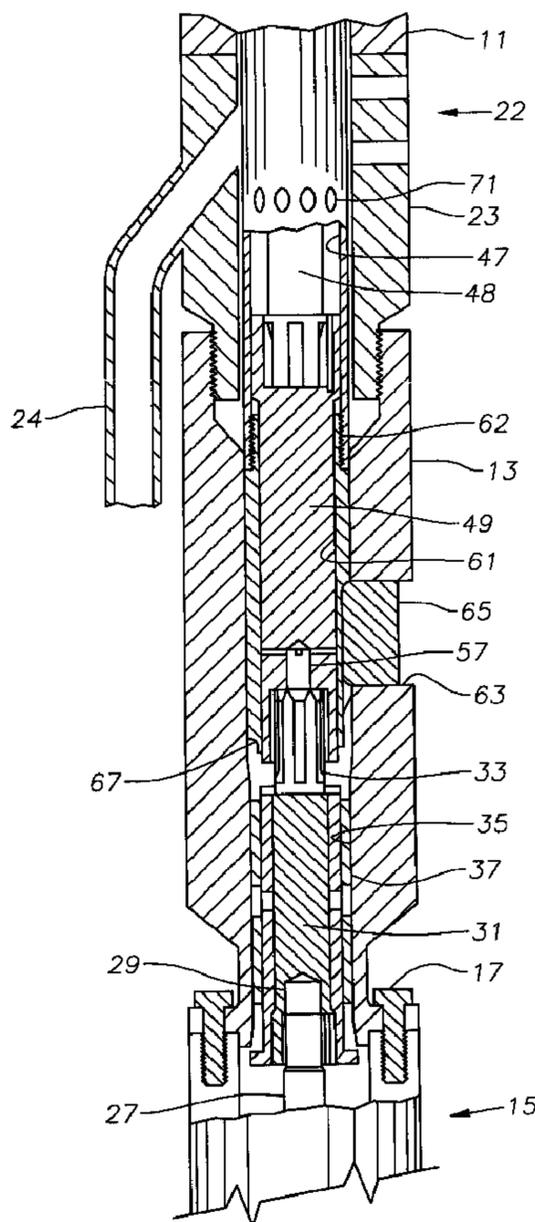




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(54) Titre : RACCORD TUBULAIRE POUR POMPE DE COLONNE DE PRODUCTION
 (54) Title: TUBULAR JUNCTION FOR TUBING PUMP



(57) Abrégé/Abstract:

A well pump assembly has a tubular junction having a main tube and a bypass tube. An electric motor and seal section hang below the tubular junction in the main tube. The motor is powered by a power cable that extends alongside the tubing to the surface. The

(57) **Abrégé(suite)/Abstract(continued):**

motor has an upper end with a drive shaft coupling. The pump for the motor is lowered through the production tubing on a wireline, wire rope or coiled tubing. The pump has a lower end which has a driven shaft coupling that makes up in stabbing engagement with the drive shaft coupling when the pump reaches the motor. The driven shaft coupling includes a guide that slides into a coupling housing. Orientating keys orient the guide and lock it from rotation. The bypass tube of the tubular junction may receive workover tools that are diverted by a wireline tool.

ABSTRACT

1
2 A well pump assembly has a tubular junction having
3 a main tube and a bypass tube. An electric motor and
4 seal section hang below the tubular junction in the main
5 tube. The motor is powered by a power cable that extends
6 alongside the tubing to the surface. The motor has an
7 upper end with a drive shaft coupling. The pump for the
8 motor is lowered through the production tubing on a
9 wireline, wire rope or coiled tubing. The pump has a
10 lower end which has a driven shaft coupling that makes up
11 in stabbing engagement with the drive shaft coupling when
12 the pump reaches the motor. The driven shaft coupling
13 includes a guide that slides into a coupling housing.
14 Orientating keys orient the guide and lock it from
15 rotation. The bypass tube of the tubular junction may
16 receive workover tools that are diverted by a wireline
17 tool.

1 TUBULAR JUNCTION FOR TUBING PUMP

2 Cross-Reference

3 This application claims the benefit of provisional
4 application S.N. 60/107,919 filed 11/10/98.

5 Technical Field

6 This invention relates in general to a hydrocarbon
7 production well, and in particular to a well utilizing a
8 centrifugal pump operated by a submersible electric
9 motor, wherein the pump is retrievable through a main
10 tube of a tubular junction. Wire line tools may be
11 inserted through a bypass tube of the tubular junction.

1 Background Art

2 Electrical submersible well pumps for deep wells are
3 normally installed within casing on a string of tubing.
4 Usually the tubing is made up of sections of pipe screwed
5 together. Coil tubing deployed from a reel may also be
6 used. The motor is supplied with power through a power
7 cable that is strapped alongside the tubing. The pump is
8 typically located above the motor, is connected to the
9 lower end of the tubing, and pumps fluid through the
10 tubing to the surface. One type of a pump is a
11 centrifugal pump using a plurality of stages, each stage
12 having an impeller and a diffuser. Another type of pump,
13 for lesser volumes, is a progressing cavity pump. A
14 progressing cavity pump utilizes a helical rotor that is
15 rotated inside an elastomeric stator that has double
16 helical cavities. The stator is located inside a metal
17 housing.

