(12) PATENT
(19) AUSTRALIAN PATENT OFFICE

(11) Application No. **AU 200021944 B2**
(10) Patent No. **749874**

(54) Title
Tube coupling

(51)[7] International Patent Classification(s)
F16L 037/084 **F16L 037/092**

(21) Application No: **200021944** (22) Application Date: **1999.12.17**

(87) WIPO No: **WO00/36327**

(30) Priority Data

(31) Number	(32) Date	(33) Country
09/216376	**1998.12.18**	**US**
09/425909	**1999.10.21**	**US**

(43) Publication Date : **2000.07.03**
(43) Publication Journal Date : **2000.08.31**
(44) Accepted Journal Date : **2002.07.04**

(71) Applicant(s)
Accor Technology, Inc.

(72) Inventor(s)
Jerry E. O'Neill; Charlie Whitney

(74) Agent/Attorney
DAVIES COLLISON CAVE,1 Little Collins Street,MELBOURNE VIC 3000

(56) Related Art
GB 2280006
GB 1520150
WO 97/03314

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

21944/00

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 :
F16L 37/084, 37/092

A1

(11) International Publication Number: WO 00/36327

(43) International Publication Date: 22 June 2000 (22.06.00)

(21) International Application Number: PCT/US99/30149

(22) International Filing Date: 17 December 1999 (17.12.99)

(30) Priority Data:

09/216,376	18 December 1998 (18.12.98)	US
09/425,909	21 October 1999 (21.10.99)	US

(71) Applicant *(for all designated States except US)*: ACCOR TECHNOLOGY, INC. [US/US]; Suite 210W, 1800 – 112th Avenue N.E., Bellevue, WA 98004 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: O'NEILL, Jerry, E. [US/US]; 221 – 7th Avenue South, Kirkland, WA 98033 (US). WHITNEY, Charlie [US/US]; P.O. Box 331, Rock Island, WA 98850 (US).

(74) Agents: BAYNHAM, Robert, J. et al.; Seed and Berry LLP, Suite 6300, 701 Fifth Avenue, Seattle, WA 98104-7092 (US).

(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published

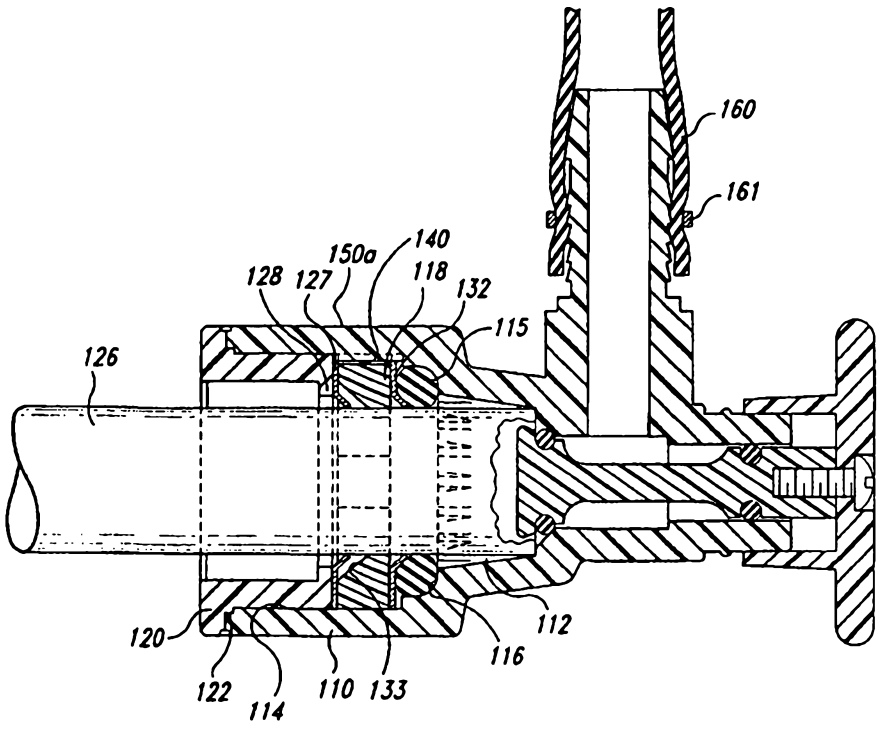
With international search report.

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: TUBE COUPLING

(57) Abstract

A fluid coupling having an outer housing (10) with an internal bore (12), an O-ring (15) fitted within the bore (12), a spacer bushing (18) fitted against the O-ring, a gripper ring (27) fitted against the axially outer side of the spacer ring (18), the gripper ring (27) having axially and radially inwardly protruding circumferentially spaced gripping teeth (29), the teeth (29) arranged for providing a twist when subjected to simultaneous rearward axial and rotational forces, and an end bushing (20) holding the gripper ring (27), spacer bushing (18), and O-ring (15) within the outer housing (10). A fluid coupling having an outer housing (10) with internal bore (12), an O-ring seal (15) fitted within the bore (12), a spacer bushing (18) fitted against the seal (15), a first gripper ring (127) fitted against the axially outer side of the spacer ring, a second gripper ring (132) fitted against the O-ring seal, the gripper rings (127, 132) having axially and radially inwardly protruding circumferentially spaced gripping teeth (29), in one embodiment the teeth (29) arranged for providing a twist when subjected to simultaneous rearward axial and rotational forces, and an end bushing (18) holding the gripper rings (127, 132), spacer Bushing (18), and O-ring (15) within the outer housing (10).



TUBE COUPLING

This invention pertains to removable couplings of the type for securing a plastic or copper tube by pressing on the tube without the need for welding or solder.

U.S. Patent No. 4,911,406 shows a tube coupling in which a metal or plastic tube can be coupled in a fluid-tight connection to a valve or the like simply by pressing the tube into the coupling. The tube is held into the coupling by a flexible gripper ring having teeth, which bite into the tube to prevent the tube from being pushed out by the fluid pressure in the coupling. The teeth are arranged such that the tube can be removed from the coupling by unscrewing the coupling but cannot be removed simply by axially pulling the tube without rotation of the tube. An O-ring seal is provided to prevent leakage of fluid outside of the coupling around the tube.

One of the advantages of the invention of the patent 4,911,406 is that by screwing the tube out of the gripper ring there is minimal damage to the surface of the tube. This then enables other advantageous arrangements of the seal and the gripper ring within the coupling.

With the introduction of softer plastic tubing, such as, polybutylene or PEX [cross-linked polyethylene, plastic] to the plumbing industry, the demands on the holding power of the gripper ring have increased. The softer tubing material can cause the teeth of the gripper ring to gouge grooves in the tubing when the tubing is subjected to high numbers of repeated cycles at higher hydrostatic pressures.

