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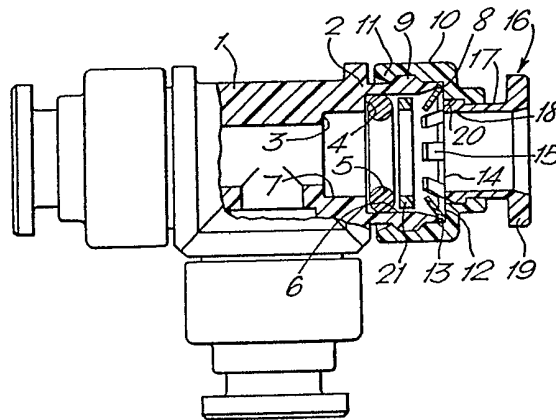
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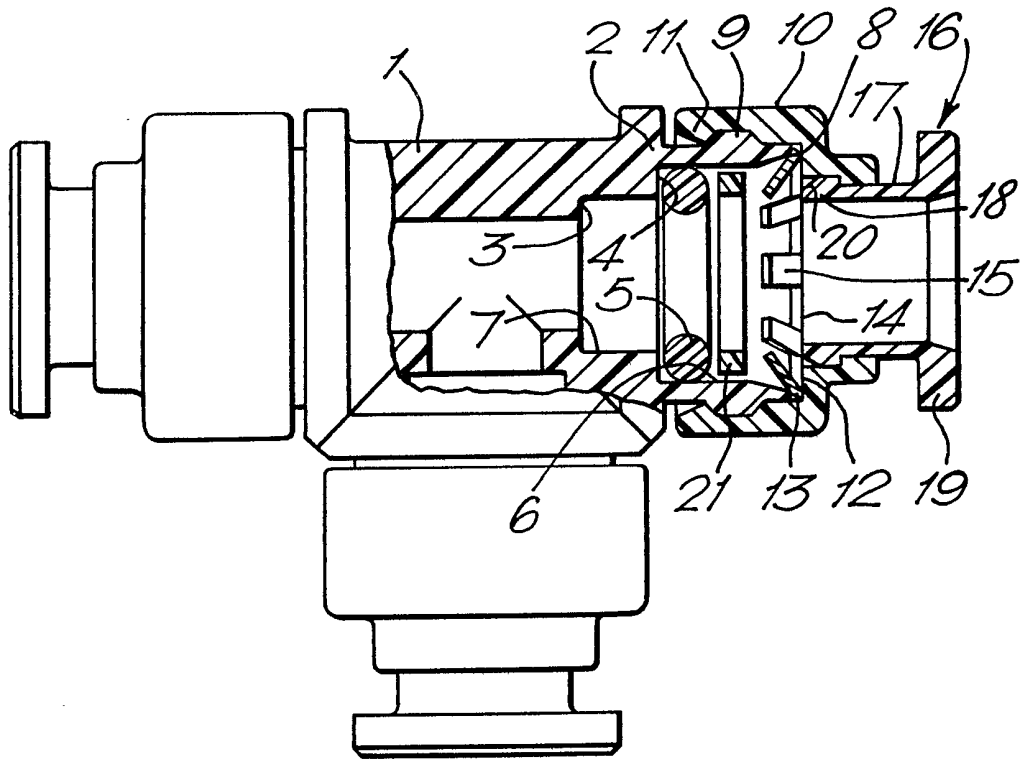
(54) Pipe coupling

(57) A pipe coupling device comprises a hollow body member (1) having at least one terminal portion (2) for receiving an end portion of a pipe to be coupled to the device, an O-ring seal (5) housed within the terminal portion (2) for sealingly engaging the external surface of the pipe, a grab washer (14) having a number of tube-gripping teeth (15) which normally prevent withdrawal of the pipe and axially movable release sleeve (16) for releasing the grip of the teeth (15) on the pipe when it is desired to withdraw the pipe from the device. The grab washer (14) and the release sleeve (16) are located by means of an annular cap member (10) that engages, as a snap fit, the external surface of the terminal portion (2).