18 Periodically, the pump assembly must be pulled to
19 the surface for repair or replacement. This involves
20 pulling the tubing, which is time consuming. A workover
21 rig is necessary for production tubing, and a coiled
22 tubing unit is needed to pull coiled tubing. Often, the
23 electrical motor needs no service, rather the service
24 needs to be performed only on the pump. Sometimes the

1 only change needed is to change the size of the pump
2 without changing the size of the motor. However, the
3 motor, being attached to the lower end of the pump, is
4 also pulled along with the tubing. Damage to the power
5 cable is not uncommon when pulling the tubing.

6 Also periodically, well workovers must be performed.
7 In some prior art wells, wire line tools are routed
8 through a main tube of a Y-tool, while the pump assembly
9 is positioned in the bypass tube of the Y-tool. However,
10 in these wells, the motor and pump must be pulled
11 together, thereby subjecting the power cable to damage.

12 Therefore, a pump assembly is needed that permits a
13 pump to be retrieved without pulling the motor, yet
14 allows workover tools to be used for well workovers.

1 Summary of Invention

2 In this invention, the motor is secured to the lower
3 end of the tubing. A power cable to the motor is
4 strapped alongside the tubing. The centrifugal pump,
5 however, is sized to be lowered through the tubing. The
6 pump has a driven shaft extending downward from it that
7 mates with a drive shaft extending upward from the motor.
8 When the pump reaches the motor, the driven shaft will
9 stab into the drive shaft.

10 A special Y-tool or tubular junction is provided
11 having a main leg and an offset leg. The seal section
12 and motor are secured to the main leg, thereby allowing
13 the offset leg of the tubular junction to be used for
14 wireline operations. The tubular junction supports or
15 incorporates an eye and locking apparatus that mates with
16 the bottom of the through tubing conveyed (TTC) pump or
17 intake. The tubular junction incorporates intake
18 passages in the main leg that allow well fluid to access
19 the pump intake.

20 The bypass tube is used for well workovers or other
21 operations which do not require pulling the tubing. It
22 will be necessary to first remove the pump with a quick
23 and inexpensive method such as wireline. After removal
24 of the pump, a wireline-deployed tool may be necessary to

1 divert the workover tools into the bypass tube, because
2 the bypass tube is offset from the production tubing or
3 liner. This wireline tool will have a means of retaining
4 the tool as it lands in position so that the workover
5 tool goes in the correct direction.

6 The upper end of the pump is designed for engagement
7 by a running and retrieving tool. The running and
8 retrieving tool is used to lower the pump through the
9 tubing and retrieve it. The pump may be secured to
10 wireline, wire rope or coiled tubing which inserts
11 through the production tubing. The pump pumps well fluid
12 up through the tubing.

13 When it is desirable to change out or repair the
14 pump, the operator lowers a running tool through the
15 production tubing and latches it to the pump. The
16 operator pulls the pump, leaving the motor in place.
17 Subsequently, the running tool lowers the repaired or
18 replacement pump back through the tubing into engagement
19 with the motor.

20 The electric motor assembly is mounted to a coupling
21 housing which is secured to the lower end of the tubing.
22 The coupling housing has an anti-rotation key within its
23 bore. The drive shaft of the electric motor assembly
24 extends into the coupling housing. The lower end of

1 the pump assembly driven shaft is located within a
2 tubular guide. The guide extends slidingly into the
3 coupling housing as the pump assembly is being
4 lowered. The guide rotatably receives the lower
5 portion of the drive shaft. The guide has an
6 engagement member on its exterior which engages the
7 internal anti-rotation member in the bore of the
8 coupling housing.

9 Accordingly, in one aspect of the present
10 invention there is provided a well pump assembly for
11 mounting to a string of tubing extending into a well,
12 comprising:

13 a tubular junction adapted to be connected to a
14 lower end of the string of tubing, the tubular
15 junction having a main tube and a bypass tube that
16 branches off of the main tube from said junction;

17 a motor coaxial with the main tube of the tubular
18 junction, the motor having a drive shaft;

19 a pump having a driven shaft that releasably
20 couples to the drive shaft, the pump being capable of
21 being lowered into and retrieved through the string of
22 tubing; and

23 wherein the bypass tube is capable of receiving
24 tools lowered from the surface through the string of
25 tubing.

26 According to another aspect of the present
27 invention there is provided a well pump assembly,
28 comprising in combination:

29 a string of tubing adapted to extend into a well;

1 a tubular junction connected to a lower end of
2 the string of tubing, the tubular junction having a
3 main tube that is coaxial with the string of tubing
4 and a bypass tube that branches off of the main tube
5 from the junction;

6 the main tube having a coupling housing located
7 below the junction of the main tube and the bypass
8 tube;

9 a motor mounted to the coupling housing, the
10 motor having a drive shaft with an upper end that
11 extends into the coupling housing;

12 a pump having a housing and a driven shaft with a
13 lower end that releasably stabs into engagement with
14 the upper end of the drive shaft, the pump having a
15 lesser outer diameter than an inner diameter of the
16 string of tubing and being capable of being lowered
17 into and retrieved through the string of tubing while
18 the motor remains mounted to the coupling housing;

19 an anti-rotation member in the main tube; and
20 an anti-rotation member on the pump that engages
21 the anti-rotation member in the main tube to prevent
22 rotation of the housing of the pump;

23 the tubular junction being perforated to admit
24 well fluid to the pump; and

25 wherein the upper end of the drive shaft of the
26 motor is located below the junction of the main tube
27 and the bypass tube to enable tools to be lowered from
28 the surface through the string of tubing.

