

May 28, 1963

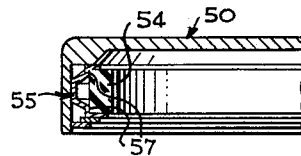
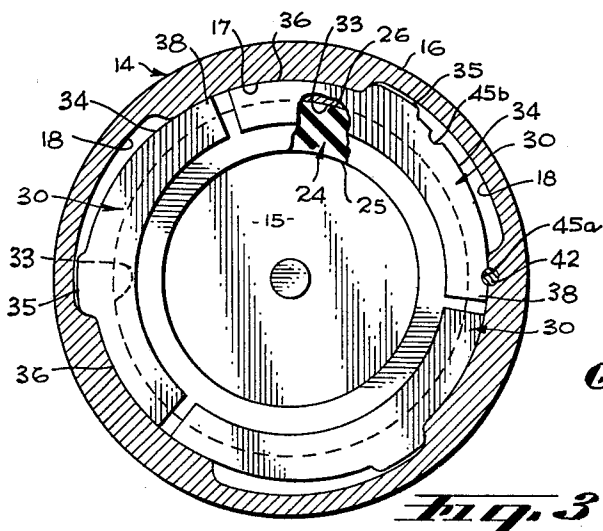
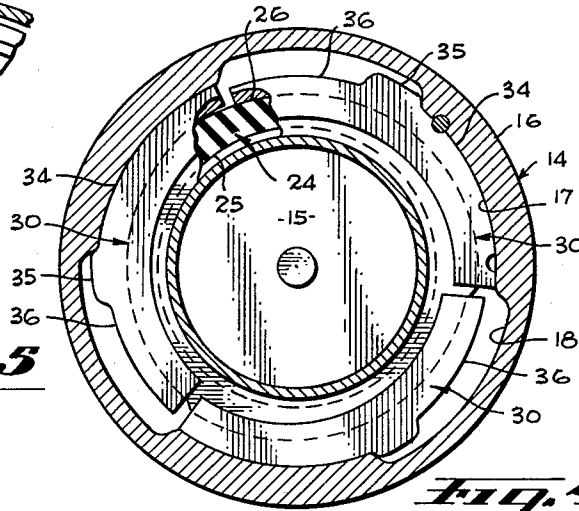
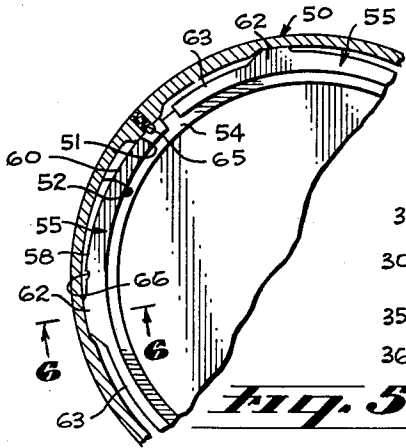
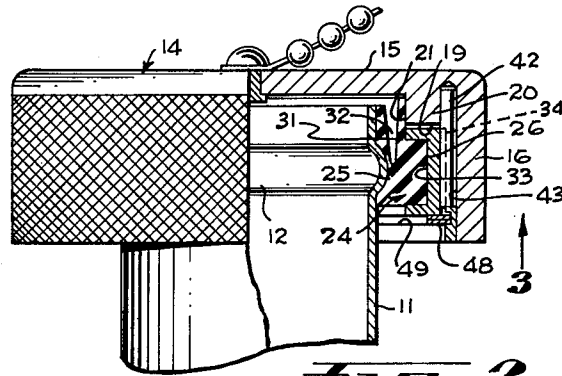
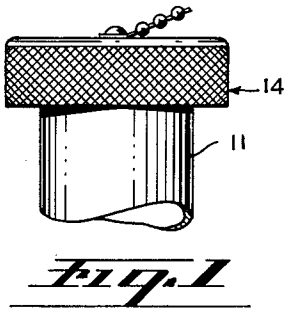
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3,091,358

