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GB 0246694 A EP 0159121 A1 WO 90/15454 A1
US 4834675 A US 3264602 A

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(71) Applicant(s)
British Engines Limited

(Incorporated in the United Kingdom)

Glasshouse Street, St Peters,
Newcastle upon Tyne NE6 1BS, United Kingdom

(72) Inventor(s)
John David Sowerby

(74) Agent and/or Address for Service
Kilburn & Strode
30 John Street, LONDON, WC1N 2DD,
United Kingdom

(54) Cable gland

(57) A cable gland for a cable with a protective armour sheath wherein the clamped armour wire (18) is held securely between the gland's body (10, 36) and an armour clamping sleeve (60, 44) by the sleeve (60, 44) and the body (10, 36) each have a radially projecting ridge (42, 48) which is an interference fit with the other. By further providing these ridges (42, 48) with locking surfaces which are engaged when the sleeve is in an armour clamping position, the risk of poor electrical connections arising between the armour wire (18) and its clamp during dismantling and recontruction of the cable gland for inspection purposes, is thereby minimised. The interference fit members for armour clamping may be clamping parts (36, 44) which are seperable from the body (10) and/or sleeve (60).

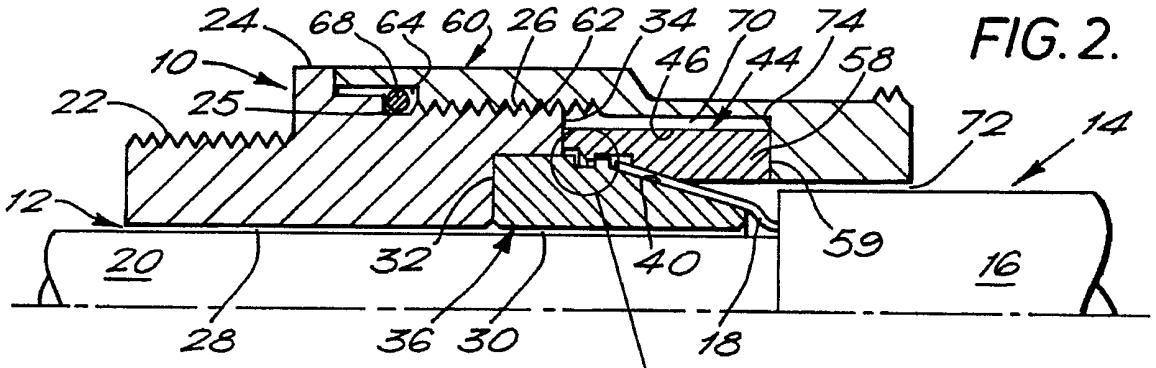

FIG. 2.

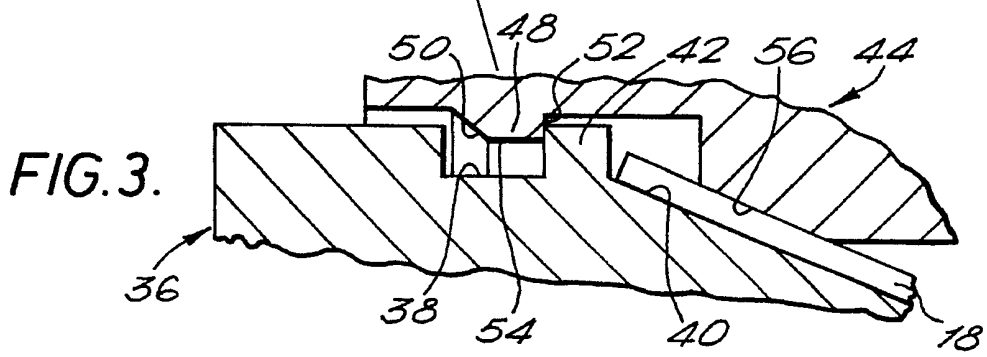

FIG. 3.