29 According to yet another aspect of the present

1 invention there is provided a method of installing and
2 operating a submersible pump in a well and conducting
3 an auxiliary operation in the well, comprising the
4 steps of:

5 (a) mounting a pump motor that has a drive shaft
6 coaxial to a main tube of a tubular junction, the
7 tubular junction having a bypass tube joining the main
8 tube at a junction;

9 (b) securing the tubular junction to a string of
10 tubing with the main tube coaxial with the string of
11 tubing, and lowering the string of tubing, tubular
12 junction, and pump motor into the well; then

13 (c) lowering a pump assembly through the string
14 of tubing until a driven shaft of the pump assembly
15 stabs into engagement with the drive shaft of the
16 motor; then

17 (d) providing power to the motor and rotating
18 the pump assembly, thereby pumping well fluid through
19 the string of tubing; then, to perform an auxiliary
20 operation,

21 (e) retrieving the pump through the string of
22 tubing while leaving the motor mounted to the main
23 tube; then

24 (f) lowering a line through the string of tubing
25 and through the bypass tube and performing the
26 auxiliary operation with the line.

1 Brief Description of Drawings

2 Figure 1 is a partially exploded schematic view of
3 a pump system in accordance with this invention.

4 Figure 2 is an enlarged sectional view, of the
5 tubular junction and area surrounding the pump/motor
6 interface of the invention of Figure 1. Figure 3 is
7 an enlarged sectional view, of the tubular junction and
8 area surrounding the pump/motor interface of the
9 invention of Figure 1, wherein the pump and motor are
10 disengaged. Figure 4 is a sectional view of a stage of
11 a centrifugal pump used in one embodiment of the
12 invention.

1 Best Mode for Carrying Out the Invention

2 Referring to Figures 1, 2, and 3, a string of
3 production tubing 11 extends from the surface into a
4 cased well (not shown). Production tubing 11 is a
5 conduit made up of sections of pipe, for example four
6 inches in diameter, screwed together. Alternatively,
7 production tubing 11 may be coiled tubing. A coupling
8 housing 13 is located at and forms the lower end of
9 tubing 11. Coupling housing 13 is a tubular member with
10 approximately the same diameter as tubing 11 and is
11 preferably connected to the tubing by threads.

12 An electric motor assembly 15 is secured to coupling
13 housing 13 by bolts 17. Motor assembly 15 includes a
14 seal section 19, and optionally a gear reducer 20, which
15 is mounted to an A.C. electric motor 21 (Fig. 1). Seal
16 section 19 equalizes hydrostatic pressure with pressure
17 of lubrication in the motor and seals around the drive
18 shaft extending from the motor 21. Seal section 19 is of
19 a conventional design.

20 Tubular junction, such as Y-tool 22 has a main
21 tube 23 and a bypass tube 24. Bypass tube 24 joins main
22 tube 23 above seal section 19. A three-phase power cable
23 25 connects to motor 21 and extends alongside tubing 11

1 to the surface for delivering power. Motor 21 typically
2 operates at about 3600 rpm, which is reduced by gear
3 reducer 20 to a lower speed if a gear reducer is
4 employed. Seal section 19 seals well fluid from the
5 interior of motor 21 and also equalizes pressure
6 differential between lubricant in motor 21 and the
7 exterior.

8 As shown in Figures 2 and 3, a drive shaft 27
9 extends upward from and is driven by motor 21. Drive
10 shaft 27 extends through seal section 19 and has a
11 splined end 29 which mates with a drive shaft coupling
12 31. Drive shaft coupling 31 is a short shaft that forms
13 the upper end of drive shaft 27. Drive shaft coupling 31
14 has a splined upper end 33 and is carried within bore 35
15 of coupling housing 13. Drive shaft coupling 31 is
16 rotatably supported within bore 35 by bushings 37.

17 Referring again to Figure 1, a pump 39 is driven by
18 motor 21. Pump 39 may be a progressing cavity pump, or
19 a centrifugal pump. A progressing cavity pump has a
20 metal rotor which has an exterior helical configuration.
21 The rotor orbitally rotates within an elastomeric stator.
22 The stator has double helical cavities located along its
23 axis through which the rotor rotates. Gear reducer 20 is
24 used if pump 39 is a progressive cavity pump.

1 Pump 39 may also be a centrifugal pump having a
2 plurality of stages 40 (Fig 4). A conventional
3 centrifugal pump stage 40 includes an impeller 41 having
4 a hub 42, a top shroud 43, and a bottom shroud 44. Pump
5 stage 40 additionally includes a diffuser 45 having a
6 diffuser bore 46. If pump 39 is a centrifugal pump, a
7 gear reducer 20 will not be used.

8 Tubular housing 47 is secured to a lower end of pump
9 39 and may be considered a part of pump 39. A metal
10 shaft 48 is located within housing 47. If pump 39 is a
11 progressing cavity pump, shaft 48 is flexible and orbits
12 at its upper end and rotates in pure rotation at its
13 lower end. Shaft 48 is connected on its upper end to
14 pump 39 and may be considered a part of a driven shaft of
15 pump 39.

