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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 :		(11) International Publication Number:	WO 00/19060
E21B 21/01, 17/02, 21/10	A1	(43) International Publication Date:	6 April 2000 (06.04.00)

(21) International Application Number: PCT/US99/22051

(22) International Filing Date: 22 September 1999 (22.09.99)

(30) Priority Data:
09/161,051 25 September 1998 (25.09.98) US

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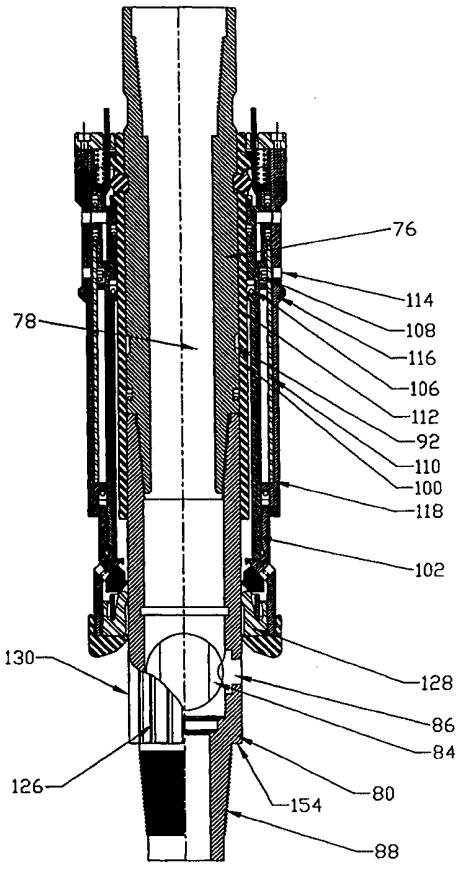
(81) Designated States: NO, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: TUBULAR FILLING SYSTEM

(57) Abstract

Multiple embodiments of a system for capturing displaced fluid or adding fluid to tubulars (20) being run into or out of the wellbore are described. Several embodiments are supported by a top drive (54) with telescoping features to rapidly seal over a tubular (20) to connect to a mudline. A flapper valve (18) in one embodiment is described to keep fluid from spilling when the apparatus is removed from the tubular (20). In the event of a well kick, the valve (18) can be shattered with pressure from the mudline. In another embodiment, the apparatus can be placed in sealing contact with the tubular (20) and can incorporate a valve (84) which can be manually closed in the event of a well kick. In yet another alternative, the incorporated valve (84) can be automatically actuated to open as the apparatus sits on the tubular (20) and closed as the apparatus lifts from the tubular (20).



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TITLE: **TUBULAR FILLING SYSTEM**

INVENTOR: ALBERT AUGUSTUS MULLINS

FIELD OF THE INVENTION

The field of this invention relates to an apparatus for filling or circulating fluids in tubulars for running in or coming out of the wellbore, and for recovery of fluids displaced when running in tubulars in the wellbore.

BACKGROUND OF THE INVENTION

When tubulars are being run or pulled from a wellbore, it is often necessary to fill the tubular, take returns from the tubular, or circulate fluid through the tubular to the lowest point in the wellbore to condition the fluid system or the wellbore or to control a "kick" or high pressure surge from the well. Previous devices for filling and circulating the wellbore are firmly attached to the traveling block, in the case of a conventional rig, or to the top drive, in the case of a top drive-equipped rig. In either case a very precise spacing is required of the seal assembly relative to the tubular and elevators. In the case where slip-type elevators are used, the spacing of the seal could be such that when the elevators were near the upset of the tubular, the seal could be out of the tubular. When required, the slips at the rig floor must be set on the tubular and the traveling block or top drive lowered in order to move

the seal into sealing engagement with the tubular. This required that the running or pulling of the tubular stop until the slips were set at the rig floor and the seal engagement was made. This is not desirable when a well kick occurs or fluid is overflowing from the tubular. It must be noted that slip-type elevators are used infrequently due to their size, weight, and the time required to latch and unlatch them since they must be placed over the top of the tubular and lowered to the desired location in order to latch and grip the tubular, a process that is almost impossible when tubulars are racked back in the derrick and the top of the tubular is far above the derrick man's head.

In the case where "side door" or latching elevators are used, the spacing of the seal system is even more critical and the seal must be engaged in the tubular prior to latching the elevators below the upset portion of the tubular. This requires that the seal be engaged in the tubular at all times that the elevators are latched on the tubular. When tubulars are racked back in the derrick such as drill pipe or a work string, it would be very time-consuming if not impossible to insert the seal into the tubular prior to latching the elevators with the top of the tubular far above the derrick man. Also, with the seal engaged in the tubular at all times, this is a disadvantage when there is a need to access the top of the tubular while the tubulars are in the elevators or when the tubular is being filled with fluid and the air in the tubular begins to be entrained in the fluid column rather than escaping the tubular. For example, if a high-pressure line was to be attached to the tubular and the tubular moved at the same time, all previous devices had to be "laid down" to allow a hard connection to be made to the tubular since they are in the way of the tubular connection.

It will be seen that the invention described in this application, with its extending and retracting features and the ability to easily connect to or disconnect, seal or unseal from the tubular, is very advantageous during any of the operations involved in well control, drilling, completion, workover, fishing or running and pulling the tubular, and eliminates all of the disadvantages of the prior art.

When tubular such as casing is run into a wellbore, each successive stand is attached and filled with mud as it is run into the wellbore. As the casing or tubing advances into the wellbore, a certain amount of mud is displaced. If the casing is open-ended on bottom or has a check valve, advancement of the casing or tubular into the wellbore will force mud from the wellbore uphole. If the tubular or casing is installed in a situation of fairly tight clearances, rapid advancement of the tubular into the wellbore will result in significant flow of mud through the tubular onto the rig floor area. Conversely, when attempting to pull the tubular out of the wellbore, resistance to extraction can be experienced and consequently "swabbed in" unless compensating fluid can be added into the wellbore to maintain sufficient hydrostatic pressure created by extraction of the tubular. Thus, there arises a need for a device which will simply allow capturing of any displaced returns during advancement of the tubular or, alternatively, allow rapid filling of the tubular for insertion into or extraction out of the wellbore.

Another situation that needs to be dealt with during these procedures is the ability to handle sudden surges of pressure from the formation to the surface. In these situations, it is desirable to be able to secure a valve in the string connected to the mud supply so that the pressure surge from the well-

bore can be contained. Thus, an objective of the present invention is to allow rapid connection and disconnection to a tubular being added or removed from a string during insertion or removal operations, while at the same time allowing rapid threaded connection to the string with an integral valve which can be manually or automatically operated so as to shut-in the well and thereafter control the well by applying fluid behind the valve which has been used to control the pressure surge from the formation.

It is yet another object of the present invention to allow a system of rapid connection and disconnection to the tubular for filling or capturing of returns with minimal or no spillage in the rig floor area.

It is another object of the present invention to allow circulation of fluid at any time during rig operations for conditioning the wellbore, fluid system, or controlling a kick.

Prior systems relating to techniques for filling casing are disclosed in U.S. Patents 5,152,554; 5,191,939; 5,249,629; 5,282,653; 5,413,171; 5,441,310; and 5,501,280, as well as 5,735,348.

The objectives of the present invention are accomplished through the designs illustrated and described below where the preferred embodiment and alternative embodiments are specified in greater detail.

SUMMARY OF THE INVENTION

Multiple embodiments of a system for capturing displaced fluid or adding fluid to tubulars being run into or out of the wellbore are described. Several embodiments are supported by a top drive with telescoping features to rapidly seal over a tubular to connect the tubular to a mudline. A flapper

valve in one embodiment is described to keep fluid from spilling when the apparatus is removed from the tubular. In the event of a well kick, the valve can be shattered with pressure from the mudline. In another embodiment, the apparatus can be placed in sealing contact with the tubular and can incorporate a valve which can be manually closed in the event of a well kick. In yet another alternative, the incorporated valve can be automatically actuated to open as the apparatus sits on the tubular and closed as the apparatus lifts from the tubular. In yet another embodiment, sealing contact with the tubular can be obtained by simply advancing the apparatus into the tubular.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a sectional elevational view of one embodiment employing a telescoping feature and a built-in flapper valve for mud spill control, showing the apparatus approaching a tubular to be run into the wellbore.

Figure 2 is the view of Figure 1, showing the apparatus extended into contact with the tubular.

Figure 2A is a section view of Figure 2, showing the rotational restraining tab.

Figure 2B is a detail view of the tubular seal in Figure 2.

Figure 3 shows the apparatus threaded into the tubular in the event of a pressure surge from the well.

Figure 4 shows the apparatus of Figure 3, with pressure applied from above shattering the flapper valve which normally retains fluid when the apparatus is disconnected from a tubular.

Figure 5 shows the apparatus of Figure 1 in the position of Figure 1, while further illustrating the positioning of the top drive supporting the apparatus.

Figure 6 is the view of Figure 5 where the apparatus has been telescoped onto the tubular.

Figure 7 is the apparatus shown in the position of Figure 3, illustrating the top drive.

Figure 8 is the apparatus shown in the position of Figure 4, also illustrating the top drive.

Figure 9A shows a double-acting version of the apparatus mounted for swingaway action from the bails in a retracted position.

Figure 9B is the view of Figure 9A from a position rotated 90° around the vertical axis.

Figure 9C is the view of Figure 9A with the double-ended apparatus swung into position for contact with the tubular.

Figure 10 is an alternative embodiment where there is no top drive and the mudline is hooked directly to a single-acting apparatus which can be swung out of the way when suspended from the bails.

Figure 11 is a sectional elevational view of an alternative embodiment in a retracted position.

Figure 12 is a detailed view of the top portion of Figure 11.

Figure 13 is the view of Figure 11 with the apparatus lowered into a position where it can contact a tubular below.

Figure 14 is a detailed view of the bottom of a sliding assembly shown in Figure 11.

Figure 15 is the view of Figure 14 after the sliding assembly has come into contact with the tubular below.

Figure 16 is an external view of the device of Figure 11, showing its position just before contact with the tubular.

Figure 17 is the view of Figure 16, with the telescoping portion of the apparatus extended into contact with the tubular.

Figure 18 is the view of Figure 17, with the telescoping portion retracted sufficiently for manual operation of a shut-off valve and with the lower threaded connection secured to the tubular.

Figure 19 is the view of Figure 18, with the telescoping portion physically removed from the underlying hub.

Figure 20 is a detailed view showing the shut-off valve remaining on the tubular with the hub removed.

Figure 21 is the view of Figure 20, with a backpressure valve and pipe added above the shut-off valve and all screwed into the tubular below.

Figure 22 is an alternative to Figure 11, where the shut-off valve opens and closes automatically on shifting of the telescoping component.

Figures 23 and 24 show how shifting the telescoping component opens and closes the valve in the hub.

Figure 25 is the view of Figure 22, with the valve closed and the hub screwed into the tubular below.

Figure 26 is yet another alternative embodiment where the apparatus is retracted above a pipe supported in the elevator.

Figure 27 shows the apparatus brought into contact with the tubular as the top drive is lowered and prior to final make-up.

Figure 28 is the view of Figure 27, with the thread made up.

Figure 29 is similar to Figure 27 except that the apparatus is supported by telescoping pistons and cylinders as opposed to a spring-like device prior to thread make-up.

Figure 30 is the view of Figures 28 and 29 after thread make-up and the pipe supported by the elevators.

Figure 31 is a side view of Figure 26, showing the device being guided by the bails and attachment of cylinders or springs.

Figure 32 is an alternative embodiment which is supported by a hook when there is no top drive available.

Figure 33 is a side view of Figure 32.

Figure 34 is a detailed view of the apparatus as shown in Figure 26.

Figure 35 is a detail of the handwheel for manual operation of the apparatus.

Figure 36 is an alternative to the gear drive design shown in Figure 34.

Figure 37 is a top view of the apparatus as shown in Figures 34 or 36.

Figure 38 is a detailed of an alternative technique for engaging a tubular with the apparatus where rotation is not required.

Figure 39 is a detailed view showing how the engagement and sealing portion operates without rotation.

Figure 40 is an alternate assembly of a more automated alternative to that shown in Figure 38, showing not only the thread engagement and releasable portion but also the sealing tube feature of the apparatus.

Figure 41 is a complete apparatus incorporating the details of Figure 40, showing engagement into a tubular.

Figure 42 shows the locked position of the apparatus shown in Figure 40, with pressure applied internally.

Figure 43 is a detail of a component of the locking mechanism showing how it is guided by the apparatus.

Figure 44 is an elevational view of part of the locking mechanism for the apparatus.

Figure 45 is a view of the apparatus shown in Figure 41 in the condition where it is released from the tubular below.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to Figures 1-10, the first embodiment, originally disclosed in provisional application serial No. 60/084,964 filed May 11, 1998, will be described. Referring to Figure 1, the apparatus **A** has a tubular body **10**, with a bore **12**. Located at the lower end **14** of body **10** is a valve assembly **16** which includes a flapper **18**, shown in the closed position in Figure 1. The purpose of the flapper **18** is to close when the assembly is lifted away from the tubular **20** so that the mud in bore **12** does not spill out on the rig floor. However, the material construction of the flapper **18** is preferably easily breakable under pressure applied from the rig pumps as shown in Figure 4 where the flapper has broken into little pieces so that pressure can be applied to the wellbore for well control in the event of an unexpected surge in pressure from downhole. The valve body **16** is secured to the tubular body **10**. Thread **22** is on the lower end of the body **10** and is selectively securable to thread **24** in the tubular **20**, as will be explained below.

Body **10** has a recess **26** with sleeve **28** mounted over recess **26**. Sleeve **30** is mounted over sleeve **28** and has lug **32** extending therefrom. A cylinder **34** receives hydraulic or other fluid or gas through connections **36** and **38** for respective downward and upward movements of shaft **40**, which is in turn connected to lug **32**. Lug **32** can be actuated mechanically or electrically where cylinder **34** is an electric motor/lead screw device as alternatives. Cylinder **34** is supported from lug **35** which is secured from the top drive (shown in Figure 5) so that body **10** can be rotated with respect to sleeves **28** and **30** to secure thread **22** to thread **24**. Extension of shaft **40** moves lug **32** downwardly and extends sleeve **30** downwardly with respect to stationary and rotatable sleeve **28**. Located on body **10** is seal **42** to seal between sleeve **28** and body **10**. Another seal **44** seals between sleeves **28** and **30**.

At the lower end of sleeve **30** is skirt **46** which serves as a guide for sleeve **30** over the tubular **20**. Located at the bottom of sleeve **30** is an internal seal **48** which is a ring-shaped seal having a chevron configuration in cross-section in the preferred embodiment, which is designed to land near the top end **50** of the tubular **20** for sealing engagement to the outer surface of the tubular **20**. Figure 2B shows the working of seal **48** in cross-section, illustrating its chevron design with opposed wings, one of which rests on the tubular **20** and the other **52** sealing against the lower portion of the sleeve **30**.

The valve assembly **16** is an optional feature which can be attached at the lower end **14** of the tubular body **10** or it can be omitted completely. When the sleeve **30** is telescoped downwardly, as shown in Figure 2, and the seal is established against the tubular **20**, the tubular can be run into the well and any displaced mud will come up past the flapper **17** and flow upwardly through

the bore **12** back to the mud pit. Should it become necessary, the thread **22** can be secured to the thread **24** through the use of the top drive **54**, as shown in Figures 3, 4, 7 and 8. A tab **55** shown in Figure 2A (Section B–B) extends from the sleeve **28**, or from any other location, connected to sleeve **30** to hold it against rotation. Those skilled in the art will appreciate that the tubular body **10** can be rotated with respect to sleeves **28** and **30** to secure thread **22** to thread **24**. This situation could become necessary if a sudden rise in pressure from the well below occurs and pressure is needed from the mud pumps to control the well. At that point, it is not desirable to rely on the sealing capability of seal **48** and it is preferable to have a hard pipe connection between threads **22** and **24**. Such a connected position is shown in Figure 3. It should be noted that in Figure 3, the mud saver valve assembly **16** has been removed. The connection between threads **22** and **24** can be made-up, regardless of whether the valve assembly **16** is employed. If the valve assembly **16** is still in position, as shown in Figure 4, pressure from the mud pumps simply breaks the flapper **18** to allow well pressurization with heavy fluids so as to bring the well under control in an emergency situation.

Another feature of this embodiment of the present invention is that pressure in bore **12**, as extended when sleeve **30** is brought down toward tubular **20**, acts to put a net force on sleeve **30** to hold it down on the tubular **20**. This occurs because there is a bearing area for the pressure within sleeve **30** adjacent seal **48** which is far larger than any available bearing area from the presence of seal **44** near the top of sleeve **30**, as shown in Figure 2. Thus, the presence of internal pressure in bore **12** gives a supplemental force to the sleeve **30** to hold the seal **48** against the tubular **20**.

Referring now to Figures 5–8, the various steps shown in Figures 1–4 are illustrated again, with the further addition of the top drive **54**. In Figure 5, the top drive **54** is connected to the body **10** so that mud can be pumped through the top drive **54** down the bore **12** should that become necessary to control the well. Conversely, advancing the tubular **20** into the wellbore displaces fluid through the bore **12** into the top drive **54** and back to the mud pit through a mud hose. Shown in Figure 5 is an elevator **56** which is supported by a pair of bails **58** and **60**. The apparatus substantially as shown in Figure 1 is also shown in Figure 5 and its details will not be repeated. Referring to Figure 6, the cylinder **34** has been actuated to extend sleeve **30** such that seal **48** is sealingly engaged to the tubular **20**. The assembly including the top drive **54** can be let down with rig equipment, allowing the tubular **20** to be lowered using the elevators **56**, with fluid displaced upwardly through bore **12** back to the mud pits.

Referring to Figure 7, the top drive **54** has been lowered so that the body **10** can have its thread **22** engage the thread **24** of the tubular **20** so that the top drive **54** can be operated to secure the body **10** to the tubular **20**. The mud saver valve **16** is eliminated from the view of Figure 7. It can be manually removed prior to connecting thread **22** to thread **24** or it can be eliminated altogether. Eliminating the valve assembly **16** altogether may cause some mud to dribble near the rig floor when the cylinder **34** is retracted since the height of bore **12** up to the mudline (not shown) would drain each time in the rig floor area without the use of the valve assembly **16**.

Figure 8 illustrates the threads **22** and **24** connected so that body **10** is threaded tightly to the tubular **20** with the mud pump turned on to break the flapper **18** into little pieces for control of the well below.

Figures 9a–c illustrate an alternative double–ended version which can telescope upwardly and downwardly. As shown in Figure 9A, the apparatus **A** is merely two of the embodiments shown in Figure 1 and is extendable in opposite directions. Swinging arms, such as **62** and **64**, are each in pairs and pivoted from the bails, one of which **58** is shown in Figure 9A. The pivot points on each bail are denoted as **66** and **68**. Each of the arms **62** and **64** has a travel stop. All four travel stops are illustrated in Figure 9B as **70**. The travel stops **70** engage the bails **58** and **60** to place the apparatus **A** in the position shown in Figure 9C. In the position shown in Figure 9A, the apparatus **A** is out of the way so that a tubular **20** can be engaged in the elevator **56**. Once the tubular **20** is secured in elevator **56**, the apparatus **A** is allowed to swing in a clockwise direction until travel stops **70** come in contact with bails **58** and **60** and the position of Figure 9C is assumed. Thereafter, the cylinders **34** and **34'** can be actuated, whereupon a lower seal **48** will engage the top of the tubular **20** at its outer periphery, while an upper seal **48'** will make contact with the top drive **54** for sealing engagement with the tubular **20** at the lower end and the top drive **54** at the upper end so that mud can flow therein without leakage. Again, a valve assembly, such as **16**, can be incorporated into this design.

An alternative design where no top drive is available is shown in Figure 10. There, a hook **72** supports the bails **58** and **60**, only one of which is shown in Figure 10. The apparatus **A** swings out of the way by virtue of arms

62 and 64, as before. These arms pivot respectively from pivots 66 and 68, as before. The main difference is that the mud hose 74 is now connected directly to the apparatus A instead of through the top drive as it would in the installation of Figures 9a–c. In all other respects, the function of the apparatus A is as previously described.

Those skilled in the art will appreciate that this first–described embodiment has several advantages. Easy sealing contact can be made with a tubular 20 through the telescoping feature using the cylinder 34 in conjunction with the seal 48. A travel stop can also be incorporated with sleeve 30 to ensure the proper placement of seal 48 adjacent the outer periphery at the upper end of the tubular 20. The configuration of the area around seal 48 ensures that internal pressures in bore 12 produce a net force downwardly on sleeve 30 to hold seal 48 in position above and beyond the retention force applied to sleeve 30 through shaft 40 connected to the lug 32. The other advantage of the embodiment described in Figures 1–10 is that it has a body 10 with lower threads 22 which can be readily made–up to the tubular 20 by employing either the top drive 54 if available or through manual threading of thread 22 into thread 24. It can be appreciated that the system of "out of the way" when in the retracted position, allowing normal well operations such as pulling, running pipe, or drilling to occur without need to "lay the assembly down." It can also be appreciated that a "fill–up" valve can be incorporated in the body to prevent fluid from spilling on the rig floor while allowing fluid to return to the mud pit through the integral check valve.

Referring now to Figure 11, the preferred embodiment of the present invention will be described.

Referring now to Figure 11, the preferred embodiment of the apparatus **A** has a body **76** with a bore **78**. Secured below body **76** is valve body **80**, which is connected to body **76** at thread **82**. Valve body **80** has a 90° ball **84**, shown in Figure 11 in the open position. Ball **84** can be manually operated through a hex connection **86** by sticking a wrench in it and rotating 90°. The valve body **80** has a thread **88** so that it can be secured to a tubular **90** (see Figure 18) should the need arise for pressure control of the well. It will be recognized by those familiar with the art that the valve body can be at the upper end of the body assembly as well as the bottom, as illustrated with the hex connection **86** above the tab **94** shown in Figure 12.

Referring to Figure 12 for a closer look at the outer assembly on the body **76**, it can be seen that body **76** has a series of external grooves **92** at different locations. In the position shown in Figure 12, the apparatus **A** is in its initial position, but the outer assembly as will be described can be shifted with respect to the body **76**. This occurs by lifting up tab **94** which allows dogs **96** out of groove **92**. Tab **94** is biased downwardly by spring **98** so as to retain the locked position of dogs **96** through the window in inner sleeve **100**. Thus, inner sleeve **100** has a multiplicity of positions relative to the body **76**. Referring again to Figures 11 and 12, a piston **102** rides outside of the inner sleeve **100**. Hydraulic fluid is connected to an inlet **104** and communicates with the top of the piston **102**. Seal **106** is disposed between the inner sleeve **100** and the piston **102**. Seal **108** is disposed between the piston **102** and intermediate sleeve **110**. A seal **112** ensures that hydraulic fluid pumped into connection **114** travels downwardly between the intermediate sleeve **110** and an outer housing **116**. Intermediate sleeve **110** has a series of slots or openings

118 (see Figure 11) to allow fluid communication into cavity 120. Clearly, applying pressure through the connection 114 ultimately puts an upward force on piston 102, while applying pressure through the inlet 104 applies a downward pressure on piston 102. Those skilled in the art will appreciate that the outer housing 116 can be made in several components. A top plate 122 is secured by fasteners 124 and acts to ultimately support the outer housing 116 when the dog or dogs 96 are firmly engaged in a groove or grooves 92. The top plate 122 also holds in the spring 98.

Referring to Figure 11, it will be noticed that there is a series of longitudinal flutes 126. The purpose of these is to prevent the seal 128 from sealingly engaging the outer surface 130 of the valve body 80 so as to prevent the piston 102 from being telescoped upwardly, as will be explained below.

The lower assembly adjacent the bottom of piston 102, while shown in Figure 11, can be seen in greater detail in Figures 14 and 15. Figure 14 represents the position of the components when the lower end of piston 102 is in the position shown in Figure 11. Figure 15 illustrates the position of the components when set against the tubular 90. Lower sub 132 is connected to the lower end of piston 102. It has a port 134 to which a pressure gauge can be connected or a vent valve to be sure that there is no internal pressure in the sub 132 before the seal 128 is lifted clear of the tubular. Located within the sub 132 is an expandable stop ring 136. A travel stop 138 limits the minimum diameter of stop ring 136. In the position in Figure 11, the outer surface 130 of the valve body 80 pushes the stop ring 136 radially outwardly away from stop 138, as shown in Figure 14. Stop ring 136 is an annularly shaped ring with selected cutouts to allow it to expand radially as it is forced

up and over the outer surface **130** of the valve body **80**. In its contracted position shown in Figure 15 against the travel stop **138**, the stop ring **136** protrudes inwardly sufficiently to contact the upper edge **140** of tubular **90**. With contact established between the stop ring **136** and the tubular **90**, the seal **128**, which has a chevron shape in cross-section as shown in Figure 15, has one lip **142** up against the outer surface of the tubular **90** with the other lip **144** in sealing contact with the sub **132**. A bottom ring **146** is secured to the sub **132** at thread **148**. A retainer ring **150** extends between the two lips **142** and **144** to hold the seal **128** in position and to act as a travel stop when the stop ring **136** contacts it, as shown in Figure 14. The stop ring **136** has a surface **152** which allows it to be pushed radially out of the way when it contacts the lower end of the valve body **80**. In the event that the thread **88** needs to be made-up to the tubular **90**, the stop ring **136** has to be pushed radially out of the way. This happens when the shoulder **154** (see Figure 11) contacts surface **152** to urge the stop ring **136** from the position shown in Figure 15 to the position shown in Figure 14. Surface **156** on the stop ring **136** is designed to catch the top **140** of the tubular **90** so as to properly position the seal **128** on the outer periphery of tubular **90** for a seal therewith.