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

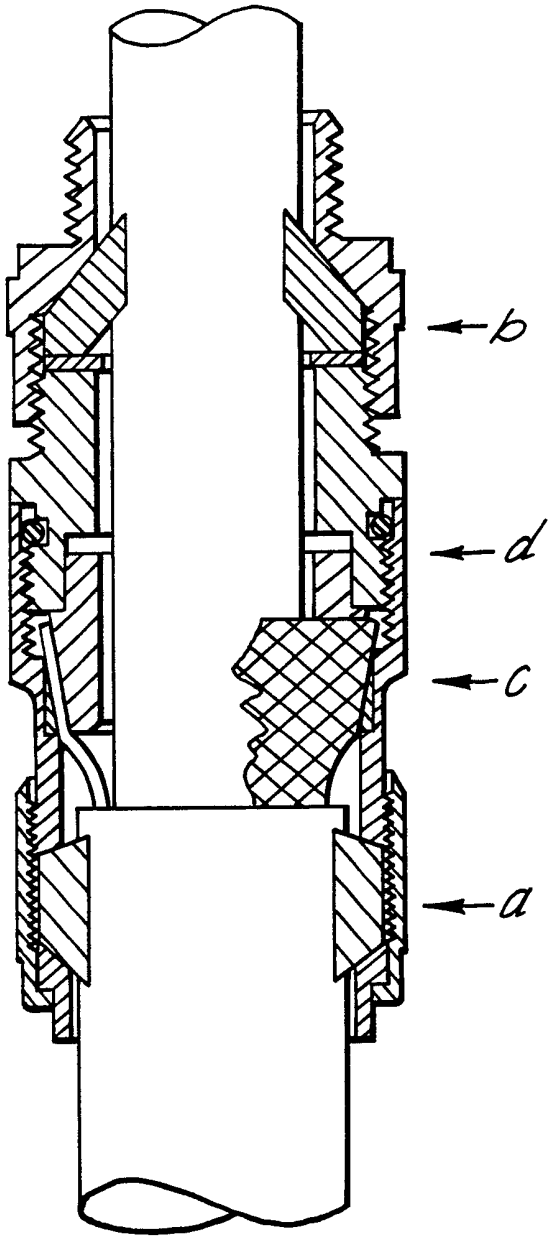

FIG.1.

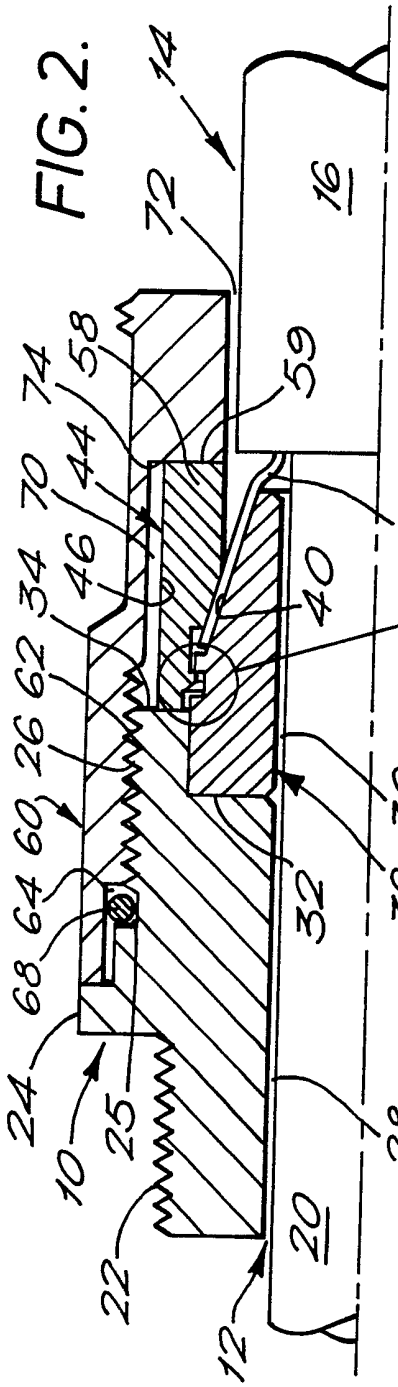
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FIG. 2.