16 Shaft 48 has a driven shaft coupling 49 on its lower
17 end. Driven shaft coupling 49 may be secured to shaft 48
18 by a pin (not shown). Driven shaft coupling 49 is a
19 solid cylindrical member which has a cavity on its lower
20 end containing a sleeve or receptacle 53 (Figure 3)
21 having splines (not shown) therein. Receptacle 53 has an
22 upward extending shank 57 to secure receptacle 53 within
23 the cavity of drive shaft coupling 49 by means of a pin.

1 Receptacle 53 mates slidably with splined upper end 33
2 of drive shaft coupling 31.

3 A guide 61 surrounds driven shaft coupling 49.
4 Guide 61 is a tubular member or sleeve having an outer
5 diameter for close reception within bore 35 of coupling
6 housing 13. Guide 61 has a bore through it which
7 rotatably receives driven shaft coupling 49. Guide 61
8 has threads 62 on its upper end which secure guide 61 to
9 shaft housing 47. Guide 61 also has three elongated
10 slots 63 (only one shown) on its exterior spaced 120°
11 apart. Slots 63 are sized to mate with three keys 65.
12 Keys 65 are stationarily mounted to coupling housing 13
13 and protrude radially inward into bore 35. Keys 65 are
14 also 120° apart from each other and serve to prevent
15 rotation of guide 61 in coupling housing 13.

16 Guide 61 has a tapered nose 67 for orienting and
17 mating slots 63 with keys 65 when pump 39 is lowered into
18 engagement with motor assembly 15. Preferably, there are
19 three tapered surfaces on nose 67. Each tapered surface
20 extends upward and leads to one of the slots 63.

21 Referring again to Figure 1, well fluid for pump 39
22 is drawn through perforations 71 in tubing 11 below pump
23 39 and through perforations 73 in tubular housing 47. A
24 packing sleeve 75 is positioned on an upper end of pump

1 39, sealing the housing of pump 39 to the interior of
2 tubing 11. Packing sleeve 75 preferably has a GS
3 fishing neck and packing bore thereon. V-type packing 77
4 is positioned within packing sleeve 75. Packing 77
5 isolates the intake of pump 39 from its discharge. A
6 check valve 79 is positioned above V-type packing 77. A
7 tubing joint or sand tube 81 is provided to collect sand
8 in the well bore. V-type packing 77 seals off sand tube
9 81 to discharge from pump 39. A second packing sleeve 83
10 is positioned above sand tube 81. Second packing sleeve
11 83 preferably has a GS fishing neck and packing bore
12 therein. Second V-type packing 85 is positioned above
13 packing sleeve 83 to seal off sand tube 81. Tubing
14 packoff 87 is provided proximate V-type packing 85.
15 Tubing packoff 87 preferably has a GS fishing neck and a
16 rubber element. Tubing stop 89 is frictionally fit into
17 the top of tubing packoff 87. Tubing stop 89 has slips
18 to stop any upward movement of pump 39. A full open
19 flapper valve or retrievable flapper valve assembly 91
20 may be provided instead of a surface lubricator.

21 In operation, during initial installation, the
22 operator will connect motor assembly 15 together
23 including gear reducer 20 and seal section 19. The
24 operator connects motor assembly 15 to coupling housing

1 13, and connects coupling housing 13 to the lower end of
2 a string of tubing 11. The operator then lowers the
3 string of tubing 11 into the well to its desired depth.
4 Power cable 25 is strapped alongside tubing 11 as tubing
5 11 is lowered into the well.

1 The operator then makes up the pump assembly
2 including pump 39, tubular housing 47, packing sleeve 75,
3 v-type packing 77, check valve 79, tubing joint 81,
4 packing sleeve 83, v-type packing 85, tubing packoff 87,
5 tubing stop 89 and flapper valve 91 unless it was
6 previously installed. The operator latches the pump
7 assembly to a running tool (not shown). The running tool
8 is fastened to a line, which may be wireline, wire rope
9 or coiled tubing. The operator lowers the pump assembly
10 through tubing 11. Figure 3 shows guide 61 shortly
11 before it stabs into engagement with drive shaft coupling
12 31. Tapered surfaces on tapered nose 67 of guide 61 will
13 contact keys 65 and rotate guide 61 an amount necessary
14 to orient slots 63 with keys 65. Receptacle 53 will
15 slide over splined upper end 33, engaging pump 39 with
16 motor 26.

17 The operator supplies power to power cable 25, which
18 causes motor 21 to rotate, which in turn rotates shaft 48
19 and impellers 41 of a centrifugal pump or a rotor for a
20 progressing cavity pump. Well fluid is drawn in through
21 intake perforations 71 and 73. Well fluid pumps out of
22 the upper end of pump 39 and flows upward through
23 production tubing 11 to the surface.