Accordingly, one aspect of the invention provides a fluid conduit coupling for removably holding a tube therein comprising:

an outer housing having an internal bore with a circumferential side wall,

a seal support surface in said bore,

a seal engaged in said support surface,

at least one spacer bushing retaining said seal in said support surface, said spacer bushing having an axially inner side and an axially outer side, said seal positioned axially inward of said spacer bushing, and

a gripper ring having radially and axially inwardly protruding circumferentially spaced gripper teeth having inner edges protruding inwardly into said internal bore, said gripper ring lying adjacent said axially outer side of said spacer bushing, said gripper ring held in said outer housing to preclude rotational movement of said gripper ring, and

said spacer bushing being secured in said internal bore, wherein

said spacer bushing has circumferentially spaced grooves, said gripper teeth of said gripper ring are aligned and fitted with said grooves, with said grooves causing friction on one edge of said teeth allowing said teeth to twist and the tube screw out of said gripper ring.

Another aspect of the invention provides a fluid conduit coupling for removably holding a member therein comprising:

an outer housing having an internal bore with a circumferential side wall,

a seal support surface in said bore,

a seal engaged in said support surface,

a spacer bushing retaining said seal in said support surface, said spacer bushing having an axially inner side and an axially outer side, said seal positioned axially inward of said spacer bushing,

a first gripper ring located axially outward of the seal and having radially and axially inwardly protruding circumferentially spaced gripper teeth having inner edges protruding inwardly into said internal bore, said gripper ring lying adjacent said

spacer bushing, said teeth arranged for providing a twist when subjected to simultaneous rearward axial and rotational forces,

a second gripper ring located axially off said first gripper ring and having radially and axially inwardly protruding circumferentially spaced gripper teeth having inner edges protruding inwardly into said internal bore, said second gripper ring held in said outer housing to preclude rotational movement of said second gripper ring, and

means for securing said spacer bushing in said internal bore, and wherein

said spacer bushing has circumferentially spaced grooves, said gripper teeth of said first gripper ring are aligned and fitted with said grooves, with said grooves causing friction on one edge of said teeth allowing said teeth to twist and the member to screw out of said first gripper ring.

A further aspect of the invention provides a fluid conduit coupling for removably holding a member therein comprising:

an outer housing having an internal bore with a circumferential side wall,

a seal in said internal bore,

a first spacer bushing having an axially inner side and an axially outer side, said seal positioned inward of said first spacer bushing,

a circular continuous gripper ring having radially and axially inwardly protruding circumferentially spaced gripper teeth having inner edges protruding inwardly into said internal bore, said teeth protruding into said bore for holding the member against axial movement,

a second gripper ring located axially off said first gripper ring and having radially and axially inwardly protruding circumferentially spaced gripper teeth having inner edges protruding inwardly into said internal bore, said teeth protruding into said internal bore for holding the member against axial movement,

a second spacer bushing positioned between said seal and said second gripper ring,

a third gripper ring located axially off said first and second gripper rings and between said seal and second spacer bushing, said third gripper ring having radially and axially

inwardly protruding circumferentially spaced gripper teeth having inner edges protruding inwardly into said internal bore, said teeth protruding into said internal bore for holding the member against axial movement,

said first spacer bushing and said second and third gripper rings being held in said internal bore against rotation and

said first spacer bushing having circumferentially spaced grooves, said gripper teeth of said first gripper ring being aligned and fitted with said grooves, with said grooves causing friction on one edge of the teeth allowing said teeth to twist and the member to screw out of said first gripper ring.

It is a first improvement of preferred embodiments of the invention to reverse the position of a gripper ring in the coupling from the position shown in the patent 4,911,406. In the embodiments of this invention, the seal, such as an O-ring seal, is arranged axially inward of the gripper ring in the outer housing of the coupling. This is followed by a spacer bushing which holds the ring in place and the gripper ring, with its teeth, is on the axially outer side of the spacer bushing.

It is a second improvement of preferred embodiments of the invention, in contrast

Figure 6 is an axial section of a coupling according to another preferred embodiment of the invention with multiple gripper rings for use, for example, with a valve.

Figure 7 is an exploded view of the coupling shown in Figure 6.

Figure 8 is a fragmentary section of the gripper ring showing one of the gripper teeth.

Figure 9 is a generic illustration of uses for the coupling with what could be a valve, a shower head, a tub faucet coupling, a tube coupling, or any other application or use for this unique coupling.

Figure 10 shows another embodiment of the invention with three gripper rings. This view is intended to show that the number of gripper rings can be any multiple of two or more.

Figure 11 shows still another embodiment of the coupling used for a test cap. These various views are intended to show that the coupling has a wide variety of uses and configurations not all of which are shown for purposes of brevity.

Figure 12 shows another embodiment of the coupling.

As best shown in Figure 1, the unique coupling is shown in one form as a generic coupling but could be a test cap. A test cap, for example, is used in the plumbing industry for checking temporarily on the pressure of a plumbing system to see if all of the joints are free from leaks and that the proper pressure may be maintained. Usually then the test cap is removed and a permanent valve soldered or bonded onto the tube. The many applications for the coupling is further shown generically in phantom lines in Figure 4, in which the phantom line box is a test cap coupling, a valve, an end unit like a shower-head, a coupling for joining two pieces of tubing together, etc. Figure 5 shows more specifically a preferred embodiment of the invention for the

valve. The details of these different applications are obvious to one of ordinary skill in the art and the details of U.S. Patent No. 4,911,406 are incorporated herein by reference thereto.

In all of the couplings of Figures 1-5, the preferred embodiments of the invention include an outer housing 10 having an inner bore 12 with a side wall 14. The inner bore has a seal support surface 16 against which is fitted a conventional O-ring seal 15. The seal is held in the bore by a spacer bushing 18. The spacer bushing has circumferentially spaced axial grooves 33, as best shown in Figure 2. A metallic gripper ring 27 is provided with circumferentially spaced axially and radially inwardly protruding teeth 29. The spacer bushing has a flat 36 aligned with a flat 30 on the gripper ring 27. The inside wall of the housing has a protruding flat 31 to receive the flats on the bushing and gripper ring. The gripper ring is also provided with a notch 39 and the spacer bushing provided with a notch 41, which notches engage a protrusion 40 (Fig. 1) on the inside wall 14 of the outer housing 10. The flats on the inner bushing and the gripper ring and the notches are provided to assure proper installation of the gripper ring and inner bushing within the housing.

An end bushing 20 is positioned against the gripper ring and holds the O-ring, spacer bushing, and gripper ring tightly together so that the teeth of the gripper ring extend into the inner bore 12. The end bushing is held within the internal bore of the outer housing 10 by sonic welds 22. The end bushing is provided with guide ribs 28 for guiding a plastic or copper tube 26 into the coupling. The tube end inserted into the coupling is shown in phantom lines in Figure 1. Inner ribs 35 are provided in the side wall 14 of the internal inner bore 12. In general, the gripper ring is made from a full hard stainless steel, the coupling parts from plastic, such as, acetal, or for larger couplings, metal, and the tubes or pipe made from copper or conventional PVC used in plumbing polybutylene, CPVC, PEX or other metals and plastics used in plumbing.