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SPECIFICATION

Tube coupling devices

5 This invention relates to tube coupling devices in which, in use, the tube (for example a flexible plastics tube or other hollow cylindrical member such as a rigid tailpiece) is releasably retained in the device by a so called grab washer, a sealing member, 10 for example in the form of a resilient O-ring, being provided within the body of the device for forming a fluid-tight seal with the tube. Such devices are already generally known and the present invention provides an improved construction thereof.

15 According to the present invention, a tube coupling device comprises a hollow body member having at least one terminal portion for receiving therein a tube, annular sealing means housed within the terminal portion for sealingly engaging 20 the tube, annular tube gripping means comprising a plurality of resilient teeth that extend generally towards the axis of said terminal portion and that grip the external surface of the tube normally preventing withdrawal thereof, and release means axially movable between a first, inoperative, position 25 and a second position in which it resiliently deforms said teeth generally radially outwardly in order to permit removal of the tube from the device, characterised in that the tube gripping means and 30 the release means are located by means of a generally annular cap member that engages, as a snap-fit, the external surface of the said terminal portion of the device.

A preferred tube coupling device of the invention 35 will now be described, by way of example only, with reference to the accompanying drawing which is a side elevation, partly in section, of a T-connector.

Referring to the drawing, the T-connector includes a bored body 1 which may be made of any suitable metal or plastics material, for example 40 brass or nylon. The two arms and the leg of the body, and the tube-retaining and sealing parts associated with them, are respectively substantially identical and the following description refers to the 45 right-hand, sectioned arm of the connector.

That arm comprises, as an integral part of the body 1, a terminal portion 2 that extends from an annular abutment surface 3 formed internally of 50 the body 1; as is conventional, the abutment surface 3 serves to limit insertion of the tube (not shown) into the connector. The terminal portion 2 has formed internally thereof an annular abutment surface 4 which seats a sealing O-ring 5, made of a 55 suitable resilient material such as nitrile rubber. The outer periphery of the O-ring 5 sealingly engages the cylindrical surface of a bore 6 formed in the terminal portion 2. Intermediate the surfaces 3 and 4, the terminal portion 2 is formed with a short 60 cylindrical bore 7 that serves to locate the tube radially.

The bore 6 terminates, at the outermost end of the terminal portion 2, at an annular surface 8.

The external surface of the terminal portion 2 is 65 formed integrally with an annular projection 9

70 which serves to retain, as a snap-fit, an annular cap 10. To this end, the cap 10 is provided with a radially inwardly extending flange 11 which engages behind the projection 9 and which is radially resilient to a sufficient degree that the cap 10 may be assembled onto the terminal portion 2 merely by pushing it onto that portion until the flange 11 has ridden over, and has snapped back behind, the 75 projection 9. A sufficient degree of resilience may be realised by making the cap 10 of a plastics material such as an acetal resin.

However, the cap 10 could be substantially rigid, eg made of metal, the projection 9 (which may, for 80 example, alternatively comprise one or more local projections) then being resilient so that the required snap-fit can be realised. The cap 10 is formed integrally with an annular surface 12 between which and the annular surface 8 of the terminal portion is sandwiched the periphery 13 of a 85 grab washer 14. The periphery of the washer 14 is preferably a continuous ring from which there extends generally radially inwardly a plurality of tube-gripping teeth 15. The grab washer 14 is preferably made of a metal such as stainless steel or 90 beryllium/copper.

The cap 10 also retains a tubular release sleeve 16. More particularly, the release sleeve 16 comprises a cylindrical portion 17 having an integral 95 enlarged inner end 18 and an outer, integral flange 19. The sleeve is axially slidable within the cap 10 between an innermost limit (dictated by abutment of the flange 19 against the cap 10) at which it resiliently deforms the teeth 15 of the grab washer 14 away from the axis of the terminal portion 2 100 and an outermost limit (as shown in the drawing and dictated by abutment of the enlarged end 18 against an internal surface formed on the cap 10) in which the teeth 15 engage the tube in use. The release sleeve 16 is preferably made of a plastics 105 material, for example an acetal resin and as such may be assembled into the cap 10 as a snap-fit merely by pushing its enlarged inner end 18 in to the cap 10 until the former snaps behind the internal surface formed in the cap. Such assembly is facilitated by providing the enlarged inner end 18 of 110 the release sleeve 16 with a tapered surface 20 and, more importantly, this facilitates deformation of the grab washer teeth.