The significant components of the preferred embodiment shown in Figures 11-15 now having been described, its straightforward operation will be reviewed in more detail.

Figure 16 illustrates the apparatus **A** suspended from a top drive (not shown) or otherwise supported in the derrick by body **76**. The operating position of the assembly which includes the piston **102** can be adjusted by operation of the tab **94** to secure the assembly, including the inner sleeve **100**,

to a particular groove **92** on the body **76**. That position has already been obtained in Figure 16, and the tubular **90** is illustrated in position to accept the seal **128**. Hydraulic pressure is applied to inlet **104** to begin the downward movement of the piston **102**. It should be noted that there is no substantial difference between the apparatus in the position of Figure 16 and in the position of Figure 13, except that a lower groove **92** has been engaged in Figure 13, putting the seal **128** below the hex connection **86**, while in Figure 16 the hex connection **86** is still exposed prior to actuating the piston **102**. Figure 17 illustrates the movement and extension of piston **102** so that the tubular **90** now has seal **128** engaged to its outer periphery. The tubular **90** can then be run in the well and returns will come up through the bore **78** of body **76**. In the event of sudden rise in pressure in the wellbore, necessitating the connection of thread **88** to the tubular **90**, the body **76** can be lowered to bring thread **88** into engagement with tubular **90** for make-up by actuation of a top drive. The piston **102** and all components connected to it will remain stationary, while the body **76** is lowered and rotated by a top drive (not shown) or manually by the rig crew.

Figure 18 shows the thread **88** fully engaged into the tubular **90** with the hex connection **86** exposed so that the ball **84** can be rotated 90° to be closed. Figure 19 illustrates that the connection between the body **76** and the top drive has been released and the tab **94** has been pulled up to release the dogs **96** so that the inner sleeve **100** and everything attached to it can be removed from body **76**. Figure 20 illustrates that the body **76** has been removed from the valve body **80** by a disconnection at thread **82**. Figure 21 illustrates the addition of a backpressure valve **158** above the valve body **80**,

followed by pipe **160**, which is in turn connected to a pressurized mud supply so that the well, if it is experiencing a surge in pressure, can be easily brought under control and all the connections can be secure, threaded connections when handling such an operation. Once the backpressure valve **158** is connected, the valve **84** can be rotated to the open position. Pipe can then be added to allow the pipe to be run into the wellbore to allow better control of the pressure surge or well problem.

Referring to Figures 22–25, the operation of the ball **84** can be automated. The valve body **80** can have a series of guide pins **162** which ride in a longitudinal track **164** to prevent relative rotation with respect to the piston **102**. Piston **102** can have an operating pin **166**. The ball **84** can have an operating plate **168** which has a groove **170** such that when the piston **102** is stroked downwardly, the pin **166** engages the groove **170** to rotate plate **168**, thus putting the ball **84** in the open position shown in Figure 22. Conversely, when the piston **102** is retracted, the pin **166** hits a different portion of the groove **170** to rotate the ball **84** in the opposite direction to the closed position shown in Figure 25.

Thus, the typical operation, whether the ball **84** is operated manually, as in Figure 11, or automatically as in Figures 22 and 25, is to position the apparatus **A** close to a tubular **90**. Piston **102** is extended with the ball **84** in the open position as shown in Figure 11. Ultimately, seal **128** engages the outer surface of the tubular **90** and the stop ring **136** hits the top edge **140** of the tubular **90** and the seal is made up. Internal pressures in bore **78** further put a downward force on piston **102** to help hold seal **128** against the tubular **90**. As the piston **102** is being extended, seal **128** passes flutes **126** and

ultimately clears surface **152**, at which time the stop ring **136** contracts radially to put itself in the position shown in Figure 15 so that it may hit the top **140** of the tubular **90**. The tubular **90** merely displaces lip **142** as the piston **102** is extended. Should the need arise to connect thread **88** to the tubular **90**, the body **76** is lowered to the point where surface **154** engages surface **152** on the top ring **136** to push it out of the way by expanding it radially outwardly. The body **76** is further brought down and is rotated by a top drive or manually.

As to the embodiment shown in Figures 22 and 25, extension of the piston **102** actuates the ball **84** into the open position. There may be some minor spillage as the piston **102** extends further until seal **128** engages the tubular **90**. On the reverse motion, lifting piston **102** may also cause some slight spillage until the pin **166** turns the plate **168** so that a 90° rotation of the ball **84** is completed to the position shown in Figure 25, at which point leakage of mud will stop. The operation of ball **84** can be further automated to end the possibility of any spillage by assuring that the ball **84** is in the closed position before releasing the sealing grip of seal **128** against the outer surface of the tubular **90**.

The advantage of the apparatus in the preferred embodiment illustrated in Figures 11–25 is readily seen. Previous inventions have required that the bore through the tubular be reduced and special space out and movement of the traveling block or top drive be incorporated into the operations while running or pulling tubulars. This device has a cylinder that extends to engage the tubular. The device may be located at different positions relative to the body **76** so that a variety of different situations can be addressed and the stroke of piston **102** is not a limiting factor. The piston **102** is shown to be

driven hydraulically but can be driven by other means for obtaining a sealing contact on the outer periphery of the tubular **90**. The use of the stop ring **136** allows accurate positioning each time adjacent the upper end **140** of the tubular **90** at its outer periphery. The positioning of the seal can be controlled by the relative location of the stop and seal so that the seal is always in the most desirable (clean/unmarked) portion of the tubular connection. Other techniques to position seal **128** can be used, such as a proximity switch or a load detector when the stop ring **136** lands on the tubular **90**. Should there be a need to rigidly connect to the tubular **90**, the body **76** can be lowered and the top drive engaged to drive body **76** to connect thread **88** to the tubular **90**. As shown in Figures 16–21, the assembly from the inner sleeve **100** can be easily removed from the body **76** and a backpressure valve **158** and pipe **160** can be further added so that there is a hard pipe connection to the tubular **90** and the tubular string below for control of a high–pressure situation from the wellbore. It is also an advantage of the invention that additional joints of tubular can be added to the string to allow the tubular to be run to any depth in the well to allow fluid to be pumped to the deepest position in the well for well control purposes. The tubular can then re run into the well under control.

When in the automatic operation, the movements of the ball **84** can be coordinated with the movements of the piston **102** so as to close off the bore **78** in body **76** when the piston **102** is retracted and to open it when the piston **102** is being extended. The flutes **126** prevent liquid lock when trying to retract the piston **102** because there can be no sealing connection against the outer surface **130** of the valve body **80** in the area of the flutes **126**. Thus, the piston **102** can be fully retracted without trying to compress a trapped area of

liquid just inside the piston **102** and outside the valve body **80**. Those skilled in the art will appreciate that the stop ring **136** can be constructed in a number of configurations and can be made from numerous materials, including metals and nonmetals, depending on the well conditions. The significant feature of the stop ring **136** is that it works automatically to reduce its inside diameter so that it contacts the top of the tubular **140**, while at the same time having sufficient surfaces for engagement by the surface **154** to be pushed out of the way or radially expanded to allow the thread **88** to advance into the tubular **90** for proper make-up.

Referring now to Figures 26–37, yet another embodiment of the apparatus **A** of the present invention is disclosed. In this version, the system in its normal retracted position is "out of the way" and the apparatus **A** is power-driven to connect to a tubular **172** by virtue of a drive motor **174** which connects a thread **176** into a mating thread **178** of the tubular **172**. Ultimately, a seal **180** engages just above the thread **178** at surface **182** in the tubular **172**. The overall assembly is best seen in Figure 26, where a top drive **184** is connected to a mud hose fitting **186** which is, in turn, connected to a swivel elbow **188** and ultimately to a mud hose **190**. Hose **190** is connected by a swivel coupling **192** to an on/off valve **194**. On/off valve **194** is, in turn, connected by a fitting **196** into fluid communication with passage **198**, which is to be inserted into the tubular **172**.

The details of the apparatus can be more clearly seen in Figure 34, where it can be seen that the tube **200**, which defines bore **198**, has a support surface **202** to support the connector **204** on which threads **176** can be found. The handwheel **214** has an internal gear **206** which is engaged to a pinion

208 which is, in turn, driven by a motor 174. Motor 174 can be electrical, hydraulic, air- or gas-operated or any other kind of driver. A spring or springs 210 place a downward force on the connector 204 at its external shoulder 212. Although different configurations are possible, those skilled in the art will appreciate that in Figure 34, the pinion 208 actually drives the handwheel 214. Handwheel 214 is, in turn, splined to connector 204 at splines 216. The gear 206 is literally part of the assembly of the handwheel 214 in the embodiment illustrated in Figure 34. The handwheel assembly 214 and connector 204 can be made unitary. However, looking at the spline assembly 216 in the plan view of Figure 35, it can be seen that the handwheel assembly 214 has a pair of lugs 218 which fit between lugs 220 on the connector 204. There are, thus, gaps 222 for the purpose of allowing initial movement of the handwheel assembly 214 before it engages the lugs 220 to assist in breaking loose thread 176 from the tubular 172 when a manual operation of handwheel 214 is required. It can be appreciated by those skilled in the art that two motors can be used, one for tightening the connection and the other for loosening the connection, and these motors could have Bendix drives for disengaging the gears when not in operation. This would be preferred when it is necessary to operate the system manually by turning the handwheel.

Figure 36 illustrates an alternative arrangement having an accessible pinion 208′ engaged to a gear 206′. Here, the assembly is in one piece and it holds a seal 180′. The connector is supported by a tube 200′ which has at its lower end a surface 202′ to support the connector 204′. In all other ways, the version of Figure 36 operates identically to the version in Figure 34.

Referring again to Figure 34, seal **224** seals between the connector **204** and the tube **200**. Another seal **226** is toward the upper end of tube **200** to seal to fitting **196**. Accordingly, there is full swivel action for the hose **190** due to swivel elbow **188** on one end and a swivel connection at its other end at coupling **192**. Additionally, the fitting **196** allows rotation about the vertical axis of tube **200** with respect to fitting **196**.

Referring to Figure 34, the apparatus **A** is suspended on a frame **228**. Frame **228** has aligned openings **230** and **232** on two sides, each pair accepts a bail **234**, as shown in Figure 36. The frame **228** can have open-ended cutouts to accept the bails **234**, or it can use a closure member **236** secured by a fastener **238**, as shown in Figure 36 on the right-hand side. In an alternative embodiment, the frame **228** supporting the apparatus **A** can be made so that its center of gravity is at a point different than between the bails **234** so that its mere weight holds the apparatus against the bails and prevents it from swinging through or between the bails. Doing it in this manner will provide a coarse alignment for the apparatus **A** with the tubular **172**, but it will not control side-to-side movement between the bails.

The details of how the frame **228** is securable to the bails **234** are seen in Figure 37. There, it will be appreciated that on one end, there is a U-shaped opening **240** which is moved into position to straddle one of the bails **234**, while the closure device **236** is secured with fasteners **238**, fully around the other bail **234**.

Referring again to Figure 26, it will be seen that the elevator **242** has engaged the tubular **172**. The frame **228** can be suspended from the top drive **184** by different types of mechanisms which can either affirmatively

move the frame **228** with respect to the bails **234** or alternatively which suspends the frame **228** using the bails **234** as guides and depends on operator assistance to position the apparatus **A** so that the thread **176** can engage the thread **178**. Thus, item **244** can be a piston/cylinder combination or a spring which suspends the weight of the apparatus **A** from the top drive **184**. As seen in Figure 26, it is desirable to have the apparatus **A** out of the way so that the tubular **172** can be hooked into the elevator **242**. Having engaged the tubular **172** in the elevator **242**, it is desirable to bring the apparatus **A** into proximity with the tubular **172** to make up thread **176** to thread **178**. This can be accomplished in various ways, as shown in Figures 27, 28 and 30. In Figure 27, the top drive **184**, along with the bails **234** and elevator **242**, can be brought down with respect to the tubular **172** which remains stationary because it has already been secured to the tubular below it (not shown). The tubular below it is supported in the rig floor with slips. The threads **176** and **178** are brought close together prior to engagement of the seal **180**. As shown in Figure 28, the final movement to get the threads **176** and **178** together can be accomplished by operation of the motor to drive the threads together and fully engage the seal **180**. The top drive **184**, bails **234** and elevator **242** can then be raised to allow the tubular **172** to be picked up by the elevators **242**.

An alternate method is illustrated in Figure 29 and 30. Figure 29 indicates that the apparatus **A** can be pulled down to bring threads **176** close to threads **178** so that the motor **174** can be operated to complete the joint. The completed joint from the position shown in Figure 29 is shown in Figure 30.

Figure 31 shows a side view of Figure 26 to illustrate how the bails **234** guide the frame **228**.

Figure 32 shows an alternative to Figure 26 where there's no top drive available. In that situation, a hook **246**, better seen in the side view of Figure 33, supports a swivel fitting **248**. A mud supply hose **250** is connected to the rig mud pumps (not shown). The balance of the assembly is as previously described. Again, the apparatus **A** can be supported by a piston/cylinder assembly or springs **244'** to keep the apparatus **A** when a tubular **172** is being engaged in the elevators **242** and thereafter to allow the apparatus **A** to be brought closer to the tubular **172** to connect thread **176** to thread **178**, as previously described.

Those skilled in the art will appreciate that the advantages of the preferred embodiment are its simplicity, full bore, positive-sealing engagement, and ease of operation. The seal **180** engages a well-protected portion of the tubular connection for a more positive sealing location. The apparatus **A** stays out of the way to allow a tubular **172** to be easily engaged in the elevator **242**. Thereafter, the apparatus **A** can be brought into operating position, either by a piston/cylinder assembly. Alternatively, the weight of the apparatus **A** can be supported off a spring and an operator can grab the handwheel **214** to overcome the weight of the suspended apparatus **A** and pull it down to begin engagement of thread **176** into thread **178**. Various alternative power supplies can be used to turn the connector **204** to complete the engagement. Once the tube **200** is secured into the tubular **172**, the valve **194** can be opened so that the tubular **172** can either be put into the wellbore or pulled out.

When going into the wellbore, the displaced fluid through bore **198** returns to the mud tanks on the rig. When pulling out of the hole, fluid is made up from the mud pumps (not shown) through the bore **198** and into the tubular **172** being pulled out of the hole to facilitate rapid removal from the wellbore. As previously stated, when running tubulars into tight spots in the wellbore, the displaced fluid will come up through the tubulars into bore **198** and needs to be returned to the mud pits to avoid spillage at the rig. Conversely, when pulling tubulars out of the wellbore, fluid needs to be pumped in to replace the volume previously occupied by the tubulars being pulled to avoid resistance of the fluids to removal of the tubular. Thus, in this embodiment, each joint can be readily connected and disconnected to the apparatus **A** for quick operations in running in or pulling out tubulars from the wellbore. Furthermore, in the event of a pressure surge in the well, all the connections are hard-piped to allow rapid deployment of the rig mud pumps to bring the pressure surge situation in the wellbore under control. In those situations, valve **194** can also be closed and other assemblies installed in lieu of or in addition to hose **190** to aid in bringing the unstable situation downhole under control. Hose can be connected to a mud scavenging or suction system. It can be appreciated by those skilled in the art that a safety valve as described in the apparatus of Figure 11 can be attached below the thread **176** having a seal similar to **180**, thereby allowing complete well control as described for the apparatus of Figure 11.

Referring now to Figures 38-45, an alternative embodiment to the preferred embodiment previously described is discussed. In this embodiment, rotation is not required to lock the apparatus **A** to the tubular. Instead, a

locking device allows the apparatus to be simply pushed into the tubular for locking therewith as well as for a sealing connection which allows the addition of mud or the receipt of mud, depending on the direction of movement of the tubular.

Referring now to Figures 38 and 39, the embodiment which allows the connection to be made up by simply pushing in the apparatus **A** into a tubular **252** is disclosed. As before, a frame **228'** has aligned openings **230'** and **232'** to engage the bails (not shown). A mud hose (not shown) is connected to connection **254** and may include a valve (not shown). The mud hose (not shown) is connected into a housing **256**. Secured within housing **256** is locking member **258**, which is held to the housing **256** at thread **260**. A series of downwardly oriented parallel grooves **262** are present on the locking member **258**. A locking collet **264** has a series of projections **266** which are engageable in grooves **262**. A piston **268** is biased by a spring **270** off of housing **256** to push down the collet **264**. Since the locking member **258** is fixed, pushing down the collet **264** ramps it radially outwardly along the grooves **262** of locking member **258** for engagement with a tubular **252**, as shown in the final position in Figure 39. Seals **272** and **274** seal around opening **276**. A groove **278** is accessible through opening **276** for release of the apparatus **A** by insertion of a tool into groove **278** and applying a force to drive the collet **264** upwardly with respect to locking member **258**, thus moving projections **266** within grooves **262** and allowing the apparatus **A** to be retracted from the tubular **252**. A seal **280** lands against surface **282** in the tubular **252** for sealing therewith, as shown in Figure 39. Another seal **284** is on piston **268** to prevent loss of drilling mud under pressure which surrounds

the spring **270** from escaping onto the rig floor. Similarly, seal **286** serves the same purpose.

Those skilled in the art will appreciate that in this embodiment, the apparatus **A** is simply brought down, either with the help of a rig hand lowering the traveling block or by automatic actuation, such that the collet **264**, which has an external thread **288**, can engage the thread **290** in the tubular **252**. This occurs because as the apparatus **A** is brought toward the tubular **252**, the piston **268** is pushed back against spring **270**, which allows the collet **264** to have its projections **266** ride back in grooves **262** of the locking mechanism **258**. The spring **270** continually urges the seal **280** into sealing contact with the mating tubular surface. Upon application of a pickup force to the housing **256**, the locking mechanism **258** along with its grooves **262** cam outwardly the projections **266** on the collet **264**, forcing the thread **288** into the thread **290** to secure the connection. At that time, the seal **280** is in contact with the internal surface **282** of the tubular **252** to seal the connection externally. Those skilled in the art will appreciate that internal pressure in bore **292** will simply urge the locking member **258** in housing **256** away from the tubular **252**, which will further increase the locking force on the collets **264**, and that the internal pressure will also urge piston **268** into contact with the tubular member **252**, maintaining sealing engagement of seal **280**. As a safety feature of this apparatus, in order to release this connection, the pressure internally in bore **292** needs to be relieved and a tool inserted into slot **278** so that the collets **264** can be knocked upwardly, thus pulling them radially away to release from the thread **290** on tubular **252**. Sequential operations of a valve on the mudline (not shown) can be then employed for spill-free opera-

tions on the rig floor. Essentially, once the connection is made as shown in Figure 39, the valve on the mudline is opened and the tubular **252** can be run into or out of the hole. The connection is then released as previously described by use of groove **278**. As in the other embodiments, the full bore is maintained.

There may be difficulty in getting the connection shown for the apparatus **A** in Figures 38 and 39 to release through the use of a tool applied on groove **278**. Accordingly, the next embodiment illustrated in Figures 40–45 can be employed to more fully automate the procedure. The principle of operation is similar, although there are several new features added. Where the operation is identical to that in Figures 38 and 39, it will not be repeated here. What is different in the embodiment of Figure 40 is that there is a tube **294** which is now biased by a spring **296**. At the lower end of tube **294** is a seal **298** which is preferably a chevron shape in cross–section, as shown in Figure 40. An external shoulder **300** is used as a travel stop within the tubular **302** for proper positioning of the seal **298**, as shown in Figure 41. Thus, in this embodiment, the seal **298** engages surface **304** inside the tubular **302** for sealing therewith. Pressure in bore **306**, in conjunction with the force from spring **296**, keeps the tube **294** pushed down against the tubular **302**. The other feature of this embodiment is that the locking and release is done automatically. Extending from the housing **308** is a frame **310** with a pair of opposed openings **312**. Connected to locking member **258'** is a plate **314**. A motor **316** which can be of any type has shafts **318** and **320** extending from it which can be selectively extended or retracted. The shafts **318** and **320** are respectively connected to connections **322** and **324**. Connection **324** extends

out of or is a part of the collets **264'**. A spring **326** forces apart plate **314** from the assembly which is the collets **264'**.

Those skilled in the art will appreciate that when it comes time to engage the apparatus **A** as shown in Figure 40 into a tubular **302**, the motor or motors **316** can be engaged to bring the plate **314** closer to the collet member **264'** to thus retract the collet member **264'** into the grooves **262'** of the locking member **258'**. This position is shown in Figure 41, where the spring **326** is stretched as plate **314** is moved away from the collet assembly **264'**. The collets with the thread **288'** can now slip in and engage the thread **290** on the tubular **302**. As this is happening, the spring **296** biases the tube **294** to engage the seal **298** onto surface **304**. Thereafter, the motor or motors **316** are engaged to bring together the plate **314** from the collets **264'**, thus forcing the collets **264'** to be cammed radially outwardly as the locking member **258** is forced upwardly by the motor or motors **316**. The apparatus **A** is now fully connected, as shown in Figure 42. The collet assembly **264'** has a set of opposed dogs **328** shown in Figure 43. These dogs **328** extend into openings or slots **312** to prevent relative rotation of the collet assembly **264'** with respect to frame **310**. A guide **330** is conical in shape and assists in the initial alignment over a tubular **302**. The guide **330** is part of the frame **310** and the frame **310** lands on top of the tubular **302**, as shown in Figure 41. A more detailed view of the collet assembly **264'**, showing threads or grooves **288'** which engage the thread **290** in the tubular **302**, is shown in Figure 44. Figure 45 is similar to Figures 40–42, with the exception that the housing **308** is more readily removable from the frame **310** using lugs **332** which can be hammered onto make or release the joint between the housing **308** and the frame **310**.

In all other ways, the operation of the embodiment of the apparatus **A** shown in Figure 45 is identical to that shown in Figures 40–42.

Those skilled in the art will appreciate that there are advantages to the embodiment shown in Figures 40–42 to that shown in Figures 38–39. By using one or more motors which separate and bring together parallel plates, the collets **264'** can be placed in a position where they can be easily pushed into a tubular **302**. Then by reverse actuating the motor and allowing the locking mechanism **258** to push the collet assembly **264'** outwardly, the apparatus **A** is locked to the tubular **302** and seal **298**, which can be any type of seal, seals around the tube **294** to accept returns or to provide mud, depending on the direction of movement of the tubular **302**. Thus, by the use of the motor **316**, which brings together and separates the plates **314**, the outward bias on the collet assembly **264'** can be controlled by a power assist which greatly speeds up the connection and disconnection to each individual tubular **302**. As in previous embodiments, the full bore of the tubular is maintained.

The foregoing disclosure and description of the invention are illustrative and explanatory thereof, and various changes in the size, shape and materials, as well as in the details of the illustrated construction, may be made without departing from the spirit of the invention.

mullins\03 tubular filling system.wpd ss

What is claimed:

1. An apparatus for delivery or receipt of fluids with respect to tubulars run into our out of a wellbore, comprising:

a frame supporting a housing, said housing having a first and second fluid connection;

said housing having a first telescoping member having a first seal adjacent its lower end for sealingly engaging a tubular to be run in or removed from the wellbore so that fluids can pass through said first and second connections in either direction.

2. The apparatus of claim 1, wherein:

said first seal engages the outside of a tubular.

3. The apparatus of claim 1, wherein:

said housing comprises a thread at its lower end engageable to the thread on a tubular by relative rotation of said housing with respect to said telescoping member.

4. The apparatus of claim 1, further comprising:

a valve in said housing which is flow-actuated to open when fluids are displaced in a direction out of the wellbore, going from said second to said first fluid connection, said valve closes in the absence of such displaced fluid flow to prevent spillage on retraction of said telescoping member.

5. The apparatus of claim 4, wherein:

fluid under pressure from said first toward said second connection forces said valve to open.

6. The apparatus of claim 5, wherein:

said value is a flapper which breaks under pressure coming from said first toward said second connection.

7. The apparatus of claim 1, wherein:

said frame comprises a plurality of arms pivotally mounted to bails supporting an elevator to allow said housing to be moved out of the way for securing tubulars in the elevator and into position for sealing engagement of a tubular in the elevator.

8. The apparatus of claim 7, further comprising:

a second telescoping member having a second seal thereon and movable outwardly in an opposite direction from said first telescoping member such that when said housing is moved into position above a tubular, said first seal extends to engage the tubular and said second seal extends to sealingly engage a top drive which supports the bails to allow flow in either one of two opposed directions through the top drive.

9. The apparatus of claim 1, further comprising:

a travel stop on said first telescoping member to position said first seal on the tubular.

10. The apparatus of claim 9, wherein:
said first seal engages the outside of the tubular.

11. The apparatus of claim 9, wherein:
said travel stop is expandable to allow it to be pushed out of the way by a portion of said housing which can translate with respect to said first telescoping member.

12. The apparatus of claim 11, wherein:
said housing having a thread at its lower end engageable with the tubular upon relative movement of said housing with respect to said first telescoping member.

13. The apparatus of claim 12, wherein:
said housing can rotate with respect to said first telescoping member for making up said thread to the tubular.

14. The apparatus of claim 1, further comprising:
a valve body connected to said housing having a thread at the lower end thereof for selective engagement to the tubular to control pressures in the well.

15. The apparatus of claim 14, wherein:
actuation of said first telescoping member actuates a valve member in said body toward open and closed positions.

