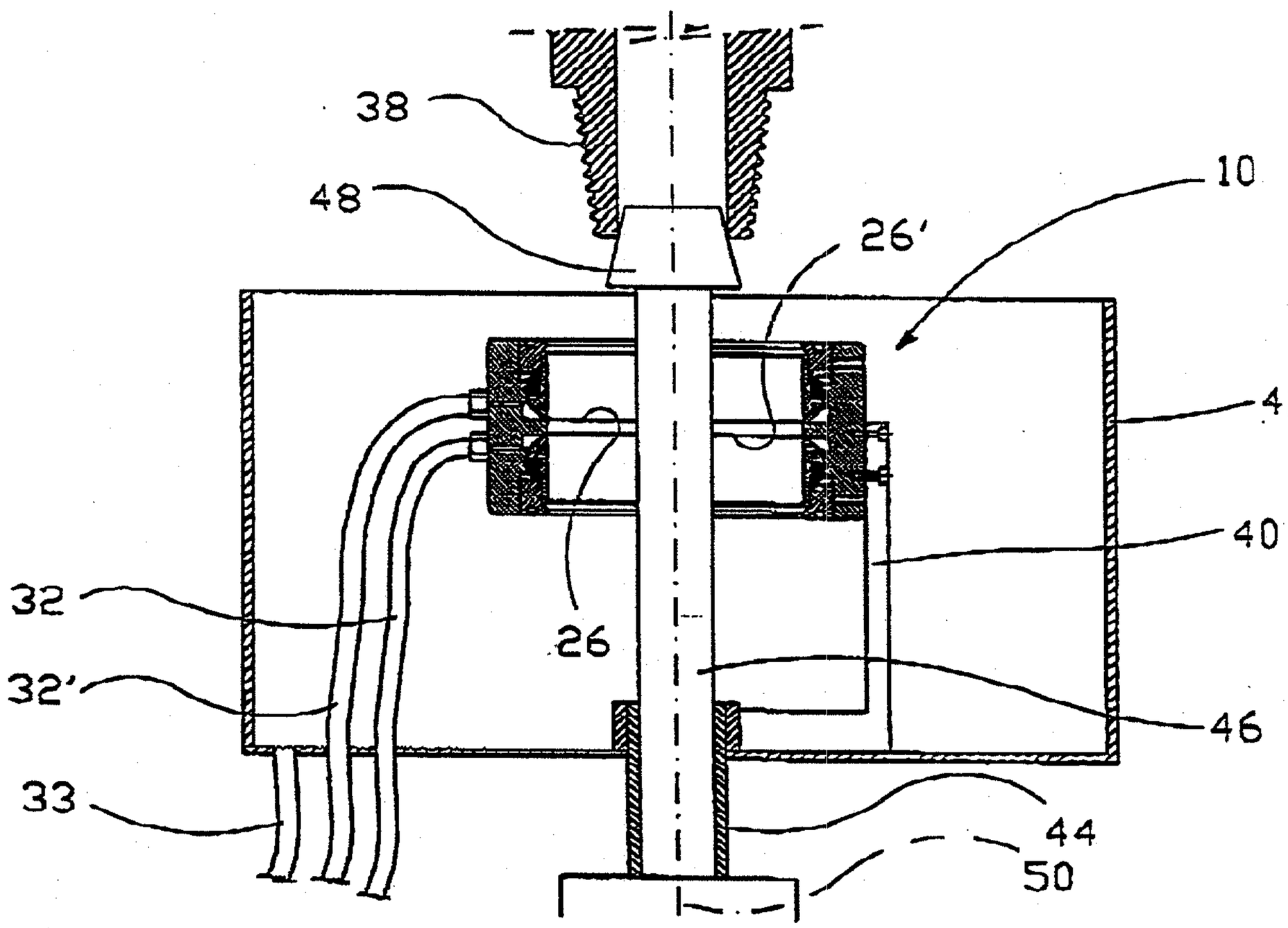