As best shown in Figure 1, the coupling is assembled by placing the O-ring against the ring support surface 16, the spacer bushing is aligned with its flat 36 against the flat 31 of the outer housing and slid into place against the O-ring, the gripper ring is then placed against the spacer bushing with its flat 30 aligning the teeth 29 into the grooves 33 of the spacer bushing. Then the end bushing is placed within the outer housing and welded into place by sonic welding 22. For metal couplings, the outer housing can be secured by any suitable permanent attachment such as crimped or interfering threads. When a tube 26 is to be inserted in the coupling or the coupling inserted over a tube, the tube and the coupling are moved axially to one another with the tube engaging the teeth. The teeth extend into the inner bore of the housing a distance further than the outer diameter of the tube 26 so that the teeth are deflected by the tube as the tube and housing are moved axially to one another. This creates an immediate gripping engagement of the teeth even before any fluid pressure is applied in the coupling. The tube is inserted until it tightly engages the end wall 50 of the bore 12. This can be felt by the user of the coupling since the tube can be pushed to move axially, albeit tightly, until the end of the tube stops against the end wall 50 and cannot be pushed any further relative to the outer housing.

The O-ring seal maintains the fluid seal around the tube. The tube cannot be solely axially withdrawn by fluid pressure without destroying the coupling and will maintain quite a high fluid pressure. The tube can be removed by unscrewing the coupling relative to the tube. The teeth 29 in the gripper ring can be manufactured with a slight twist or by using the full hard stainless steel or equivalent material, such as manganese, or composites, and a ring thickness of no greater than about .012 inches, preferably .008 inches, then the twist can be created by the forces acting on the teeth as the tube 26 is simultaneously rotated and pulled out of the housing. By rotating the tube while pulling, edges of the

gripper teeth will move within the grooves 30 causing friction on one edge of the teeth allowing the teeth to twist and the tube screw out of the gripper ring. If the tube is initially not inserted past the gripper ring, or is not inserted through the O-ring seal, leakage will be apparent almost immediately when the pressure is applied to the plumbing system. Thus, an advantage of this embodiment is it gives an immediate visual check on the proper placement of the tube within the coupling or the position of the test cap over the coupling.

Figure 4 shows a phantom version of a coupling to illustrate that the coupling could be a test cap as shown in Figure 1, a valve in U.S. Patent No. 4,911,406, or simply a mirror image of the right side coupling 50 being on the left side to simply join two tubes together.

Figure 5 shows an embodiment using the valve or housing 50a of patent 4,911,406 as the coupling. Another advantageous feature of the preferred embodiment of the invention is illustrated in Fig. 5 by showing that pre-cut lengths of tubing or hose 60 can be bonded and crimped as at 61 or otherwise permanently secured to the valve to provide a complete connection from the plumbing system to an appliance or other plumbing fixture. Thus, installation can be made more economically and faster having a complete pre-cut plumbing connection already made-up and available.

As best shown in Figure 6, the unique coupling is shown with multiple gripper rings in one form as a valve. However, while a valve has been shown in the embodiment of Figure 6, this is for illustration purposes only and the coupling can be used for a valve, such as shown in U.S. Patent No. 4,911,406 or any other use for a coupling. This is shown generically in phantom lines in Figure 9, in which the phantom line box is a valve, a coupling for joining two pieces of tubing together, a shower head, a tub faucet coupling, or any other use where a soft tubular plumbing material is to be joined to more tubing or to some plumbing fixture. These different applications or uses for the coupling are obvious to one of ordinary

skill in the art and the details of U.S. Patent No. 4,911,406 are incorporated herein by reference thereto.

In the couplings of Figures 6-11, the preferred embodiments of the invention include an outer housing 110 having an inner bore 112 with a side wall 114. The inner bore has a seal support surface 116 against which is fitted a conventional O-ring seal 115. The seal is held in the bore by a spacer bushing 118. The spacer bushing has circumferentially spaced axial grooves 133, as best shown in Figure 7. A metallic gripper ring 127 is provided with circumferentially spaced axially and radially inwardly protruding teeth 129. A second identical gripper ring 132 is provided against the O-ring seal and thus on the opposite side of the spacer bushing 118. The spacer bushing has a flat 136 aligned with a flat 130 on the gripper rings 127, 132. The inside wall of the housing has a protruding flat 131 to receive the flats on the bushing and gripper rings. The gripper rings are also provided with a notch 139 and the spacer bushing provided with a notch 141, which notches engage a protrusion or key 140 (Fig. 6) on the inside wall 114 of the outer housing 110. The flats on the inner bushing and the gripper rings and the notches are provided to assure proper installation of the gripper rings and inner bushing within the housing.

An end bushing 120 is positioned against the gripper ring 127 and holds the O-ring, spacer bushing, and gripper rings tightly together so that the teeth of the gripper rings extend into the inner bore 112. The end bushing is held within the internal bore of the outer housing 110 by sonic welds 122 [Fig. 10]. The end bushing is provided with guide ribs 128 for guiding a plastic or copper tube 126 into the coupling. In the alternative, these ribs can be eliminated so that existing old repaired plumbing tubing with existing ferrules can be fitted into larger diameter of the end bushing 120. The tube end inserted into the coupling is shown in Figure 6. Inner ribs 135 [Fig. 7] are provided in the side wall 114 of the internal inner bore 112. In general, the gripper rings are made from a full hard stainless steel,

the coupling parts from plastic, such as, acetal, or for larger couplings, metal, and the tubes or pipe made from copper, conventional PVC, polybutylene, PEX, or other metals and plastics used in plumbing.

As best shown in Figure 6, the coupling is assembled by placing the O-ring against the ring support surface 116, the gripper ring 132 is placed against the O-ring, the spacer bushing is aligned with its flat 136 against the flat 131 of the outer housing and slid into place against the gripper ring 132, the gripper ring 127 is then placed against the opposite side of the spacer bushing with its flat 130 aligning the teeth 129 into the grooves 133 of the spacer bushing. Then the end bushing is placed within the outer housing and welded into place by sonic welding 122. For metal couplings, the outer housing can be secured by any suitable permanent attachment such as crimped or interfering threads. When a tube 126 is to be inserted in the coupling or the coupling inserted over a tube, the tube and the coupling are moved axially to one another with the tube engaging the teeth. The teeth of both rings extend into the inner bore of the housing a distance further than the outer diameter of the tube 126 so that the teeth are deflected by the tube as the tube and housing are moved axially to one another. This creates an immediate gripping engagement of the teeth even before any fluid pressure is applied in the coupling. The tube is inserted until it tightly engages the end wall 150 [Fig. 10] of the bore 112. This can be felt by the user of the coupling since the tube can be pushed to move axially, albeit tightly, until the end of the tube stops against the end wall 150 and cannot be pushed any further relative to the outer housing.

The O-ring seal maintains the fluid seal around the tube. The tube cannot be solely axially withdrawn by fluid pressure without destroying the coupling and will maintain quite a high fluid pressure. The tube can be removed by unscrewing the coupling relative to the tube, although with softer plastic tubing the teeth may dig into the tubing more deeply and the gouged surface of the tubing may be damaged when the

coupling is unscrewed. In this case, a new tube may be needed or the damaged section of the original tube can be cut-off and the remaining undamaged end of the tubing can then be re-inserted into the coupling. The teeth 129 in the gripper rings can be manufactured with a slight twist or by using the full hard stainless steel or equivalent material, such as manganese, or composites, and a ring thickness of no greater than about .012 inches, preferably .008 inches, then the twist can be created by the forces acting on the teeth as the tube 126 is simultaneously rotated and pulled out of the housing. By rotating the tube while pulling, edges of the gripper teeth will move within the grooves 130 causing friction on one edge of the teeth allowing the teeth to twist and the tube screw out of the gripper ring.