16. A fill-up and circulating apparatus suspended from a traveling block for filling fluid into a tubular and circulating fluid through the inside surfaces of the tubular and into a wellbore, the fill-up and circulating apparatus comprising:

a top drive rig assembly suspended from the traveling block, and further comprising a top drive unit having a flowpath therein;

a fill-up and circulating apparatus having a flowpath therein in communication with said flowpath in said top drive;

said fill-up and circulating apparatus having a body with an upper end fixedly supported by said top-drive, a lower end, and a telescoping member selectively extendable past said lower end for selective contact with the tubular.

17. The apparatus of claim 16, wherein:

said telescoping member is power driven.

18. The apparatus of claim 17, wherein:

said telescoping member is pneumatically driven.

19. The apparatus of claim 16, wherein:

said telescoping member is not actuated by said top drive.

20. The apparatus of claim 16, wherein:

said body has a longitudinal axis and said telescoping member can advance in the direction of said longitudinal axis without rotation about said axis.

21. The apparatus of claim 16, wherein:

said fill-up and circulating apparatus is directly connected to said top drive.

22. The apparatus of claim 16, wherein:

said telescoping member mounted over said body;

said body rotatable by said top drive while said telescoping member is stationary;

said lower end comprising threads which can be selectively made up to the tubular.

23. The apparatus of claim 16, further comprising:

said telescoping member comprising a seal adjacent its lower end to selectively sealingly engage the tubular.

24. The apparatus of claim 23, wherein:

said seal sealingly engages on top or on the outside of the tubular.

25. The apparatus of claim 23, wherein:

said seal does not enter into the tubular.

26. A tubular fillup and circulating tool comprising:

a body having a passage therethrough, said body comprising a stationary and a movable component;

said movable component selectively movable for sealing engagement with the outer periphery of the tubular.

27. The tool of claim 26, further comprising:

a resilient seal on said movable component adjacent a lower end thereof having a seal diameter such that upon application of internal pressure in said body, said movable component experiences a net force to hold said seal in contact with the tubular.

28. The tool of claim 27, wherein:

said stationary component further comprises a connection at a lower end thereof;

said movable component retractable sufficiently to expose said connection to allow it to be selectively sealingly affixed to the tubular.

29. The tool of claim 27, further comprising:

a mud saver valve insertable in said passage

said mud saver valve can be defeated by pressure in said passage with said seal in sealing engagement with said tubular.

30. The tool of claim 26, further comprising:

two movable components, movable in opposite directions to extend the length of said body and selectively seal said body to the tubular at one end and a mud supply source at an opposite end.

31. The tool of claim 30, wherein:

said movable components each comprise a seal so configured so as to apply a net force to each movable component in a direction to keep said seal thereon in a sealing position.

32. The tool of claim 30, further comprising:

a pivotally mounted support structure for said body to support it in two positions, from bails which support an elevator, such that said body can be selectively aligned or misaligned with the elevator.

33. A fillup and circulating tool comprising:

a body having a passage therethrough;

a telescoping assembly mounted over said body;

an adjustment mechanism to selectively change the initial position of said telescoping assembly relative to said body, independently of actuation of said telescoping assembly to extend its length.

34. The tool of claim 33, wherein:

said body further comprises a valve;

said valve activated by extension or retraction of said telescoping assembly

35. The tool of claim 34, further comprising:

a seal on said telescoping assembly to engage the outside of a tubular such that pressure applied in said body with said seal engaged to the tubular will put a net force on said telescoping assembly to force said seal toward the tubular.

36. The tool of claim 35, further comprising:

a travel stop to engage near the top of the tubular to properly position said seal in a portion of the tubular near its end where there are less tong gouges.

37. The tool of claim 36, wherein:

said travel stop is resilient and can change dimensions from a smaller size so it can engage the tubular to a larger size so that said telescoping assembly can be retracted onto said body to expose a lower end thereof.

38. The tool of claim 37, further comprising:

a connection at said lower end of said body to selectively sealingly secure said body to the tubular;

said body further comprises at least one external passage to facilitate retraction of said telescoping assembly which supports said travel stop, over said body by permitting liquid displacement through said passage.

39. A fillup and circulating tool, comprising:

a body having a passage therethrough;

a telescoping assembly mounted to said body having a seal adjacent a lower end thereof;

a valve in said passage operable by said telescoping assembly.

40. The tool of claim 39, wherein:

said seal engages the outside of the tubular such that pressure in said passage with said seal engaged to the tubular applies a net force to said telescoping assembly tending to hold said seal in place

41. The tool of claim 40, further comprising:

a travel stop on said telescoping assembly that can expand so that said telescoping assembly can be retracted over said body and contract so that said travel stop will engage the top of the tubular.

42. The tool of claim 41, wherein:

said travel stop comprises a resilient ring cammed by said body to its said expanded position and stopped by a tab on said telescoping assembly to define its said retracted position.

43. The tool of claim 39, wherein:

said valve operates by an approximately 90° turn of a ball activated by said telescoping assembly through engagement of a pin in a slot;

said body has a thread at its lower end for selective sealed contact with the tubular

44. The tool of claim 41, wherein:

said body comprises at least one external passage to permit fluid displacement as said travel stop is moved over said body.

45. A tubular fillup and circulating tool, comprising:

a body having a passage therethrough;

a telescoping member mounted to said body for selective engagement with the tubular;

said telescoping member further comprising a seal to engage the outside of the tubular.

46. The tool of claim 45, further comprising:

a travel stop on said telescoping member which is expandable to straddle said body and which contracts to a small enough dimension to engage the tubular when advanced beyond said body.

47. The tool of claim 46, wherein:

said body cams said travel stop to its expanded position and said telescoping member comprises a stop surface defining the contracted position of said travel stop

48. The tool of claim 47, further comprising:

a valve in said passage activated by movement of said telescoping member

49. The tool of claim 48, further comprising:

a plurality of initial positions on said body for said telescoping member so as to permit a variety of different overall lengths with said telescoping member extended.

50. A fillup and circulating tool to engage threads on a tubular for connection to a mud system, comprising:

a body

a sleeve rotatably mounted to said body having an exposed thread and a seal;

a driver for said sleeve to make up or release said exposed thread with the tubular.

said seal engaging the tubular upon makeup of said thread.

51. The tool of claim 50, wherein:

said sleeve and driver have meshing gears for securing and releasing said exposed thread.

52. The tool of claim 50, wherein:

said sleeve is biased toward said tubular;

said sleeve is loosely secured to an intermediate member selectively driven by said driver so as to allow said intermediate member to turn a predetermined amount before said sleeve is driven.

53. A fillup and circulating tool to engage threads on a tubular for connection to a mud system, comprising:

a body having a passage therethrough having a lower end insertable into the tubular for contact past the threads in the tubular, said body comprising a seal selectively engageable inside the tubular.

a gripping mechanism on said body actuable to engage the thread in said tubular to hold said seal in position.

54. The tool of claim 53, wherein:

said gripping member comprises a plurality of collets having an outer surface comprising portions of a thread, and a camming device on said body to selectively actuate said outer surface of said collets into or out of contact with the threads in the tubular.

55. The tool of claim 54, wherein:

said camming device comprises a shifting sleeve mounted between said body and said collets, said sleeve and said collets having sloping surfaces such that contact therebetween drives said collets with respect to the tubular.

56. The tool of claim 55, wherein:

said sleeve is manually driven.

57. The tool of claim 55, wherein:

said sleeve is power driven;

said body comprises a housing supporting a tube to which said seal is connected and a biasing device between said housing and said tube to bias said seal into contact with the tubular.

58. The tool of claim 45, further comprising:

a vent passage and a vent valve therein mounted to said telescoping member for selective pressure venting prior to disengagement of said seal from the tubular.

59. The tool of claim 33, wherein:

said adjustment mechanism allows removal of said telescoping assembly from said body.

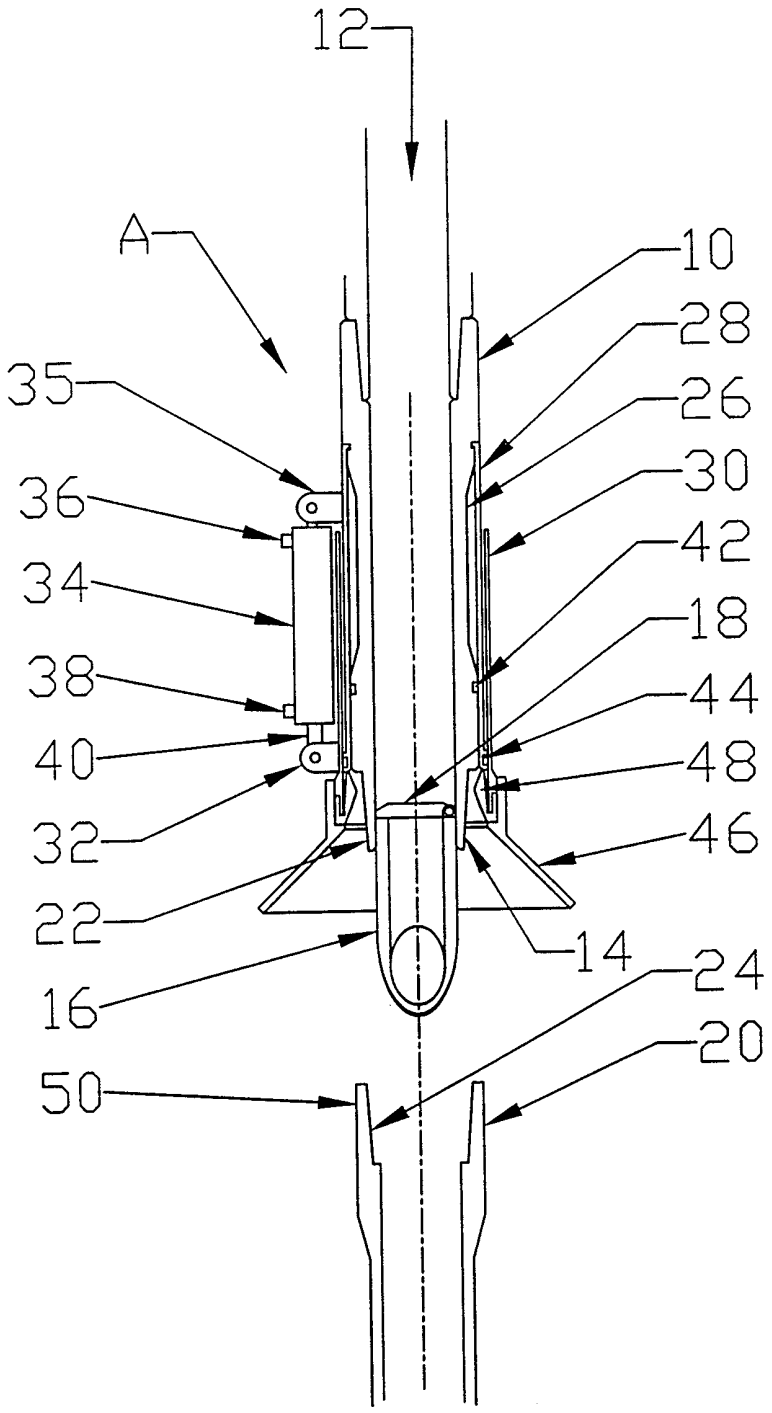


FIG. 1

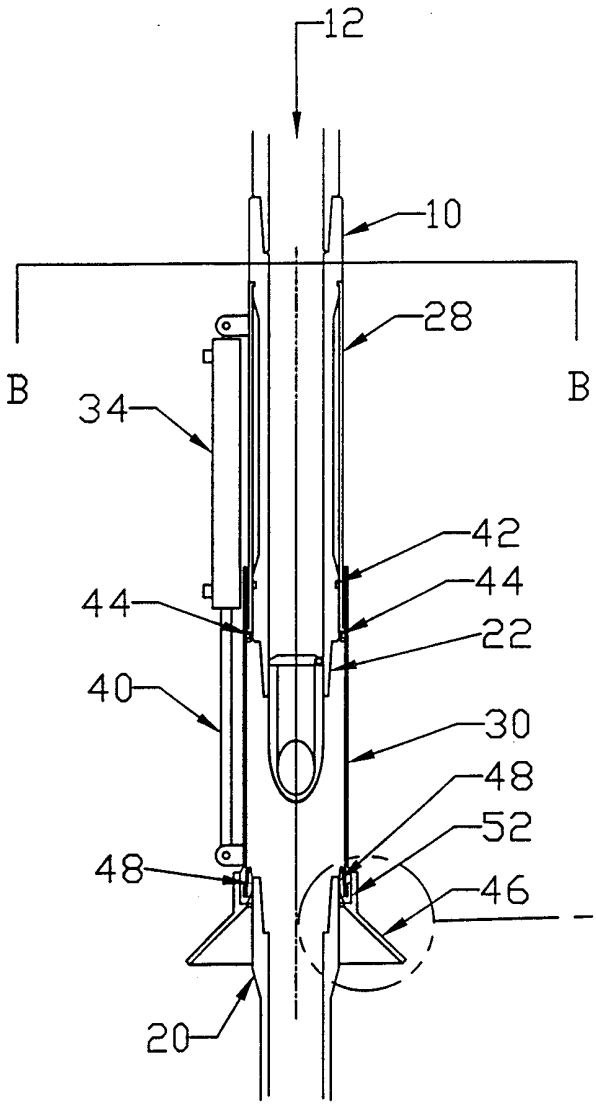
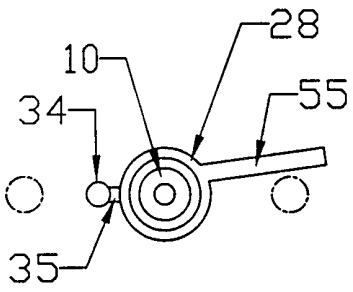