CLOSURE

Filed Dec. 20, 1960

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

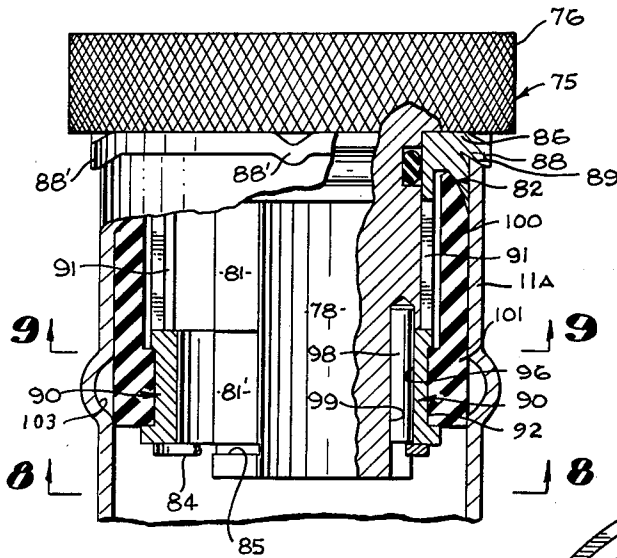


Fig. 7

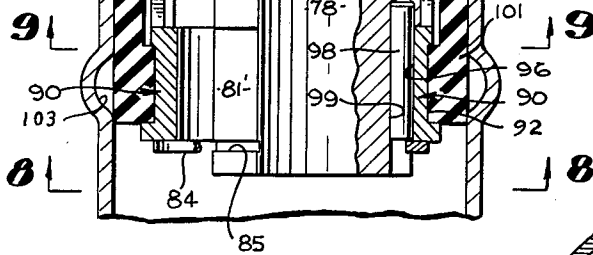


Fig. 8

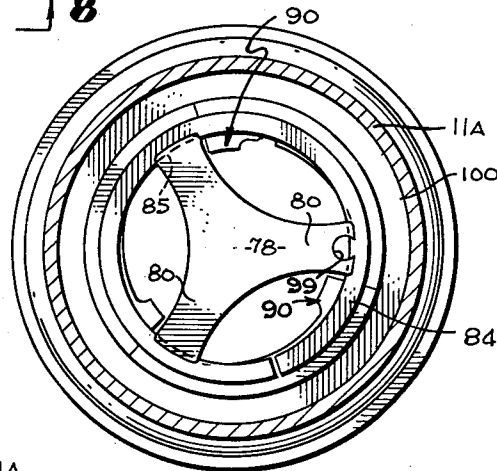
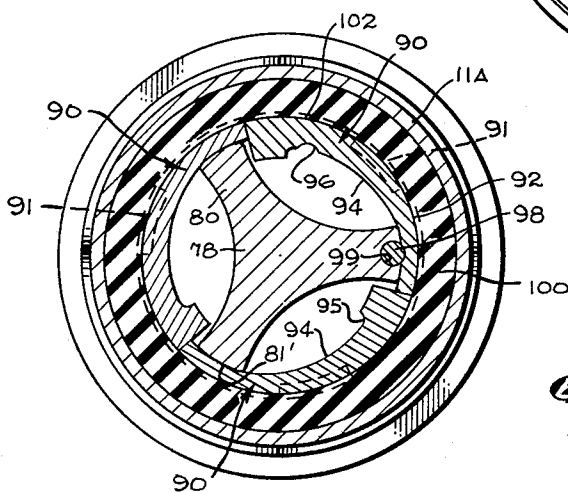


Fig. 9



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3,091,358
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This invention has to do with closures in the nature of caps for conduits, tubes and the like.

An object of the invention is to provide a novel and improved closure or cap for the end of a conduit which tightly embraces the conduit in a manner to provide a fluid-tight seal.

Another object is to provide such a cap or closure which can be readily fitted to the open end of a tube and which operates to sealingly engage the tube when the outer portion thereof is turned slightly.