Fig.6

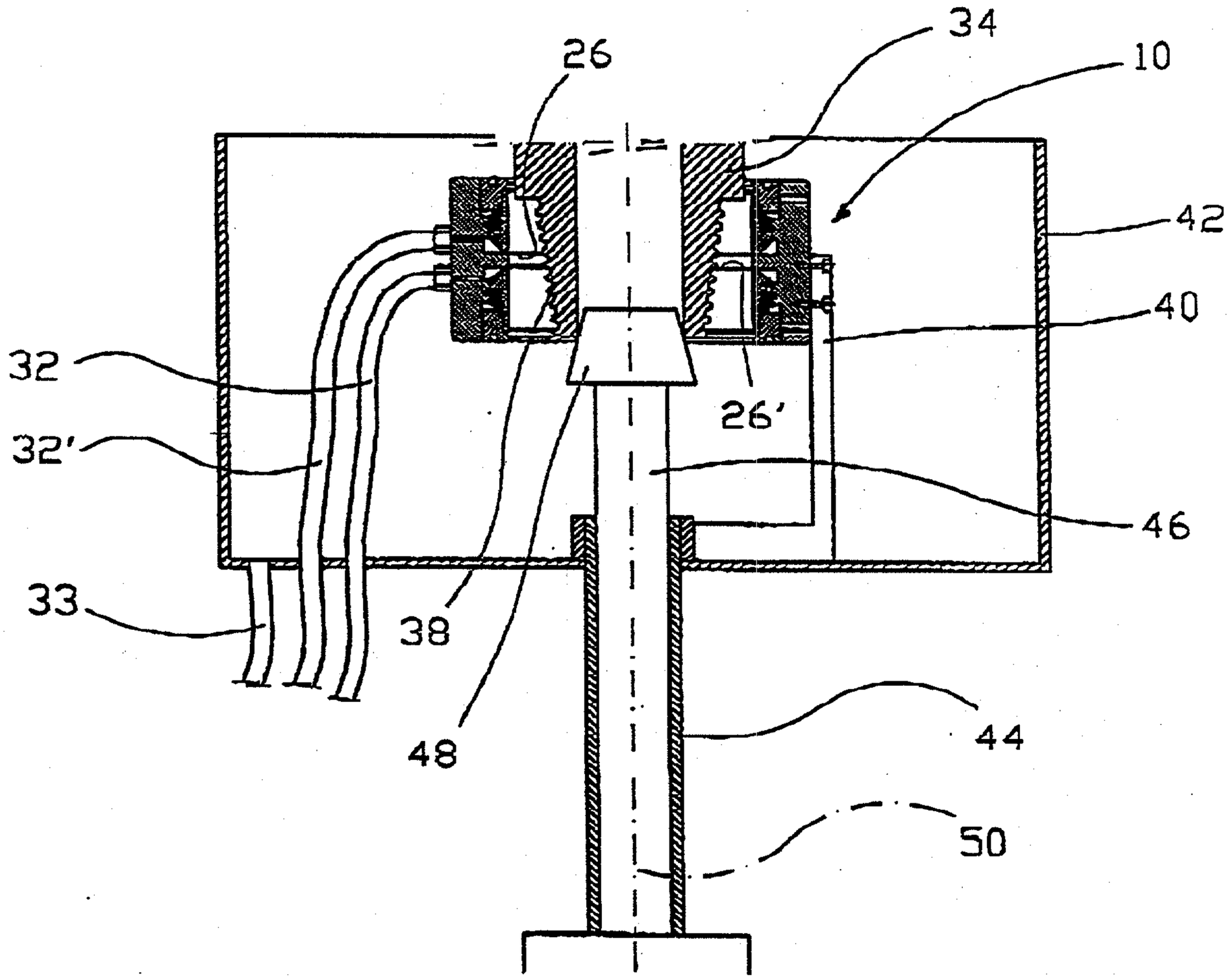