FIG. 2



Section B-B

FIG. 2A

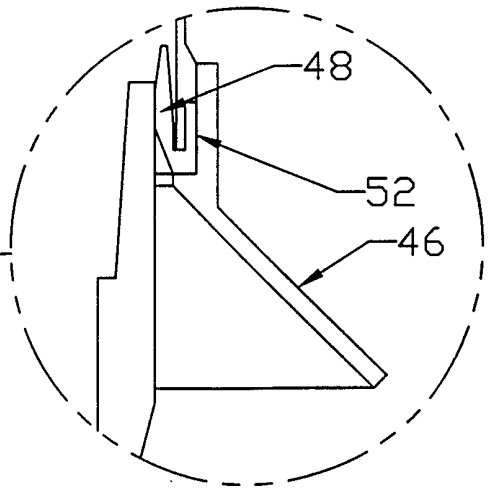


FIG. 2B

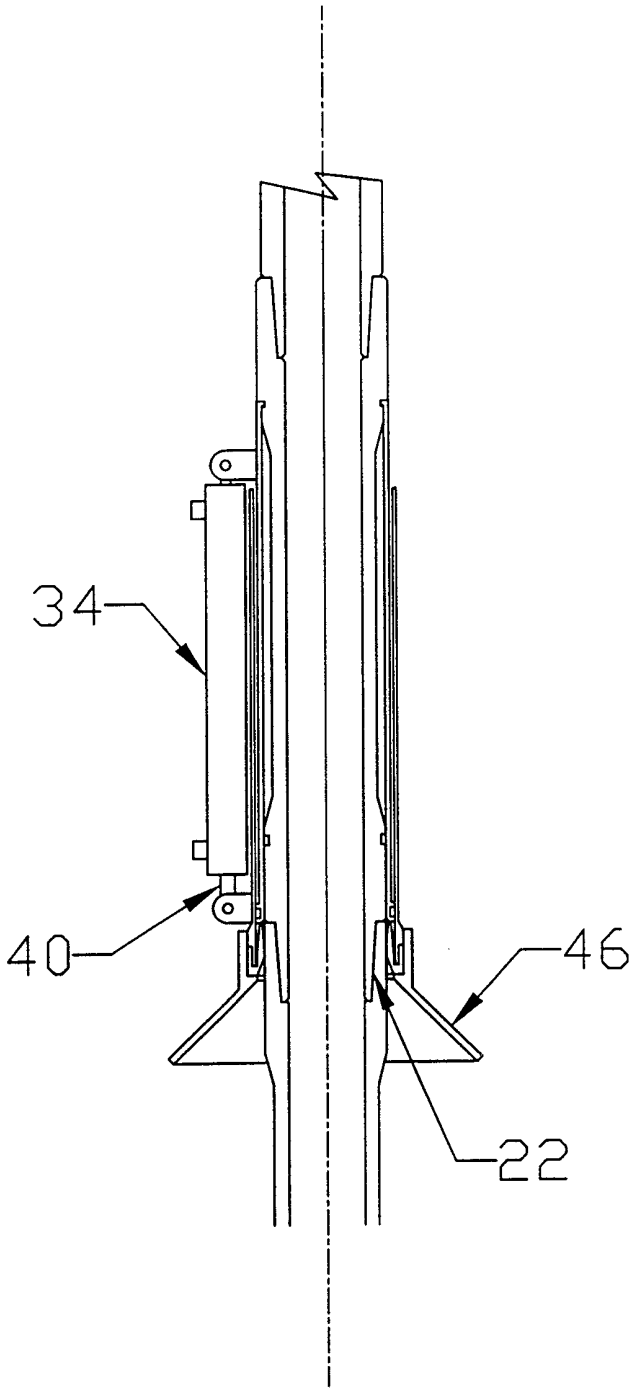


FIG. 3

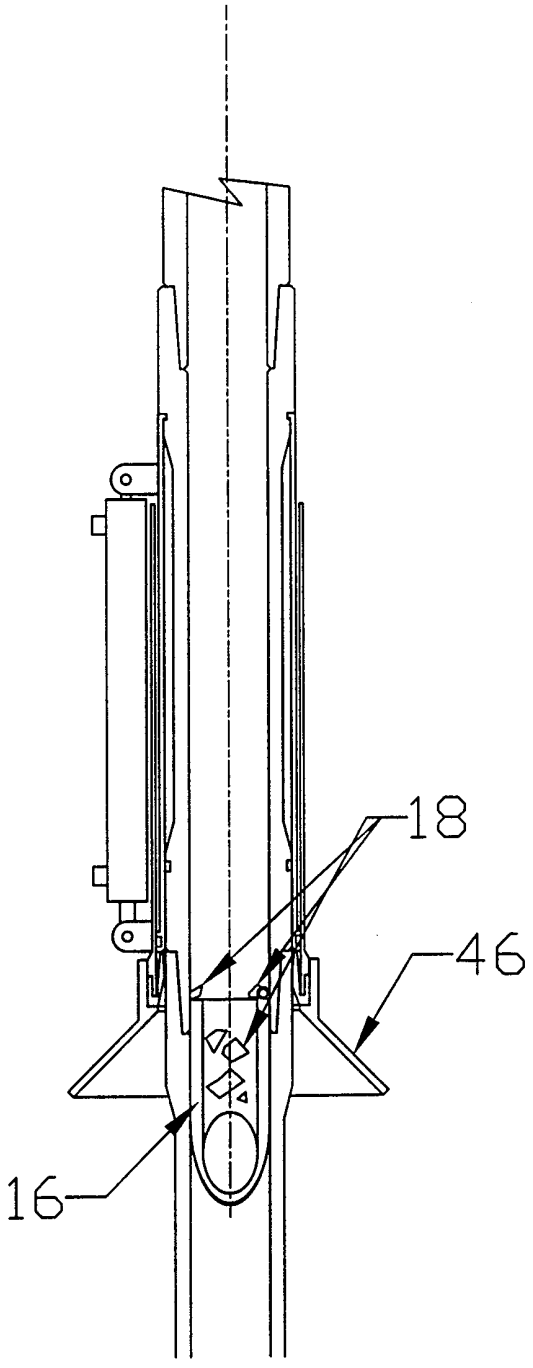


FIG. 4

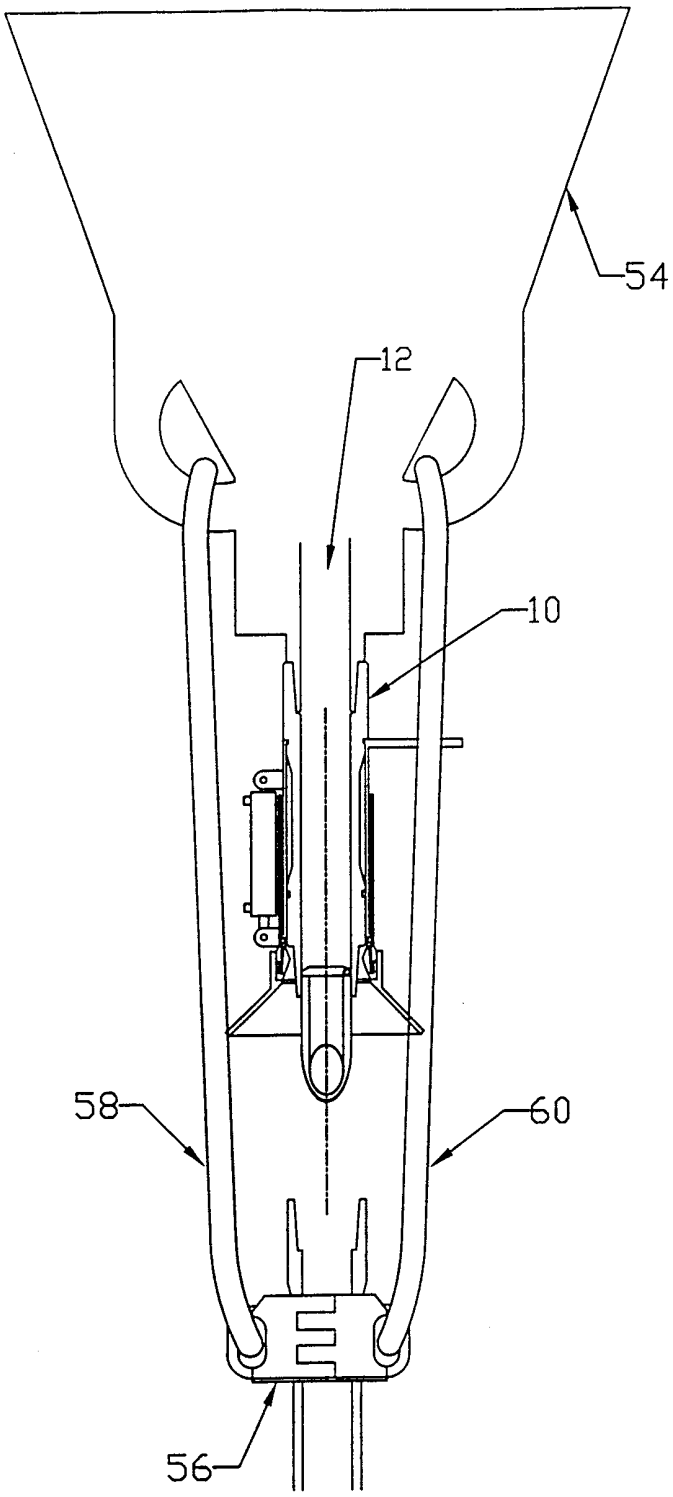


FIG. 5

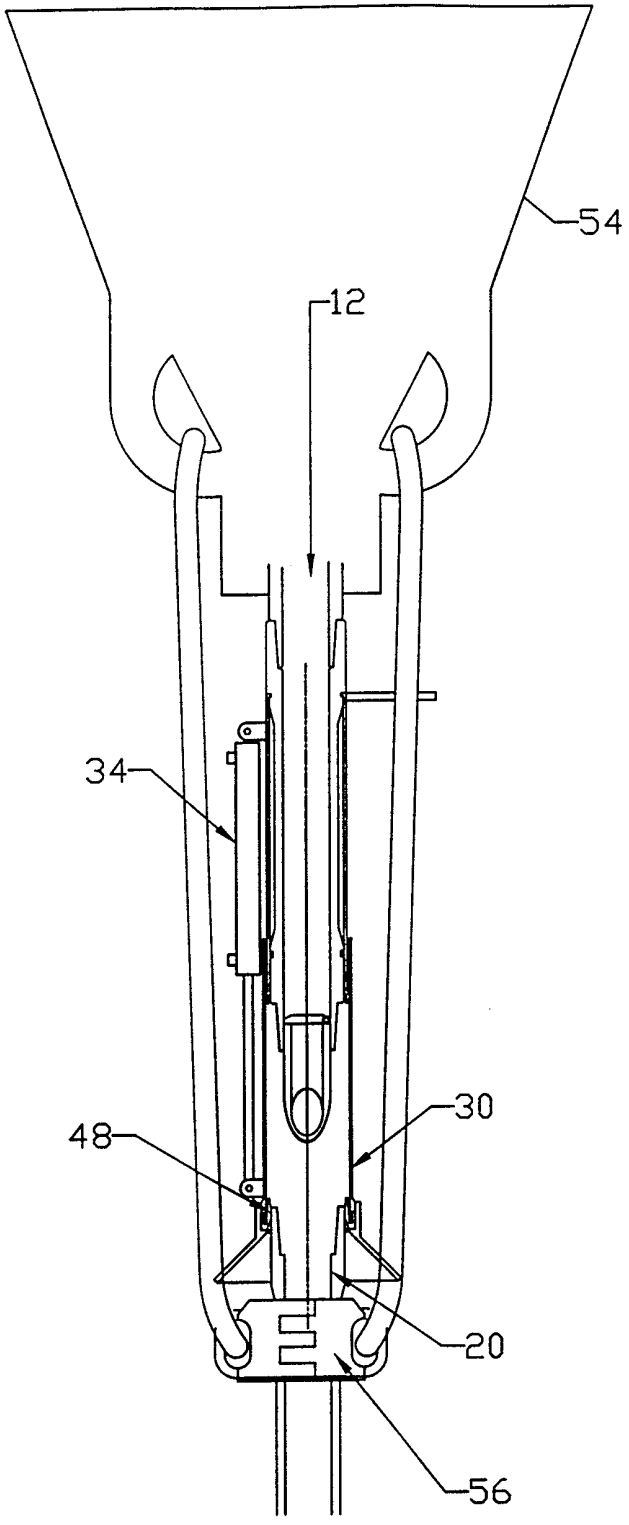


FIG. 6

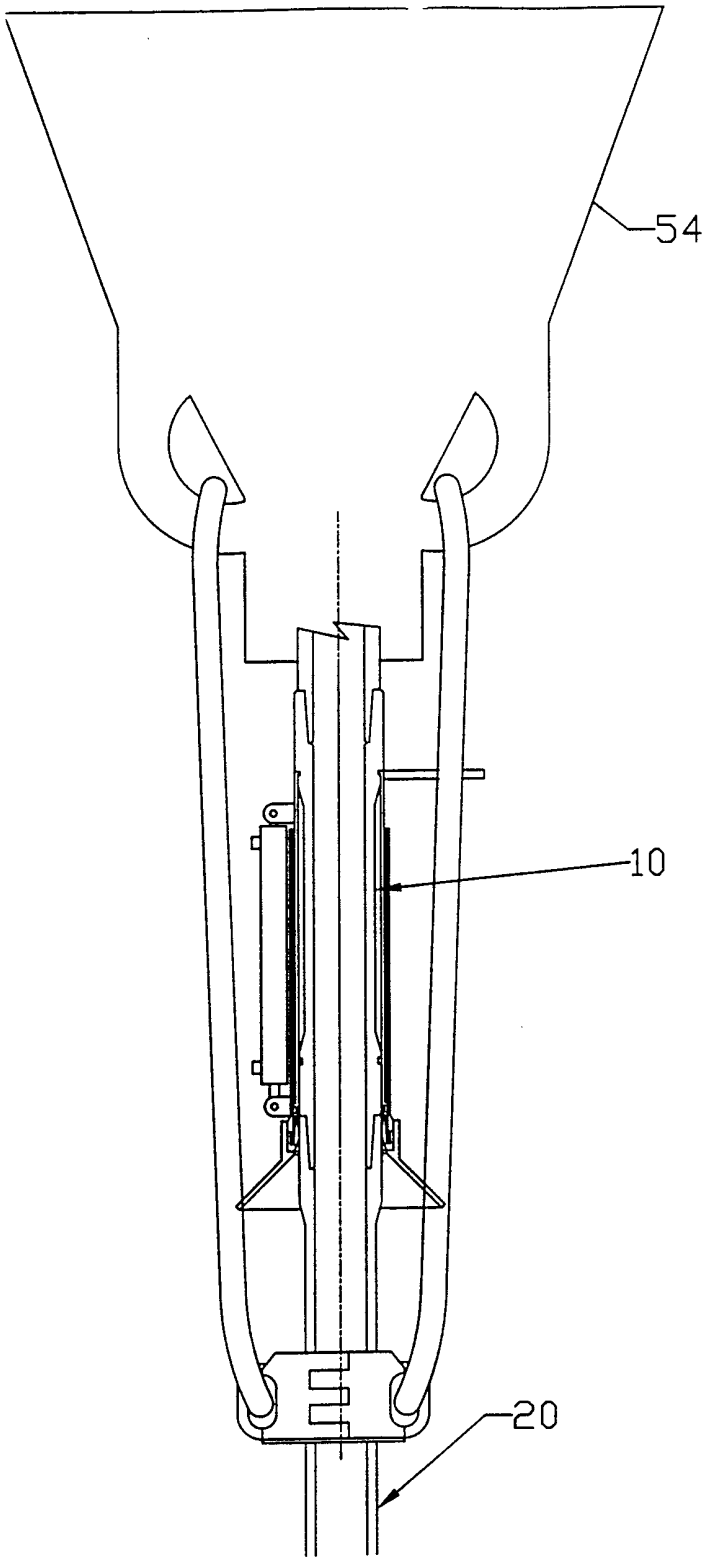


FIG. 7

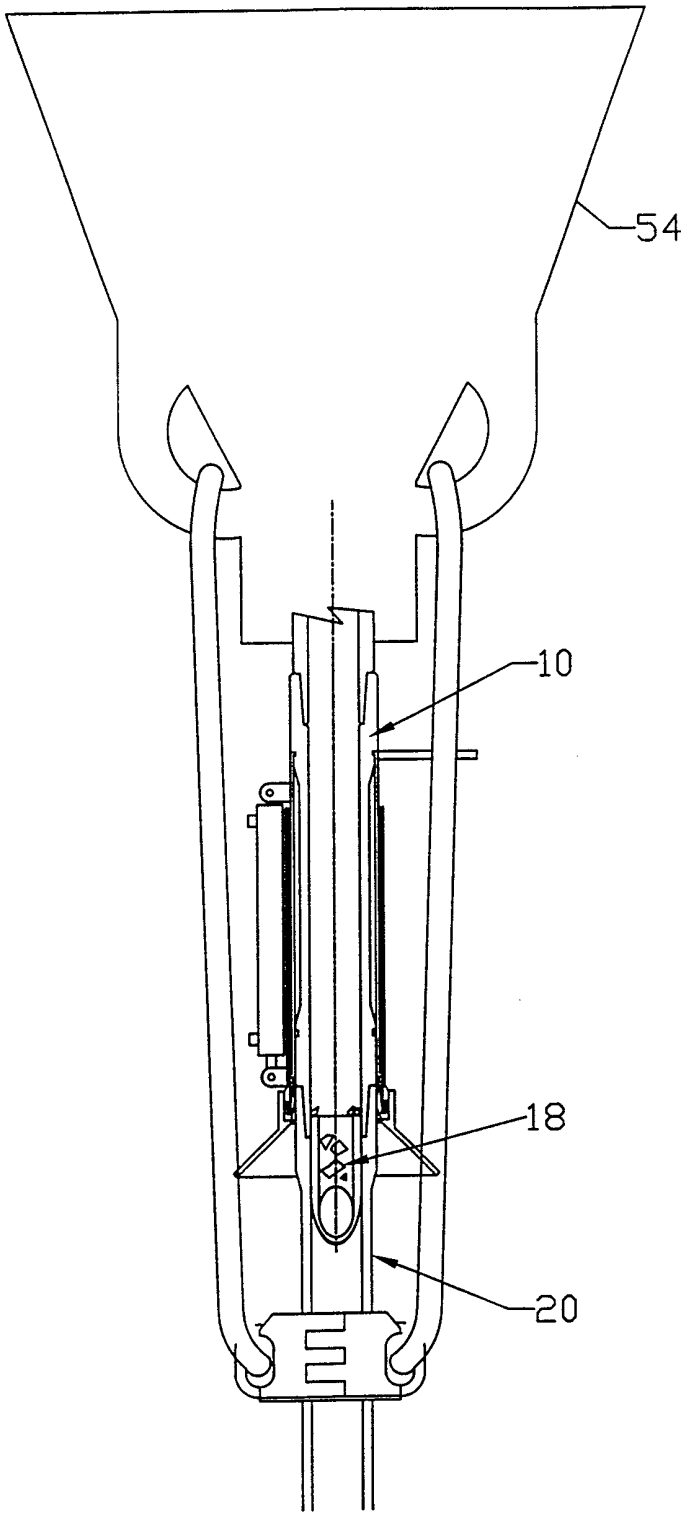


FIG. 8

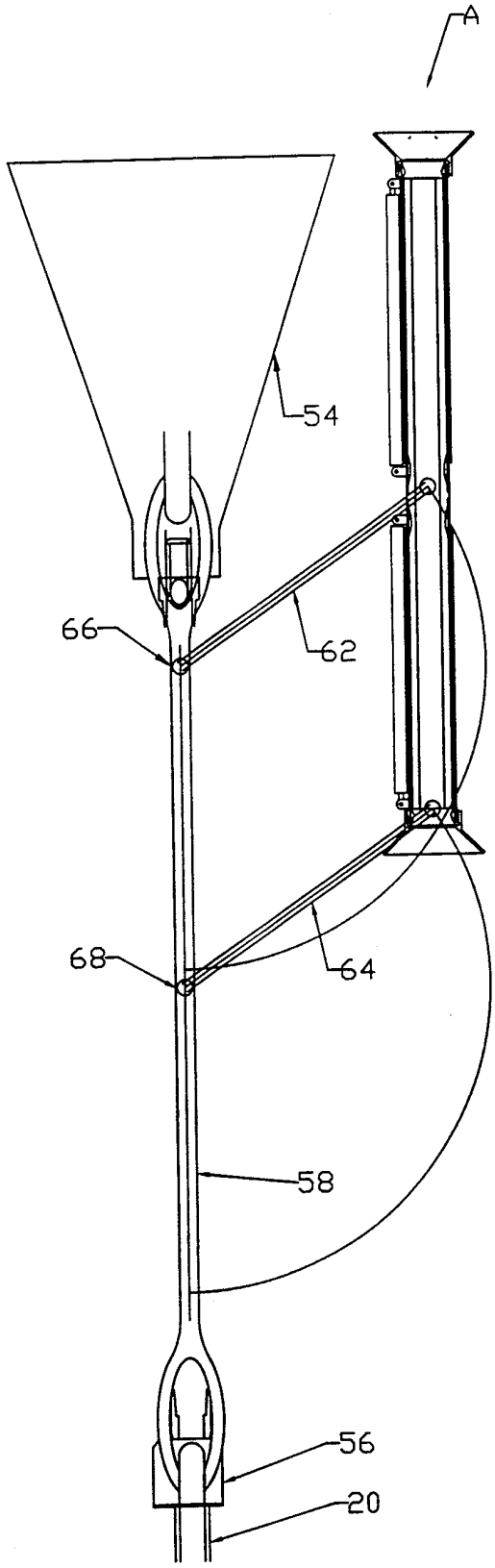


FIG. 9A

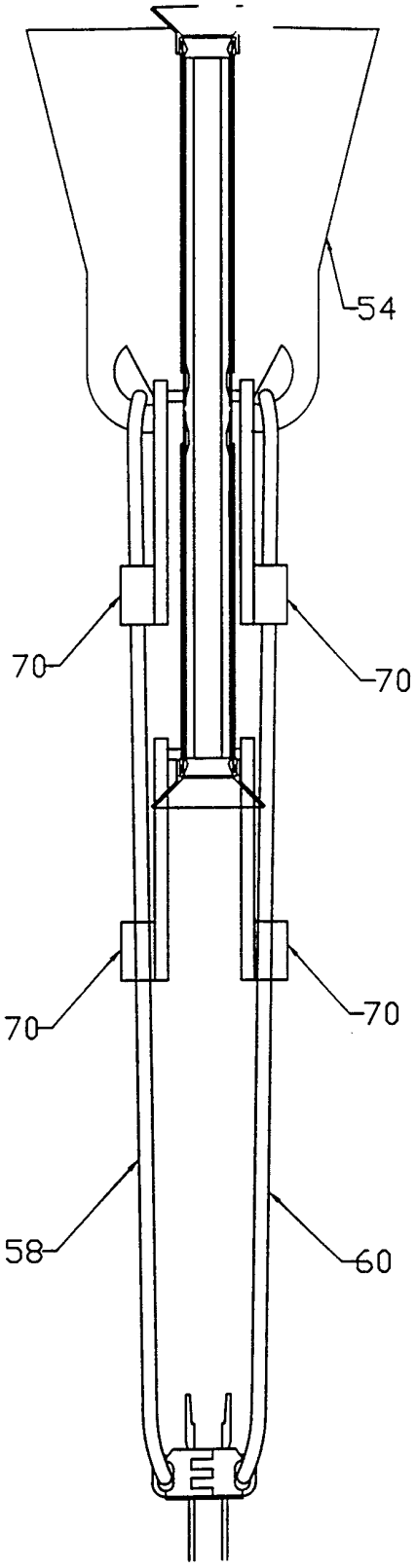


FIG. 9B

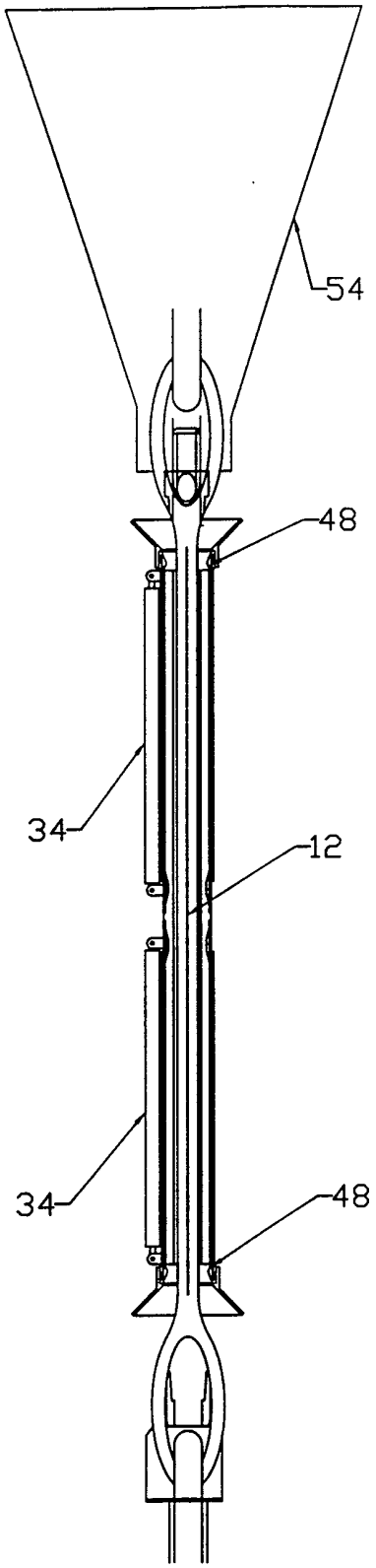


FIG. 9C

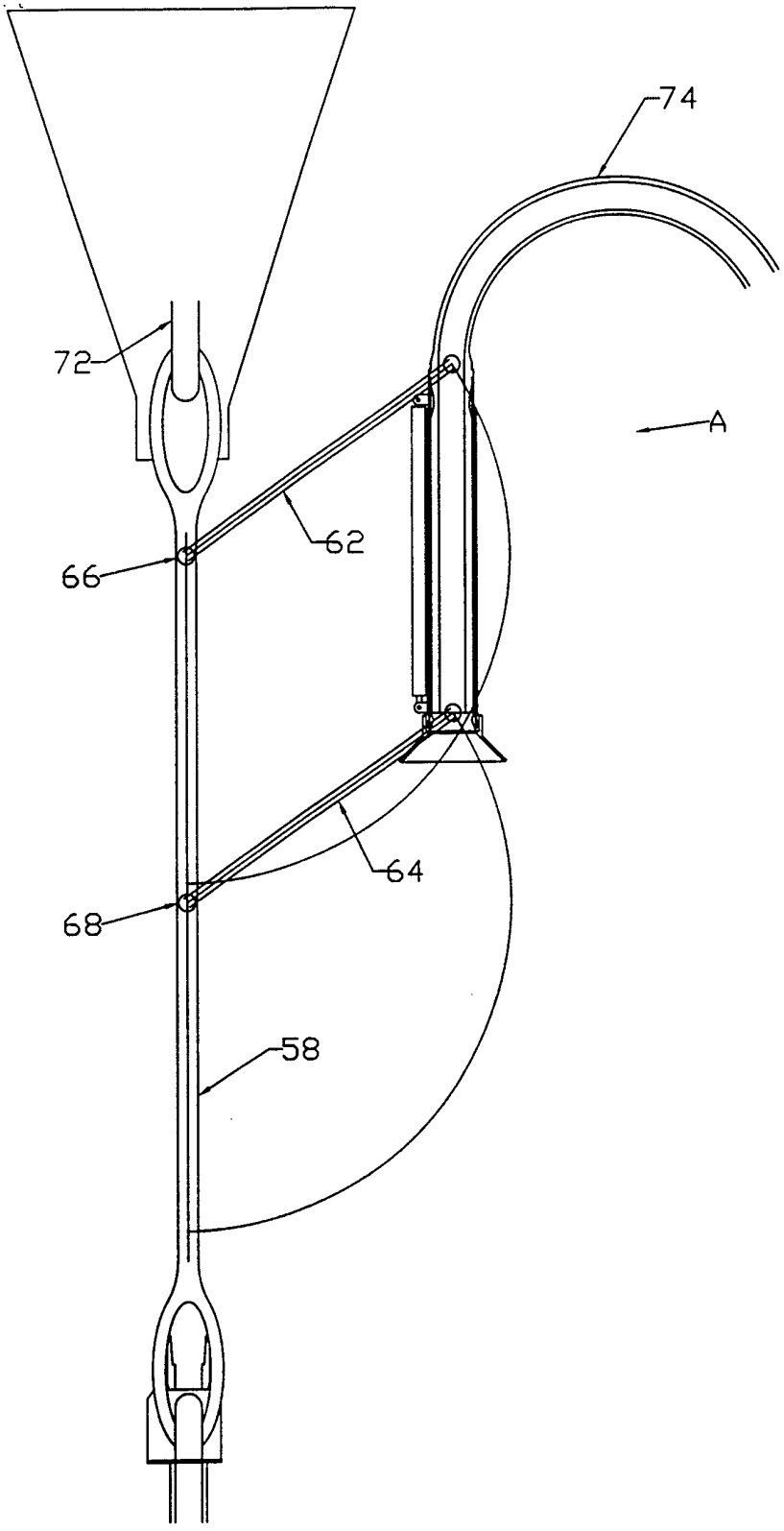


FIG. 10

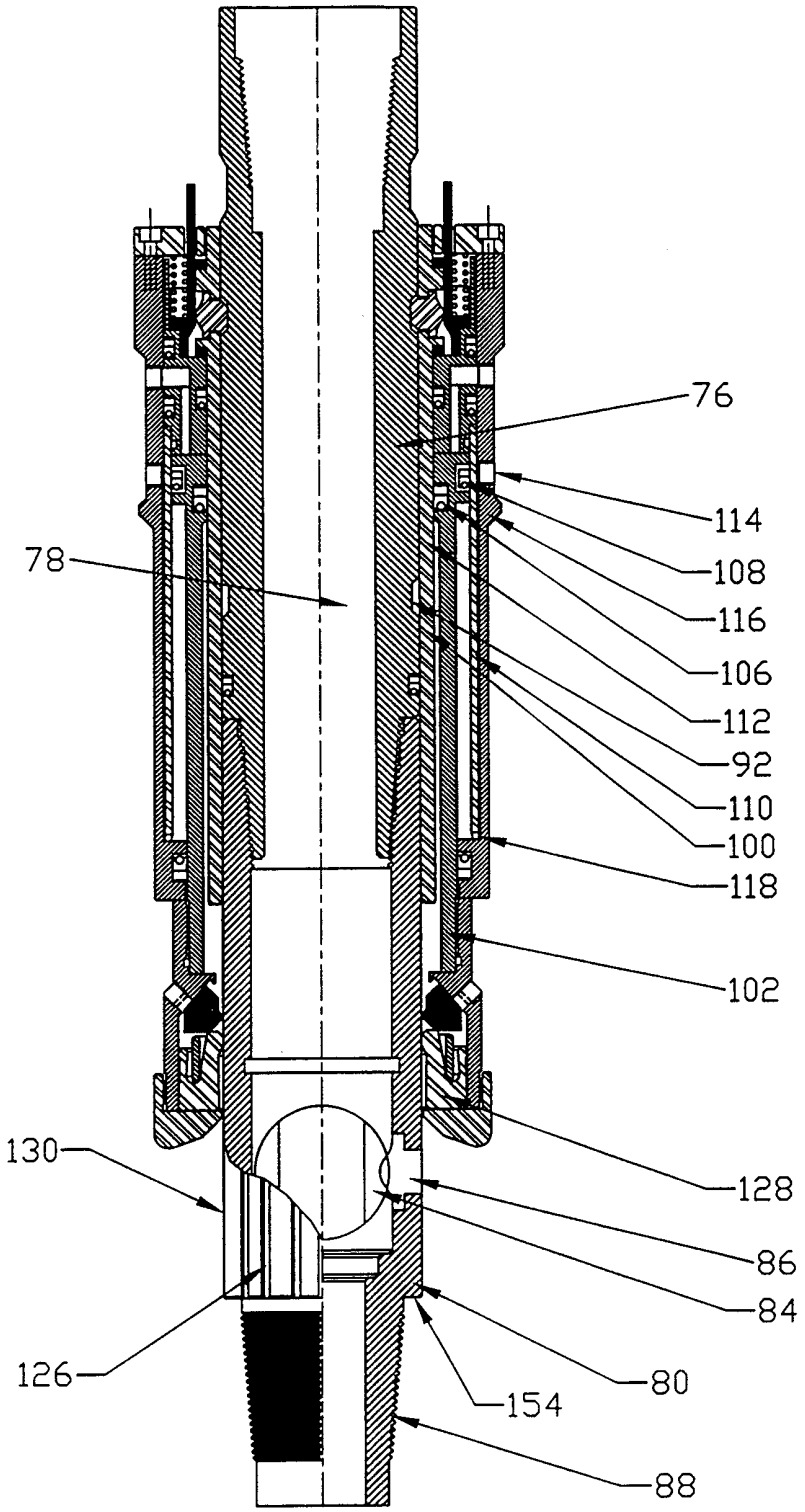

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Figure 11

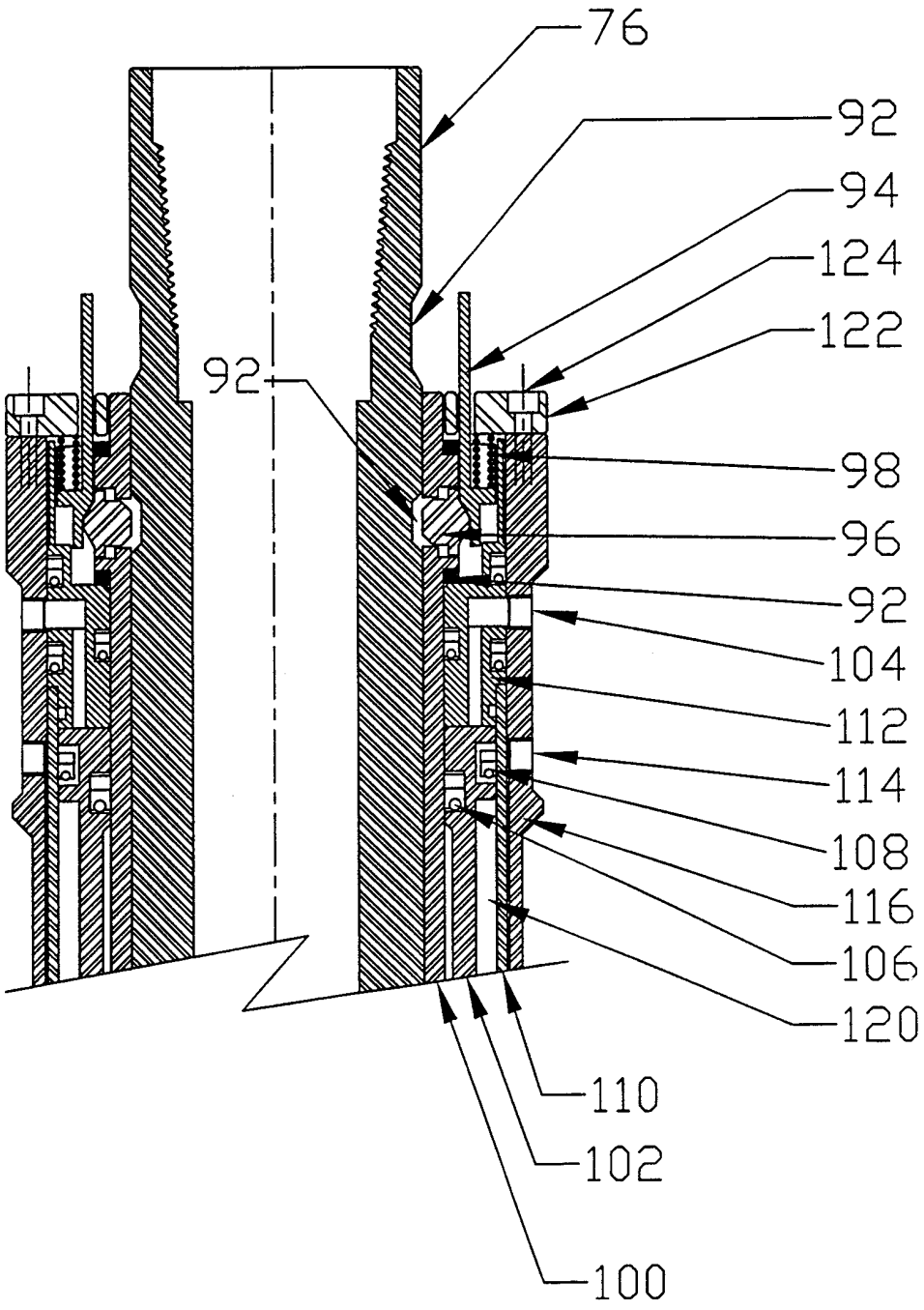
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Figure 12

