

[54] CLOSURE FOR PRESSURE VESSELS

[72] Inventor: Norman H. Kemp, 726 Regal Row, Dallas, Tex. 75247

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[58] Field of Search 220/46, 55; 138/90; 166/118

[56] References Cited

UNITED STATES PATENTS

3,498,493 3/1970 Kemp 220/46

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Primary Examiner—George T. Hall

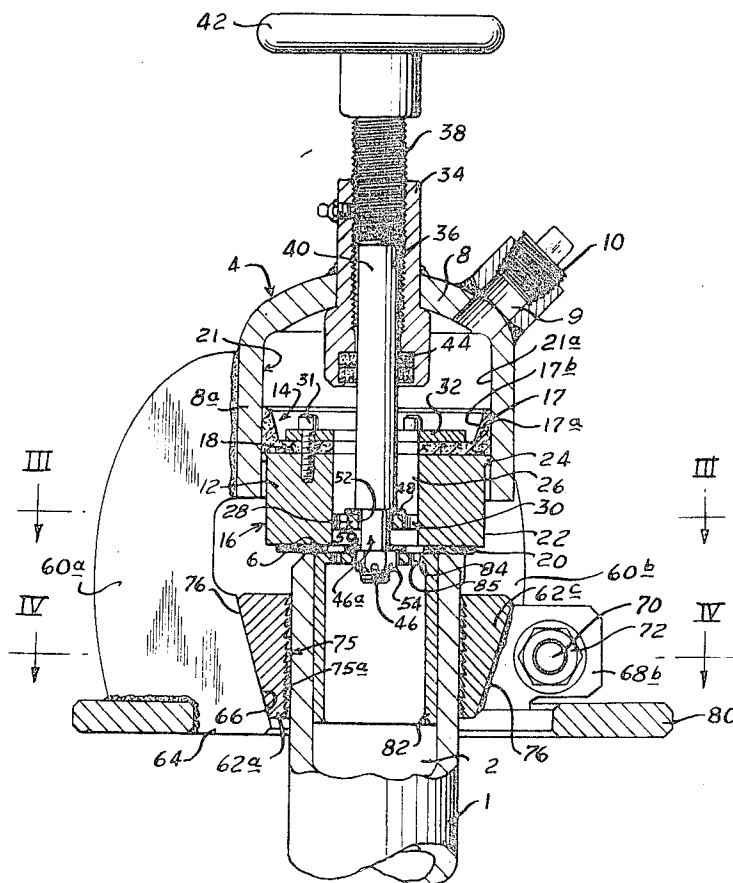
Attorney—Howard E. Moore and Gerald G. Crutsinger

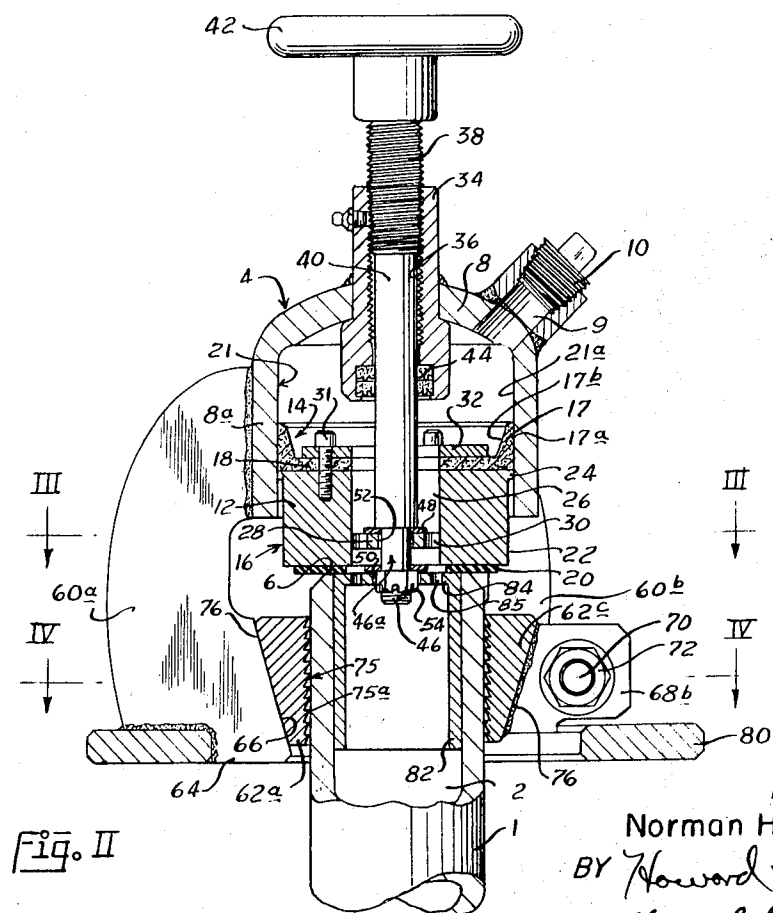
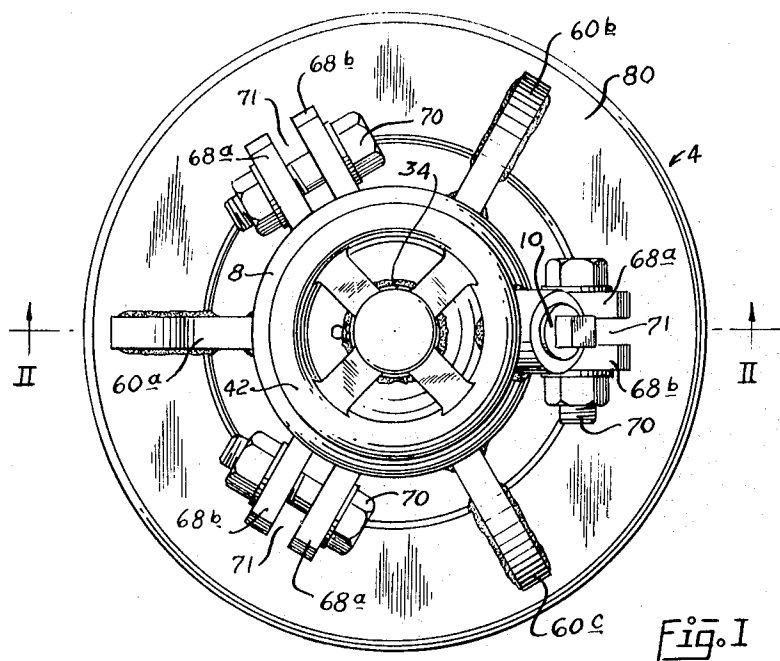
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ABSTRACT