1 When it is desired to change out pump 39 for repairs
2 or otherwise, the operator lowers a running tool on a
3 line back into engagement with the pump assembly. Pump
4 39 will move upward, bringing along with it shaft 48 and
5 guide 61 as illustrated in Figure 3. Motor 21 will
6 remain in place as the operator pulls the pump assembly
7 to the surface. The operator replaces or repairs the
8 pump assembly and reinstalls it in the same manner as
9 described. When it is necessary to run workover tools
10 into the well bore or to perform other downhole
11 operations, a wireline tool may be used to direct the
12 tools into the bypass leg 24 of the tubular junction 22.
13 Pump 39 must be removed to gain access to bypass leg 24.
14 Then a kickover tool (not shown) will be landed next to
15 the entrance of bypass leg 24. Wireline tools then may
16 be lowered through tubing 11 and down bypass tube 24.
17 The wireline tool can be lowered below tubular junction
18 22 into the casing.

19 The invention has significant advantages. By
20 leaving motor 21 in place and retrieving only pump 39,
21 the operation to change out pump 39 is much faster. In
22 the case of production tubing, a workover rig need not be
23 employed for pulling the tubing. Damage to power cable
24 25 is avoided as the production tubing will remain in

1 place. Reducing the expense of changing out pump 39
2 reduces the cost of using a pump of this nature in the
3 well. Guide 61 readily orients and stabs the lower end
4 of pump 39 into engagement with drive shaft coupling 31.
5 By positioning pump 39 in main tube 23 of tubular
6 junction 22, rather than in bypass tube 24 of tubular
7 junction 22, pump 39 may be disengaged from motor 21 for
8 change-out or repair. A wireline tool may be used to
9 divert workover tools into bypass tube 24 to enable
10 wireline operations without pulling the tubing.

11 The use of the tubular junction is advantageous for
12 use in 9 5/8 inch casing with pull/run and/or lost
13 production costs. The pump and intake, which are subject
14 to wear due to the well fluid, can be inexpensively
15 changed out as a preventative maintenance measure. Pumps
16 can be frequently evaluated and repaired to avoid damage
17 to the seal section and motor. The seal section can have
18 a hardened bearing installed in the top end to extend its
19 life after moderate pump radial wear. Additionally, the
20 seal section, motor and cable will have a much longer
21 useful life. Pull/run and lost production costs can also
22 be greatly reduced.

23 While the invention has been shown in only one of
24 its forms, it should be apparent to those skilled in the

1 art that it is not so limited but is susceptible to
2 various changes without departing from the scope of the
3 invention. For example, although the junction is shown
4 below the pump intake, it could be above the pump
5 discharge. Further, the pump could be a progressing
6 cavity type rather than a centrifugal type.

1 We claim:

2 1. A well pump assembly for mounting to a string of
3 tubing extending into a well, comprising:

4 a tubular junction adapted to be connected to a
5 lower end of the string of tubing, the tubular junction
6 having a main tube and a bypass tube that branches off of
7 the main tube from said junction;

8 a motor coaxial with the main tube of the tubular
9 junction, the motor having a drive shaft;

10 a pump having a driven shaft that releasably couples
11 to the drive shaft, the pump being capable of being
12 lowered into and retrieved through the string of tubing;
13 and

14 wherein the bypass tube is capable of receiving
15 tools lowered from the surface through the string of
16 tubing.

17 2. The well pump assembly according to claim 1 wherein
18 an upper end of the drive shaft of the motor is located
19 below said tubular junction.

20 3. The well pump assembly according to claim 1 wherein
21 said bypass tube receives said tools while said pump is
22 removed from the string of tubing.

1 4. The well pump assembly according to claim 1 wherein
2 the pump extends above the junction when the driven
3 shaft is coupled to the drive shaft of the motor, thereby
4 blocking access to the bypass tube.

5 5. The well pump assembly according to claim 1 wherein
6 the main tube of the tubular junction is perforated to
7 allow well fluids to flow to the pump.

8 6. The well pump assembly according to claim 1 wherein
9 the pump is a centrifugal pump.

10 7. The well pump assembly according to claim 1 wherein
11 the pump is a progressive cavity pump.

12 8. The well pump assembly according to claim 1 wherein
13 the main tube of the tubular junction is adapted to be
14 in axial alignment with the string of tubing.

15 9. The well pump assembly according to claim 1 further
16 comprising:

17 a coupling housing on a lower end of the main tube
18 of the tubular junction, the coupling housing having a
19 bore therein;

1 a guide located on a lower end of the pump,
2 surrounding a lower end of the driven shaft and
3 releasably received within the bore of the coupling
4 housing, the guide having at least one elongated slot on
5 its exterior; and

6 a key stationarily mounted to the coupling housing
7 that protrudes radially inward into the bore and engages
8 the elongated slot on the guide to prevent rotation of
9 the guide within the bore of the coupling housing.

10 10. The well pump assembly according to claim 9 wherein
11 the guide has a tapered nose to orient the slot with the
12 key.

13 11. The well pump assembly according to claim 1 further
14 comprising:

15 a coupling housing on a lower end of the main tube
16 of the tubular junction, the coupling housing having a
17 bore therein;

18 a guide located on a lower end of the pump,
19 surrounding a lower end of the driven shaft and
20 releasably received within the bore of the coupling
21 housing, the guide having at least one elongated slot on
22 its exterior;

1 a shaft coupling secured to a lower end of the
2 driven shaft having a receptacle on a lower end for
3 engaging an upper end of the drive shaft of the motor;
4 and

5 a key stationarily mounted to the coupling housing
6 that protrudes radially inward into the bore and engages
7 the elongated slot on the guide to prevent rotation of
8 the guide within the bore of the coupling housing.