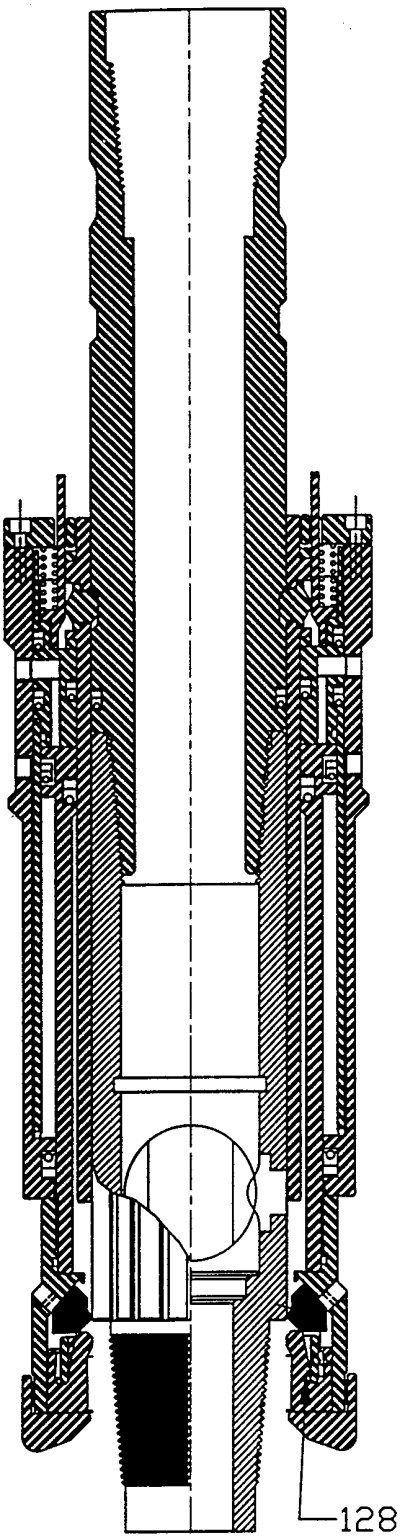

Figure 13

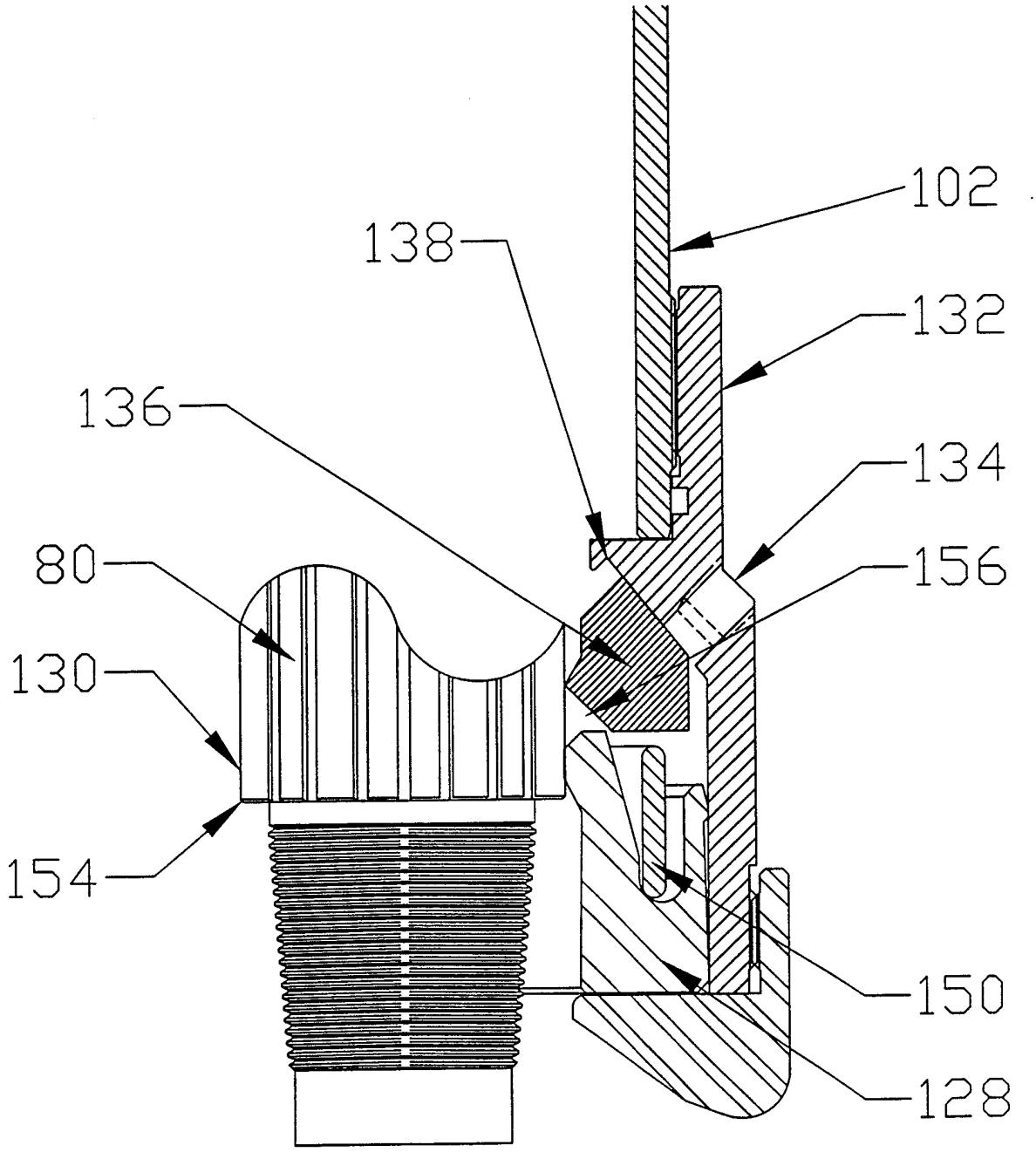

Figure 14

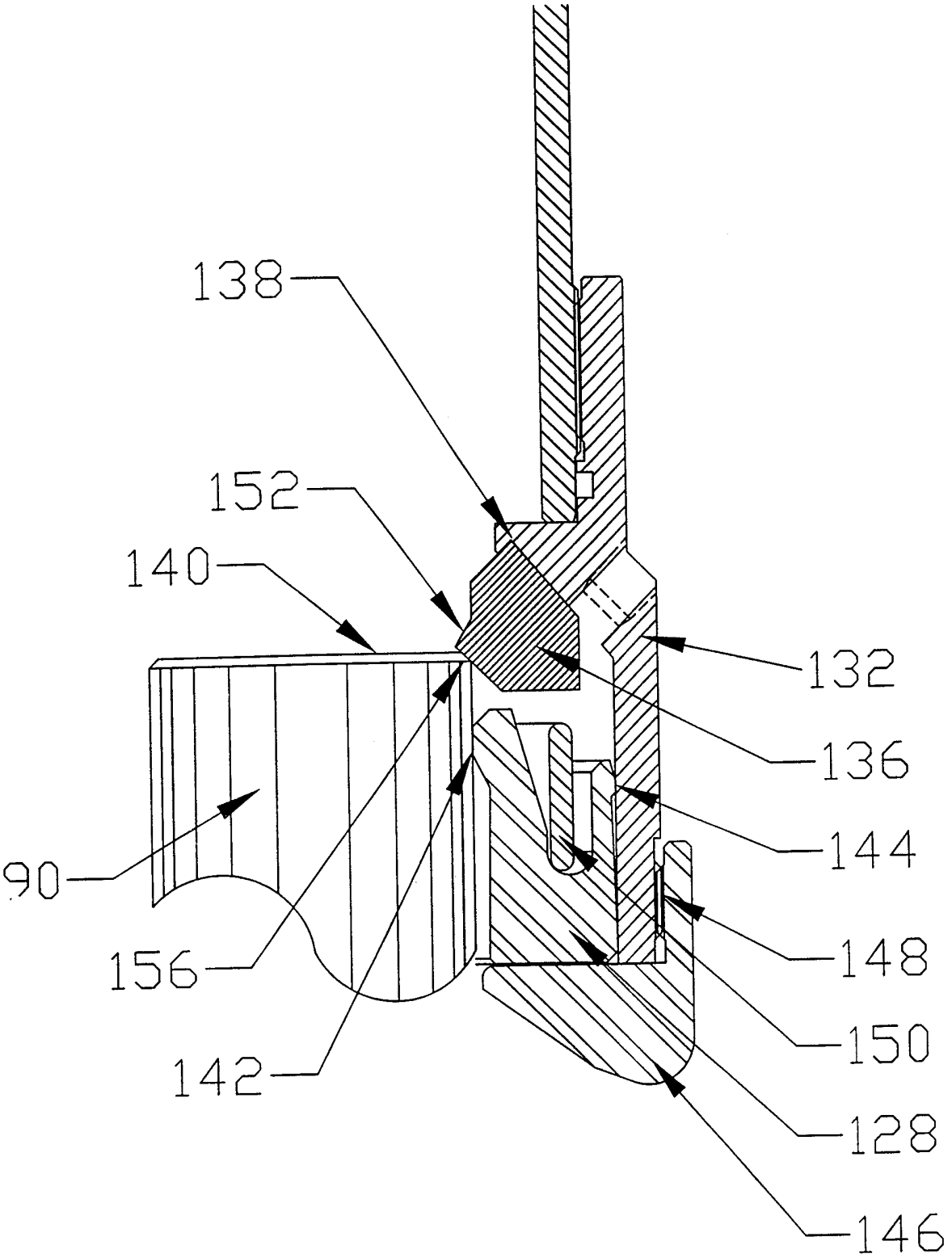

Figure 15

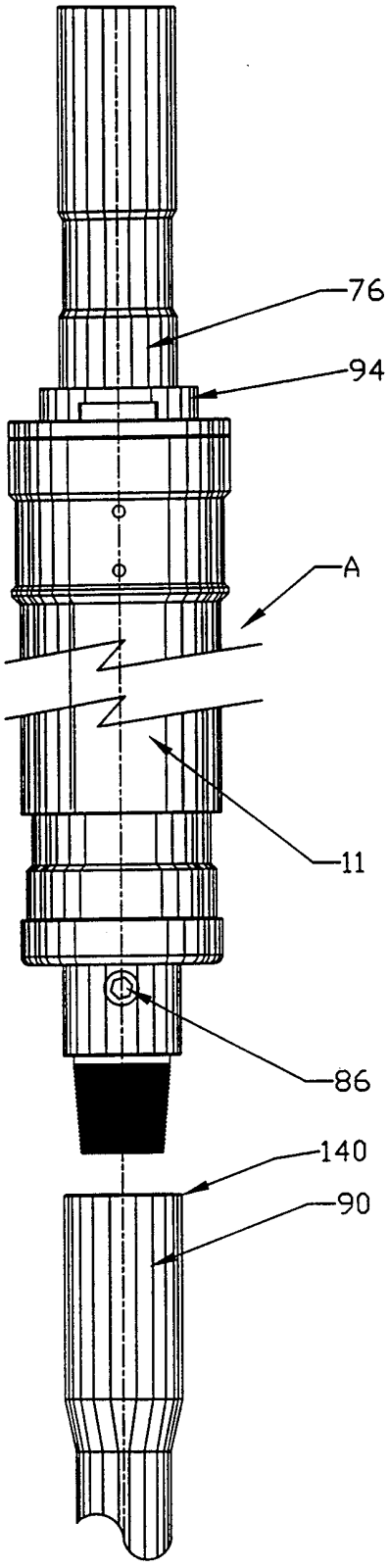

Figure 16

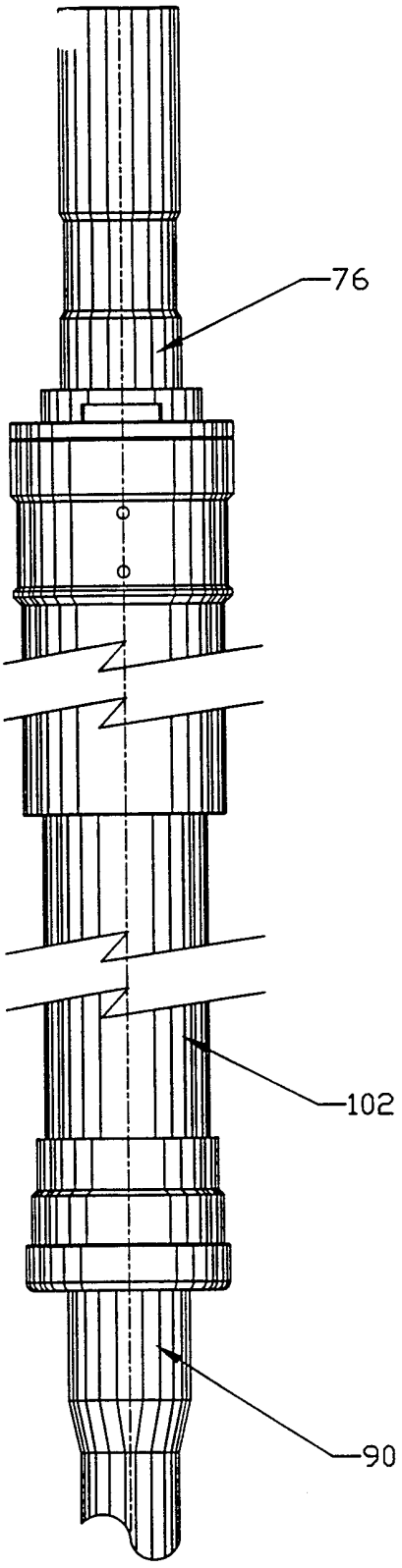

Figure 17

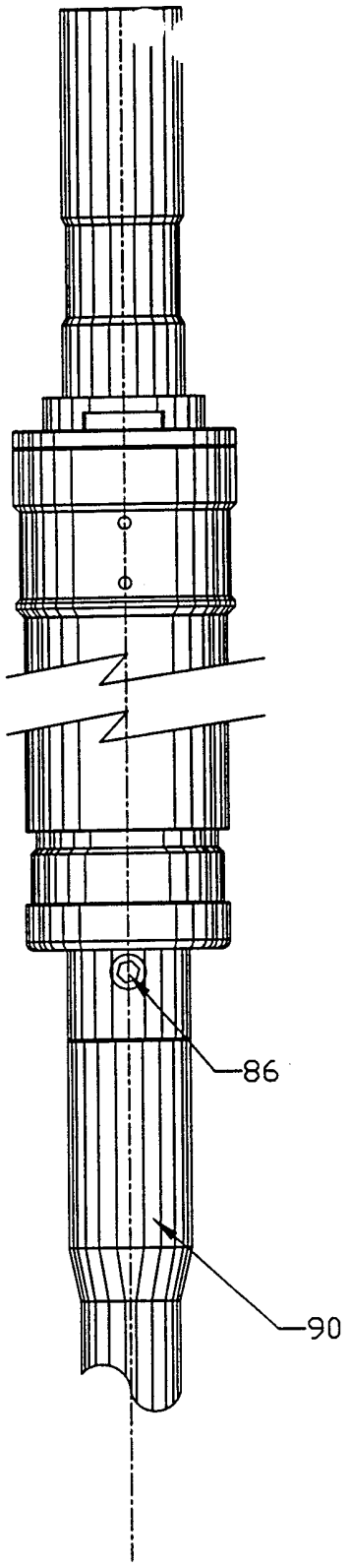

Figure 18

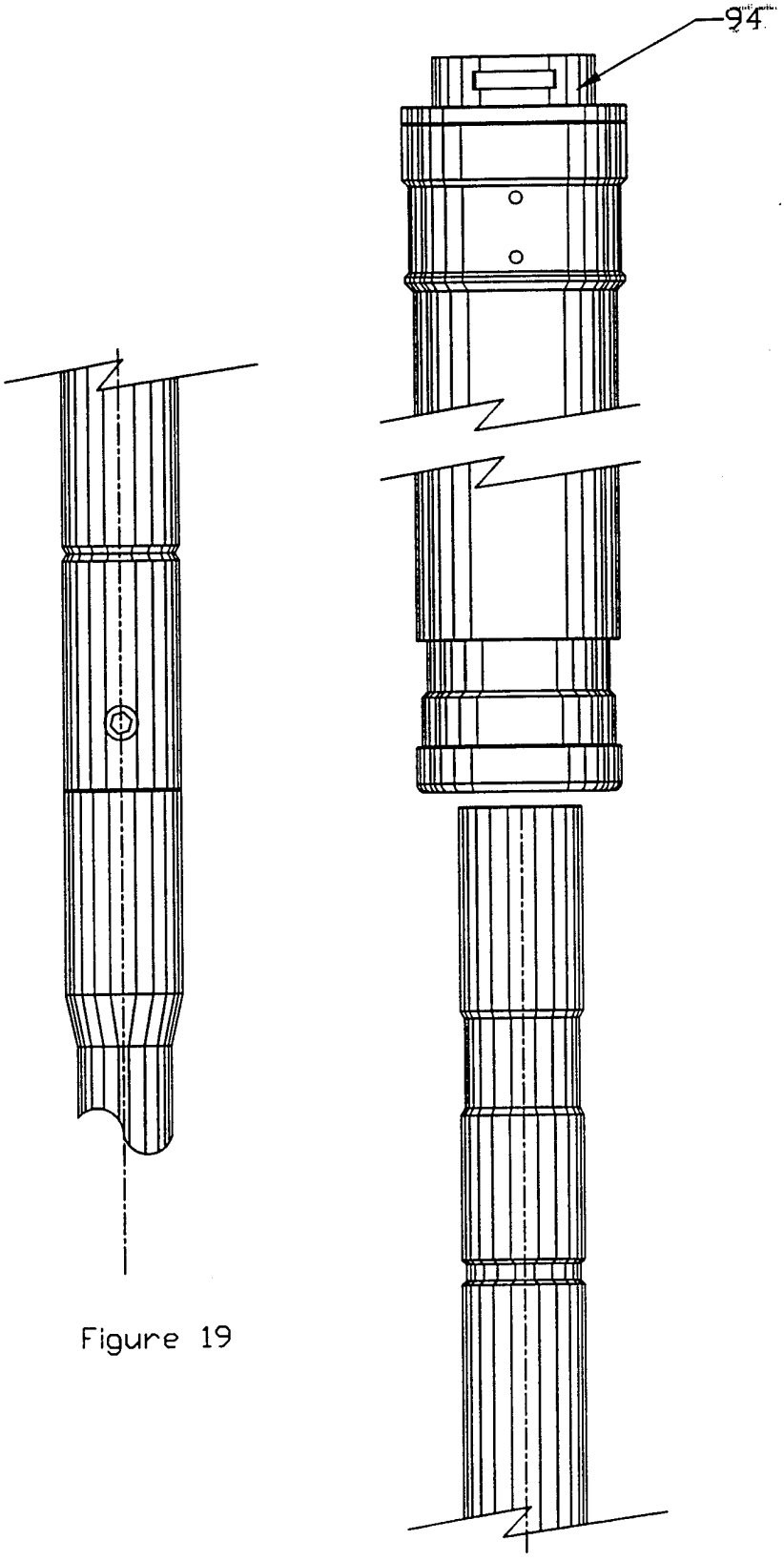

Figure 19

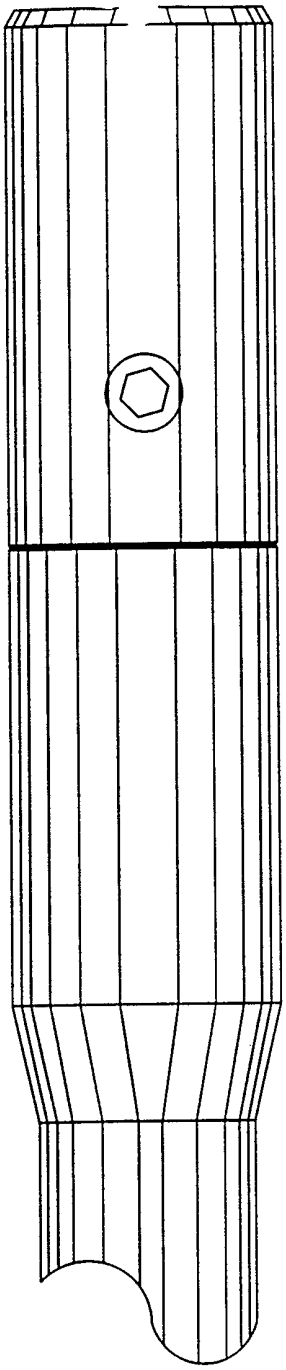

Figure 20

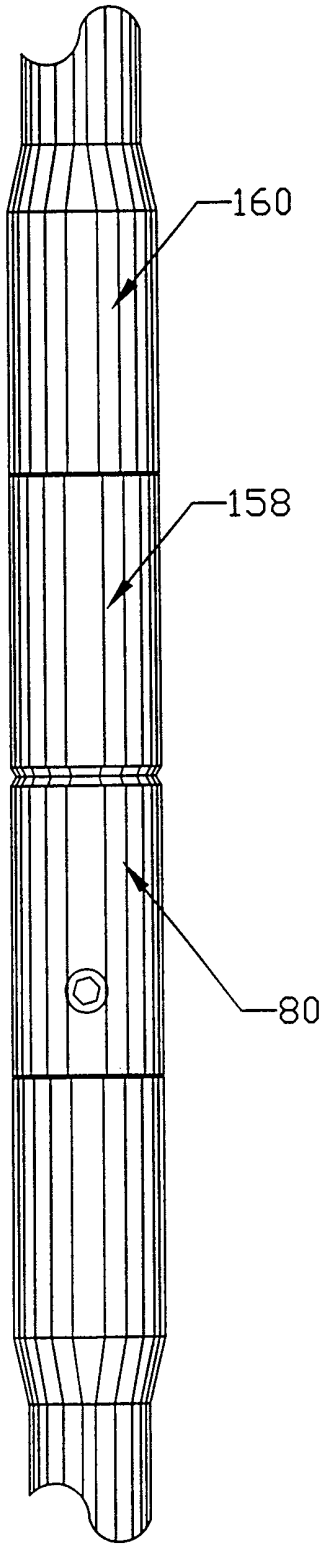

Figure 21

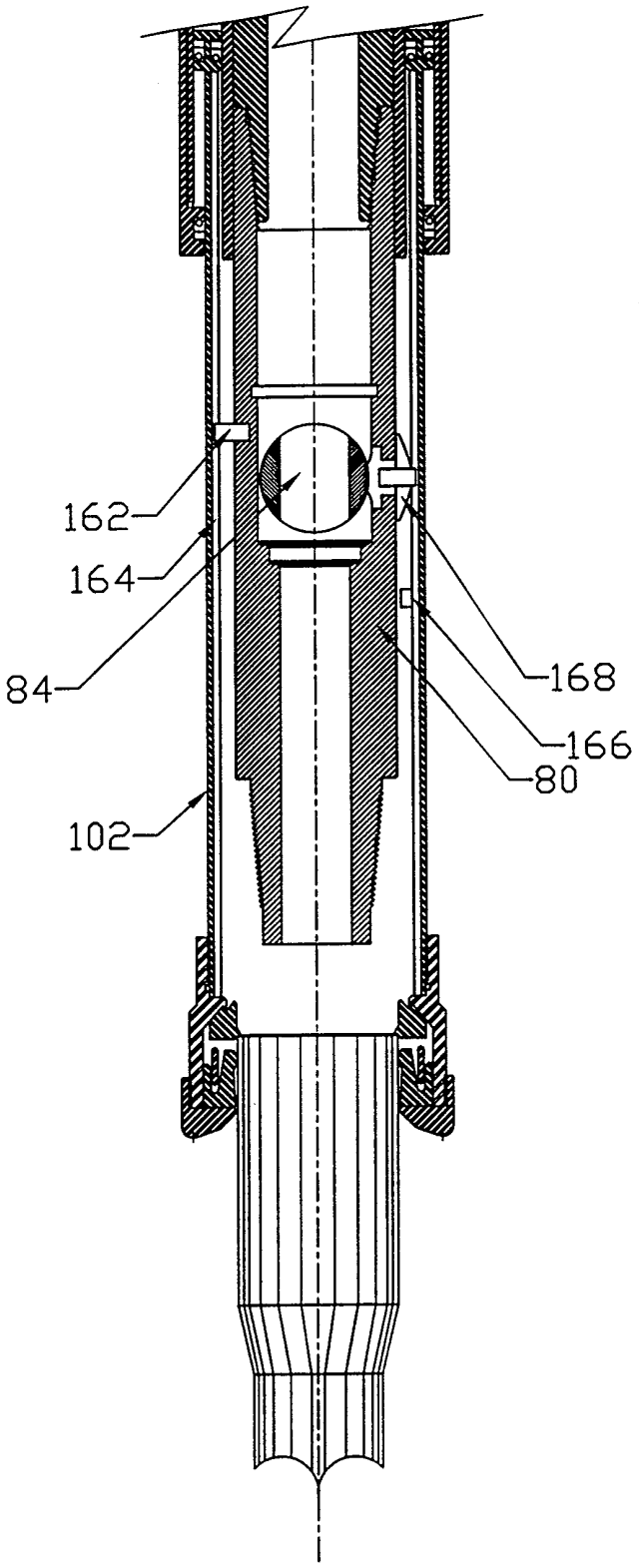

Figure 22

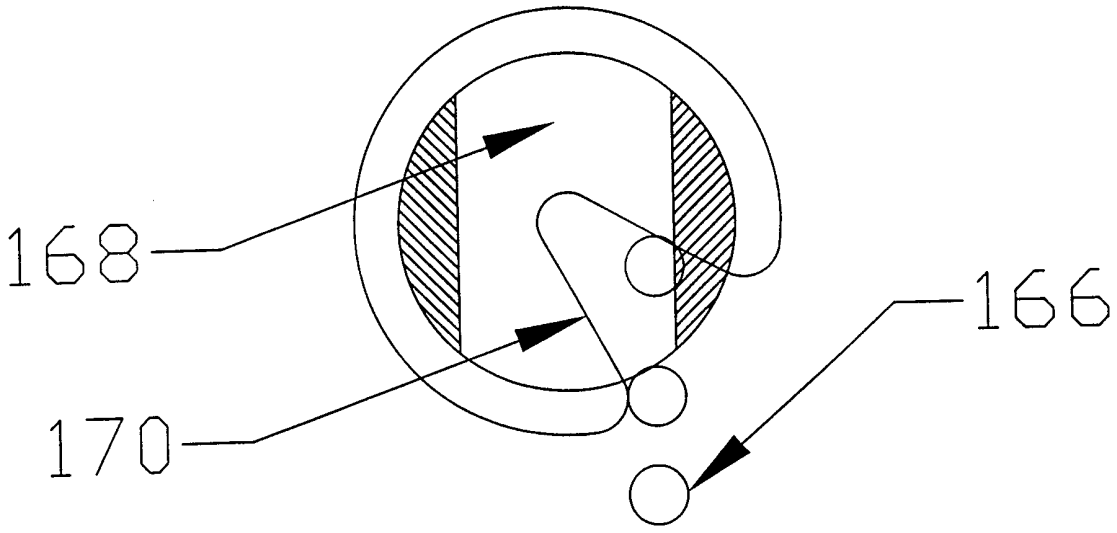

Figure 23

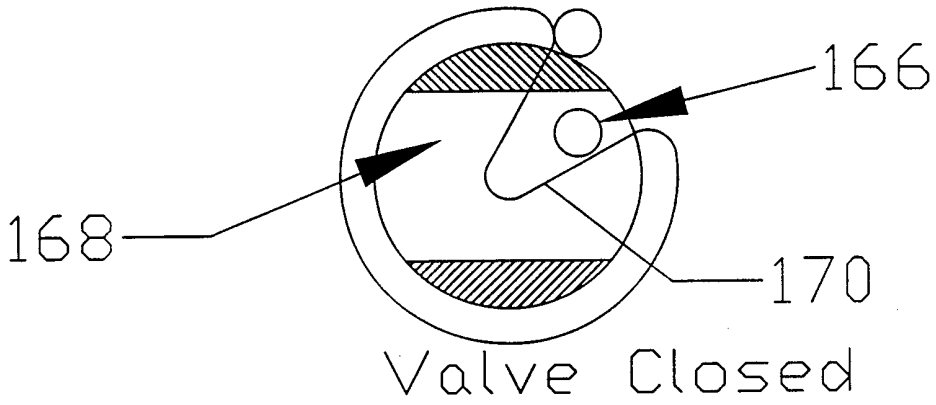

Figure 24

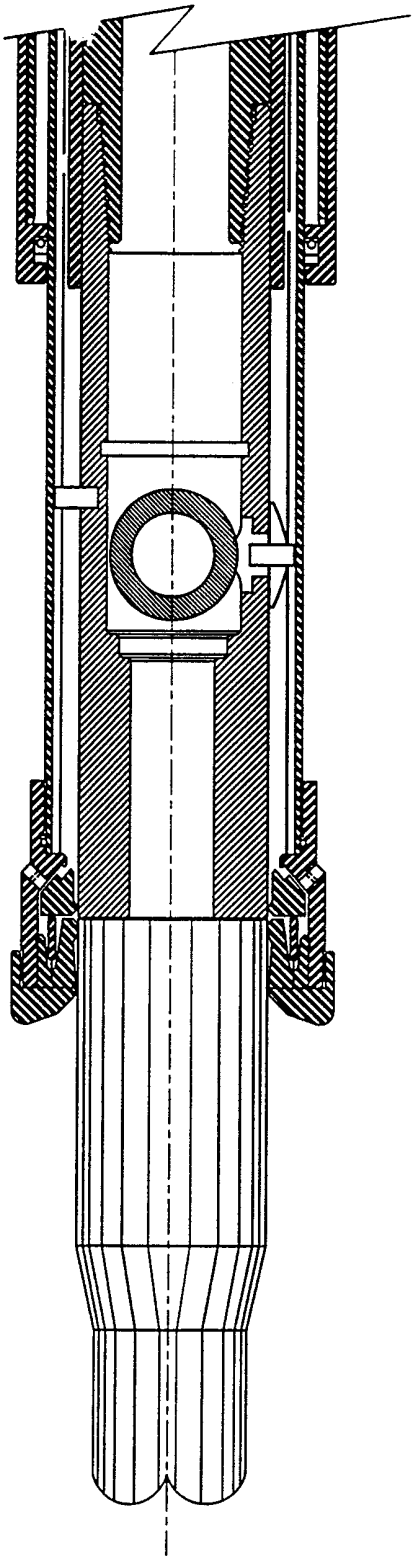

Figure 25

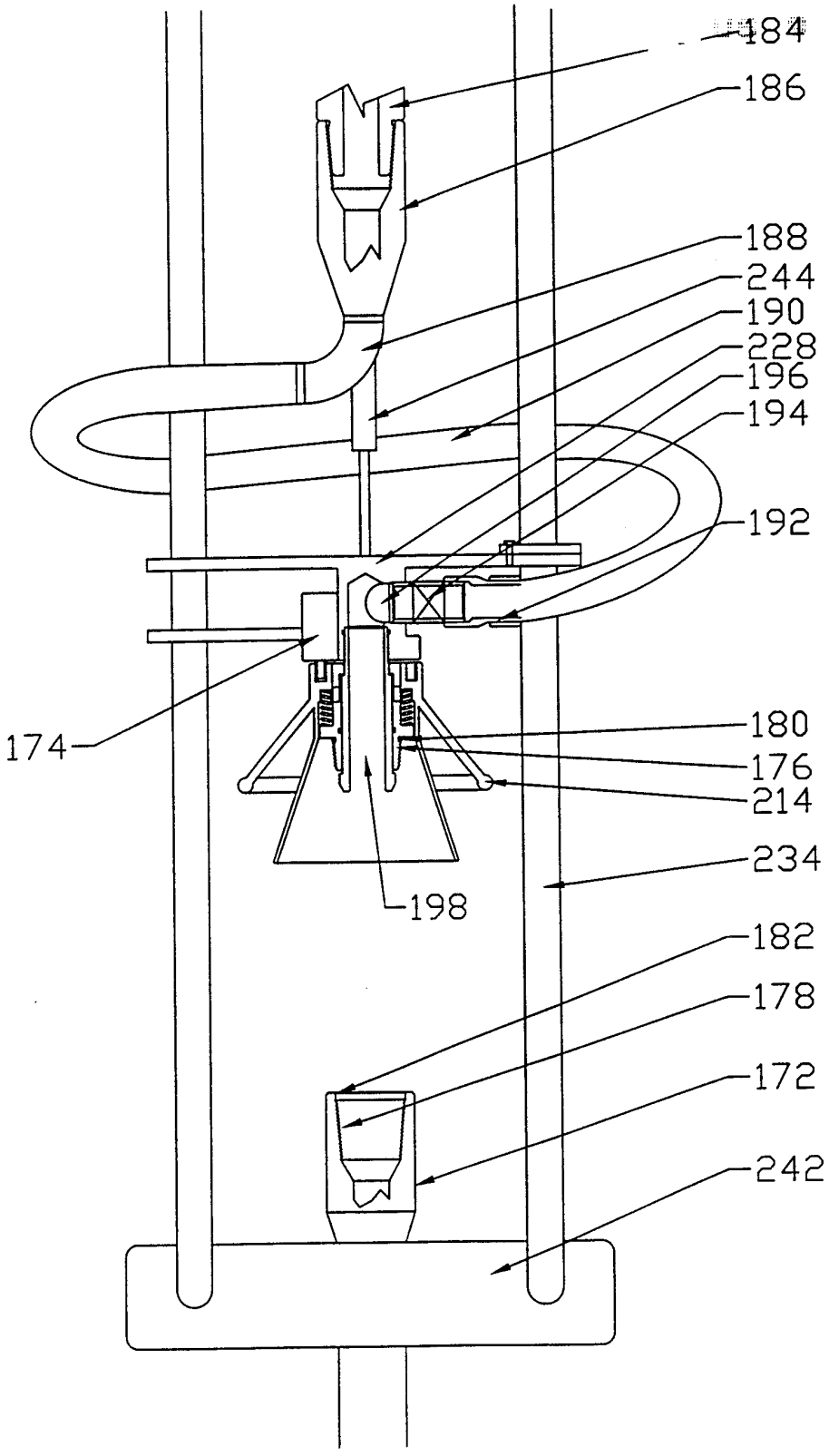
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Fig. 26