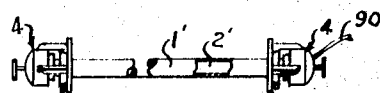
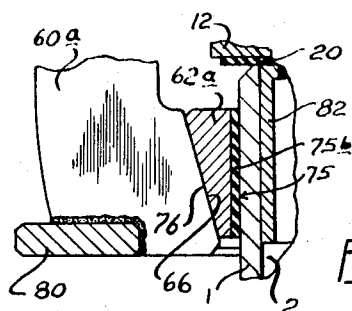
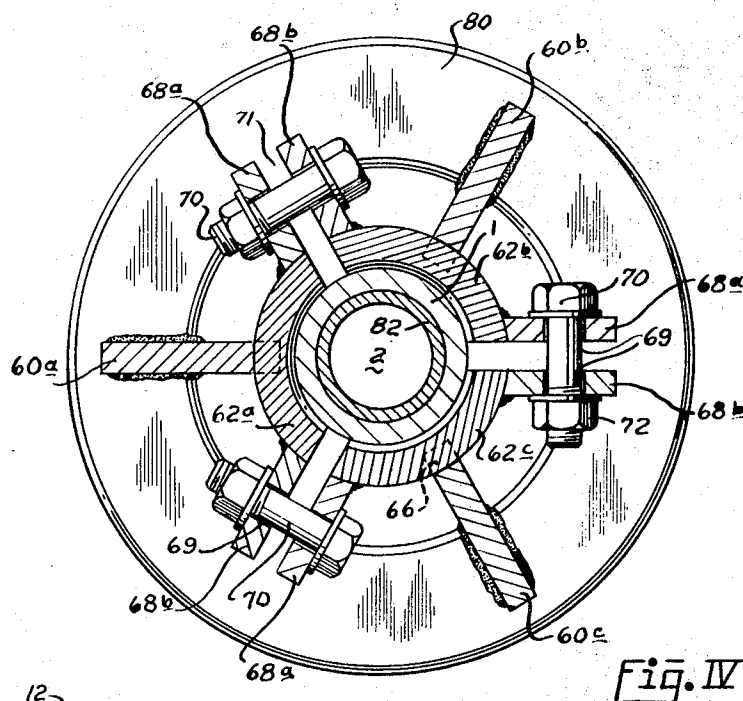
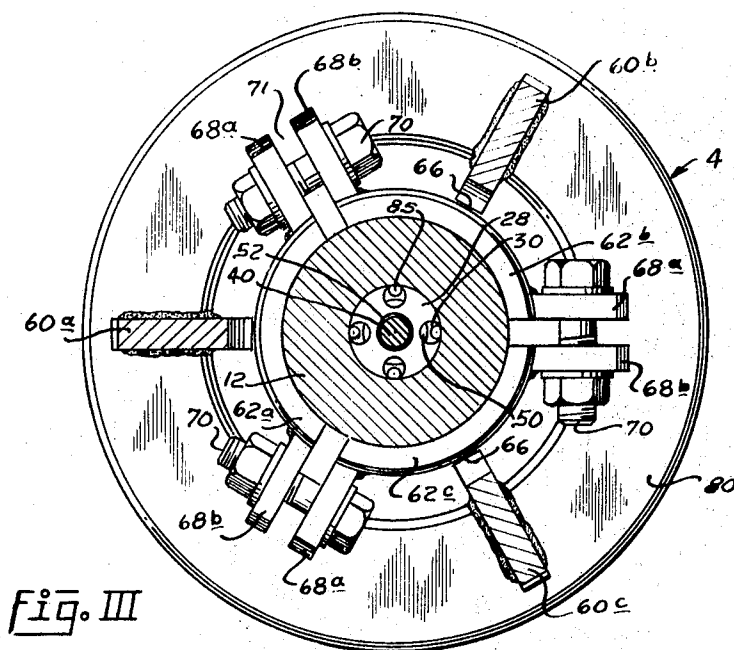
A closure for pressure vessels including a resilient seal ring having an outer lip and an inwardly turned flange angularly disposed to the outer lip whereby pressure within the vessel is exerted through an opening in the seal ring to urge the seal ring into positive sealing relation with the vessel around an opening in the vessel. The closure member has a seal ring receptacle having a plurality of anchor members secured thereto, said anchor members having surfaces engageable with slip rings to urge the slip rings into gripping engagement with a portion of the vessel.