In the embodiments shown, if the tube is initially not inserted past the gripper ring, or is not inserted through the O-ring seal, leakage will be apparent almost immediately when the pressure is applied to the plumbing system. Thus, an advantage of this embodiment is it gives an immediate visual check on the proper placement of the tube within the coupling or the position of the valve over the coupling.

Figure 8 shows a typical gripper ring.

Figure 9 shows a phantom version of a coupling to illustrate that the coupling could be a valve, a coupling joining two tubes, a faucet coupling, a shower head, a test cap, or any other plumbing fixture using a push on coupling.

Figure 10 shows another embodiment with the same features of the invention but with more gripper rings [three, namely, 127, 177, and 187 being shown] and more spacers 118, 178, and 188.

Figure 11 shows an embodiment using the coupling as a test cap. A test cap is used in a plumbing system to see if all of the joints are free from leaks and that the proper pressure may be maintained. Usually

then the test cap is removed and a permanent cap soldered or bonded onto the tube.

Figure 12 shows another embodiment similar to Figs. 10 and 11 but with a spacer 118a placed between the o-ring and the gripper ring.

While two and three gripper rings have been shown in the drawing, any multiple of gripper rings can be used within the spacing of the coupling.

While the preferred embodiments have been illustrated and described, it should be apparent that variations will be apparent to one skilled in the art. Accordingly, the invention is not to be limited to the specific embodiments shown in the drawings.

The reference to any prior art in this specification is not, and should not be taken as, an acknowledgment or any form of suggestion that that prior art forms part of the common general knowledge in Australia.

Throughout this specification and the claims which follow, unless the context requires otherwise, the word "comprise", and variations such as "comprises" and "comprising", will be understood to imply the inclusion of a stated integer or step or group of integers or steps but not the exclusion of any other integer or step or group of integers or steps.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A fluid conduit coupling for removably holding a tube therein comprising:
an outer housing having an internal bore with a circumferential side wall,
a seal support surface in said bore,
a seal engaged in said support surface,
at least one spacer bushing retaining said seal in said support surface, said spacer bushing having an axially inner side and an axially outer side, said seal positioned axially inward of said spacer bushing, and
a gripper ring having radially and axially inwardly protruding circumferentially spaced gripper teeth having inner edges protruding inwardly into said internal bore, said gripper ring lying adjacent said axially outer side of said spacer bushing, said gripper ring held in said outer housing to preclude rotational movement of said gripper ring, and
said spacer bushing being secured in said internal bore, wherein
said spacer bushing has circumferentially spaced grooves, said gripper teeth of said gripper ring are aligned and fitted with said grooves, with said grooves causing friction on one edge of said teeth allowing said teeth to twist and the tube to screw out of said gripper ring.

2. A coupling as claimed in claim 1, including a second gripper ring lying against the axially inner side of the spacer bushing and against the seal.

3. A coupling as claimed in claim 1, said gripper ring lying against the axially outer side of said spacer bushing, said axially inner side of said spacer bushing engaging said seal.

4. A coupling as claimed in claim 1 including a second gripper ring located axially off said first gripper ring, said first and second gripper rings being separated by a spacer bushing.

5. A coupling as claimed in claim 4, wherein said first and second gripper rings have a second spacer bushing therebetween.

6. A coupling as claimed in claim 1 wherein said securing means includes an end bushing welded to said outer housing.

7. A coupling as claimed in claim 1, said gripper ring having a flat on its circumference, said spacer bushing having a flat on its circumference, and said flats engaging a mating flat protrusion in the internal bore of said outer housing.

8. A coupling as claimed in claim 6, said internal bore having circumferentially spaced inner ribs, and said end bushing having circumferentially spaced tube guide ribs.

9. A coupling as claimed in claim 1, wherein there are more than two gripper rings in said housing and held against rotation.

10. A fluid conduit coupling for removably holding a member therein comprising:
an outer housing having an internal bore with a circumferential side wall,
a seal support surface in said bore,
a seal engaged in said support surface,
a spacer bushing retaining said seal in said support surface, said spacer bushing having an axially inner side and an axially outer side, said seal positioned axially inward of said spacer bushing,
a first gripper ring located axially outward of the seal and having radially and axially inwardly protruding circumferentially spaced gripper teeth having inner edges protruding inwardly into said internal bore, said gripper ring lying adjacent said spacer bushing, said teeth arranged for providing a twist when subjected to simultaneous rearward axial and rotational forces,
a second gripper ring located axially off said first gripper ring and having radially and axially inwardly protruding circumferentially spaced gripper teeth having inner edges protruding inwardly into said internal bore, said second gripper ring held in

said outer housing to preclude rotational movement of said second gripper ring, and means for securing said spacer bushing in said internal bore, and wherein

said spacer bushing has circumferentially spaced grooves, said gripper teeth of said first gripper ring are aligned and fitted with said grooves, with said grooves causing friction on one edge of said teeth allowing said teeth to twist and the member to screw out of said first gripper ring.

11. A coupling as claimed in claim 10 wherein said securing means includes an end bushing welded to said outer housing.

12. A coupling as claimed in claim 10, each said gripper ring having a flat on its circumference, said spacer bushing having a flat on its circumference, and said flats engaging a mating flat protrusion in the internal bore of said outer housing.

13. A coupling as claimed in claim 10, including a second spacer bushing positioned axially between said spacer bushing and said seal, said second spacer bushing having circumferentially spaced grooves, said gripper teeth of said second gripper ring aligned and fitted within said grooves of said second spacer bushing.

14. A fluid conduit coupling for removably holding a member therein comprising:

an outer housing having an internal bore with a circumferential side wall,

a seal in said internal bore,

a first spacer bushing having an axially inner side and an axially outer side, said seal positioned inward of said first spacer bushing,

a circular continuous gripper ring having radially and axially inwardly protruding circumferentially spaced gripper teeth having inner edges protruding inwardly into said internal bore, said teeth protruding into said bore for holding the member against axial movement,

a second gripper ring located axially off said first gripper ring and having radially and axially inwardly protruding circumferentially spaced gripper teeth having inner edges protruding inwardly into said internal bore, said teeth protruding into said internal bore for holding the member against axial movement,

a second spacer bushing positioned between said seal and said second gripper ring,

a third gripper ring located axially off said first and second gripper rings and between said seal and second spacer bushing, said third gripper ring having radially and axially inwardly protruding circumferentially spaced gripper teeth having inner edges protruding inwardly into said internal bore, said teeth protruding into said internal bore for holding the member against axial movement,

said first spacer bushing and said second and third gripper rings being held in said internal bore against rotation and

said first spacer bushing having circumferentially spaced grooves, said gripper teeth of said first gripper ring being aligned and fitted with said grooves, with said grooves causing friction on one edge of the teeth allowing said teeth to twist and the member to screw out of said first gripper ring.