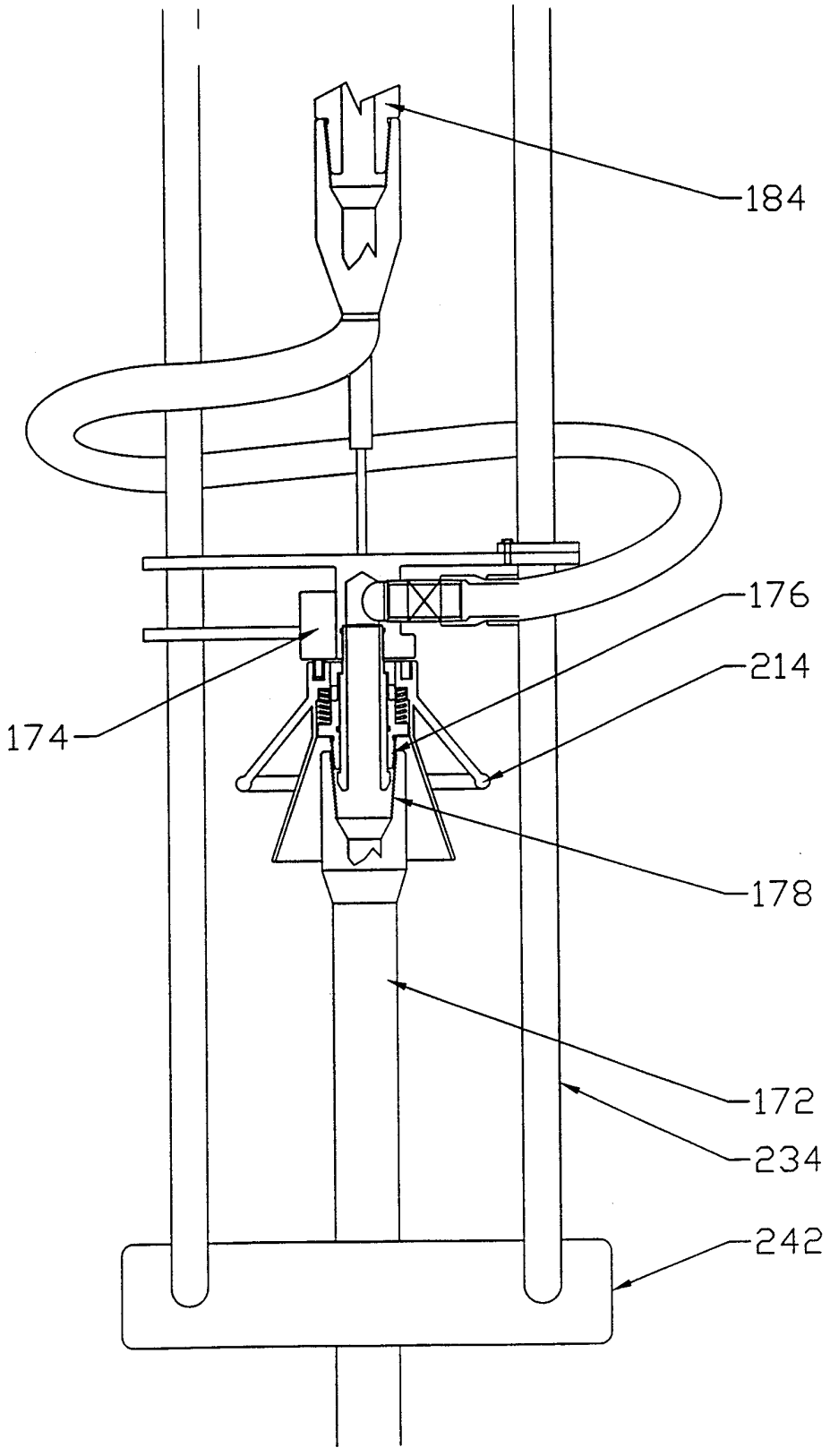

Fig. 27

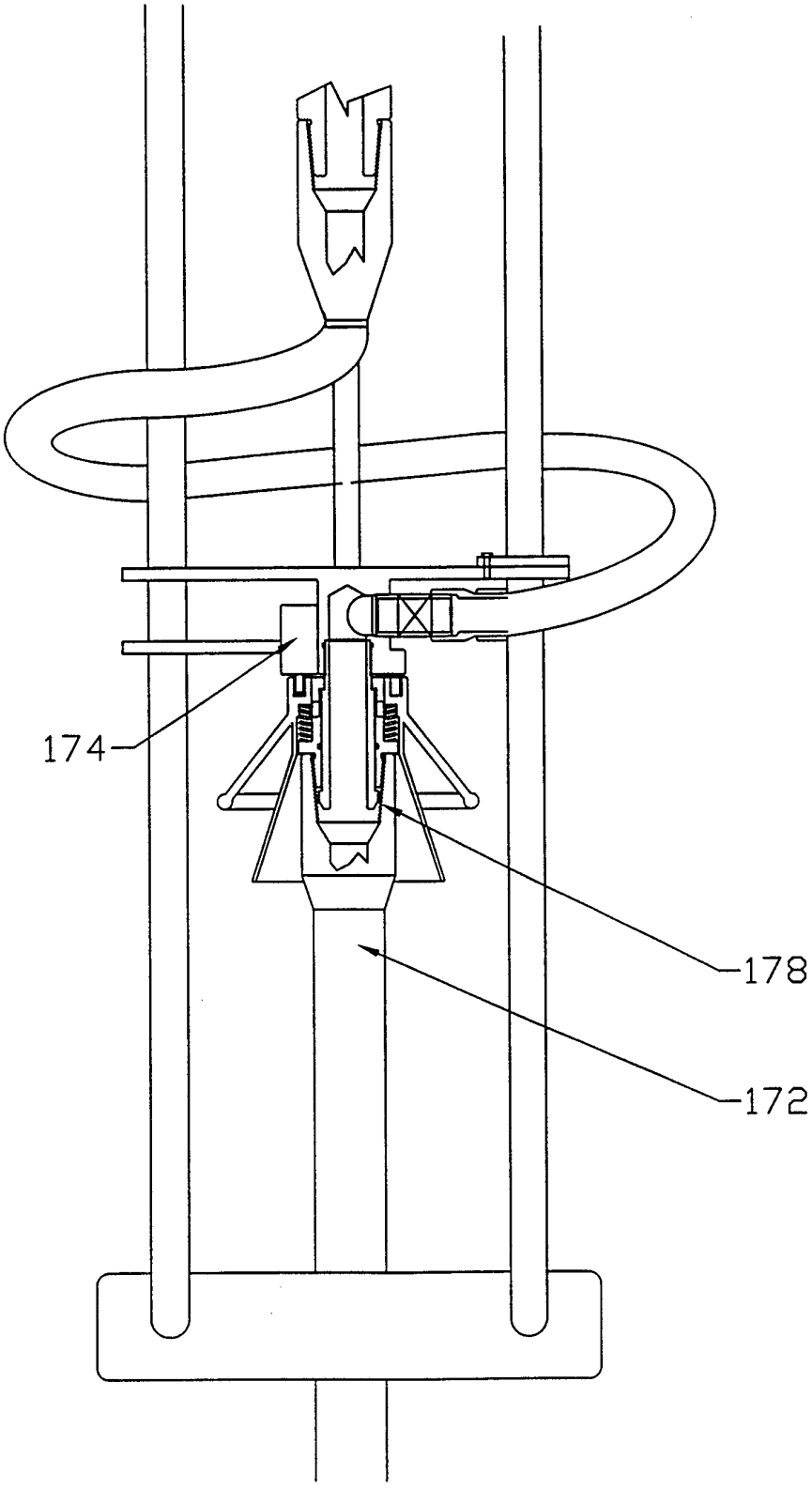

Fig. 28

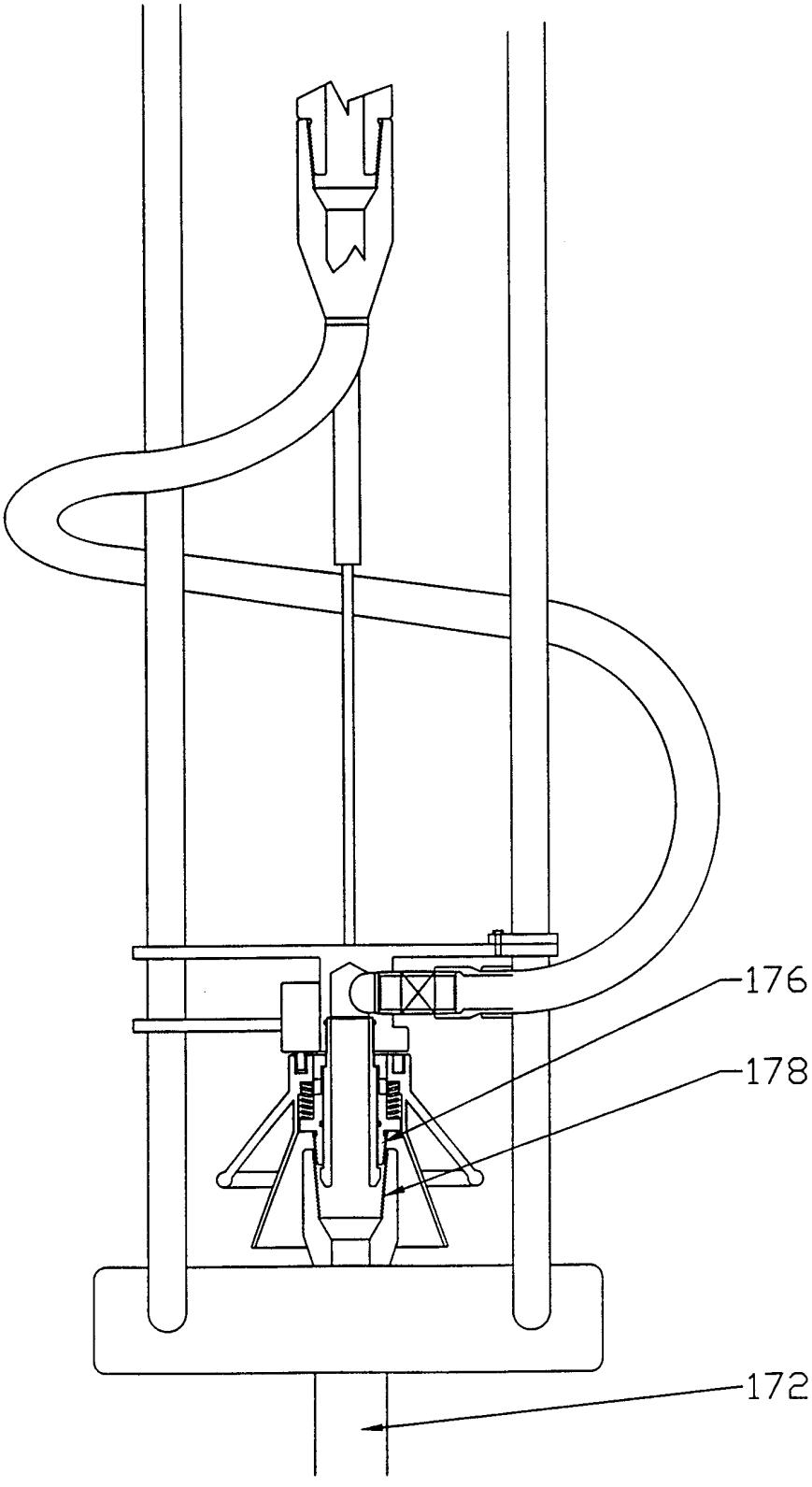

Fig. 29

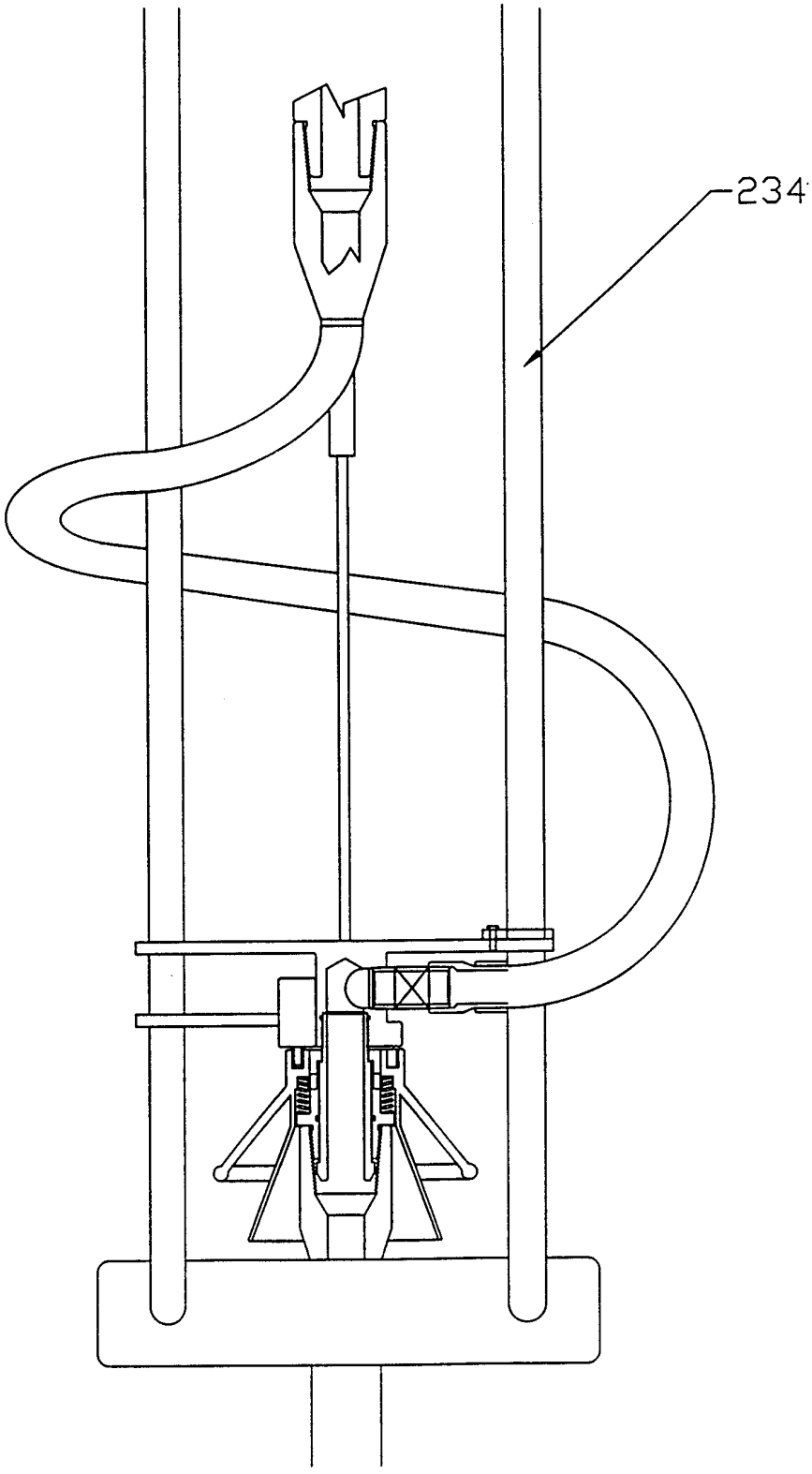

Fig. 30

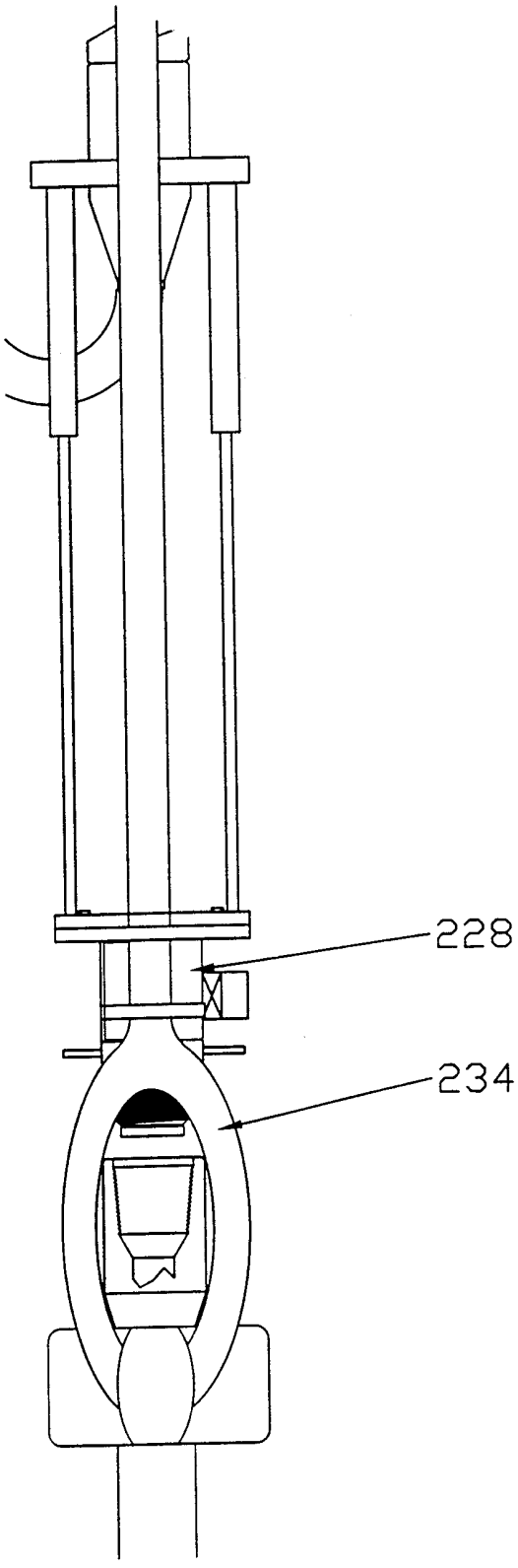

Fig. 31

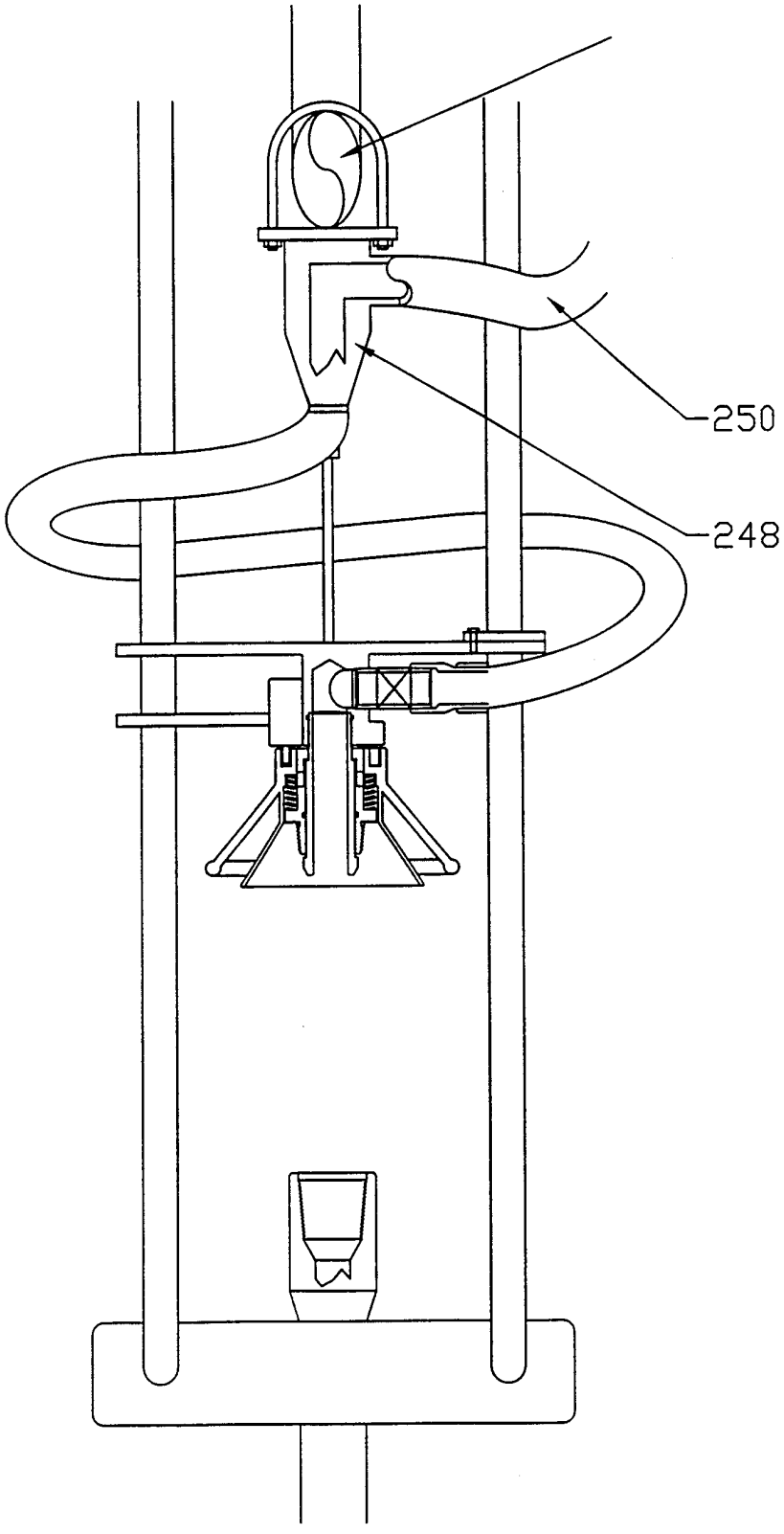

Fig. 32

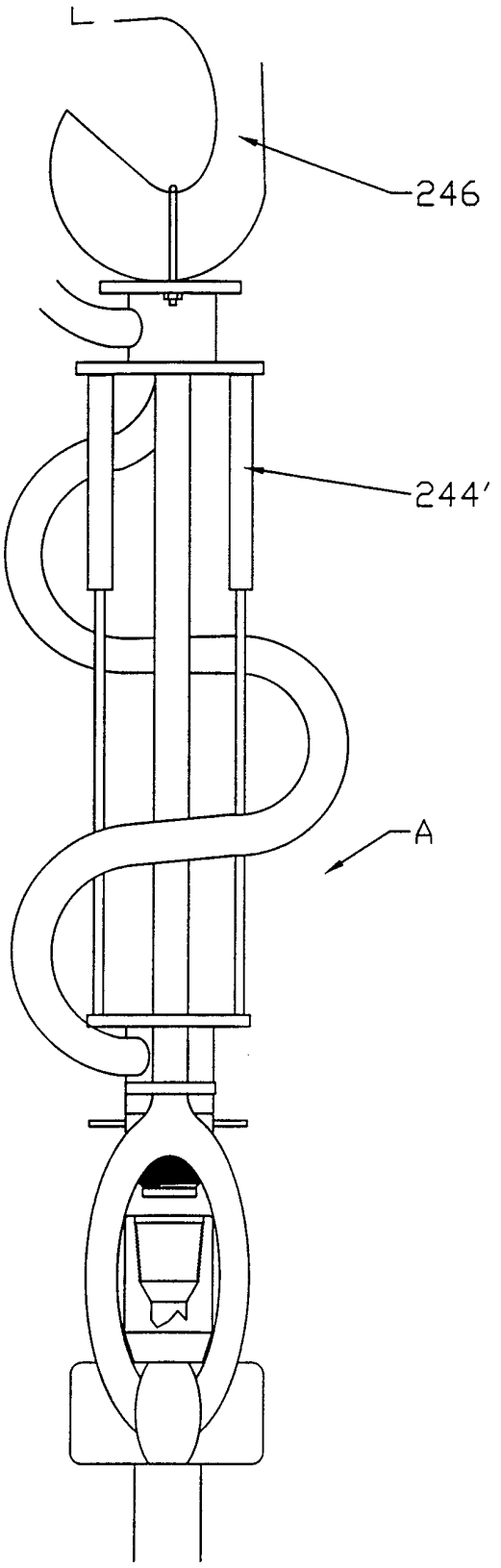

Fig. 33

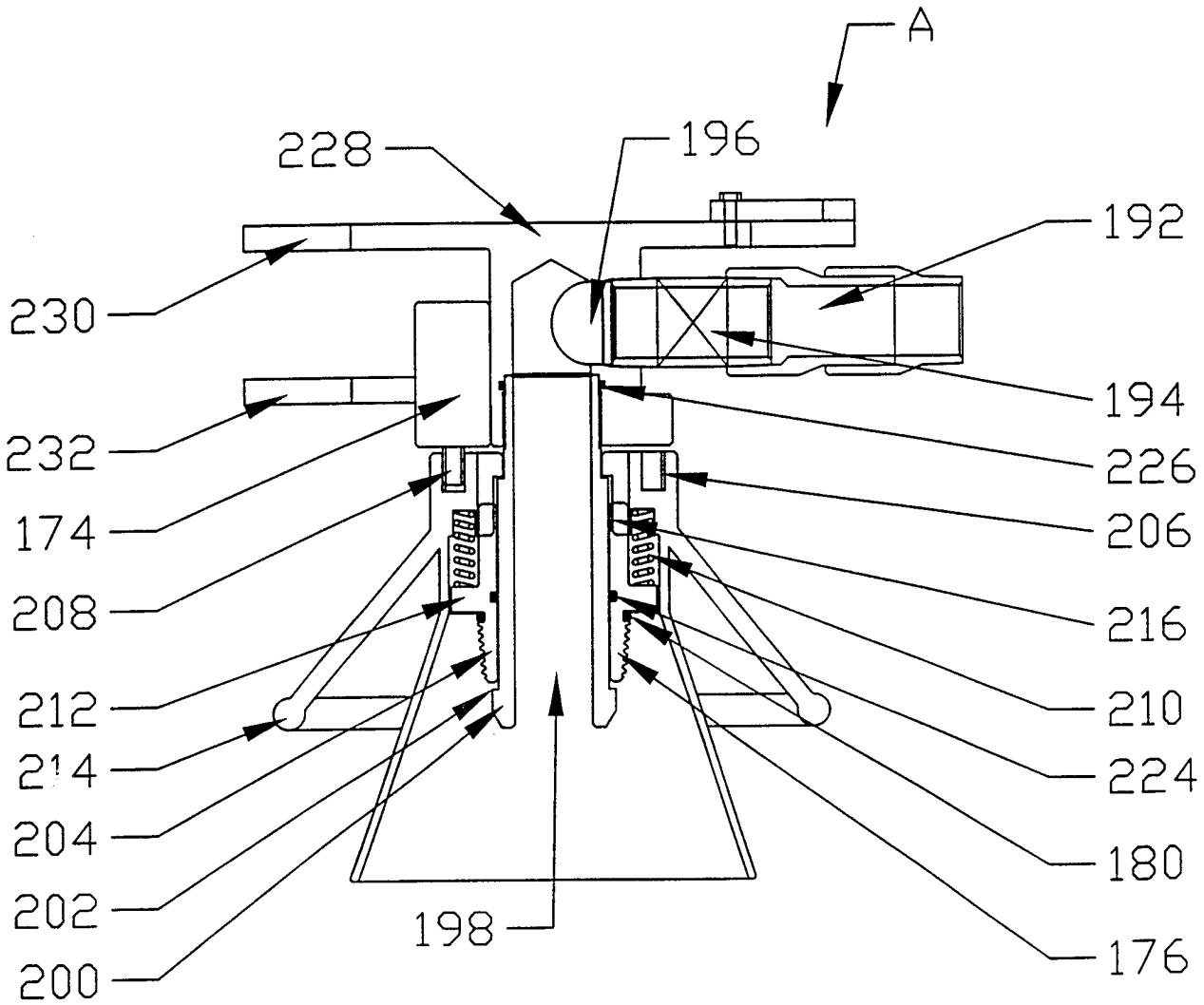
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Fig. 34