23 Claims, 6 Drawing Figures





INVENTOR
 Norman H. Kemp
 BY *Howard E. Moore*
Gerald H. Cutsinger
 ATTORNEYS



INVENTOR
Norman H. Kemp
BY *Harold E. Moore*
Herald S. Crutinger
ATTORNEYS

CLOSURE FOR PRESSURE VESSELS

BACKGROUND OF INVENTION

This is a continuation-in-part of my copending Patent application Ser. No. 729,966, filed May 17, 1968, now U.S. Pat. No. 3,498,493, entitled "Closure for Pressure Vessels," which is a continuation-in-part of Patent application Ser. No. 494,061, filed Oct. 8, 1965, entitled "Closure Seal," now U.S. Pat. No. 3,387,738.

The apparatus disclosed in the aforementioned applications offers significant improvements over sealing apparatus heretofore developed. The apparatus disclosed therein generally relates to a seal ring made of resilient material having an outer lip and inwardly extending flange angularly disposed with reference to the outer lip such that the seal ring, which is slidably disposed in a receptacle having an annular skirt, may be positioned about an opening. Fluid pressure exerted through the opening urges the flange of the seal ring downwardly to seal about the opening, while urging the annular lip outwardly to seal against the skirt of the receptacle.

Pressure vessels, such as tanks and pipe lines for storing and transporting liquids and gases under pressure must meet certain standards, as specified by regulatory authorities and users as to internal pressure as to which they can be subject without rupturing or leaking, inasmuch as many of the liquids and gases stored and transported therein are of volatile, noxious, flammable, and explosive character. Such internal pressure tests, often made in pressure ranges to double the desired working pressure of the vessel, must be carried out by the manufacturer as a safety precaution, to comply with the rules of regulatory authorities and to meet the requirements of carriers and users.

Prior to development of the invention described in the aforementioned patents, difficulty had been encountered in carrying out such testing operations due to the difficulty of properly sealing the opening or openings in the tank, pipe, or other container during such testing operations and in carrying out inspection tests to see that the prescribed standards were maintained after installation.

The apparatus disclosed in the aforementioned patents is very effective for sealing openings in pressure vessels, such as tanks and pipes. However, under certain operating conditions difficulty has been experienced in securing the seal ring receptacle or cover relative to the pressure vessel, particularly in sealing vessels having straight cylindrical openings without flanged ends, such as smooth pipe.

Difficulty has been experienced in translating the force exerted by pressure in the pipe against the receptacle, tending to move the receptacle longitudinally away from the pipe into a force exerted transversely of the pipe to frictionally engage the surface of the pipe to secure the receptacle relative to the pipe. Certain gripping apparatus which effectively translates the longitudinally directed force to a transversely directed force have resulted in bending or crushing the end of the pipe, particularly in testing of relatively thin gauge tubular members.

The problems encountered in carrying out periodic inspection of pressure vessels are so similar to those encountered in testing that the description will be directed primarily to testing operations. However, it should be noted that the use of the embodiments of the closure and seal hereinafter described is not restricted to testing operations.