Intermediate the O-ring 5 and the grab washer 115 14, the bore 6 houses, as a loose sliding fit, a spacer washer 21 which serves to prevent contact between the O-ring and the teeth of the grab washer 14 and hence possible damage to the O-ring, as described below. The washer 21 may be 120 made of a suitable metal, for example brass, or plastics material such as an acetal resin.

The operation of the connector described above will be readily apparent to those skilled in the art, but briefly it is as follows. With the release sleeve 125 16 in the position shown in the drawing (although if possible scratching of the outside of the tube needs to be avoided, the sleeve 16 may be depressed), a tube of appropriate diameter is coupled to the connector merely by inserting it, via the 130 bore in sleeve 16, until the end of the tube abuts

the surface 3. During this operation the tube deforms the teeth 15 slightly outwards, passes through the washer 21 and then through the O-ring 5 which becomes radially compressed and forms a fluid-tight seal with the external surface of the tube. The teeth 15 grip the outer surface of the tube and, if an attempt is made to withdraw the tube without first pushing the release sleeve 16 fully or substantially fully inwards, the teeth 15, in cantilever fashion, increase their gripping force on the tube (and, for example, in the case of a relatively soft plastics or metal tube, actually bite into the tube) thereby preventing withdrawal. However, if it is desired to withdraw the tube, the operator merely pushes the release sleeve 16 (by applying finger pressure to the flange 19) more or less fully inwards in order to deform the teeth 15 so that they become free or substantially free of the tube surface, and then withdraws the tube. Upon releasing the sleeve 16, the teeth 15 return to their original position and the connector is again ready for receiving a tube.

In use, particularly if the connector is being utilised in a relatively high pressure system, the O-ring 5 will tend to be pushed along the bore 6; the washer 21, in such a case, serves to prevent the O-ring contacting, and possibly being damaged by, the teeth 15 of the grab washer 14. This arrangement also means that, in cases where the O-ring 5 moves a sufficient distance along the bore 6 that it urges the washer 21 against the teeth 15, the latter's grip on the tube is increased, ie a desirable servo action operates.

It will be appreciated that a coupling device of the invention may have any desired configuration as an alternative to the T described above. Commonly used examples are straight connectors, elbow connectors, bulkhead connectors etc which may be of the fixed or swivel type.

Likewise, any suitable materials may be used and the above-mentioned ones are, of course, given as examples only. However, since, in use, fluid will come into contact with the connector body 1, the body should be made of a material that is compatible with the fluid in question. On the other hand, the O-ring 5, grab washer 14, cap 10, spacer washer 21 and release sleeve 16 may be made of any mechanically acceptable material regardless of the fluid because the latter, save in the case of leakage, will not come into contact with any of these items. Further, the specific design described with reference to the drawing may be modified without departing from the scope of the invention.

55 CLAIMS

1. A tube coupling device comprising a hollow body member having at least one terminal portion for receiving therein an end portion of a tube to be coupled to the device, annular sealing means housed within the terminal portion for sealingly engaging the external surface of the tube, annular tube gripping means comprising a plurality of resilient teeth that extend generally towards the axis

of said terminal portion and that grip the external surface of the tube normally preventing withdrawal thereof, and generally tubular release means through which, in use, said tube extends and that is axially movable between a first, inoperative, position and a second position in which it resiliently deforms said teeth generally radially outwardly in order to permit removal of the tube from the device, characterised in that the tube gripping means and the release means are located by means of a generally annular cap member that engages, as a snap-fit, the external surface of the said terminal portion of the device.

2. A tube coupling device according to Claim 1 wherein the tube gripping means comprises a peripheral annular portion with which the teeth are integral and wherein said annular portion is sandwiched between the outermost end of the terminal portion and an internal, radially extending annular surface of the cap member.

3. A tube coupling device according to Claim 1 or Claim 2 wherein the external surface of the terminal portion is provided with an annular enlargement which engages, as a snap fit, a radially inwardly extending flange of the cap member.

4. A tube coupling device according to any one of Claims 1 to 3 wherein the release means and the cap member have mutually co-operating surfaces which serve to limit axial movement of the release means to movement between said first and second positions.

5. A tube coupling device substantially as herein described with reference to and as illustrated in the accompanying drawing.