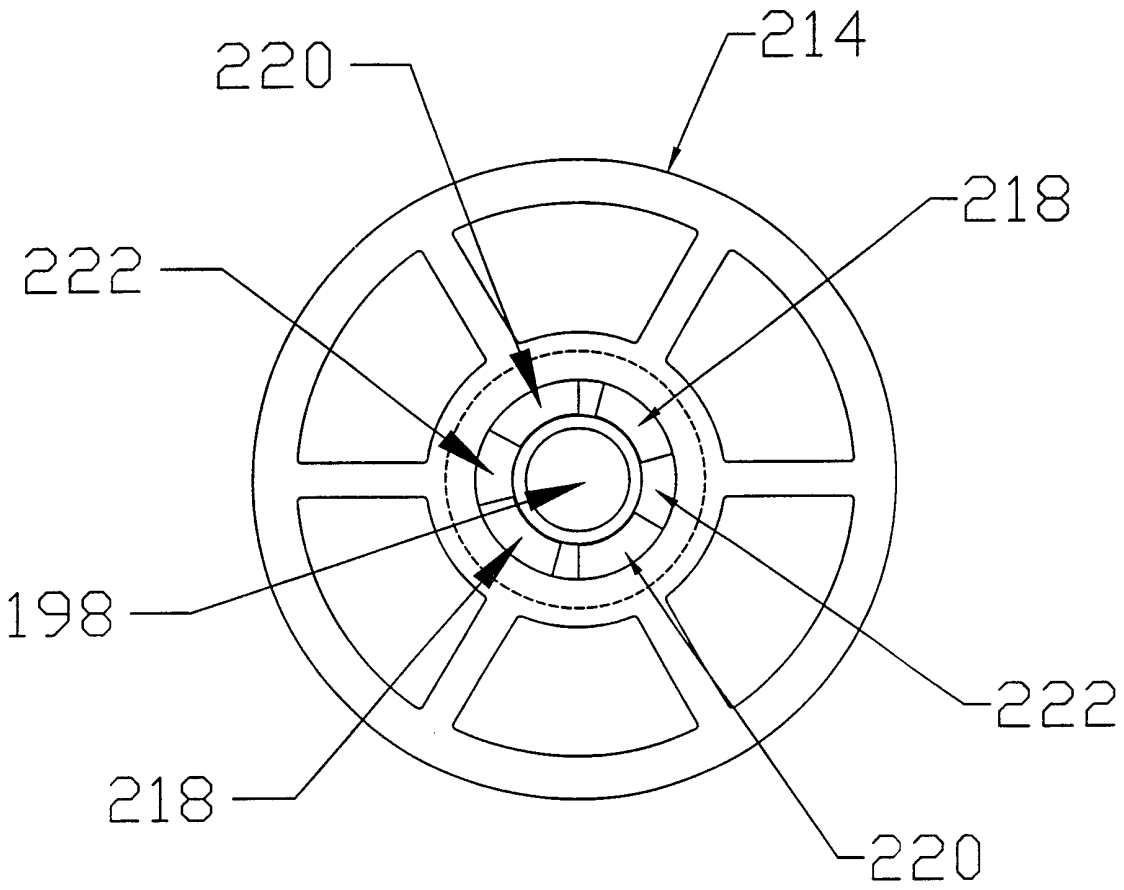

Fig. 35

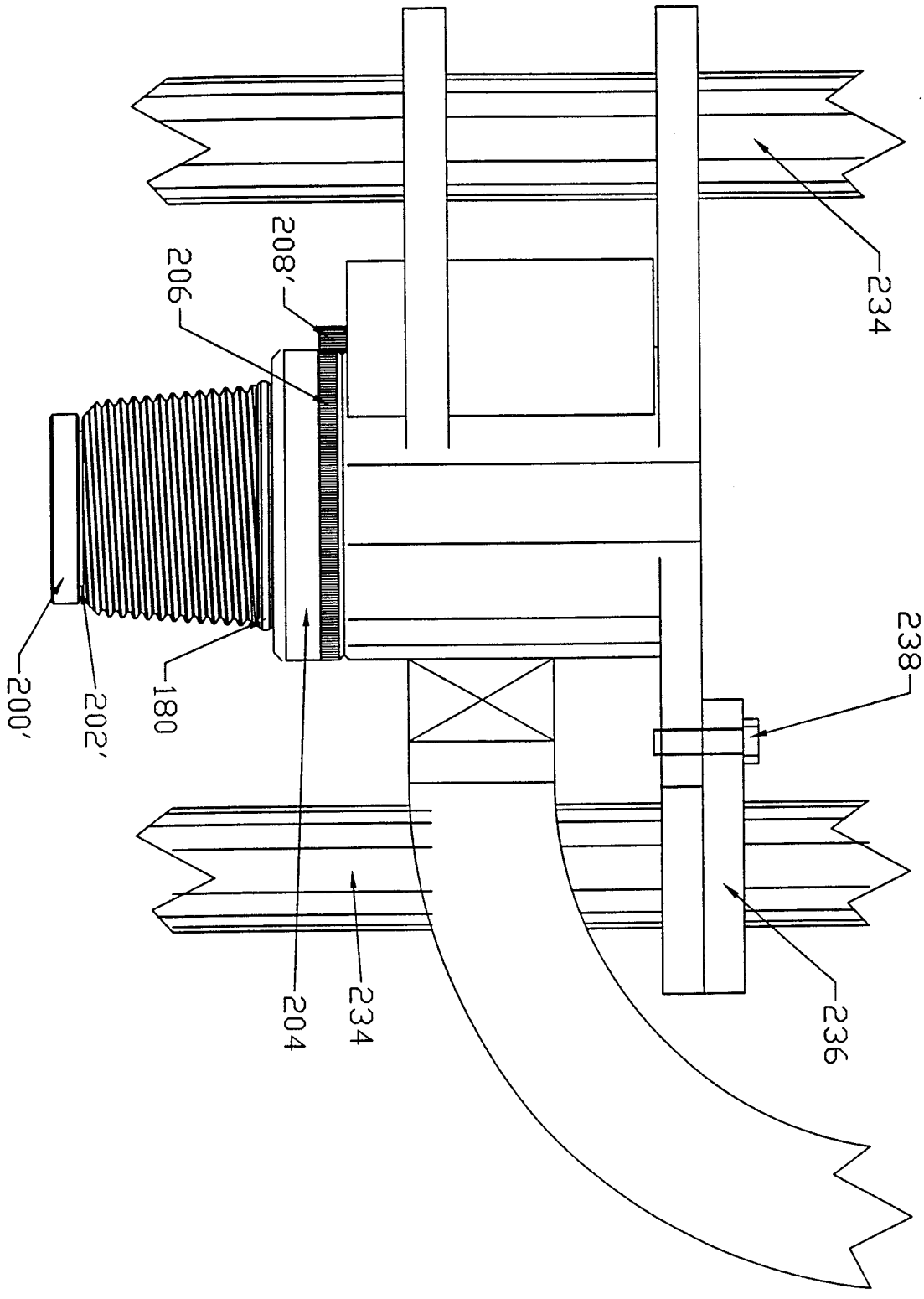

Fig. 36

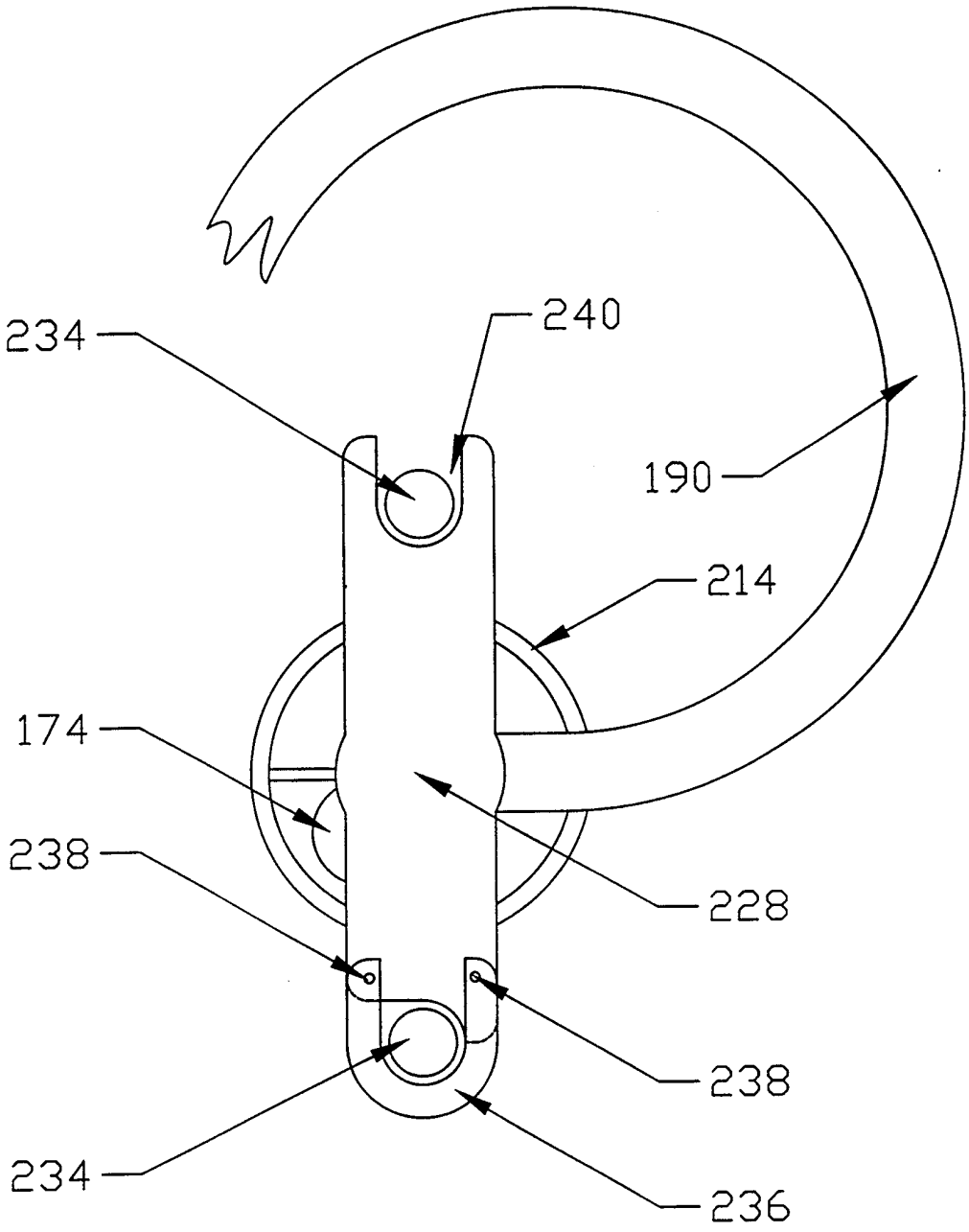

Fig. 37

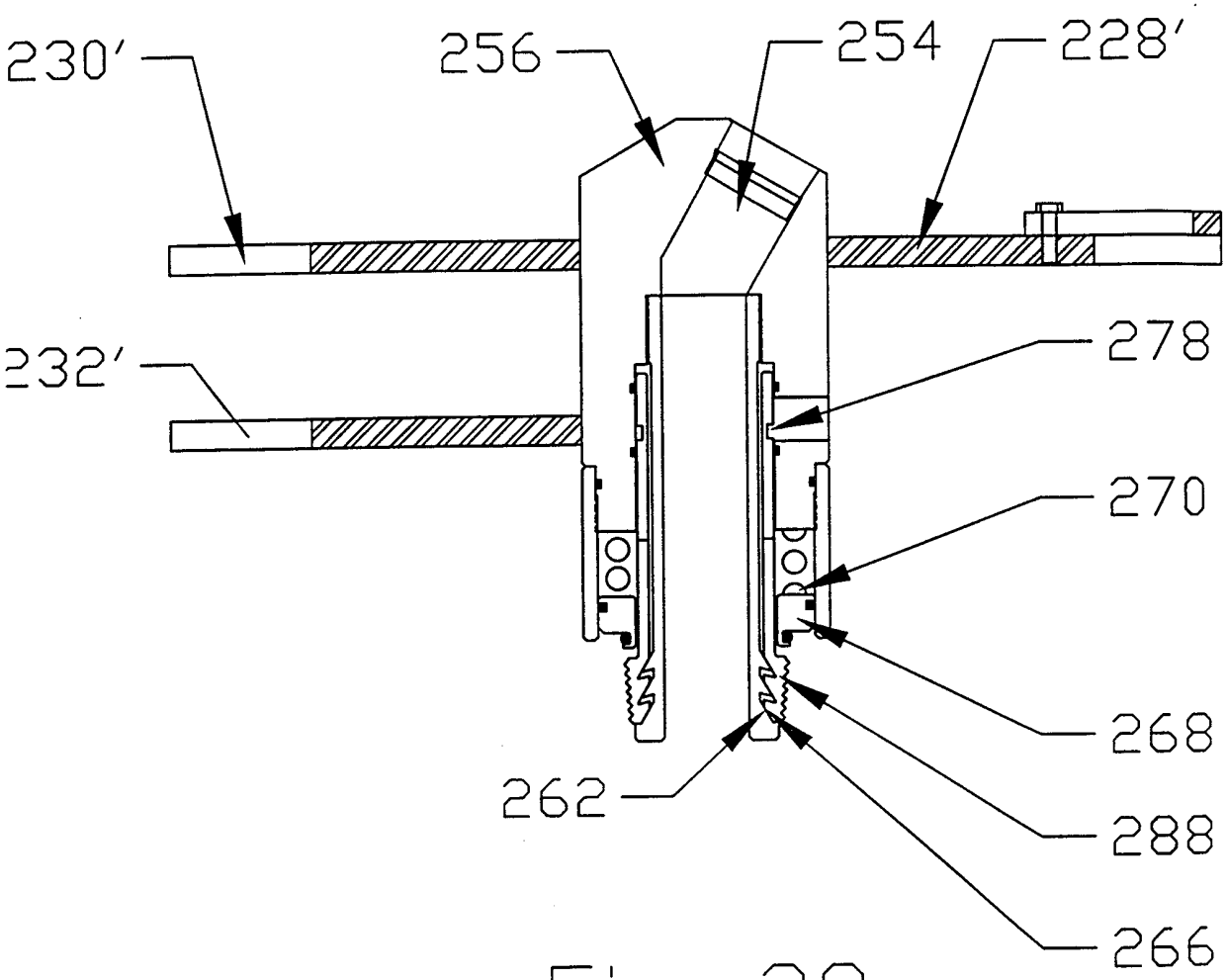

Fig. 38

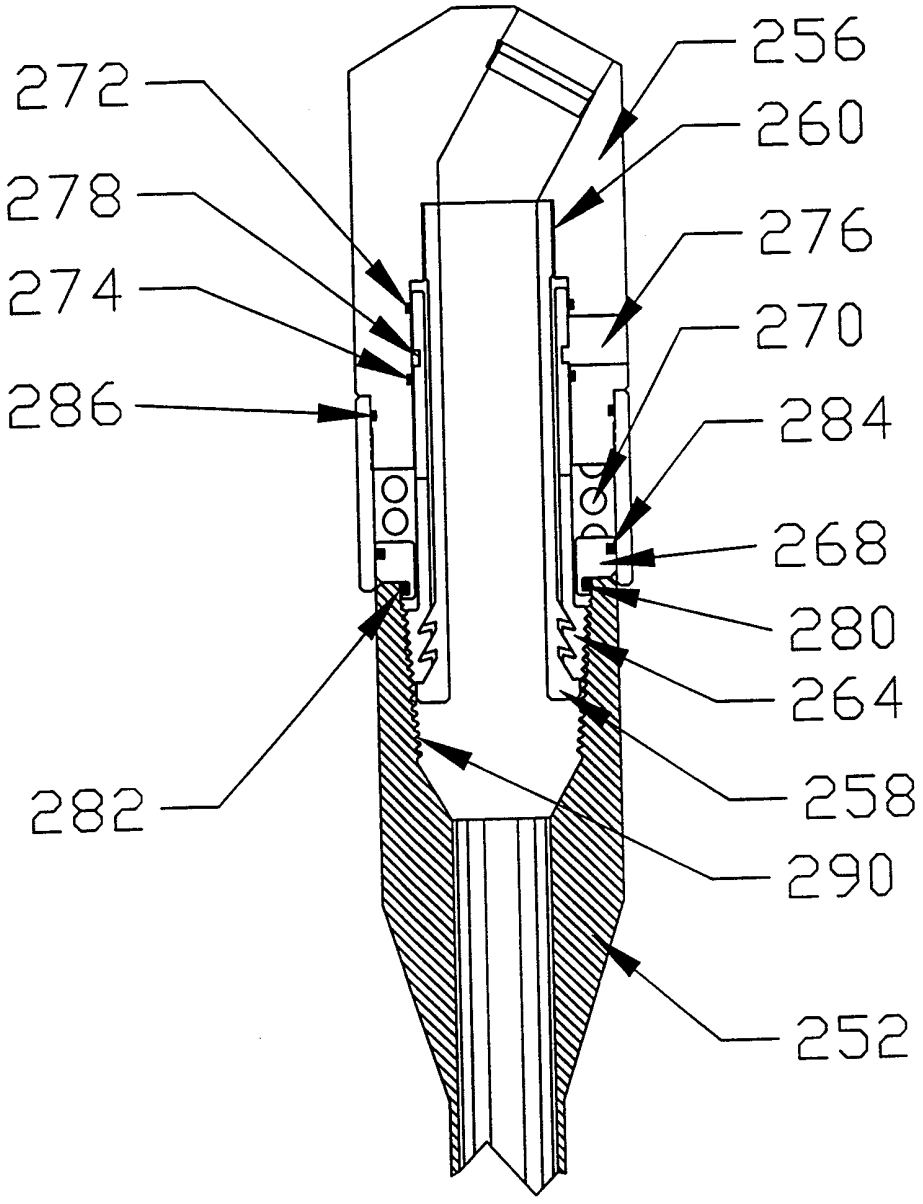

Fig. 39

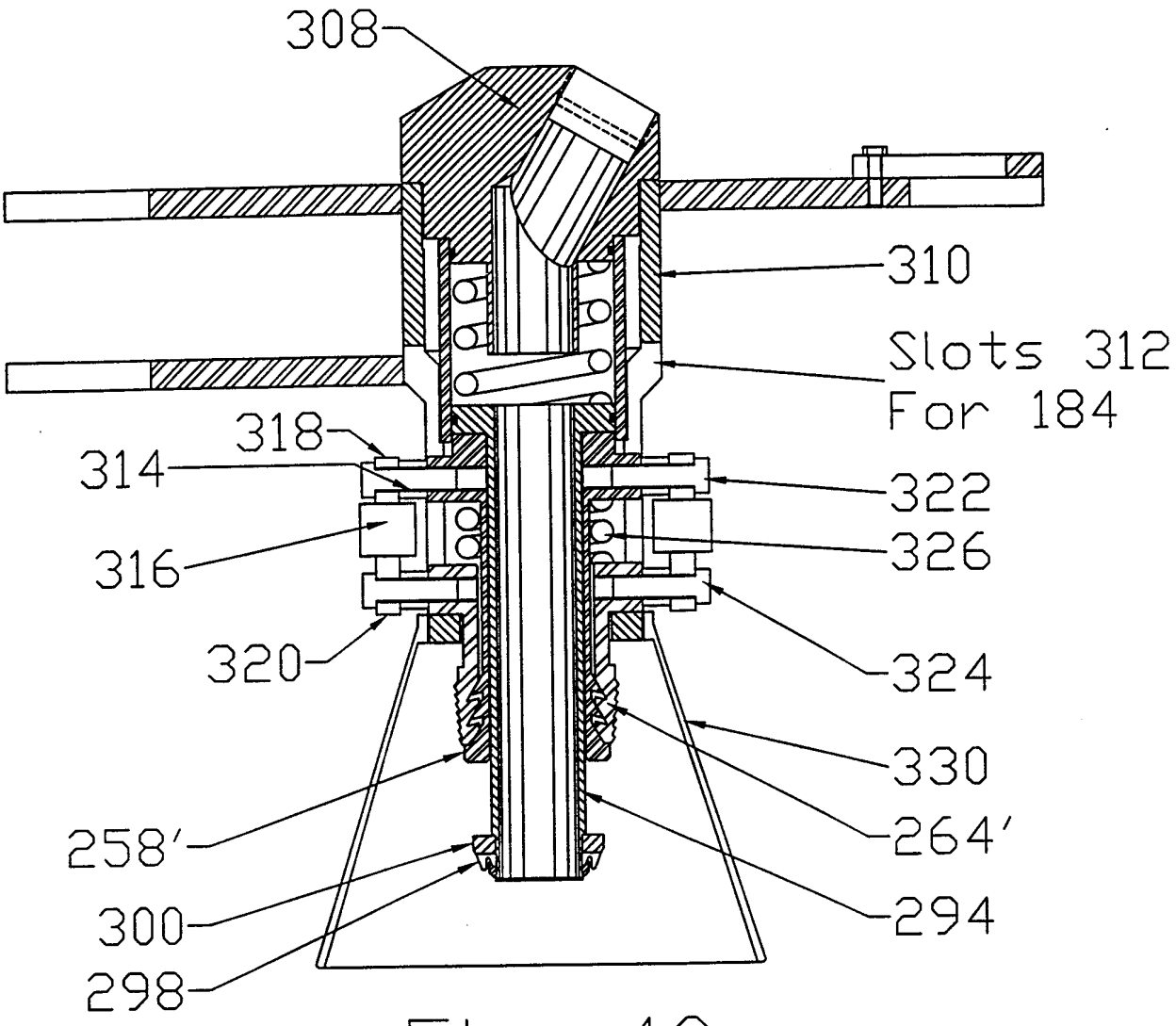
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Fig. 40

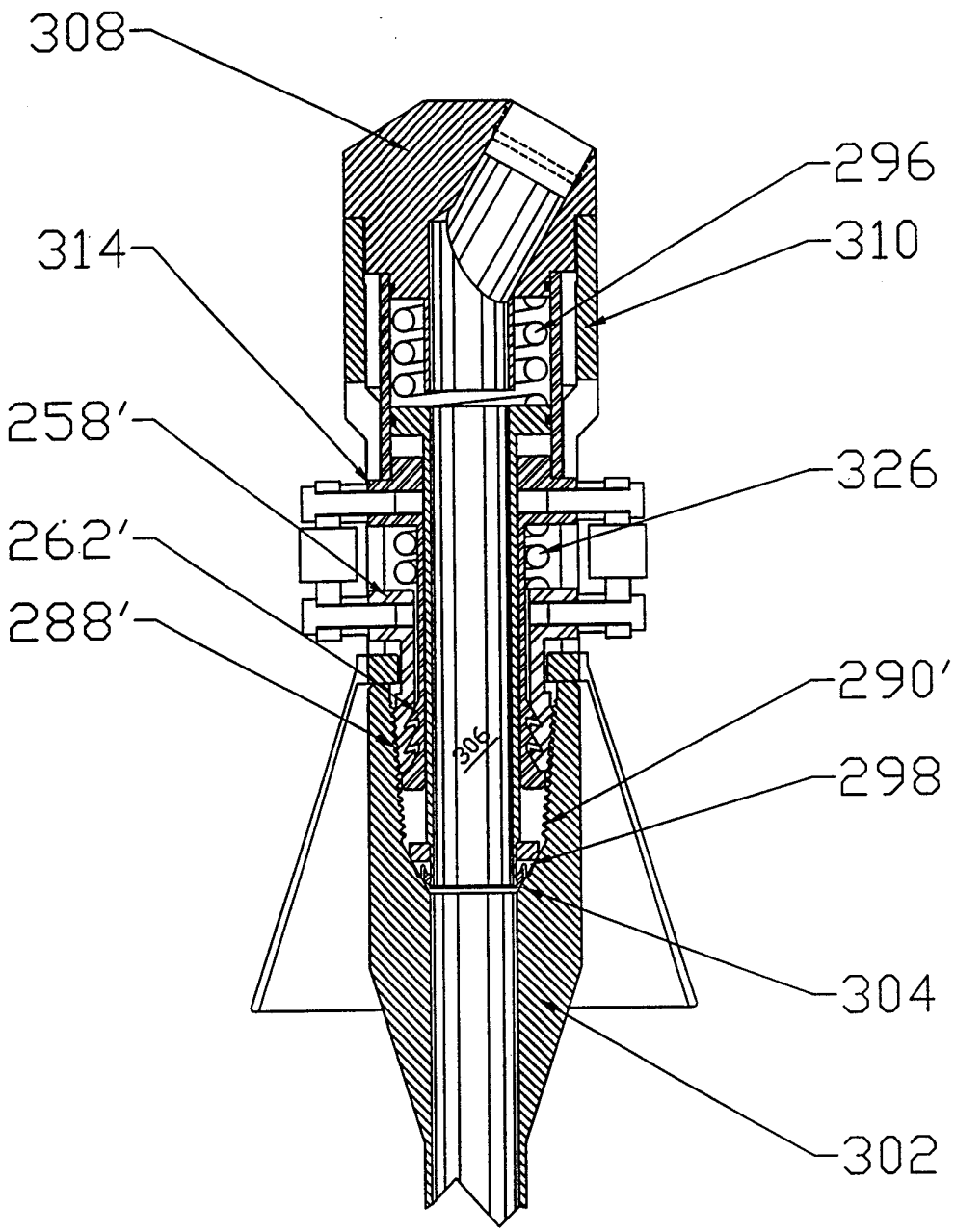

Fig. 41

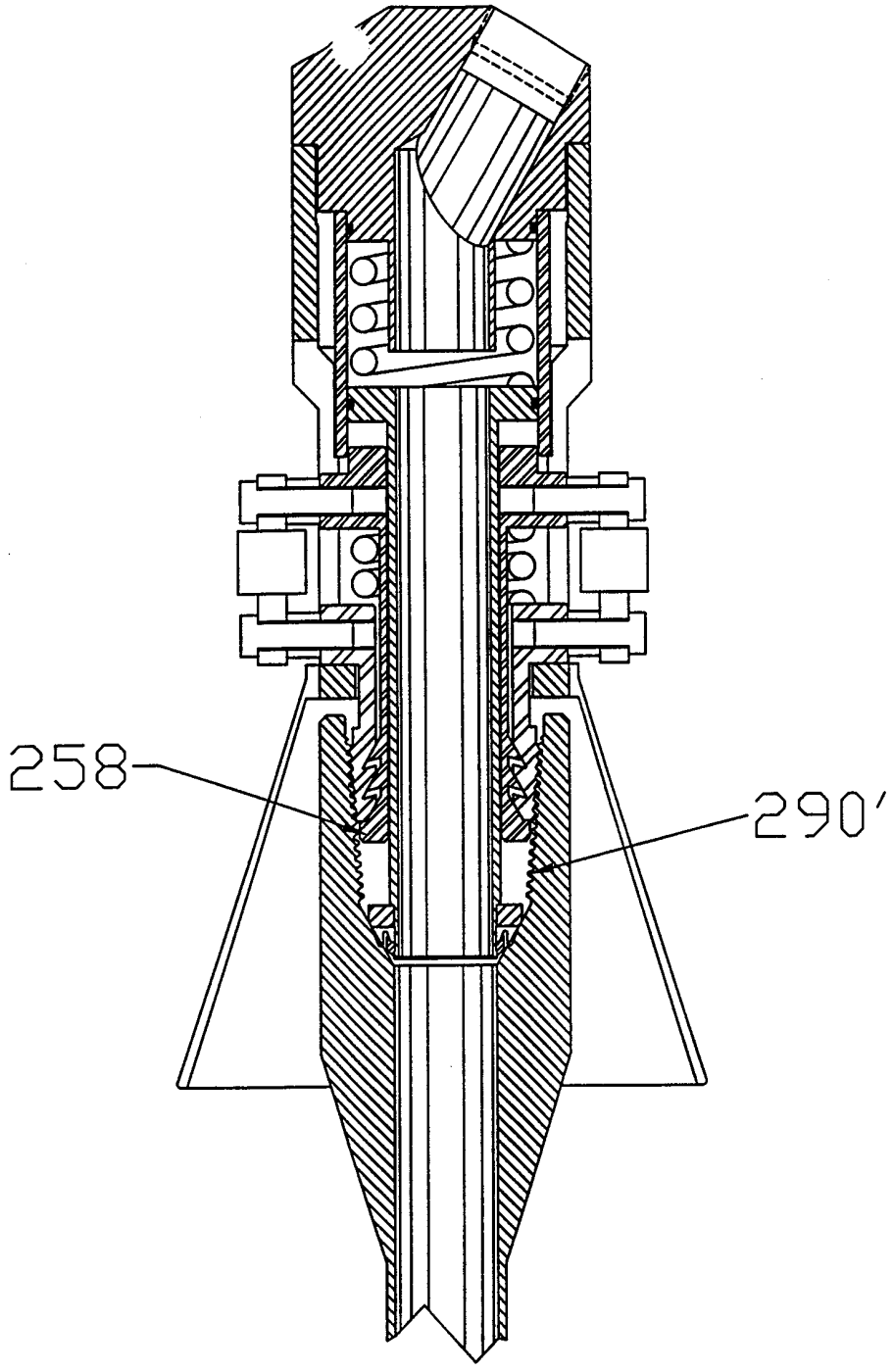

Fig. 42

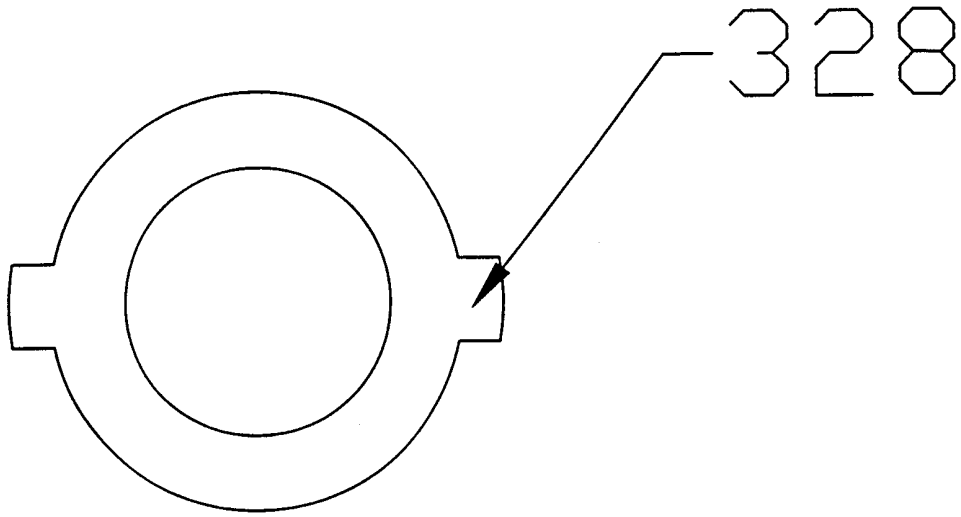

Fig. 43

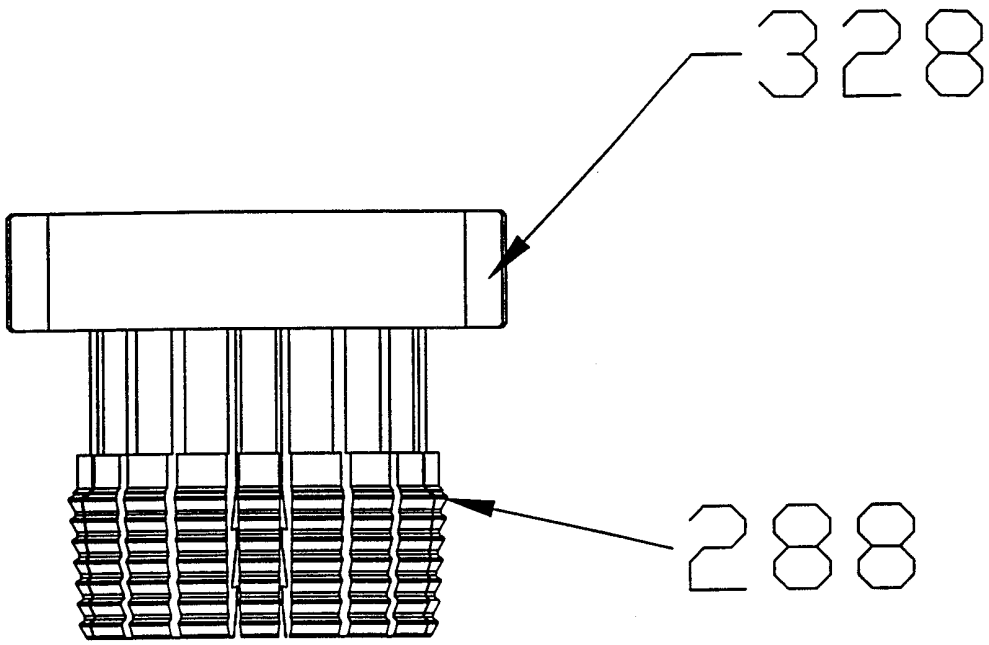

Fig. 44

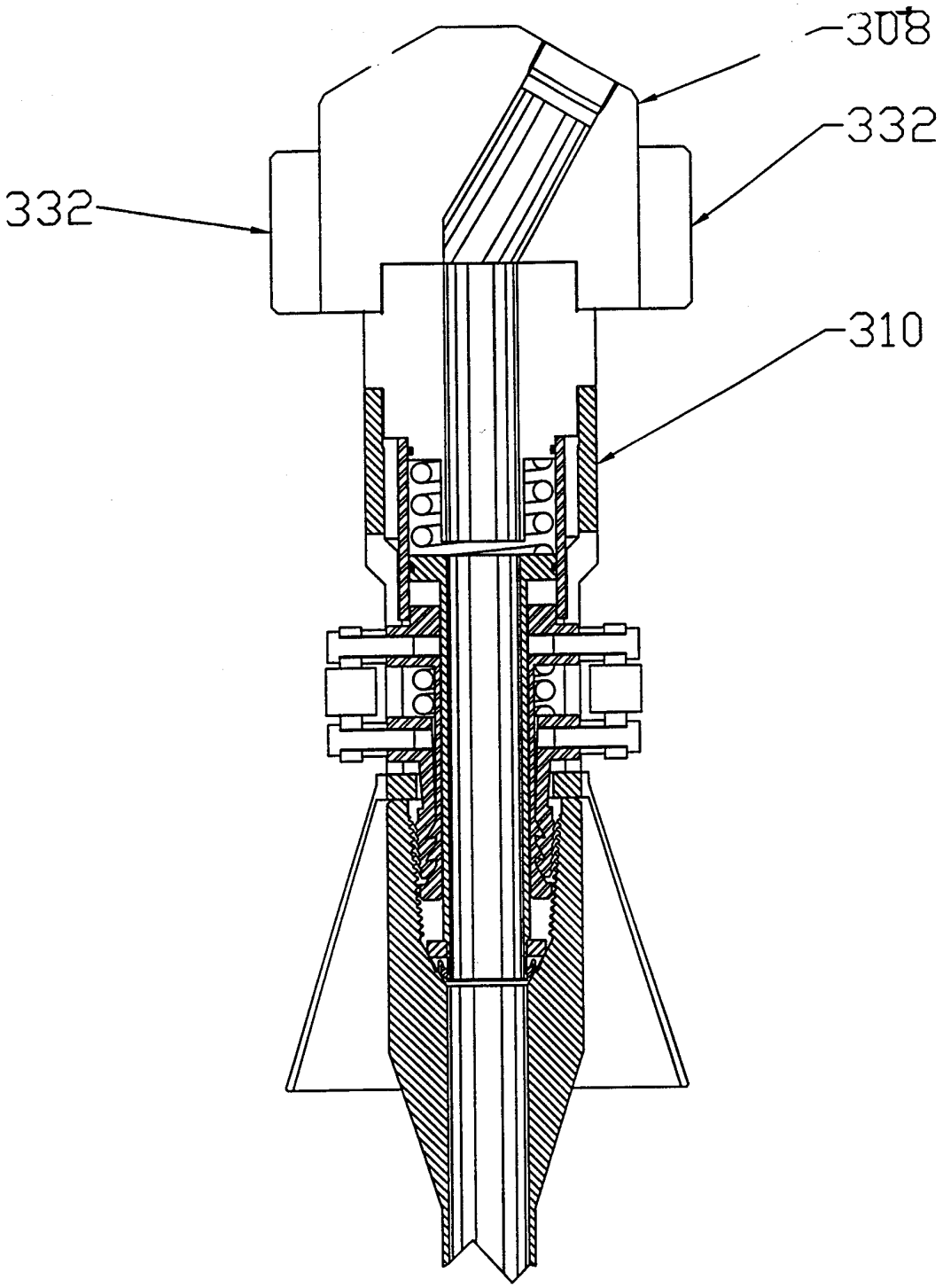

Fig. 45

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/22051

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :E21B 21/01; 17/02; 21/10
US CL :166/77.1; 77.51, 90.1, 242.1

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : Please See Extra Sheet.

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X ------ Y	US 5,682,952 A (STOKLEY) (04 November 1997) (04/11/97), see the entire patent, in particular figures 1-9.	1,2,7,9,10, 26,45 ---------- 4,5,16-21, 23-25
X	WO 93/07358 A (EIANE et al) 15 April 1993 (15/04/93), see Figures 1-4.	1,4,5,9,16,17,18, 19,20, 21,23
Y	US 5,735,348 A (HAWKINS, III) 07 April 1998 (07/04/98), see Figure 3 and column 7, lines 53-67; column 5, line 3-31.	4,5,16-21
A	US 4,111,261 A (OLIVER) 05 September 1978 (05/09/78), see Figures 2A-4.	1-25

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 27 JANUARY 2000	Date of mailing of the international search report 11 FEB 2000
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer HOANG DANG Diane Smith for Telephone No. (703) 308-2168

Form PCT/ISA/210 (second sheet)(July 1992)★

INTERNATIONAL SEARCH REPORT

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4,655,302 A (McCREADIE et al) 07 April 1987 (07/04/87), see Figure 1.	53-59
A	US 5,584,343 A (COONE) 17 December 1996 (17/12/96), see Figures 1-2.	1-25,39-44,53-59
A	US 4,188,050 A (LOCHTE) 12 February 1980 (12/02/80), see Figures 2-23.	1-59
A	US 4,433,725 A (BOWYER) 28 February 1984 (28/02/84), see Figures 2-4.	33-38
A	US 4,100,968 A (DELANO) 18 July 1978 (18/07/78), see Figures 1-5.	50-59
A	US 5,645,131 A (TREVISANI) 08 July 1997 (08/07/97), see Figures 2A-6.	1-25

INTERNATIONAL SEARCH REPORT

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Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

