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GB 0871697 A

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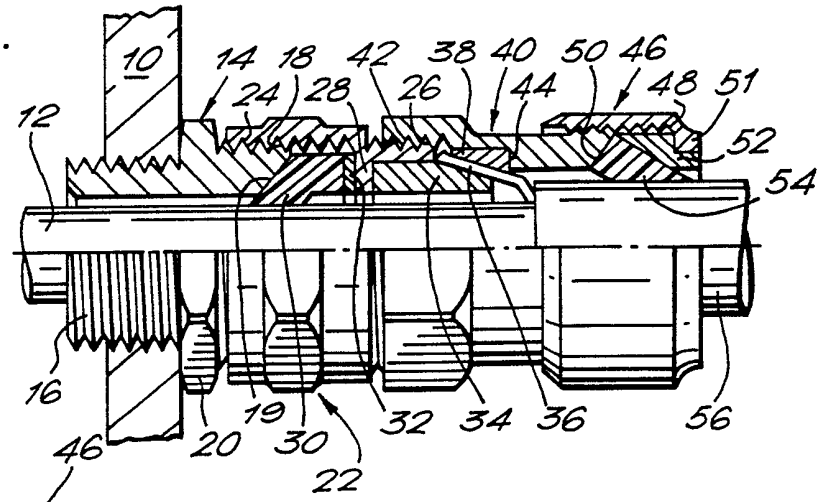
(54) Cable gland assembly

(57) In a cable gland assembly, wedge cones (34, 38) for clamping onto cable armouring (36) are separable from clamping sleeves 14, 58, 40. In fig. 1, a smaller cable seal assembly (28, 30, 32) receives the armour clamp and a larger cable seal assembly (51, 52, 54) is received on the armour clamp. In fig. 3, the smaller cable seal is omitted.

FIG.1.



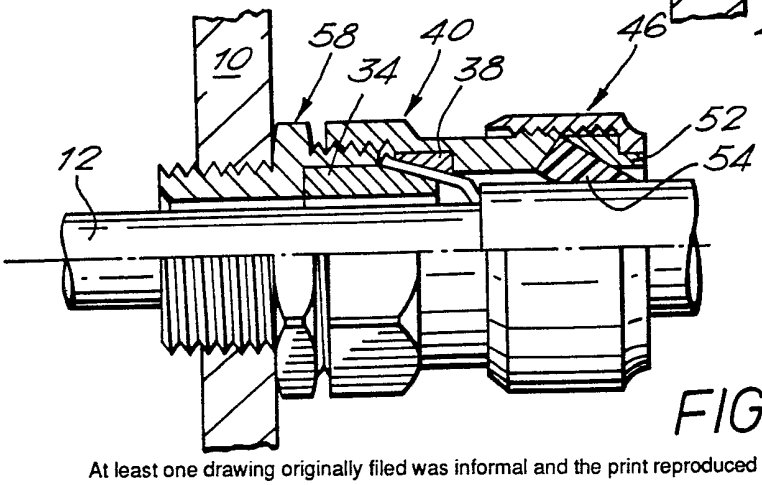


FIG.3.

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1990.