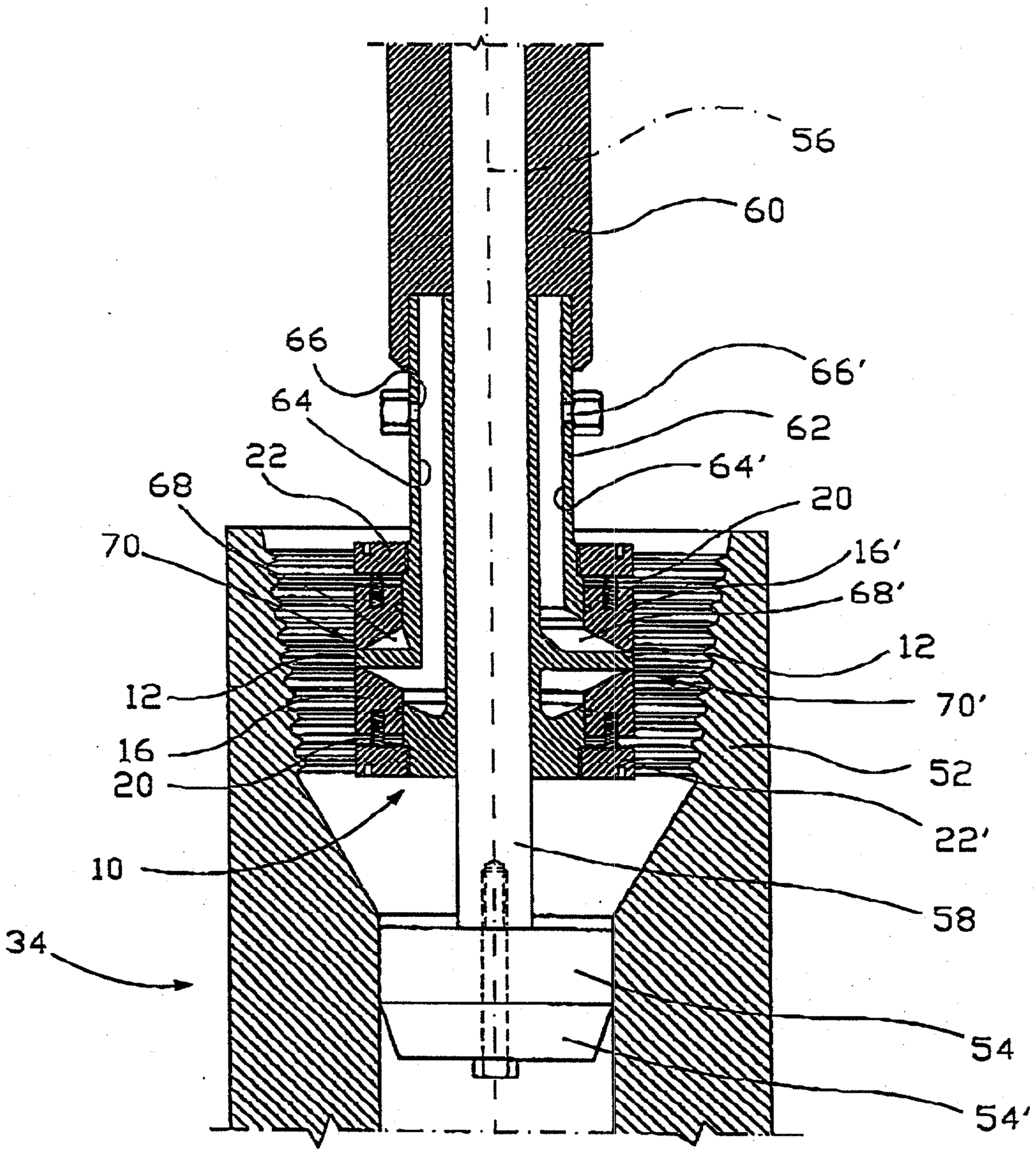