SUMMARY OF INVENTION

I have developed and improved closure for pressure vessels comprising the combination of a seal ring receptacle having a seal ring assembly slidably disposed therein which employs anchor members having inclined surfaces on the lower ends thereof to translate longitudinal forces into transversely directed forces to urge slip rings into frictional engagement with sides of a conduit or standpipe.

The seal ring assembly comprises an annular stiffener or retainer ring having an annular shoulder on the outer periphery thereof, allowing the retainer ring to wobble or tilt relative to the receptacle in which it is slidably disposed. A resilient piston, or seal ring, is secured to the retainer ring, said seal ring having an annular lip adapted to be urged into sealing relation with the inside walls of the skirt of the receptacle in which the retainer ring and piston are slidably disposed. The retainer ring also has resilient seal means secured thereto, in spaced apart relation from the seal ring, said seal means being adapted to be urged into sealing relation with the surface of the pressure vessel about the openings to be sealed.

A plurality of anchor members, having downwardly converging surfaces on lower portions thereof, are disposed in sliding relation with slip ring segments having complementary inclined surfaces such that forces exerted through the anchor members longitudinally of a portion of the vessel are translated into transverse forces urging the slip ring segments into frictional engagement with the outer walls of the vessel. The surfaces of the slip ring which are in engagement with the outer walls of the conduit have a high coefficient of static friction.

Suitable supporting apparatus is positioned inside the vessel to prevent bending or deformation of the wall of the vessel as a result of the forces exerted on the outer surface thereof by the slip rings.

It is therefore a primary object of the present invention to provide an improved closure for pressure vessels wherein a seal is applied over and about an opening in a pressure vessel, or other container, wherein the seal is actuated and uniformly applied by injecting pressure into the pressure vessel, container or conduit to positively close the opening, and wherein the greater the injected the pressure, the tighter the seal is applied.

Another object of the invention is to provide an improved closure for pressure vessels which provides means for sealing about an opening in a pressure vessel, conduit or container, which may be easily and quickly applied over and about the opening, and which may be easily and quickly removed therefrom.

Another object of the invention is to provide an improved closure for pressure vessels which provides means for sealing over and about an opening in a pressure vessel or container to be tested which is adaptable and conformable to different types of openings, i.e., openings through an extension or standpipe secured about the opening of a tank or openings through the wall of a pressure vessel.

Still another object of the invention is to provide an improved closure for pressure vessels in which the seal has a lower surface conformable to the surface about the opening and arranged to close bolt holes provided through the wall of the tank about the opening or through a flange provided about the opening.

Still another object of the invention is to provide an improved closure for pressure vessels adapted to grippingly engage the walls of pressure vessel to detachably secure the closure relative to the vessel.

A still further object of the invention is to provide an improved closure for pressure vessels which provides means to resist forces tending to crush the vessel exerted by gripper means employed to connect the closure member to the vessel.

A still further object of the invention is to provide a method of sealing an opening in a tubular member comprising the steps of reinforcing the walls of the tubular member, and grippingly securing a closure member relative to the walls of the tubular member.

Other and further objects of the invention will become apparent upon reading the detailed specification hereinafter following and by referring to the drawings annexed hereto.

DESCRIPTION OF THE DRAWINGS

Drawings of two preferred embodiments of the invention are annexed hereto so that the invention may be better and more fully understood, in which:

FIG. I is a top plan view of the closure apparatus;

FIG. II is a cross-sectional view taken substantially along line II—II of FIG. I;

FIG. III is a cross-sectional view taken substantially along line III—III of FIG. II;

FIG. IV is a cross-sectional view taken substantially along line IV—IV of FIG. II;

FIG. V is a fragmentary cross-sectional view similar to FIG. II illustrating a modified form of the invention; and

FIG. VI is a fragmentary elevational view of the apparatus employed in a pressure testing operation.

Numeral references are employed to designate like parts throughout the various figures of the drawings.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring to FIGS. I and II of the drawing, the numeral 1 designates an inlet connection of a pressure vessel, pipe, conduit, tubular member, or other container, having a passage 2 formed therein.

Such inlet connection is normally provided on pressure vessels used for storing and dispensing liquefied petroleum gas, such as butane or propane, and sometimes includes an annular flange (not shown) about the upper end thereof through which are provided spaced stud-receiving holes for attachment to a corresponding flange on a control head (not shown) mounted above same. Such control head normally provides a mounting for dispensing outlet, control valves, a pressure gauge, safety valve and other control devices normally required for connecting with such equipment. Other connections besides a control head could be attached to the inlet connection 1 such as a conduit having a corresponding connector thereon.