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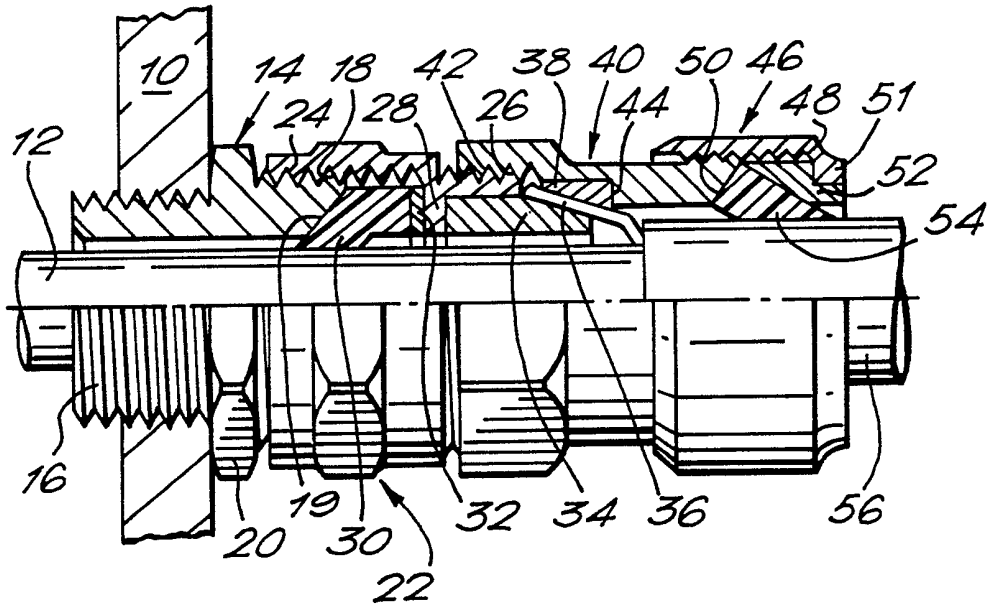
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FIG.1.

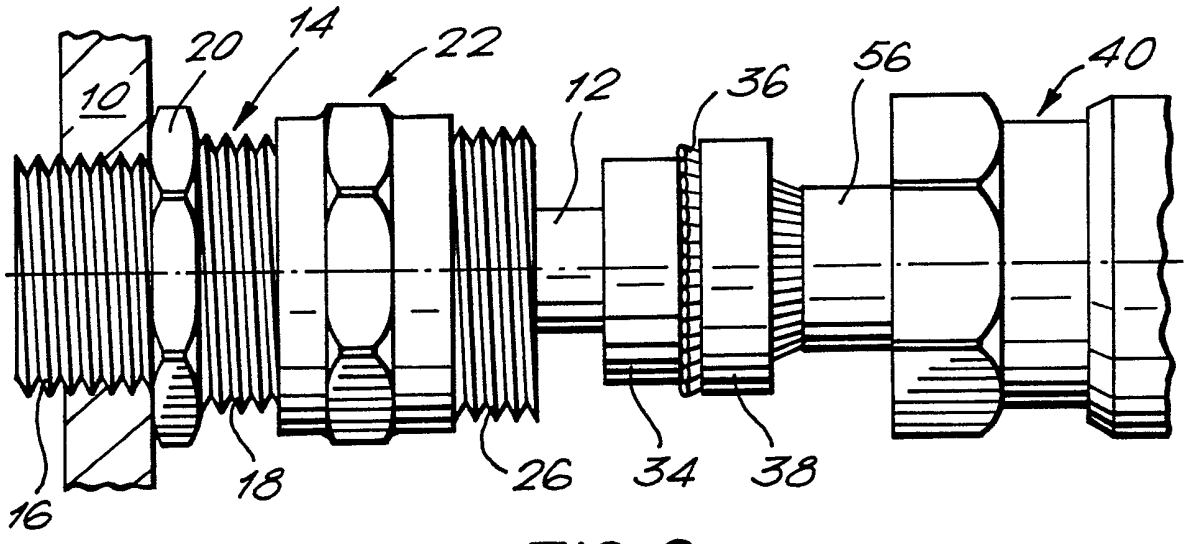
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FIG.2.