15. A coupling as claimed in claim 14, wherein said seal, said first and second spacer bushings, and said first, second and third gripper rings are arranged in said internal bore with said seal axially inwardmost, then said third gripper ring axially outward of said seal, then said second spacer bushing axially outward of said third gripper ring, then said second gripper ring axially outward of said second spacer bushing, then said first spacer bushing axially outward of said second gripper ring, and then said first gripper ring axially outward of said first spacer bushing.

16. A coupling as claimed in claim 14, wherein said second spacer bushing has circumferential spaced grooves, said gripper teeth of said second gripper ring are aligned and fitted with said grooves, with said grooves causing friction on one edge of said teeth allowing said teeth to twist and the member to screw out of the said second gripper ring.

17. A fluid conduit coupling, substantially as hereinbefore described with reference to the drawings.

DATED this 14th day of May, 2002
ACCOR TECHNOLOGY, INC.
By DAVIES COLLISON CAVE
Patent Attorneys for the applicant

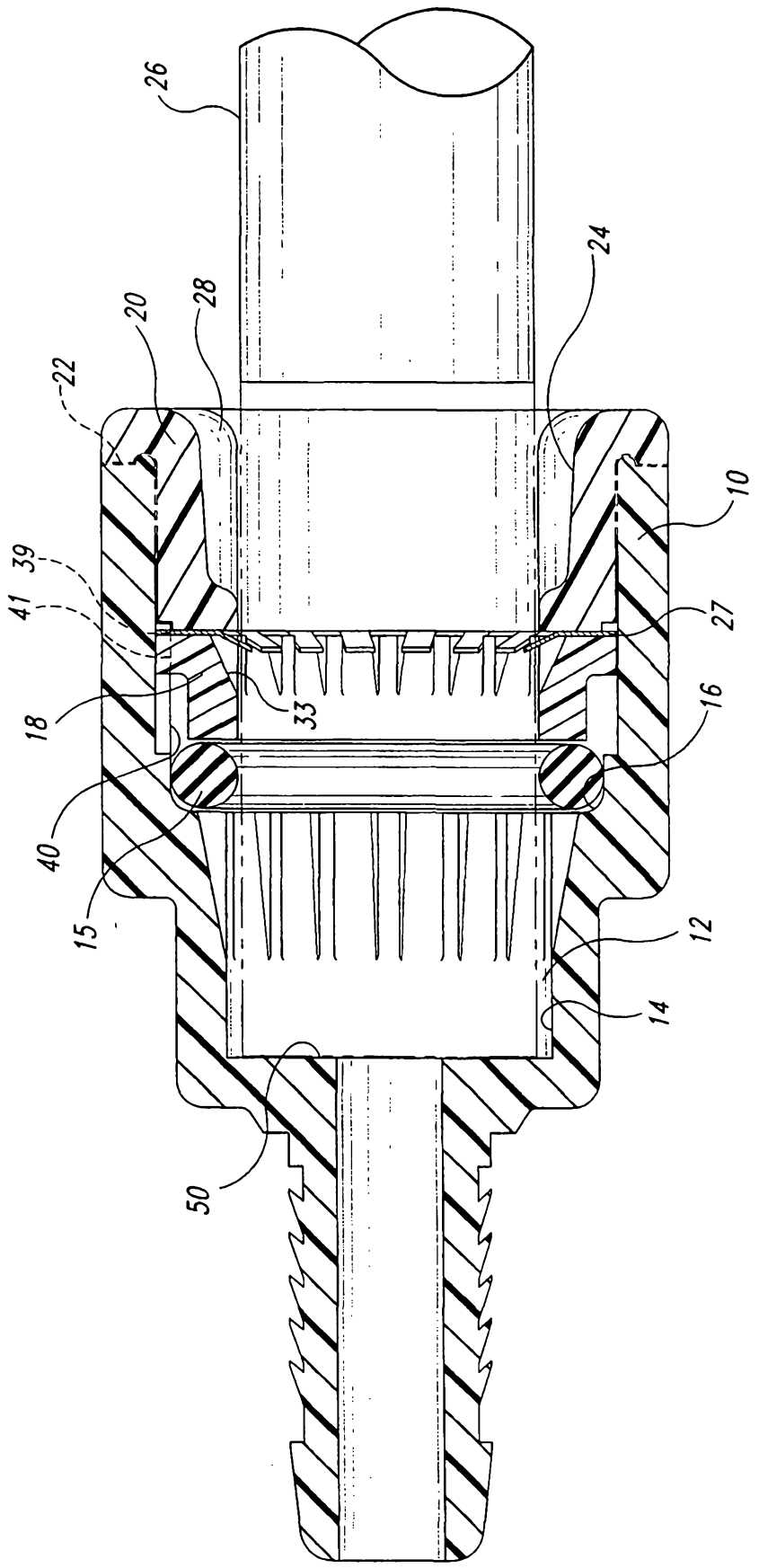


Fig. 1

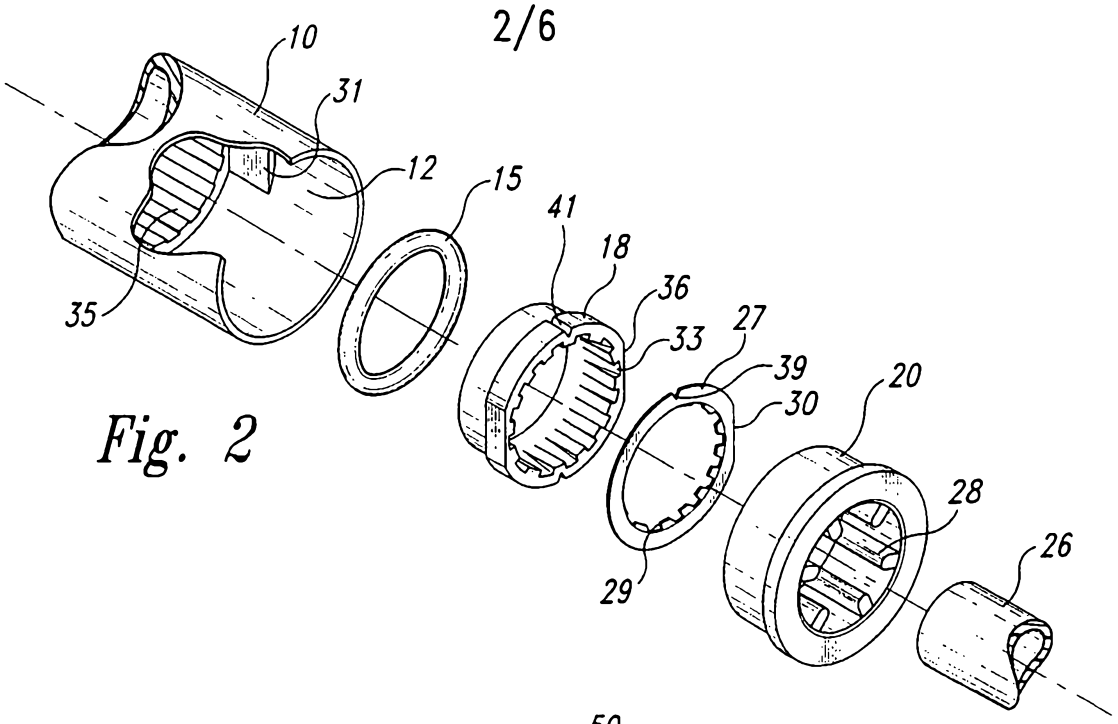


Fig. 2

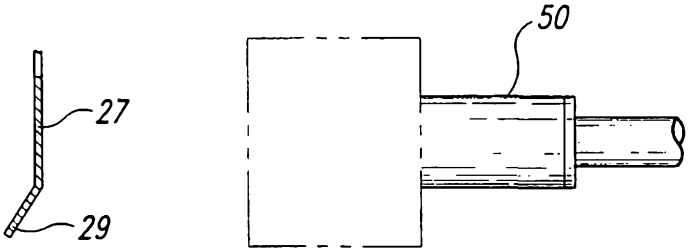


Fig. 3

Fig. 4

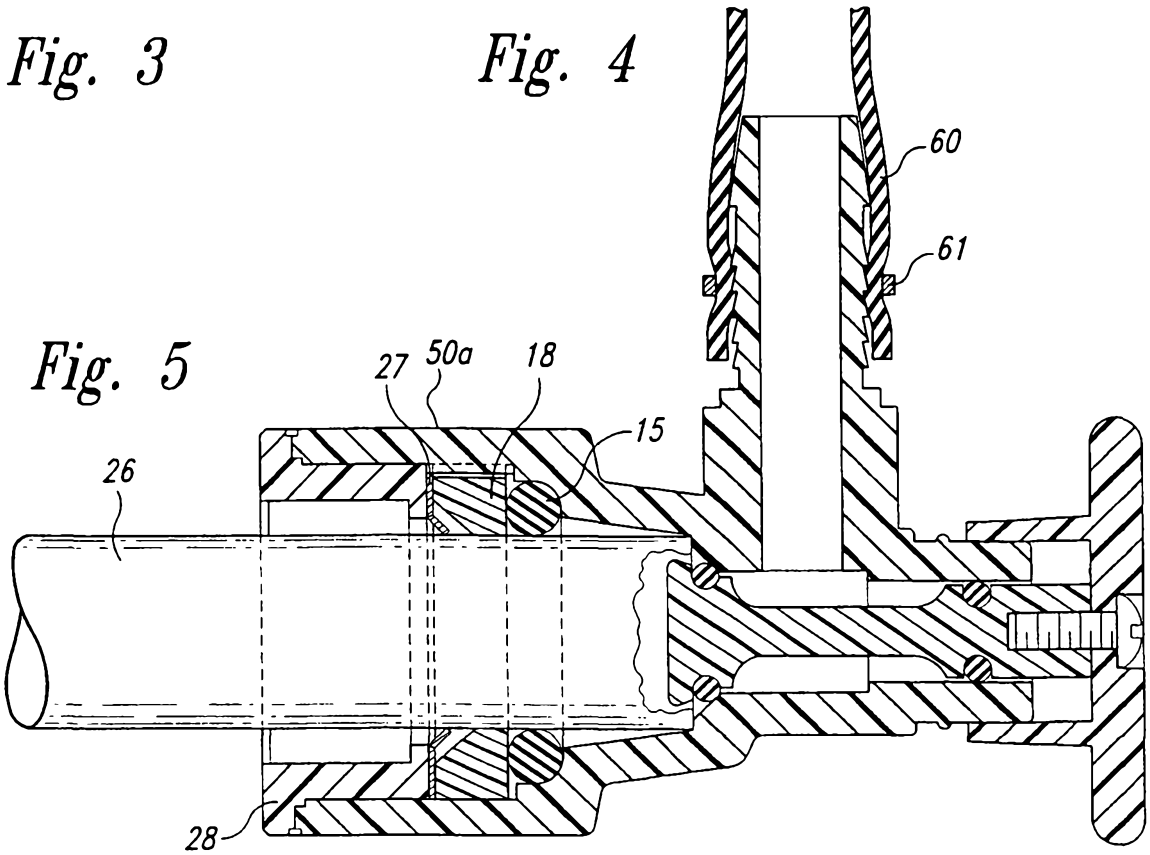


Fig. 5

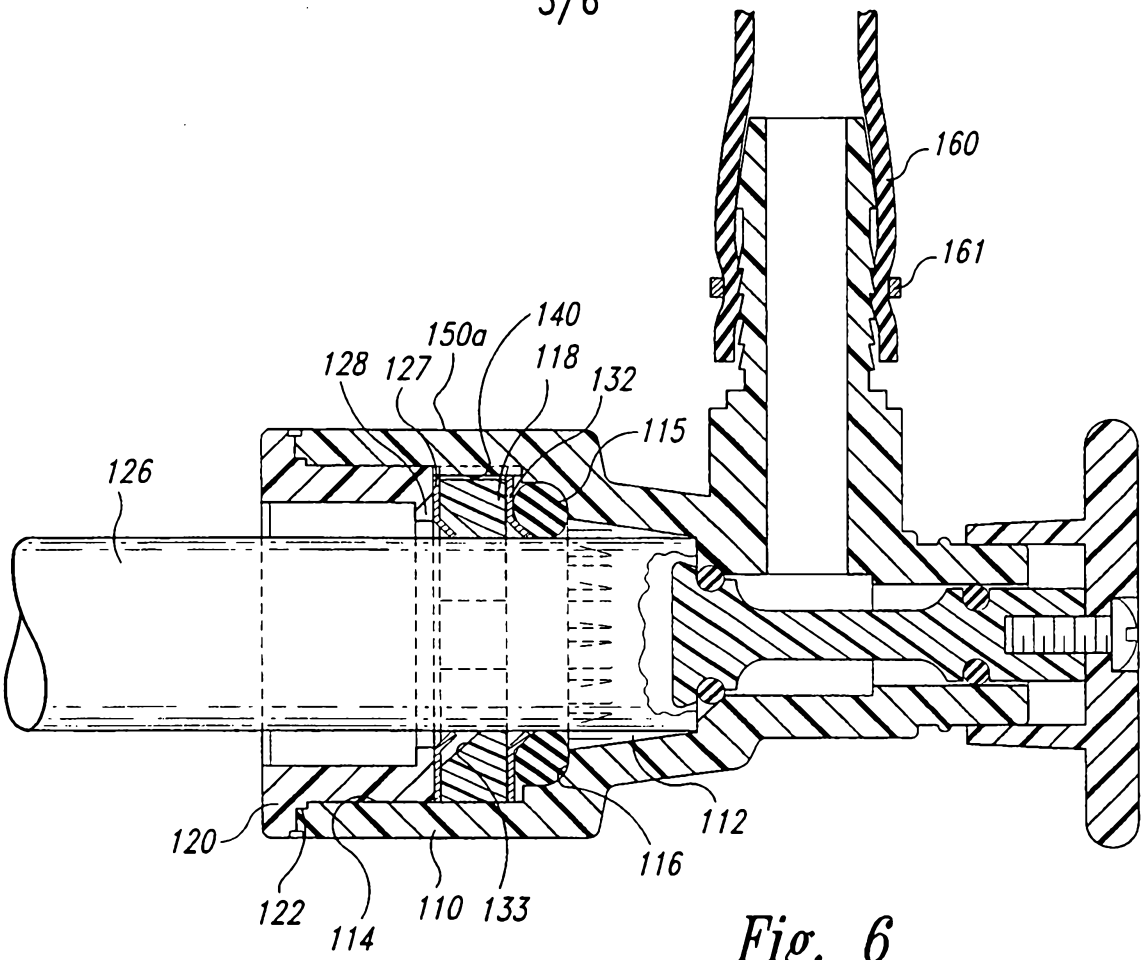

160
161
140
150a
128
127
118
132
115
126
120
122
114
110
133
116
112

Fig. 6

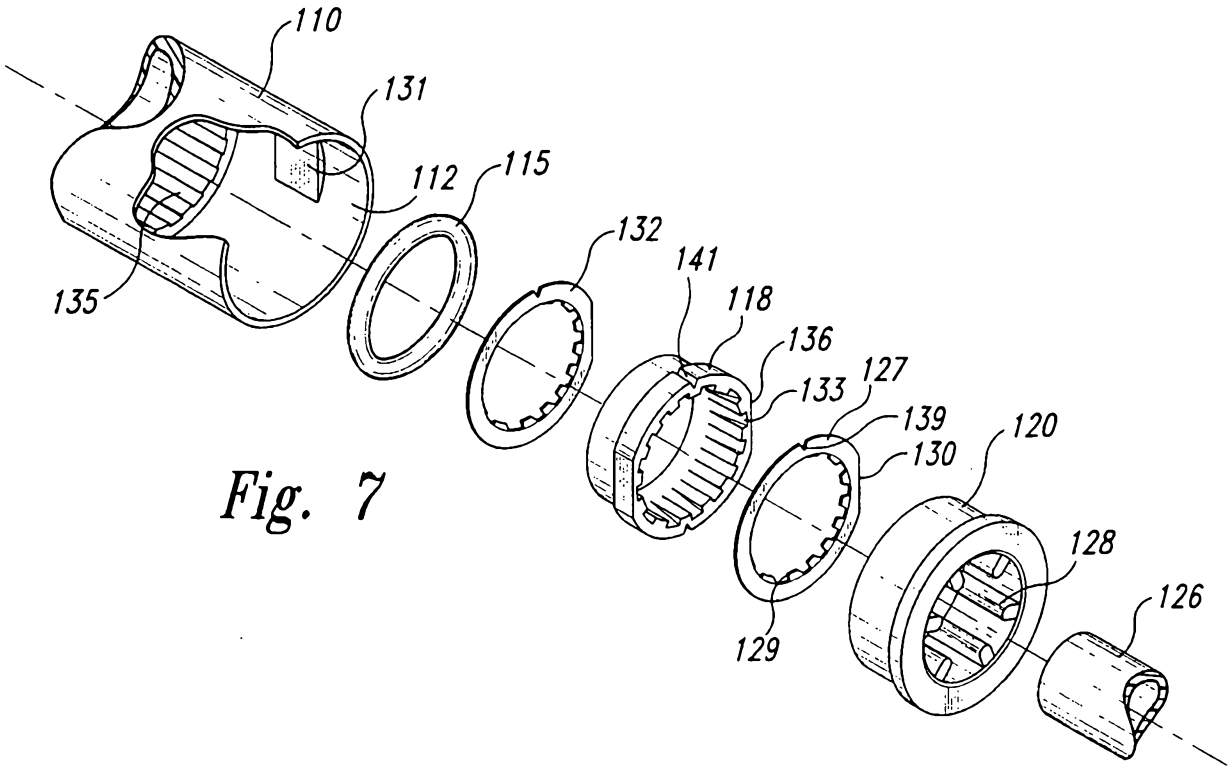

110
131
112
115
132
141
118
136
133
127
139
130