It will be further understood that such type of inlet connection is merely for illustration purposes and that the invention described and claimed herein can be employed with different types and shapes of tank outlets.

The closure apparatus, generally designated by the numeral 4, is positioned to engage and seal against the surface 6 of inlet connection 1 around passage 2 which extends therethrough.

A dome-shaped cover 8 forms a receptacle having a threaded passage 9 in the upper side thereof which is normally closed by a threaded plug 10. The threaded passage 9 provides an opening for bleeding or flushing air out of the tank or conduit before it is closed for testing. After the pressure vessel is thus flushed out the plug 10 may be threaded in the passage 9 to provide a leakproof closure during the testing operation. A suitable source of pressurized fluid may be connected through passage 9 with the passage 2 if it is deemed expedient to do so.

The domelike cover 8 includes an annular downwardly extending skirt portion 8a which has formed on its inner side an annular recess 21 for receiving the seal ring assembly 16. Preferably the inner surface 21a of the recess 21 is machined and finished to provide a smooth surface for receiving the seal hereinafter described.

Furthermore, it will be noted that the width of recess 21 is greater than the width of flange 18 of seal assembly 16 and greater in width than the shoulder on the outer periphery of stiffener or retainer ring 12, hereinafter more specifically described, so that the seal assembly 16 can move up and down to act as a piston in response to variations of pressure within the dome 8.

Seal ring assembly 16 comprises a stiffener ring 12, a resilient piston or seal ring 14 carried by the stiffener ring 12, and resilient seal means, such as gasket 20 carried by stiffener ring 12.

Stiffener ring 12 is preferably of rigid construction and has a recess 22 formed in a lower portion thereof arranged to form a shoulder 24 around the periphery of stiffener ring 12.

Stiffener ring 12 has a passage 26 formed in a central portion thereof, said passage forming a fluid connection between the passage 2 in inlet connection 1 and the inside of dome shaped cover 8 above piston assembly 16.

Suitable connection means, such as transversely extending member 28, having apertures 30 formed therein, is secured to seal ring assembly 16 to which suitable means, such as stem 40, to urge the seal ring assembly toward the surface 6 on inlet connection 1 may be connected as hereinafter more fully explained.

The resilient piston or seal ring 14 is preferably made of resilient material, such as neoprene or rubber compound, and includes an upwardly extending annular lip 17 and flange 18 being preferably, but not necessarily, disposed in right angular relationship with reference to the outer surface 17a. The flange 18 is secured to stiffener ring 12 to provide reinforcement to prevent undue extrusion of resilient material into passage 2 of inlet connection 1 and through any openings which may be formed in or around the surface 6 against which seal assembly 16 is urged. The seal ring 14 might also be made of flexible, relatively pliable metal or other material which would provide a seal, such as aluminum, asbestos composition, Teflon, and the like.

To facilitate accomplishing a seal between the surface 6 on inlet connection 1 and seal ring assembly 16, resilient seal means, such as gasket 20 is secured to stiffener ring 12. The degree of resiliency and thickness of the gasket 20 is, to some extent, dependent upon the size and shape of surface 6 of inlet connection 1.

In the embodiment of the invention illustrated in FIG. II of the drawing, the resilient piston 14 is secured to stiffener ring 12 by threaded bolts 31 which extend through apertures in backup member 32 and through apertures in flange 18 of seal ring 14 to threadedly engage threaded holes in stiffener ring 12.

A conventional bonnet 34 extends through and is rigidly connected to, a central portion of dome 8. Bonnet 34 has a threaded bore 36 threadedly engaging threads 38 on the rising stem 40. Stem 40 has a handwheel 42 at the upper end thereof whereby rotation of the handwheel 42 rotates stem 40 thereby moving said stem axially relative to dome 8.

Suitable packing material 44 is disposed about stem 40 to prevent leakage therearound.

Stem 40 has a reduced portion 46 at the lower end thereof for securing transversely extending member 28 thereto by washers 48 and 50 positioned on opposite sides of the central opening 52 in the transversely extending member 28 and is secured thereto by a nut 54 which threadedly engages the outer end of stem 40. It will be noted that a space 46a is provided between washers 48 and 50 and transversely extending member 28, allowing seal ring assembly 16 to move and float vertically toward and away from surface 6 on inlet connection 1. When pressure is applied within passage 2 of inlet connection 1, the seal ring assembly 16 acts like a piston and moves toward surface 6 to form a positive seal therewith.

Stem 40 facilitates positioning seal ring assembly 16 and prevents it from falling out while cover 8 is being placed over passage 2, while the cap 4 is being transported, or while it is in storage.