Please See Extra Sheet.

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☒ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.
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B. FIELDS SEARCHED
Minimum documentation searched
Classification System: U.S.

166/77.1, 77.51, 90.1, 242.1, 75.11, 77.52, 85.1, 242.6, 242.7, 332.2, 332.3; 175/207, 211, 218, 321; 285/302, 303, 315, 920

BOX II. OBSERVATIONS WHERE UNITY OF INVENTION WAS LACKING
This ISA found multiple inventions as follows:

This application contains claims directed to more than one species of the generic invention. These species are deemed to lack Unity of Invention because they are not so linked as to form a single inventive concept under PCT Rule 13.1. In order for more than one species to be searched, the appropriate additional search fees must be paid. The species are as follows:

The species of Figures 1-10; the species of Figures 11-21; the species of Figures 22-25; the species of 27-35; the species of Figures 38-39; and the species of Figures 40-45 respectively.

The claims are deemed to correspond to the species listed above in the following manner:

The following claims are generic: 1

The species listed above do not relate to a single inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, the species lack the same or corresponding special technical features for the following reasons: The special technical feature of the first species is the provision of a telescoping member having a seal at the lower end and extendable below the housing or body for sealing contact with the tubular. The special technical feature of the second species is the adjustment mechanism. The special technical feature of the third species is a valve activated by extension or retraction of the telescoping assembly. The special technical feature of the fourth species is the provision of a sleeve rotatably mounted to the body and having an exposed thread and a seal which engages the tubular upon makeup of the thread. The special technical feature of the fifth species is the gripping mechanism on the body actuable to engage the thread in the tubular. The special technical feature of the sixth species is the seal provided on the lower end of the body and insertable into the tubular for selective contact past the threads in the tubular.