A further object is to provide a device of the type indicated which firmly grips the end of a tube or the like but which is so constructed that it cannot mar or damage the tube.

Another object is to provide a cap or closure device which, when fitted to the end of a tube or the like and tightened thereon, is designed to withstand high vibration without loosening.

Still another object is to provide a relatively lightweight device which is economical to manufacture, simple in construction, and suitable for fabrication in a variety of materials.

These and other objects will be apparent from the drawing and the following description. Referring to the drawing, which is for illustrative purposes only:

FIG. 1 is an elevational view of a cap embodying the invention attached to the end of a tube;

FIG. 2 is a sectional elevational view of the cap and tube of FIG. 1, but on a larger scale;

FIG. 3 is a sectional view upon line 3—3 of FIG. 2;

FIG. 4 is a view similar to FIG. 3 but showing the outer wall of the cap rotated relative to the remainder of the structure with the parts in sealed or tube-gripping position;

FIG. 5 is a view similar to FIG. 3 but showing an alternate form of the invention;

FIG. 6 is a fragmentary sectional view on line 6—6 of FIG. 5;

FIG. 7 is a sectional elevational view of a modified form of the invention; and

FIGS. 8 and 9 are sectional views on lines 8—8 and 9—9, respectively, of FIG. 7.

More particularly describing the invention, referring first to FIGS. 1—4, 11 designates generally the end portion of a tube or conduit which is shown as having an external bead 12 spaced inwardly a short distance from its end. The bead is not essential to the invention and the tube might be straight-walled or have other desirable configuration. A cap or closure 14 is shown on the end of the tube and this includes an end wall 15 and an axially projecting collar wall 16. The latter includes a cylindrical inner surface 17 which is interrupted by a series of spaced recessed sections or portions 18. The wall 17 is located outwardly of the end wall with respect to an annular shoulder 19 defining a thickened portion 20 of the collar wall having a cylindrical inner wall 21.

Within the cap I provide a resilient gasket, designated 24, which may be made of rubber, plastic or other material suited to the particular purpose. The gasket is annular, having cylindrical inner and outer walls designated 25 and 26, the inner wall being adapted to receive and engage the tube 11. The gasket is partially housed within and preferably bonded to a plurality of cam elements 30 which are interposed between the periphery of the gasket

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and the collar wall 16. These elements are channel-shaped in cross section to partially receive the gasket. The latter has an axial extension 31 which extends into the cap beyond the cam elements 30, the extension having a relatively deep, annular V-groove 32. With this construction the gasket effectively seals against the tube and face 21 in the cap as will later become apparent. Also the groove is so located that fluid pressure in the tube produces expansion of the gasket.

Each cam element has an inner arcuate surface 33 which is normally concentric with the inner wall 17, and an outer arcuate surface 34 which is not concentric therewith. An enlargement 35 is provided at the end of surface 34, and beyond this is an arcuate outer surface 36 concentric with the inner surface 33. Thus each cam element is tapered and increases in thickness from its leading end 38 to the enlargement 35. In the normal or released position, much of the surface 34 and adjacent enlargement 35 of each cam element is received in a recessed portion 18.

Just ahead of one of the recessed portions 18 I provide a detent pin 42 in an axial bore 43 and this projects inwardly of its adjacent surface 17 for reception selectively in an axial notch or groove 45a or 45b of the adjacent cam element 30. A spiral washer 48 or other suitable member is received in a groove 49 to retain the parts.

In the operation of the device the cap is forced on the end of the tube to the position in which it is shown in FIGS. 2 and 3. The cap member 14 is then turned counterclockwise (as viewed in FIGS. 3 and 4) from the position of FIG. 3 to that of FIG. 4. This results in the cam elements 30 being forced inwardly to tightly engage and compress the gasket and thus cause it to firmly engage the tube. It also serves to effect a seal between the gasket and cap 14 through tight engagement with surface 21 of the cap. The detent pin 42 enters the groove 45b to releasably hold the parts. The cap is released by turning the cap clockwise from the position of FIG. 4 to that of FIG. 3. While the construction shown has been designed for operation by turning the cap in a given direction to tighten the parts and in the opposite direction to loosen them, it will be apparent that the parts can be assembled for operation by turning oppositely to the described directions.