Fig. 7


56
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66
66'
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62
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64'
68
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16'
68'
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70'
16
52
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22'
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58
34
54
54'

Fig. 8

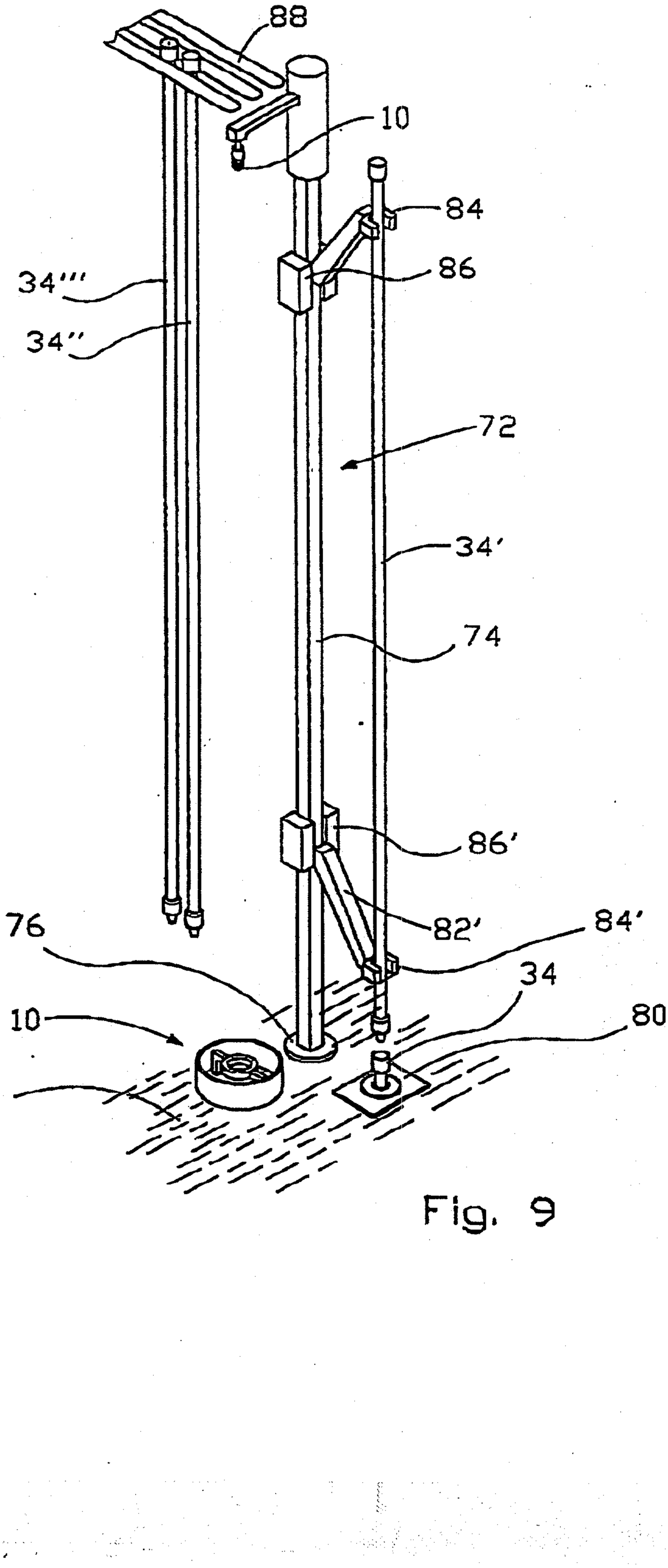


Fig. 9

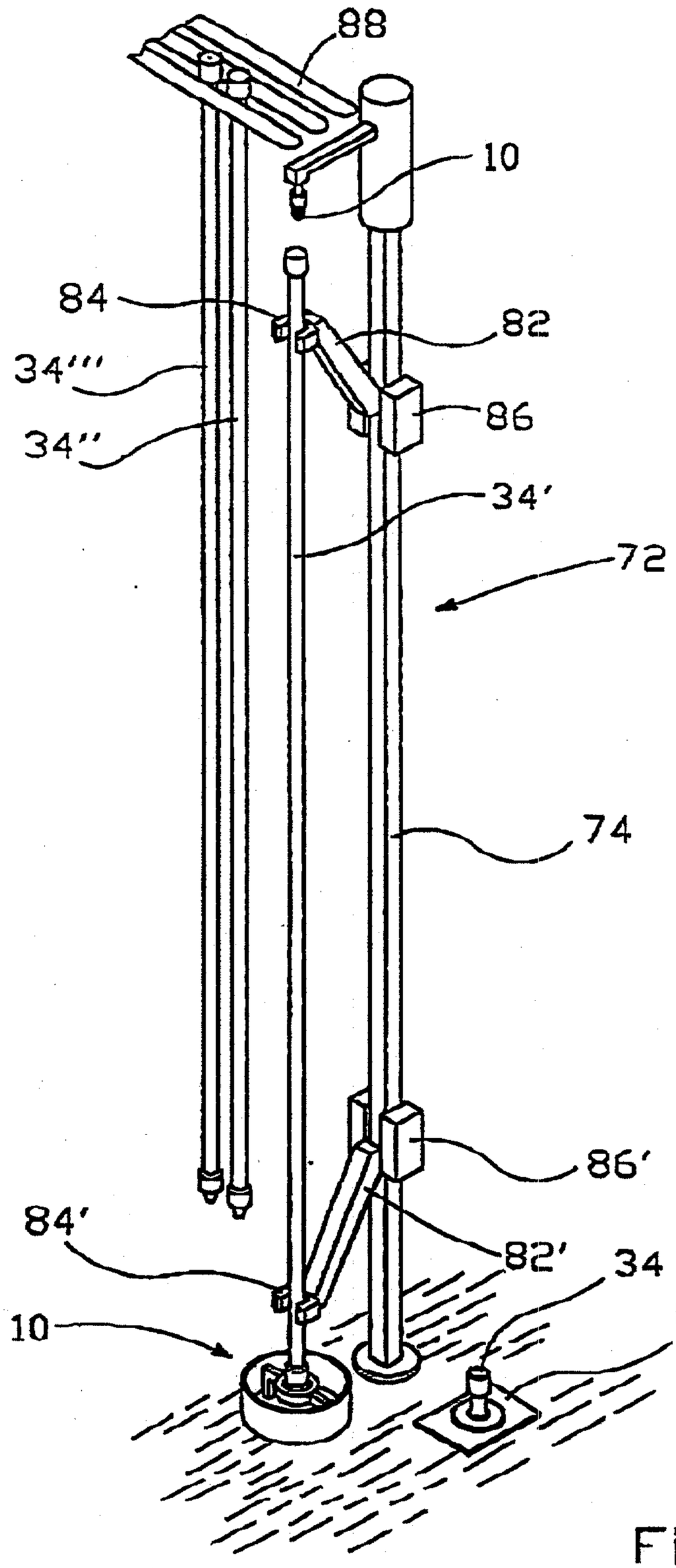


Fig.10

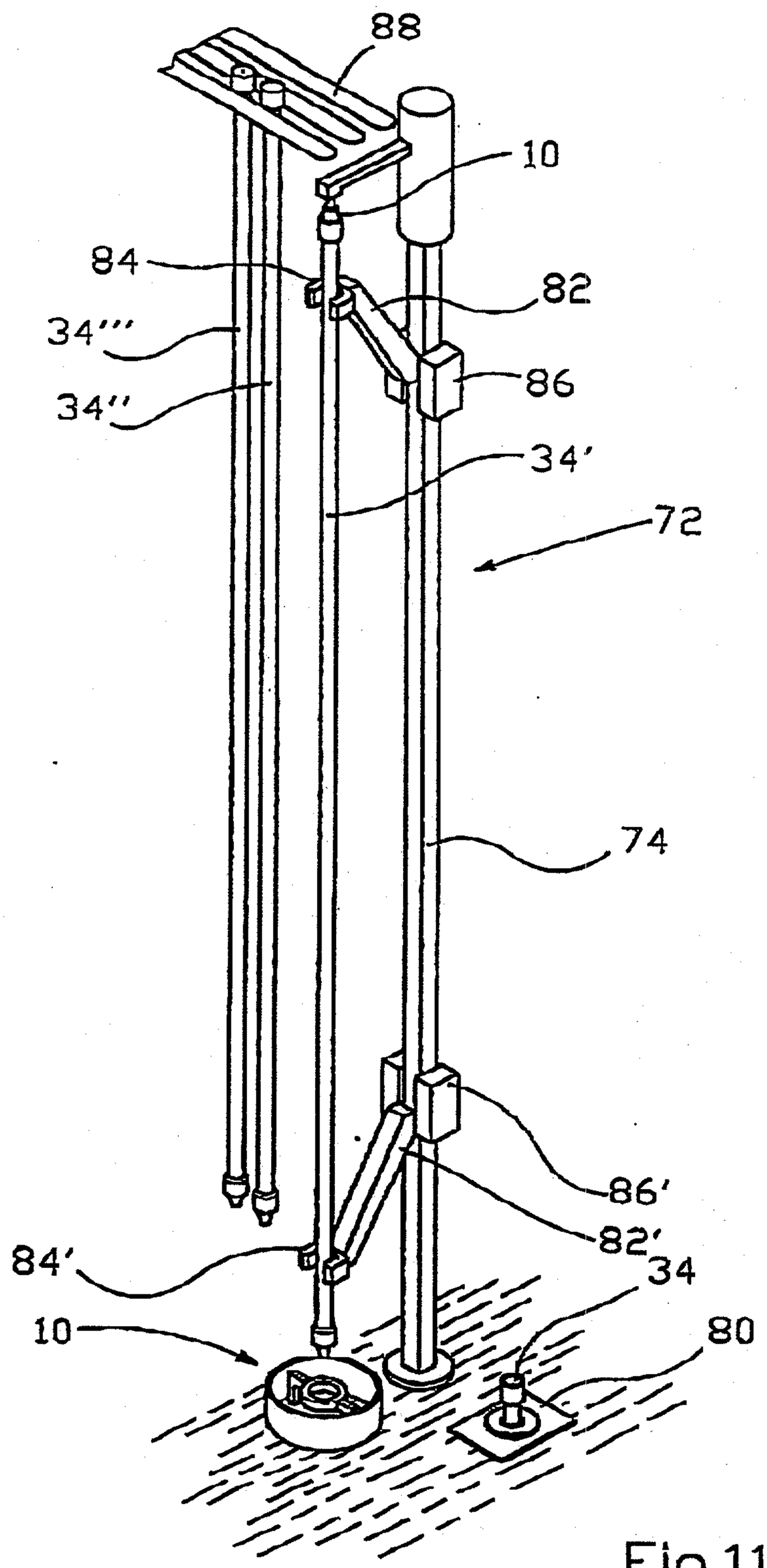


Fig.11