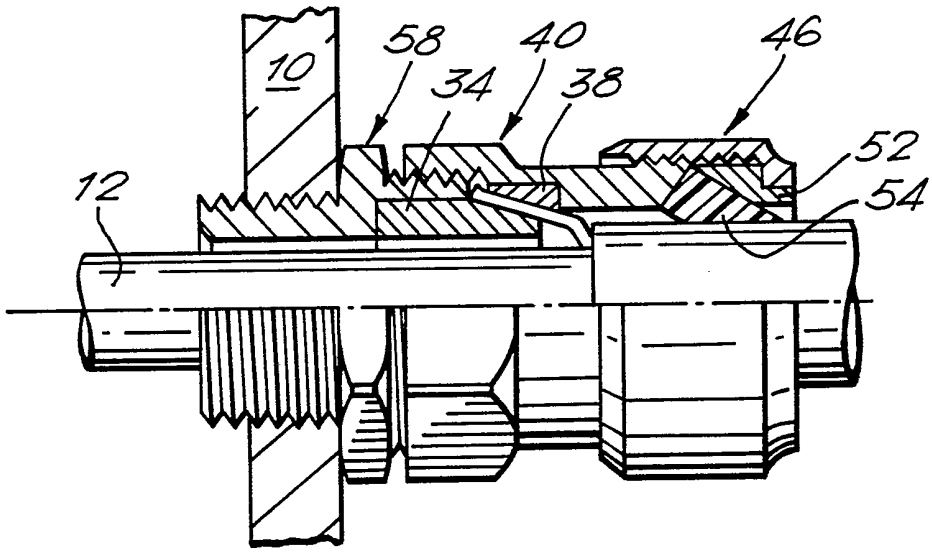

FIG. 3.

CABLE GLAND ASSEMBLY

The present invention relates to cable gland assemblies. The invention is particularly applicable to cable glands for electrical cables having armour wire protection.

Cable glands for electrical cables are known which provide a seal where a cable passes through a hole in, for example, the wall of a housing in which is installed electrical equipment. Such a gland assembly normally comprises a number of sleeve members which screw together to compress sealing components into sealing engagement with the cable. One end of the gland is formed with an externally threaded portion which is threadedly engaged in the hole.

It is also known to clamp the armour wire portion of an armoured cable to a further portion of the gland to provide an earth connection between the wall and the armour wire. One way of doing this is to clamp the armour wire between clamping faces of two threadedly engaged clamping members which are part of the gland.

However, it is often necessary to inspect and/or test cable gland assemblies. This may require removal of the cable and gland from the housing and dismantling of the gland. For example, there is a growing requirement for regular safety audits of electrical plant requiring, amongst other things, earth loop

impedance testing of earthed cable armouring. Such testing presently necessitates removal of the gland from its enclosure.

An increasing requirement of safety examination is also inspection of the internal components of a gland assembly. Amongst these may be the condition of the armour wire clamping providing an earth connection for the cable. Such inspection may necessitate the dismantling of the gland for each examination to expose the cable armouring. Repeated dismantling and re-assembly of the gland can, therefore, cause excessive wear of the component parts of the cable, in particular, the armour wire which must be unclamped and reclamped each time. In addition, re-assembly of the gland is time consuming because the armour wire must be carefully positioned each time to ensure an adequate earth connection is achieved.

Furthermore, replacement of a failed piece of electrical apparatus such as an electric motor, will necessitate disconnection and removal of the gland assembly. This operation should desirably be quick and simple to perform so that minimal disturbance to the running of the associated plant is experienced. It is also desirable that the minimum amount of dismantling of the gland components has to be effected in order to maintain as far as possible the integrity of the gland seals and/or earth connections.

It is found that the known armour clamping arrangement also exert stress on the armour wire as the clamping arrangement components are screwed together to engage the wire. This tends to carry the armour wire with the rotational movement.

The known assembly is also inflexible as only a limited range of cable diameters can be accommodated by any one clamping arrangement.

According to the present invention there is provided a cable gland assembly comprising a gland, a detachable cable wire clamp for clampingly engaging a cable wire, and retaining means for securing the cable wire clamp in relation to the gland.

The clamp connection provides an electrical earth connection between the assembly and, for example, the armour wire. This is conveniently effected when the component parts of the clamp and the gland form an electrical path.

The clamp is preferably held in contact with the gland by means of a retaining member, such as a gland sleeve, which is secured to a gland body to hold the clamp in place. This securement of the retaining member is preferably by means of a threaded engagement. In the case of a gland sleeve, it is formed with an abutment which engages the clamp to hold it in electrical contact with the body. In this case, the retaining gland sleeve is received on the cable along with the gland body and may be arranged to draw the clamp into contact with the gland body.