9 12. The well pump assembly according to claim 11 wherein
10 the guide has a tapered nose to orient the slot with the
11 key.

1 13. A well pump assembly, comprising in combination:

2 a string of tubing adapted to extend into a well;

3 a tubular junction connected to a lower end of the
4 string of tubing, the tubular junction having a main tube
5 that is coaxial with the string of tubing and a bypass
6 tube that branches off of the main tube from the
7 junction;

8 the main tube having a coupling housing located
9 below the junction of the main tube and the bypass tube;

10 a motor mounted to the coupling housing, the motor
11 having a drive shaft with an upper end that extends into
12 the coupling housing;

13 a pump having a housing and a driven shaft with a
14 lower end that releasably stabs into engagement with the
15 upper end of the drive shaft, the pump having a lesser
16 outer diameter than an inner diameter of the string of
17 tubing and being capable of being lowered into and
18 retrieved through the string of tubing while the motor
19 remains mounted to the coupling housing;

20 an anti-rotation member in the main tube; and

21 an anti-rotation member on the pump that engages the
22 anti-rotation member in the main tube to prevent rotation
23 of the housing of the pump;

24 the tubular junction being perforated to admit well
25 fluid to the pump; and

1 wherein the upper end of the drive shaft of the
2 motor is located below the junction of the main tube and
3 the bypass tube to enable tools to be lowered from the
4 surface through the string of tubing.

5 14. The well pump assembly according to claim 13 wherein
6 said tools are lowered from the surface through said
7 bypass tube while the pump is removed from said string of
8 tubing.

9 15. The well pump assembly according to claim 13 wherein
10 the pump extends above the junction of the main tube and
11 the bypass tube when the driven shaft is in engagement
12 with the drive shaft of the motor.

13 16. The well pump assembly according to claim 13
14 wherein the pump is a centrifugal pump.

15 17. The well pump assembly according to claim 13 wherein
16 the pump is a progressive cavity pump.

17 18. The well pump assembly according to claim 13 further
18 comprising:

1 a guide located on a lower end of the pump,
2 surrounding a lower end of the driven shaft and
3 releasably received within the coupling housing;

4 wherein the anti-rotation member on the pump
5 comprises at least one elongated slot on an exterior of
6 the guide; and

7 the anti-rotation member in the tubular junction
8 comprises a key stationarily mounted to the coupling
9 housing that protrudes radially inward into the coupling
10 housing and engages the elongated slot on the guide to
11 prevent rotation of the guide.

12 19. The well pump assembly according to claim 18 wherein
13 the guide has a tapered nose to orient the slot with the
14 key.

15 20. A method of installing and operating a submersible
16 pump in a well and conducting an auxiliary operation in
17 the well, comprising the steps of:

18 (a) mounting a pump motor that has a drive shaft
19 coaxial to a main tube of a tubular junction, the tubular
20 junction having a bypass tube joining the main tube at a
21 junction;

22 (b) securing the tubular junction to a string of
23 tubing with the main tube coaxial with the string of

1 tubing, and lowering the string of tubing, tubular
2 junction, and pump motor into the well; then

3 (d) lowering a pump assembly through the string of
4 tubing until a driven shaft of the pump assembly stabs
5 into engagement with the drive shaft of the motor; then

6 (e) providing power to the motor and rotating the
7 pump assembly, thereby pumping well fluid through the
8 string of tubing; then, to perform an auxiliary
9 operation,

10 (f) retrieving the pump through the string of tubing
11 while leaving the motor mounted to the main tube; then

12 (g) lowering a line through the string of tubing and
13 through the bypass tube and performing the auxiliary
14 operation with the line.

15 21. The method according to claim 20, wherein the step
16 (g) further comprises:

17 placing a kickover tool at the junction of the main
18 tube and the bypass tube; then

19 directing the line into the bypass tube with the
20 kickover tool.

21 22. The method according to claim 20, further
22 comprising:

23 removing the line from the string of tubing; and

1 lowering the pump assembly back through the string
2 of tubing into operative engagement with the motor.

3 23. The method according to claim 20, wherein step (a)
4 comprises positioning an upper end of the drive shaft
5 below the junction of the main tube with the bypass tube.

6 24. The method according to claim 20, wherein step (d)
7 further comprises preventing rotation of a housing of the
8 pump assembly relative to the tubular junction.

9 25. The method according to claim 20, wherein step (e)
10 comprises drawing the well fluid through perforations
11 provided in the tubular junction.