Stiffener ring 12, having a tapered or relieved recess portion 22 forming a shoulder 24 adjacent the upper edge thereof, allows stiffener ring 12 and seal ring 14 to float freely to conform to the configuration of the surface 6 of inlet connection 1, thereby preventing sticking or wedging in the even seal ring assembly 16 is tilted out of a plane perpendicular to the axis of the passage 2.

Recess 22 also compensates for slight deformation of retainer ring 12 when high pressure is applied thereto.

The outer surface 17a of lip 17 is preferably flat and closely conforms to the inner surface 21a of the recess 21 provided on the inner side of skirt 8a of cover 8.

Suitable means for securing the dome-shaped cover 8 to the inlet connection 1 of a pressure vessel comprises means, such

as anchor members 60 and slipring segments 62, for translating force exerted against the cover 8, tending to move said cover away from the surface 6 of inlet connection 1, into a force directed transversely of the longitudinal axis of the inlet connection 1 to grippingly engage the outer surface of the inlet connection 1.

In the particular embodiment of the invention illustrated in the drawing, anchor members 60 comprise legs 60a, 60b, and 60c spaced equidistantly about the periphery of receptacle 8. Preferably there should be at least three such spaced legs welded or otherwise rigidly attached to cover 8 to provide uniform sealing about the passage 2. However, such seal could be provided by two or more such legs spaced thereabout.

Each leg 60a, 60b and 60c is secured to the skirt 8a of cover 8 and extends downwardly therefrom. The lower end of each of said legs is turned inwardly at its lower end to provide a hooklike member 64.

As best illustrated in FIGS. II and III of the drawing, hook portions 64 on the lower ends of legs 60a, 60b, and 60c have shaped, tapered, downwardly converging surfaces 66 formed thereon.

Slipring assembly 62 is preferably formed in segments 62a, 62b, and 62c, the number of segments preferably corresponding to the number of legs 60a, 60b, and 60c.

Each of the segments 62a, 62b, and 62c has outwardly extending lugs 68a and 68b welded or otherwise rigidly secured to opposite ends thereof, each of said lugs having an aperture 69 extending therethrough. The slipring segments are secured together by the connectors such as bolts 70 which extend through apertures 69 in lugs 68a and 68b on the respective segments.

As best illustrated in FIGS. III AND IV of the drawings, spaces 71 are provided between the ends of the respective segments 62a, 62b and 62c such that tightening of nuts 72 on threaded bolts 70 urges the segments into gripping engagement with the outer surface of inlet connection 1. It should be noted that connectors 70 do not restrict movement of ring segments 62a, 62b and 62c inwardly.

Each of the segments 62a, 62b, and 62c has an inclined surface 76 on the back side thereof which is disposed in sliding relation with inclined surface 66 on the lower ends of legs 60a, 60b and 60c. Referring to FIG. II of the drawing, it should be readily apparent that the inclination of surfaces 66 and 76 cause abrasive surfaces 75 on each of the segments 62a, 62b, and 62c to be urged into gripping relation with inlet connection 1 when a force is applied to cover 8, tending to separate said cover from inlet connection 1.

In the embodiment of the invention illustrated in FIG. II of the drawing, the abrasive surface 75 is rough, having teeth 75a formed therein.

In the embodiment of the invention illustrated in FIG. V of the drawing, the abrasive surface 75 of slip ring segments 62a, 62b, and 62c has an abrasive lining 75b bonded or otherwise secured thereto which is urged into frictional engagement with inlet connection 1.

When pressure inside cover 8 exerts a force tending to separate said cover from inlet connection 1 a force equal and opposite to that exerted by legs 60a, 60b and 60c upon slip ring segments 62a, 62b, and 62c is exerted outwardly on legs 60a, 60b, and 60c, tending to bend them outwardly. Therefore, to prevent bending of the legs 60a, 60b, and 60c outwardly, suitable means such as ring 80, is provided thereabout to prevent deformation of said legs. Ring 80 is welded or otherwise rigidly secured to the lower ends of legs 60a, 60b, and 60c.

From the foregoing it should be readily apparent that inclined surface 66 on legs 60a, 60b, and 60c form a cup or socket having a cross-sectional area which decreases downwardly for receiving a substantially conical shaped slipring assembly 62.

High fluid pressure in passage 2 of inlet connection 1 and inside cover 8 of the cover assembly causes force of appreciable

magnitude to be exerted through slipring assembly 62 against the walls of inlet connection 1. In certain installations, it may be necessary to install suitable support or reinforcing means, such as spreader tube 82 to stiffen or reinforce the walls of tubular member 1. While spreader tube 82 may be of any desired configuration, the particular apparatus illustrated in FIG. II of the drawing has a transversely extending member 84, having spaced apertures 85 formed therein, to provide added rigidity to the tubular member 82 without impeding fluid flow between passage 2 of tubular member 1 and the inside of cover 8.