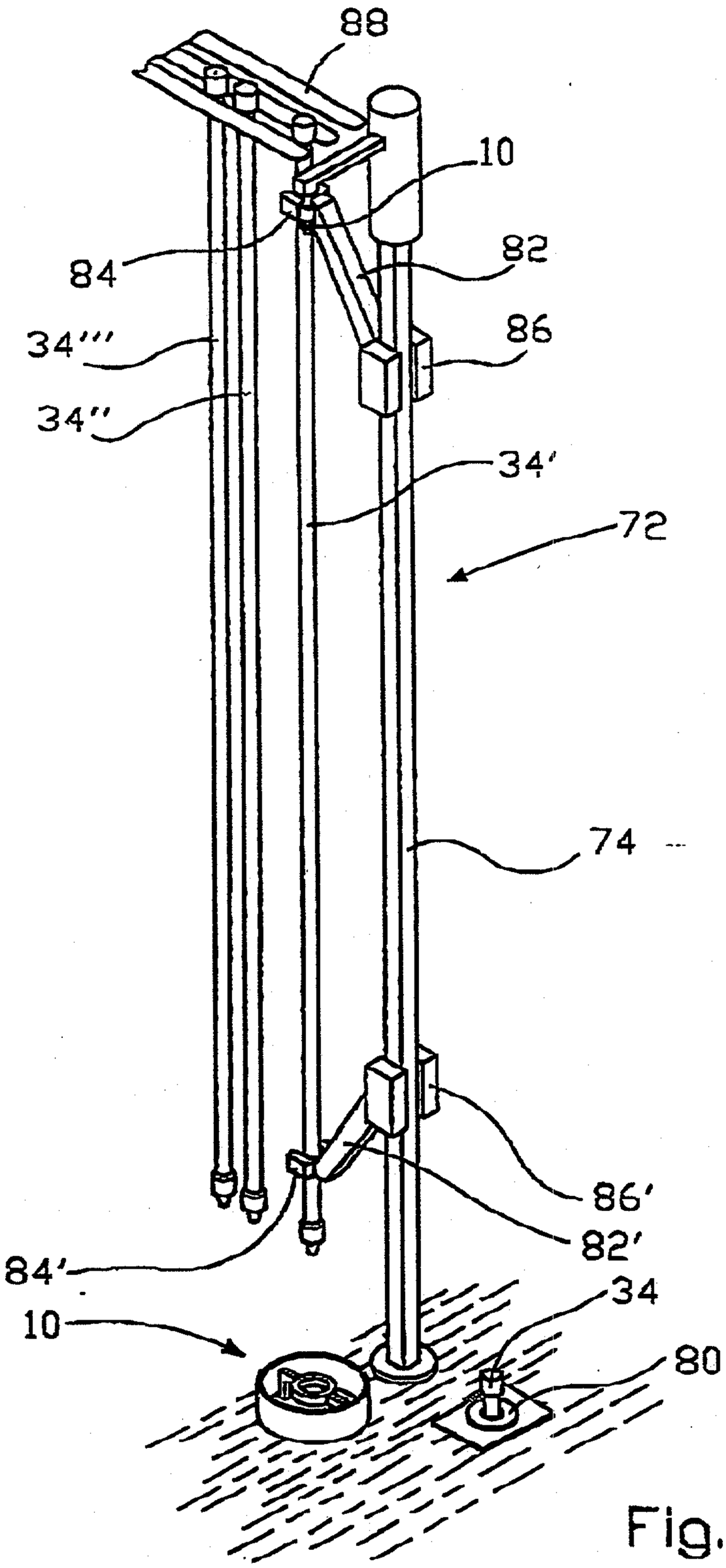
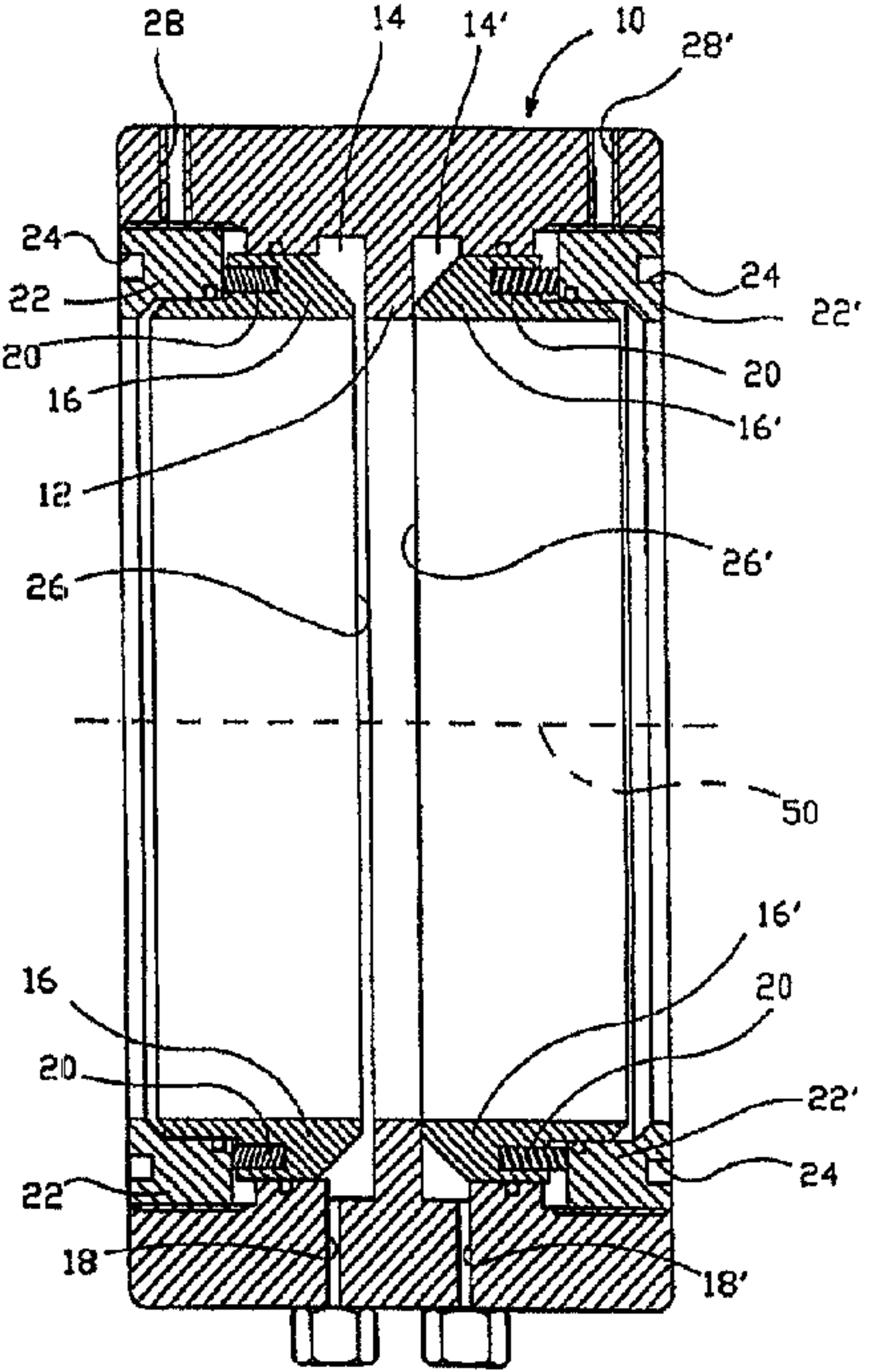


Fig.12


28
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14'
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