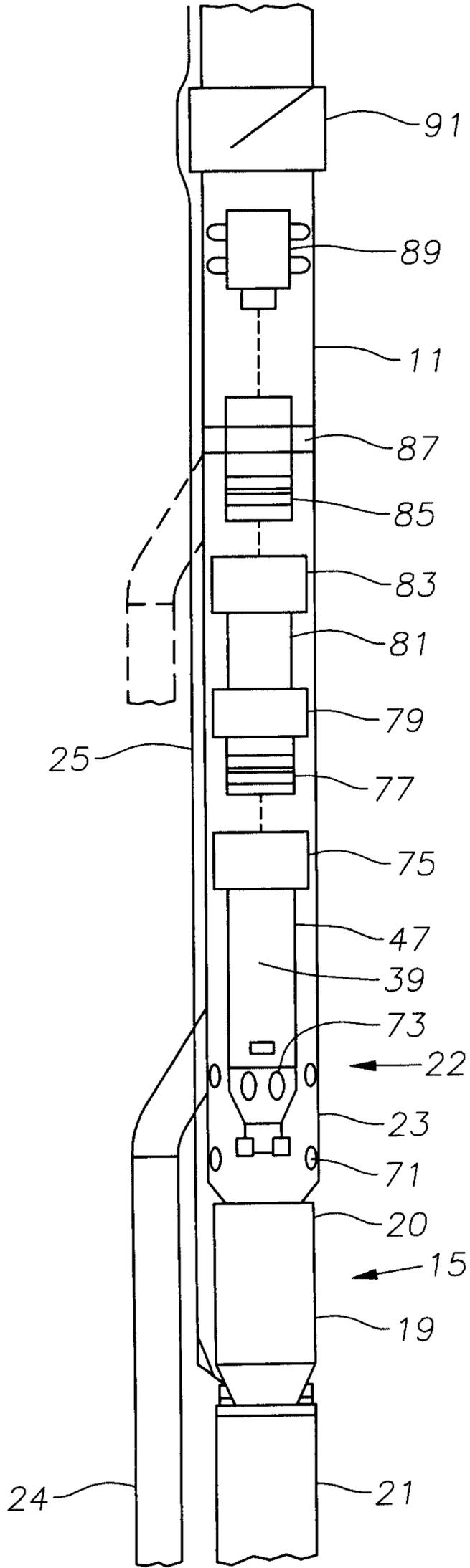


Fig. 1

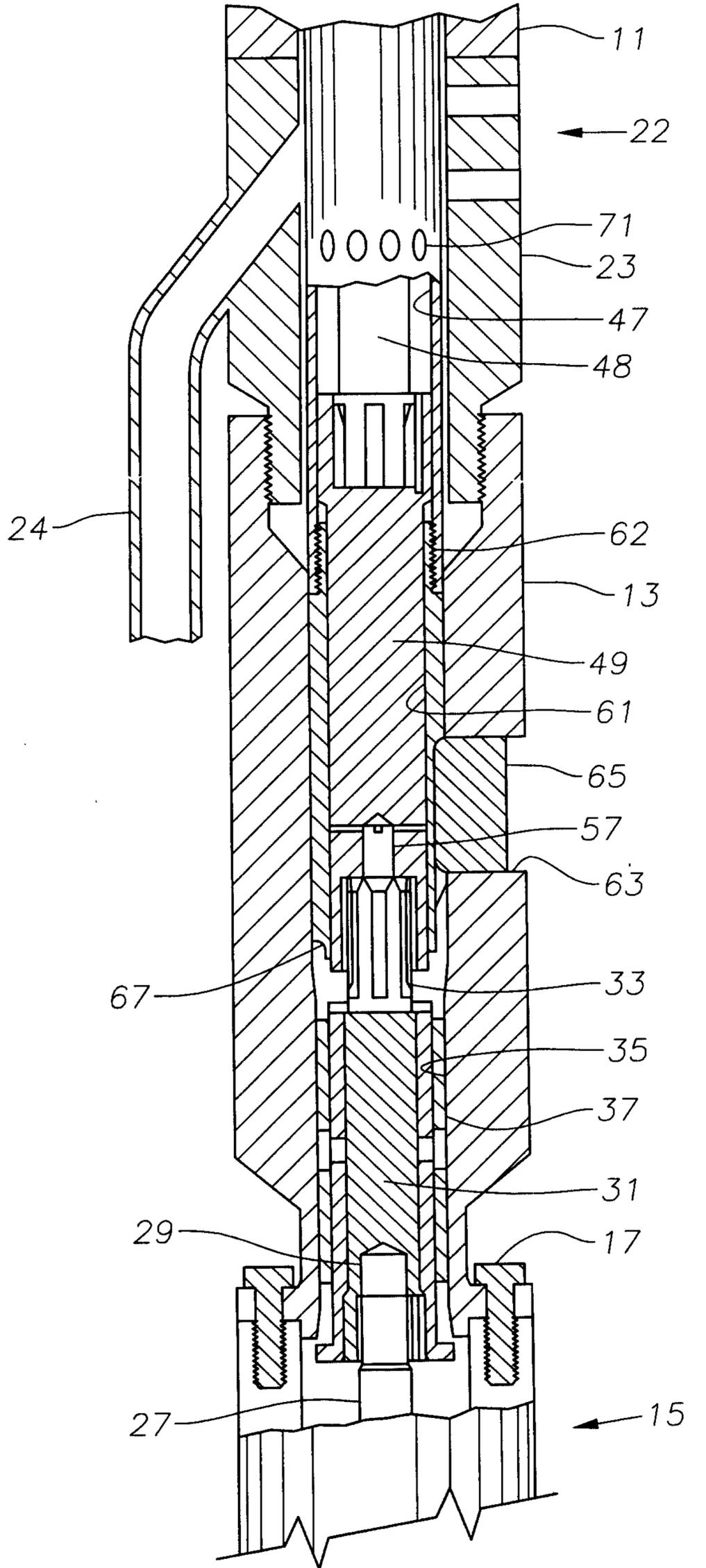


Fig. 2