The retaining means may also serve to cause the clamp to bite on the wire, for example, the armour wire of an armoured cable, at the same time as it is used to secure the clamp in relation to the gland.

Preferably, the engagement of the wire by the clamp is effected between inner and outer conical surfaces of two engaging clamping members which become frictionally engaged with the wire in between when clamping is effected. This can be used to provide a particularly secure electrical connection which is maintained even when the clamp is removed from the rest of the assembly. In this case, clamping members may be constituted by an inner clamping ring, having a radially outwardly facing frusto-conical surface and an outer clamping ring, having a radially inwardly facing frusto-conical surface.

The gland may have an external thread and an annular recess adapted to receive the inner clamping ring and the retaining means may have an internal thread complementary to the external thread of the gland body. As the clamping arrangement is separate from the gland and the retaining means, the tendency for the clamped armour wire to be angularly dragged around as clamping is effected is substantially reduced as the clamp members bear on the faces against which they abut on the gland and retaining means. The bearing face on the gland and/or the retaining may be constituted by a radially inwardly projecting ledge located within an annular recess adapted to receive the outer clamping ring. Thus, when the sleeve members are

secured together, the clamping rings are brought into engagement with, for example, the cable armour wire which is clamped between them. The armour wire is thus subjected to linear compression forces, but substantially reduced angular forces which tend to rotate the wires and abrade them in the process.

In addition, when the gland and retaining member are parted, the armour wire remains clamped between the rings and is thus not disturbed, although it is freely accessible for inspection and testing. Repeated disassembly and re-assembly of the assembly is thus possible without undue wear or disturbance being caused to the armour wire and its electrical connection through the rings. Since the tapered surfaces are provided by separate, relatively small components, i.e the clamping rings, a range of these rings may be provided having different co-operating internal and external sizes to accommodate different sizes of cable.

It is important that there is good electrical contact between the clamp, the clamping members and the gland body. It is thus preferable that the clamping members are a close tolerance push-fit within the respective annular recesses, while being manufactured accurately enough to allow relative rotation between the rings and the members in which they are housed.

To increase the electrical safety of the assembly, it is preferable that the resistance to any earth current passing through the assembly should be minimised. Thus, the area of any cross-section through an electrically conducting portion of the gland

assembly is desirably not less than the cross-sectional area of the largest cable armour wire which may be accommodated by the assembly.

Preferably, the gland comprises a resilient annular seal member received between an annular abutment on the gland body and a radially inwardly extending ledge of a threaded seal member which is received on a further complementarily threaded portion of the said gland body. The seal member is conveniently a further gland sleeve which is secured on to the gland body to compress the seal radially inwardly against the cable.

In one particular embodiment, the clamping arrangement is located between the above seal arrangement which seals against an exposed cable core and a further similar compression seal mounted on a radially inwardly extending flange inside a compression member and an end face of the retaining means, an externally threaded portion of the retaining means being in engagement with a further complementarily threaded portion of the compression member. This further seal engages an outer cable sheath.

The present invention can be put into practice in various ways, some of which will now be described by way of example with reference to the accompanying drawings in which:

Figure 1 is a side elevation, partly in section, of a cable gland assembly according to the invention;

Figure 2 is a side elevation of the cable gland assembly of Figure 1 in a partially dismantled state;

Figure 3 is a side elevation, partly in section, of a cable gland assembly of another embodiment according to the invention.

Referring firstly to Figures 1 and 2, reference numeral 10 indicates a wall of a housing which has a hole through which a cable core 12 passes and in which is received part of a cable gland body 14.

The gland body 14 is a generally cylindrical member, having an axial bore through which the cable core 12 passes. At one end of the body 14 is a first externally threaded portion 16 which is received in the hole in the wall 10 to engage with a complimentary internal thread in the hole. Alternatively, the portion 16 may be a clearance fit in the hole. In this case, the body may be secured by a retaining nut on the opposite side of the wall.

At the opposite end of the body there is a second external thread 18. Between the first and second external threads 16 and 18, there is peripherally hexagonal flange 20 for engagement by a spanner which has a flat surface on its face adjacent the wall 10 which abuts the wall surface where the body is secured in the hole.