As best illustrated in FIG. VI of the drawing, the closure assembly hereinbefore described may be employed to pressure test a segment of pipe or other vessel 1' by securing a closure assembly 4 over each opening therein. One end of conduit 90 is secured in threaded passage 9 of one of the closure assemblies while threaded plug 10 is employed to close the threaded passage in other closure assembly after the pipe 1' has been purged. The other end of conduit 90 is connected to a suitable source of pressurized fluid (not shown) for delivering pressurized fluid through one of the covers 8 to the inside of pipe 1'.

OPERATION

The operation and function of the device hereinbefore described is as follows:

The walls of the vessel are reinforced, if necessary, by positioning spreader 82 in passage 2.

To connect the closure assembly 4 to the inlet connection 1 of a tubular member, nuts 72 on bolts 70 which secure slipring segments 62a, 62b, and 62c together are loosened to allow the abrasive surfaces 75 on said sliprings to encircle and engage the outer wall of tubular member 1. Nuts 72 are then tightened.

Hand wheel 42 is then rotated to urge seal ring assembly 16 downwardly into sealing engagement with surface 6 about passage 2 of tubular member 1. This establishes an initial seal and removes slack between inclined surfaces 66 and 76 on legs 60a, 60b and 60c and slip ring segments 62a, 62b, and 62c, respectively. It will be noted that this operation is quickly, simply, and easily carried out.

The plug 10 is then removed to flush air from the tank after the injected pressure fluid is connected to the inside of tubular member 1. The plug 10 is then replaced and the liquid or gas pressure is applied to the interior of the tank or pressure vessel to test same.

Such injected pressure acts upon the upper surface of seal ring 14 to force flange 18 against the upper surface of stiffener ring 12, sealing therebetween while simultaneously urging stiffener ring 12 and seal means 20 into sealing engagement with surface 6 about passage 2 in tubular member 1. The injected pressure also acts upon the inner surface 17b of lip 17 to urge the outer surface 17a of lip 17 into sealing engagement with the inner surface 21a of recess 21 formed in the skirt 8a of the cover 8 to press such surface into sealing engagement.

The greater the pressure applied internally of the pressure vessel 1 the more positive and secure the seal is. It should also be noted that the greater the pressure applied internally of the pressure vessel the more positive the gripping action of seal ring segments 62a, 62b, and 62c. The seal about passage 2 in tubular member 1 is uniformly applied along both the surface 6 and 21a to provide a uniform seal without areas of leakage.

As hereinbefore pointed out, a source of pressurized fluid may be connected through a suitable conduit 90, best illustrated in FIG. VI, to deliver pressurized fluid to the inside of closure assembly 4 to seal opposite ends of the tubular member and to deliver pressure to the inside thereof.

It should be readily apparent that other and further embodiments of the invention may be resorted to without departing from the general concept of my invention.

Having described my invention I claim:

1. Means for sealing about a passage in a vessel comprising, a seal ring receptacle, said receptacle having an annular skirt portion; a seal ring assembly slidably disposed in the receptacle, said seal ring assembly having an aperture extending therethrough and having surfaces thereon arranged to be urged into sealing engagement with an inner surface of the skirt portion of the seal ring receptacle and with an outer surface of the vessel; spaced anchor members depending from said skirt portion; interengaging gripping means connectable between the anchor members and the vessel arranged to grippingly engage the outer wall of the vessel whereby fluid pressure in the vessel urges the seal ring assembly into sealing engagement relative to the outer wall of the vessel about the passage and with the skirt of the receptacle, and causes the interengaging means to grip the outer wall of the vessel.
2. The combination called for in claim 1 with the addition of support means insertable into the passage in the vessel, said support means being positioned to prevent deformation of the wall of the vessel gripped by the gripping means.
3. The combination called for in claim 1 wherein the anchor members have tapered surfaces on the inner ends thereof; and wherein the interengaging gripping means comprises, slirping segments positionable about a portion of the vessel, said segments having tapered surfaces thereon slidably engageable with the tapered surfaces on the anchor members.
4. The combination called for in claim 1 with the addition of means between the receptacle and the seal ring assembly to urge the seal ring assembly toward a surface about the passage.
5. The combination called for in claim 4 wherein the means to urge the seal ring assembly toward a surface about the passage comprises a stem movable through an aperture in the receptacle; and with the addition of means to secure the stem to the seal ring assembly.
6. The combination called for in claim 1 wherein the seal ring assembly comprises, an outer lip arranged to be urged by fluid pressure in the receptacle into sealing engagement with an inner surface of the receptacle; and an intumed flange angularly disposed with reference to the outer lip.
7. The combination called for in claim 3 with the addition of abrasive means on the inner side of the slirping segments engageable with an outer wall of the vessel.
8. The combination called for in claim 7 wherein the abrasive means comprises teeth formed on at least one of the slirping segments.
9. The combination called for in claim 7 wherein the abrasive means comprises abrasive material secured to at least one of the slirping segments.
10. The combination called for in claim 3 with the addition of means secured to the anchor members to prevent deformation of said anchor members.
11. An article of manufacture comprising, an annular stiffener ring; an annular shoulder on the outer periphery of the stiffener ring; a resilient piston carried by the stiffener ring, said resilient piston including an outwardly projecting annular lip and an inwardly projecting flange; a backup member carried by the piston; and means to secure the backup member relative to the piston.
12. The combination called for in claim 11 with the addition of resilient seal means on the stiffener ring in spaced relation from the piston.
13. The combination called for in claim 12 wherein the seal means is a gasket.
14. The combination called for in claim 11 wherein the stiffener ring has an opening extending through a central portion thereof.
15. A method of pressure testing a vessel having at least one opening formed therein comprising the steps of, positioning a cover having a piston slidably disposed therein over the opening in the vessel; securing the cover relative to the vessel; and delivering pressurized fluid through the cover to pressurize the inside of the vessel and to force the piston into sealing engagement with an outer surface of the vessel about the opening.