Referring now to FIGS. 5 and 6, I show an alternative form of the invention wherein the cap member, here designated generally by 50, is shown provided with a series of circumferentially spaced circular internal surfaces 51 between a plurality of recessed areas or surfaces 52. The latter are nonconcentric with the center of the cap, and thus serve as cams.

A resilient gasket 54 of cylindrical form is provided in the cap and between this and the cap are a plurality of cam elements 55. Each of these is shown as having a modified channel shape in cross section to partially receive the gasket to which they may be bonded. Internally the elements 55 have shoulder surfaces 57 which are concentric with the center of the cap and directly engaging the outer surface of the circular gasket 54. However the outer surface of each element 55 is formed to provide a wall section 58 which is nonconcentric to the surfaces 57 and thus forms a tapered or beveled cam surface. Forward of the surface 58, each element has a surface 60 concentric with the inner surfaces 57. Intermediate its ends, each element has a radial enlargement 62 which engages the adjacent recessed surface 52 of the cap, and beyond the enlargement, a trailing section 63 of reduced diameter. One or more spring-pressed detent balls 65 are provided in the cap for engagement in grooves 66 of the adjacent element 55.

In the operation, the cap member is turned counter-

clockwise as shown in FIG. 5 to move the elements 55 inwardly and compress the gasket about the tube. It will be noted that the enlarged portions 62 ride along the cam surfaces 52 while the cam surfaces 58 ride along the surfaces 51. The detent 65 engages the groove or recess 66 to releasably hold the parts in place. The assembly is released by turning the cap in the opposite direction.

Referring now to FIGS. 7, 8, and 9, I show a plug-type closure designed to fit inside the end of a conduit or tube 11A. The closure is shown as it would appear when first inserted in the end of the tube prior to being expanded.

In this form the plug body 75 is provided with a knurled, cylindrical end portion 76 which can be conveniently grasped. Projecting axially from the section 76 is a section 78 having three radially and axially projecting ribs 80 which are formed with arcuate outer surfaces 81 as portions of a cylinder having an axis coincident with the axis of the closure. The surfaces 81 are preferably formed with recesses 81', arcuately concentric with surfaces 81.

A spreader sleeve 82 is rotatably mounted upon the ribbed portion of body 75, being held in place by a snap ring 84 in grooves 85. The spreader includes an annular section 86 which fits against the end section 76 of body 75. Section 86 is provided with a flange 88 shown as having four axially offset portions 88' adapted to be received in recesses 89 formed in the end of the tube 11A. The spreader is also provided with three arcuate shoes or cams 90 mounted at the ends of legs 91. The outer surfaces 92 of the shoes are cylindrically arcuate about a common center. The inner surfaces 94 serve as cam surfaces for the surfaces 81' of the rib portions of the body of the device, since the shoes taper in width from end to end. Shoulders 95 limit relative movement between the ribs and the shoes. One cam surface has a groove 96 to receive an axially extending pin 98 mounted in a bore 99 of one rib of the body 75.

A tubular, resilient gasket 100 is provided around the spreader and preferably is formed in the region 101 to fit into the recessed surfaces 92 of the shoes 90.

In the operation of the device, the closure plug is inserted in the end of a conduit or tube 11A and the offset portions 88' of the spreader made to register with the recesses 89 in the end of the tube, as shown in FIGS. 7-9. Rotation of the body 75 in the appropriate direction then serves to force the shoes 90 radially outward and expand the gasket into tight sealing engagement with the inner surface of the conduit or tube which is shown as having an internal recess 103, although this recess is not essential. The pin 98 and recess 96 act similar to a detent means to releasably hold the parts in expanded position. Rotation of the plug body 75 in the opposite direction permits the parts to contract for removal of the plug.