The inner surface of the gland body opposite the second external thread 18 is formed with a chamfered portion 19 which extends radially inwardly and towards the first threaded portion 16.

Reference numeral 22 indicates a first gland sleeve which is a generally cylindrical hollow member having an internally threaded portion 24 at its end nearest the wall 10, and an externally threaded portion 26 at its other end. Between the two threaded portions 24 and 26 the gland sleeve 22 is formed with a radially inwardly extending annular projection 28. The outer surface of the gland sleeve 22 radially opposite the internally threaded portion 24 is formed with a hexagonal shape for engagement by a spanner.

A first or inner annular seal 30 and a first skid washer 32 are located between the projection 28 and the chamfered portion 19 of the gland body 14. The seal 30 is made from an elastomeric material, for example, a plastics material, which may be extruded or moulded. The skid ring 32 may be made of a more rigid plastics material or metal.

A second gland sleeve 40 has an internally threaded portion 42 at its end nearest the wall which carries an external hexagonal formation for engagement by a spanner. The remainder of the sleeve 40 is of a smaller diameter and is formed with an external thread at its end remote from the wall. The cylindrical portion between the threads has an internal recess defined between the internal thread 42 and an inwardly extending annular ledge 44.

An inner armour wire clamping ring 34 is received within the first gland sleeve 22 as a close tolerance fit. The ring 34 abuts a face of the annular

projection 28 opposite that contacting the skid washer 32. The ring 34 extends beyond the end of the first gland sleeve 22. The radially outer surface of the exposed portion of the ring is chamfered. Armour wire 36 is exposed and arranged to lie on the outer chamfered surface of the clamping ring 34. This is engaged by a complementary chamfered inner face of an outer clamping ring 38 which is drawn onto the inner clamping ring 34 by the second gland sleeve 40. The outer clamping ring 38 abuts the internal annular ledge 44 in the second gland sleeve 40 for it to be urged into engagement with the armour wire 36 lying on the inner clamping ring 34. The chamfered surfaces of the clamping rings may be plain or knurled or have any other suitable surface texture for engaging and retaining the cable armour wire between them.

A compression member 46 has an internal thread 48 which is engaged with the external thread at the end of the second gland sleeve 40 remote from the clamping rings. The same end of the gland sleeve 40 has an internal chamfered ledge 50. Between this ledge 50 and the radially inwardly projecting collar 51 at the remote end of the compression member 46 are located a second skid ring 52, abutting the collar 51 on the compression member 46, and a second annular seal ring 54 adjacent the chamfered ledge 50 of the second gland sleeve 40. The skid ring 52 also has a chamfered surface on its axial end face which engages the seal 54.

In use, the cable is passed through the entire assembly. An outer sheath 56 of the cable 12 is engaged by the second seal ring 54 and the exposed cable armour wire is cut to length to lie between the inner and outer armour clamping rings 34 and 38. The inner core of the cable is sealingly engaged by the first or inner seal 30. Each of the seals and the armour wire clamp can be tightened up without disturbing the others by adjusting the inner seal 30 first, and the clamp rings 34 and 38 and outer seal 54 in sequence thereafter.

The face on the hexagonal flange 20 of the gland body 14 is brought into engagement with the housing wall 10 by rotating the gland body 14 with a spanner. Similarly, the hexagonal formation on the first gland sleeve 22 may be engaged by a spanner and rotated to compress the seal 30 against the chamfered surface 19 and urge it radially inwardly sealingly to engage the cable core 12.

Rotational distortion and abrasion of the seal 30 are avoided by the inter-position of the skid ring 32 between the seal and the projection 28 which provides a low friction inter-face.

The cable armour wire 36 is clamped between the inner and outer armour clamping rings 34 and 38 by rotating the second gland sleeve 40 with respect to the first gland sleeve 22. If the engagement of the first and second gland sleeves is loosened, the clamping rings 32 and 38 tend to remain in engagement with the cable armour wire 36 rather than with the first and

second gland sleeve and thus dismantling the gland does not have to include disturbing the electrical connection between the rings and the armour wire.