120
128
126
129
135

Fig. 7

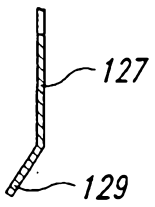


Fig. 8

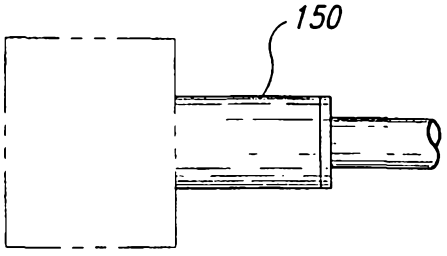


Fig. 9

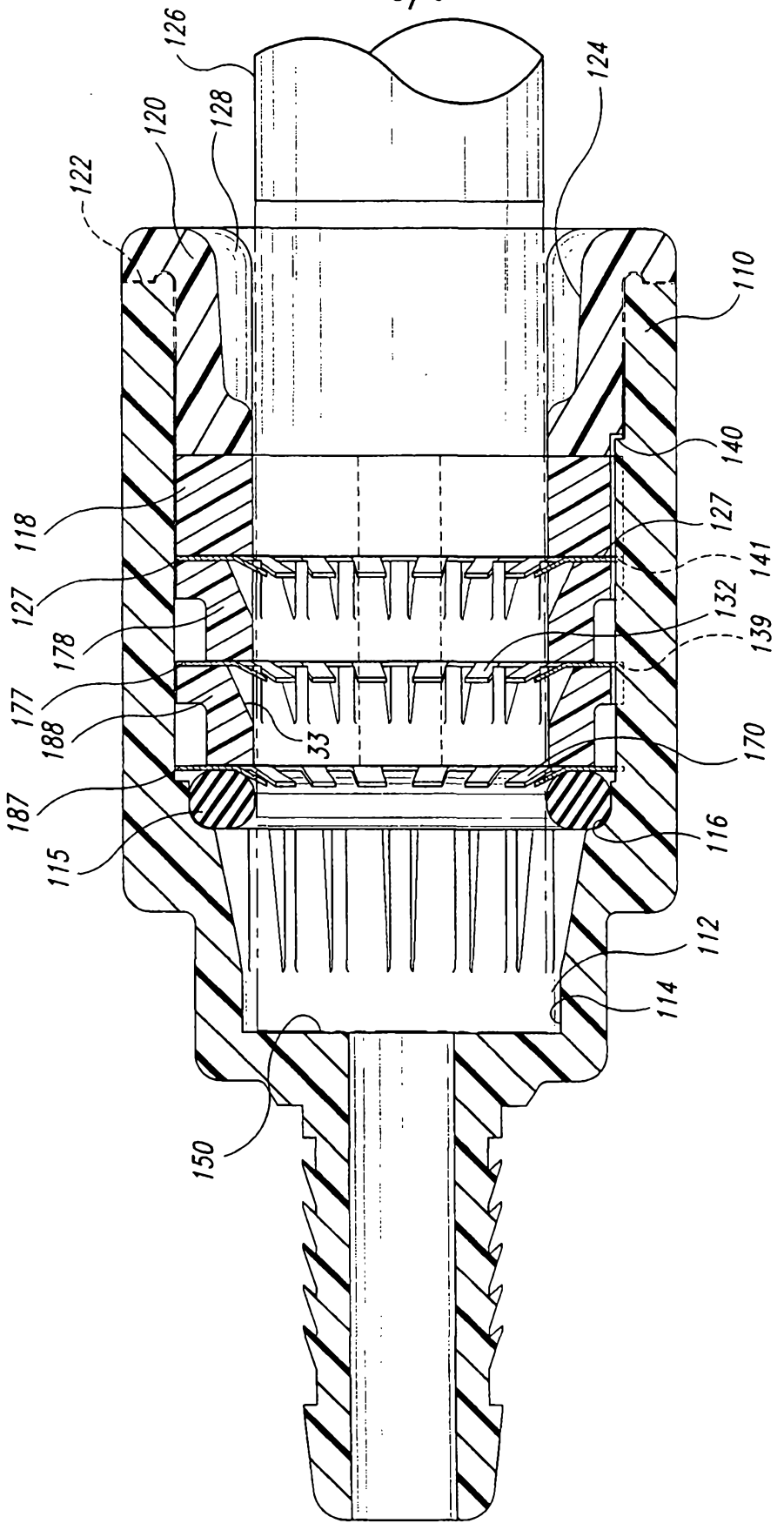

126
124
120
128
122
110
140
118
127
141
127
132
178
139
177
188
33
170
187
116
115
112
114
150

Fig. 10

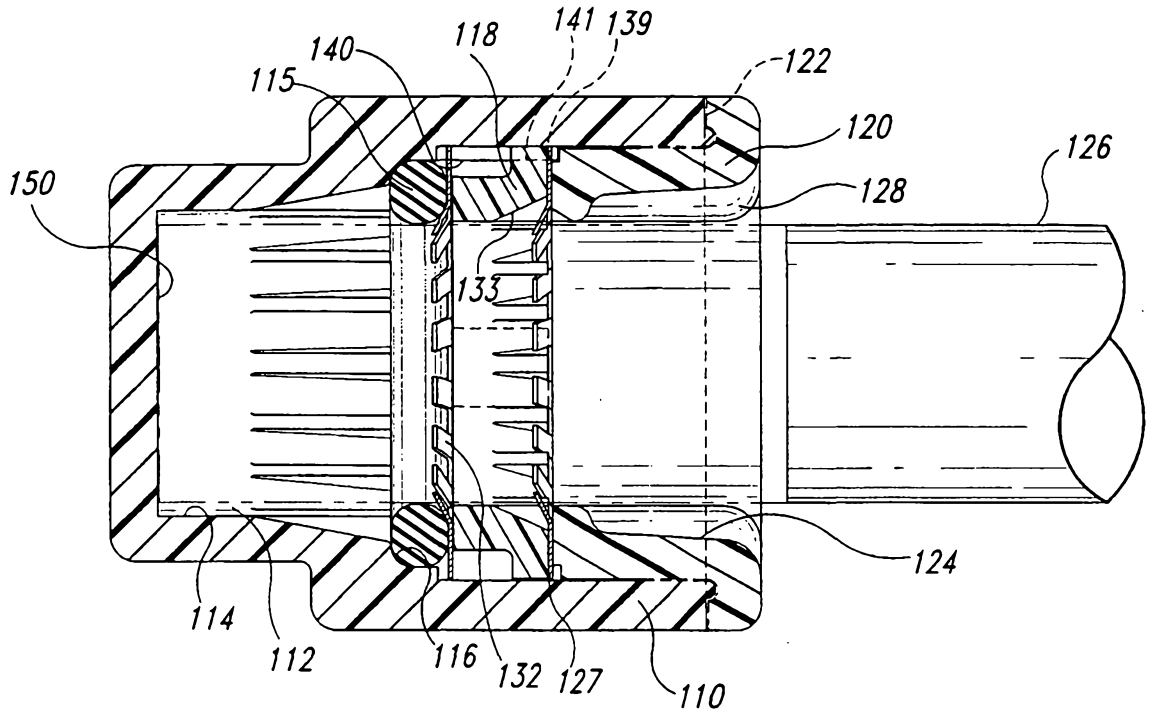

140
118
141
139
115
122
120
126
150
128
133
124
114
112
116
132
127
110

Fig. 11

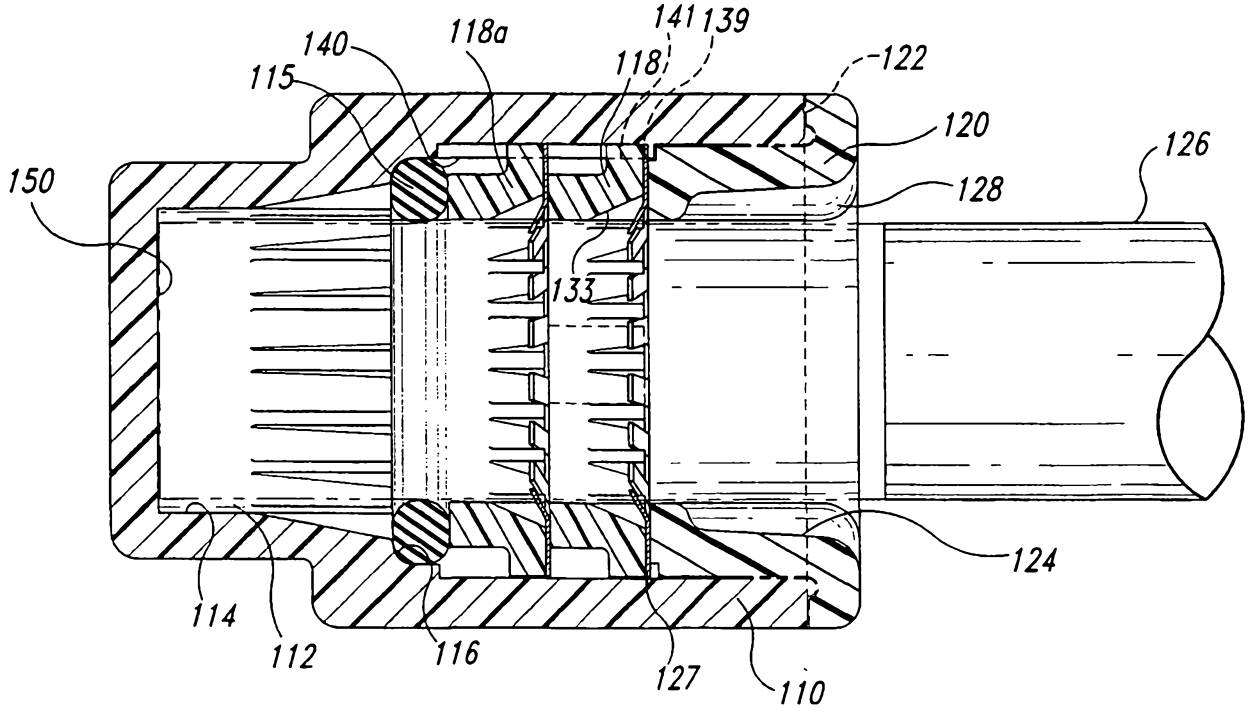

140
118a
141
139
118
115
122
120
126
150
128
133
124
114
112
116
127
110

Fig. 12