Although I have illustrated and described a preferred form of my invention, I contemplate that various changes and modifications can be made therein without departing from the invention, the scope of which is indicated by the following claims.

I claim:

1. A conduit closure, comprising a cap having an end wall and an axially projecting cylindrical collar wall, the inner surface of said collar wall having a recessed section, an annular gasket within said cap adapted to receive the end of a conduit, and an arcuate cam element extending partially around said gasket and interposed between the gasket and the collar wall of the cap, said cam element having an arcuate, gasket-engaging inner surface and an arcuate collar wall-engaging outer surface extending nonconcentrically relative to its inner surface, said cam element normally being positioned adjacent and partially

received within said recessed area of the collar wall, said cap and cam element being relatively rotatable for a limited distance whereby to enable said cam element to be forced radially inward to compress said gasket against the conduit.

2. A conduit closure as set forth in claim 1 in which said cam element has a radial enlargement received in the recessed area of said collar wall and cooperating therewith to limit relative rotation between said cam element and said cap.

3. A conduit closure as set forth in claim 1 in which said cam element has a radial enlargement received in the recessed area of said collar wall and cooperating therewith to limit relative rotation between said cam element and said cap and in which said cam element is longer than said recessed area.

4. A conduit closure, comprising a cap having an end wall and an axially projecting cylindrical collar wall, an annular gasket within said cap spaced radially inward of said collar wall and adapted to receive a conduit to be closed, a plurality of arcuate cam elements disposed between said gasket and the collar wall of said cap, said wall having an elongated recessed area adjacent each cam element, said cam elements each having an arcuate gasket-engaging inner surface and an arcuate collar wall-engaging outer surface disposed nonconcentric with said inner surface, said cam elements normally being positioned to be partially received in said recessed areas, said cap being rotatable relative to said cam elements for a limited distance whereby to enable said cam elements to be forced radially inward to compress said gasket against the conduit.

5. A conduit closure as set forth in claim 4 in which said cam elements are channel-shaped in cross section and receive said gasket.

6. A conduit closure as set forth in claim 4 in which said cam elements are attached to said gasket.

7. A conduit closure as set forth in claim 4 in which each cam element has a radial enlargement received in a recessed area of the collar wall and cooperating therewith to limit relative rotation between the cam element and said cap.

8. A conduit closure as set forth in claim 4 in which interengaging means is provided between the cap and one of said cam elements for releasably holding said elements in operative or inoperative position.

9. A conduit closure, comprising a cap body having an end wall and a cylindrical axial wall, an annular resilient gasket having continuous circular inner and outer surfaces, said gasket being radially spaced with reference to said axial wall, a plurality of arcuate elements between said axial wall and said gasket and engaging the gasket, and interengaging cam means between said axial wall and said elements effective, upon relative rotation between said axial wall and said elements to move said elements radially into tight engagement with said gasket.

10. A conduit closure, comprising a closure body, an annular resilient gasket adapted to fit next to the wall of the conduit, a plurality of arcuate elements between said closure body and said gasket, interengaging cam means between said arcuate elements and said closure body constructed, arranged and effective, upon relative rotation between said closure body and said elements to move said elements radially against said gasket and force the same into tight engagement with the wall of the conduit.

11. A closure as set forth in claim 10 in which said arcuate elements are around said body and surrounded by said gasket.

12. A conduit closure, comprising a plug body providing circumferentially spaced axially extending land portions of limited circumferential extent, a spreader ring on said plug body having arcuate shoes, said shoes taper-

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ing in thickness circumferentially, and a resilient tubular gasket around said shoes.

13. A closure as set forth in claim 12 in which said spreader includes an annular section having axially projecting portions adapted to be received in recesses in the end of a conduit and in which said shoes are carried upon leg portions of the spreader extending axially of the annular section. 5

14. A closure as set forth in claim 12 in which means is provided between said body and said spreader for releasably holding the parts in expanded condition. 10

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