The second seal 54 is urged radially inwardly by rotating the compression member 46 and thus, pinching the seal 54 between the chamfered ledge 50 of the second gland sleeve 40 and the chamfered face on the skid ring 52. Sealing engagement is thus created around the outer sheath 56 of the cable.

When dismantling the gland assembly to inspect and/or test the armour wire 36, it is necessary only to slacken the retaining member 46 in order to relax the outer seal 54 and to slacken the second gland sleeve 40 from the first gland sleeve 22, to remove the clamp retainment . The armour wire 36 can then be exposed, as shown in Figure 2, by a unscrewing the first gland sleeve from the gland body to relax the seal on the cable core 12 and drawing the cable through the inner seal. The armour wire joint can thus easily be inspected or have other testing apparatus connected to it without having to disturb the electrical connection itself.

It should be noted that, in the arrangement described above, as it is possible individually to tighten each of the seals and the armour clamp, the pressure on the cable exerted by each seal can be controlled accurately to avoid excessive distortion of the sheath, and similarly excessive distortion of the armour wire can be avoided.

Furthermore, it is possible to accommodate different diameters of cable core and armour wire by providing differently sized sets of pairs of clamping rings.

Referring now to Figure 3, a second embodiment of the invention comprises only an outer seal and clamp arrangement. Thus, this assembly has a seal compression member 46, an outer seal ring 54 and skid ring 52, inner and outer armour clamping rings 34 and 38 and a gland sleeve 40 similar to the second gland sleeve of Figures 1 and 2. The connection of the assembly with the wall 10 is by means of a single element 58 which has an externally threaded portion at its end near the wall 10 which is received in the hole in the wall, and at its other end is also externally threaded to mesh with an internal thread on the gland sleeve 40. An annular cut-away portion on the inside of the element 58 at the other end thereof, receives the inner clamping ring 32. In use, this gland assembly functions in a similar manner to the gland of Figures 1 and 2.

CLAIMS:

1. A cable gland assembly for an electrical cable, comprising a cable gland, a detachable cable wire clamp for clampingly engaging a cable wire, and retaining means for securing the cable wire clamp in relation to the gland.

2. An assembly as claimed in claim 1 in which the retaining means are also arranged to urge the clamp to engage the cable wire.

3. An assembly as claimed in claim 1 or 2 in which the retaining means comprise a gland sleeve which is securable to the cable gland to bear against the clamp, the clamp being maintained in a cable wire engaging position with respect to the cable gland by the gland sleeve.

4. An assembly as claimed in claim 3 in which the gland sleeve is securable to the cable gland by means of a threaded engagement.

5. An assembly as claimed in claim 3 or 4 in which the clamp comprises a pair of engagable collars defining an annular clamping region between co-operating surfaces of the collars.

6. An assembly as claimed in claim 5 in which the collars are receivable on a cable passing through the cable gland.

7. An assembly as claimed in claim 6 in which one of the collars abuts a bearing surface on the gland.

8. An assembly as claimed in claim 6 or 7 in which the gland sleeve has a bearing surface arranged to engage the other of the collars to urge it into clamping relationship with the one collar.

9. An assembly as claimed in claim 5, 6, 7 or 8 in which the collars constitute inner and outer members, respectively defining radially outer and inner conical surfaces between which the cable wire is clamped.

10. An assembly as claimed in any preceding claim in which the clamp is maintained in clamping engagement by means of its engagement with the cable wire.

11. An assembly as claimed in any preceding claim in which the cable wire is armour wire forming an earthing sheath around at least one electrical conductor, the clamp being arranged to engage the armour wire to form part of an earth path through the cable gland.

12. An assembly substantially as specifically described herein with reference to Figures 1 and 2 or 3 of the accompanying drawings.

13. An assembly as claimed in any preceding claim including a plurality of sets of cable wire clamps, each for securement in relation to the gland and each adapted to accommodate differing diameters of electrical cable passing through the gland.

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