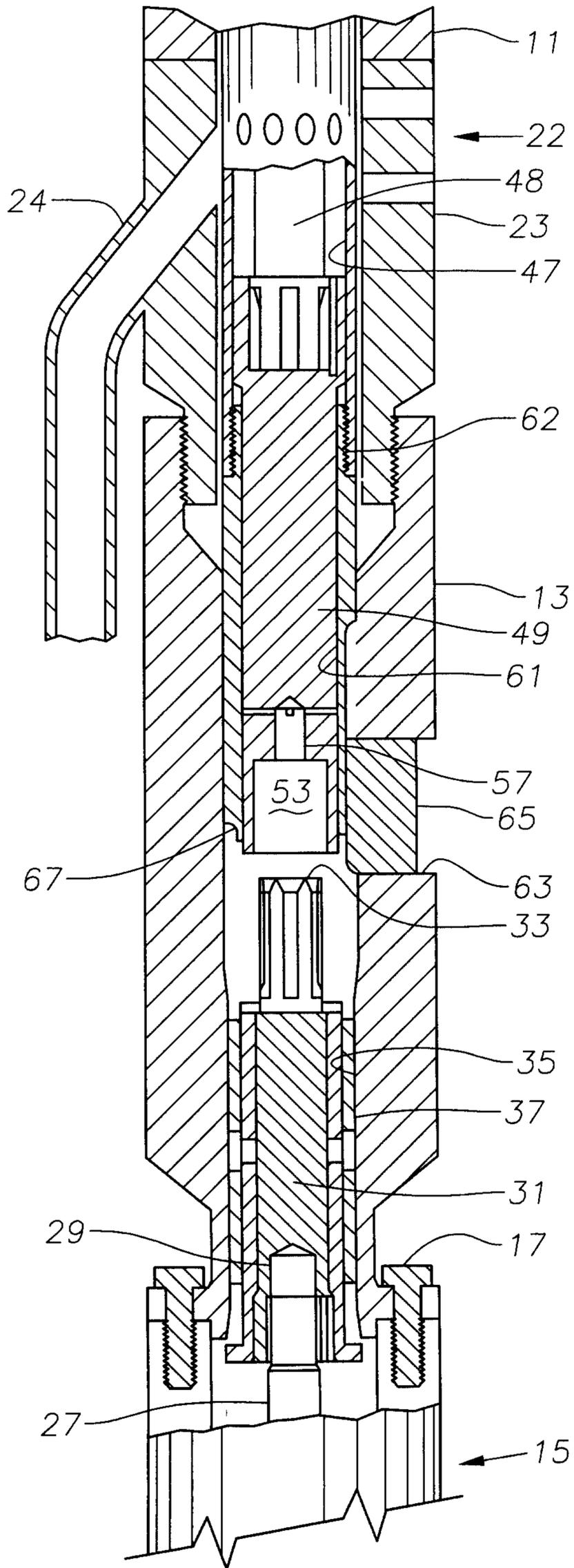


Fig. 3

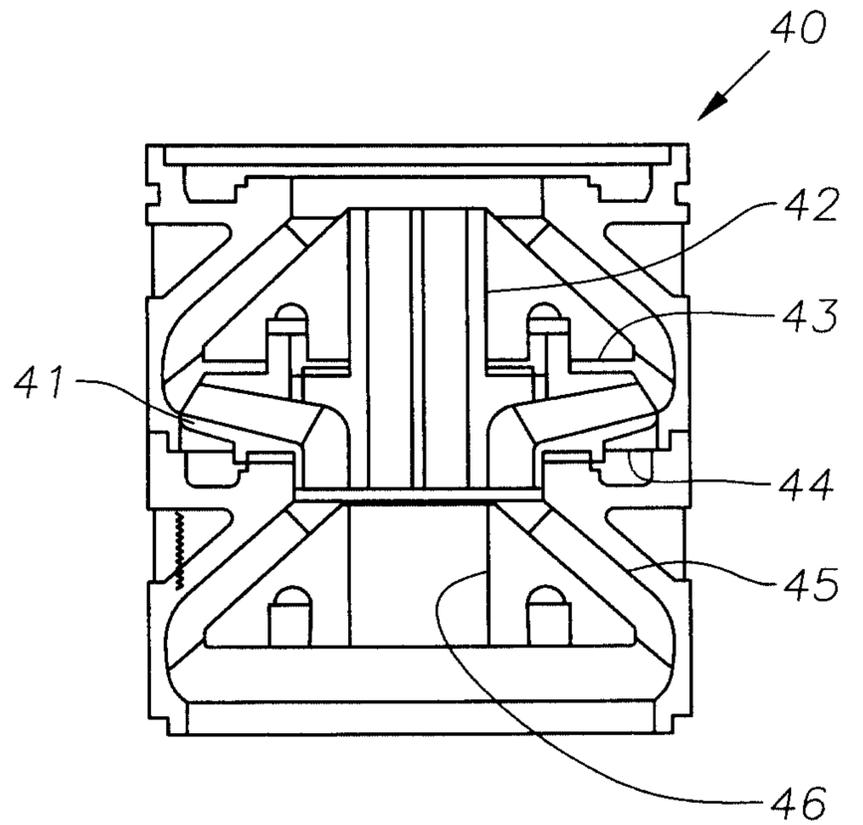


Fig. 4