16. The method called for in claim 15 with the addition of the step of inserting a support member in the opening prior to positioning the cover over the opening to prevent deformation of walls of the vessel; and wherein the step of securing the cover relative to the vessel comprises gripping outer surfaces of the vessel at positions substantially corresponding to positions which the inner surfaces are engaged by the support member.
17. Means for closing an opening in a pressure vessel comprising, a segmented slirping assembly positionable to frictionally engage a portion of the pressure vessel; seal means positionable adjacent the opening in the pressure vessel, said seal means having a passage extending therethrough; a receptacle positionable about the seal ring assembly; and anchor means secured relative to the receptacle and engageable with the slirping assembly such that internal fluid pressure in the pressure vessel urges the seal ring assembly into sealing engagement with surfaces of the pressure vessel around the opening therein, and simultaneously urges the receptacle away from the pressure vessel to cause the slirping assembly to frictionally engage a portion of the pressure vessel.
18. The combination called for in claim 17 with the addition of means positionable relative to the pressure vessel opening to prevent deformation of the pressure vessel opening by forces exerted thereon by the slirping assembly.
19. The combination called for in claim 18 wherein the means positionable relative to the pressure vessel opening comprises a tubular member.
20. Means for sealing about a passage in a vessel comprising, a receptacle having an annular skirt portion; an annular stiffener ring made of nonresilient material slidably disposed in the receptacle and having an annular recessed area about one end thereof, providing an outwardly extending shoulder about the other end thereof; a resilient piston carried by the ring, said resilient piston including an upwardly projected annular lip substantially coextensive with the outer surface of the shoulder, said ring and piston having apertures extending therethrough; spaced anchor members depending from said skirt portion; interengaging gripping means connectable between the anchor members and the vessel arranged to grippingly engage the wall of the vessel such that fluid pressure in the vessel urges the ring and piston into sealing engagement relative to the wall of the vessel about the passage and with the skirt of the receptacle, and causes the interengaging means to grip the wall of the vessel.
21. The combination called for in claim 20 wherein the resilient piston is mounted on the inner end of the stiffener ring.
22. A method of sealing an opening in a vessel having a passage formed therein comprising the steps of, inserting a rigid support member through the passage in the vessel to engage an inner wall of the vessel; positioning seal means about the opening in the vessel; gripping an outer wall of the vessel at a location substantially coinciding with the location at which the rigid support member engages the inner wall of the vessel to secure the seal means relative to the vessel; and applying fluid pressure substantially equal to pressure in the vessel for urging the seal means into sealing engagement with outer surfaces of the vessel adjacent the opening.
23. Apparatus for sealing about a passage comprising, a receptacle having an annular skirt portion; a piston slidably disposed in the skirt portion of the receptacle, said piston having an aperture extending therethrough, said piston further having a deformable lip adapted to be urged into sealing engagement with the skirt portion of the receptacle and a deformable flange movable into sealing engagement with a surface adjacent the passage; spaced anchor members depending from said skirt portion; means secured to the anchor members to limit lateral movement thereof; and means secured to the anchor members for translating force tending to move the receptacle away from the passage to force tending to limit movement of the receptacle relative to surfaces adjacent the passage.