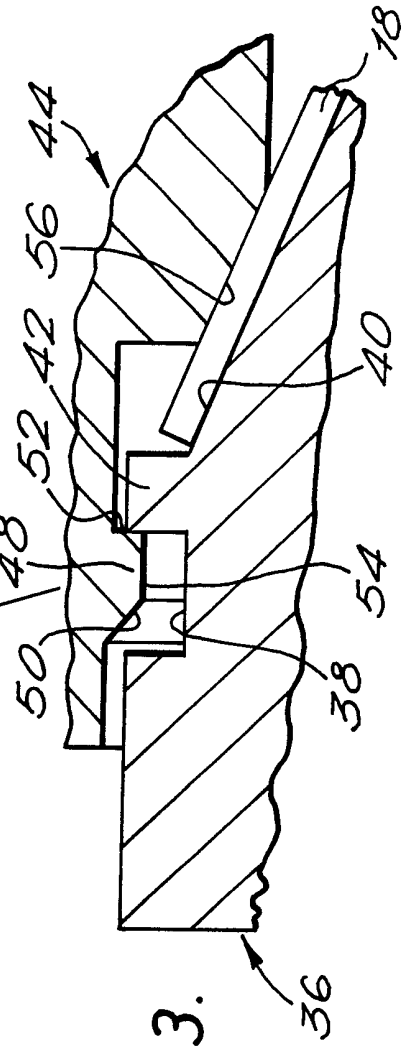
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FIG. 3.

IMPROVEMENTS IN CABLE GLANDS

This invention relates to cable glands. The invention is particularly applicable to a cable gland having a protective armour sheath.

A cable may be protected by surrounding the cable core in a sheath of armour wire. This can also usefully be used as the cable earth. The armour wire is either braided or in the form of strands each extending in a lazy helix around the insulated cable core. When two cables are to be joined together or where a cable enters or exits an enclosure the cable gland is used at the junction. The cable gland may provide a simple sealing and/or flameproofing in a potentially hazardous environment. The cable armour wire is clamped between two surfaces which are held together by a sleeve which is tightened onto the gland body.

Figure 1 of the drawings illustrates a typical flame proof cable gland manufactured by CMP (UK) Limited and sold under part no. E1F4X. This particular gland is used for many different types of cable having wire armour where it is necessary to produce an adequate seal onto the outer sheath and also to produce an explosion proof seal onto the inner sheath covering the cable core. These regions are respectively denoted a and b in the drawing. The clamp for the armour wire between engaging conical surfaces is indicated in the region denoted by the letter c. This particular gland also has a weather-proof seal provided by an O-ring in an annular recess in the gland body engaging the inner surface of an extension of a sleeve part of the gland at d. The construction of a flameproof gland of this sort will be well known to the

skilled person and will not be expanded upon here.

From time to time it is necessary to be able to inspect the conditions inside the gland. This usually involves dismantling the gland to some degree. The first aspect of this is usually disassembly of the sleeve holding the armour wire clamps in place from the gland body. Because of this the electrical connection between the armour wire and the gland body can be disturbed when an inspection is made. Each time the gland is reassembled the earth connection has to be reestablished and checks have to be carried out to see whether the connection is good enough.

It is an object of the present invention to provide a cable gland for armoured cable in which the clamped armour wire is securely held in place.

According to the present invention there is provided a cable gland for an armoured cable, comprising : a gland body having a bore through which the cable passes; an armour clamping sleeve which is engageable with the gland body from a cable inlet end thereof, the sleeve and the body having cooperating surfaces between which the cable armour is clamped when the sleeve is engaged with the body in an armour clamping position; the gland further comprising a first radially projecting ridge on the sleeve which is an interference fit with the second oppositely radially projecting ridge on the body, the ridges having locking surfaces which are engaged when the sleeve is in an armour clamping position.

The ridges, once driven past one another provide a secure means of maintaining the clamping force on the cable armour. The locked clamp is not now dependent on the

sleeve being kept tightly drawn up on the gland body.

Preferably, the cooperating clamping surfaces are formed on clamping parts of the gland body and/or the sleeve that are separable from the rest of the body and/or sleeve. For example, the sleeve may be formed with an annular shoulder which bears on one end of the clamping part associated with the sleeve to draw it into the armour clamping position in relation to the clamping part associated with the body. In this way, the sleeve can be released, once the clamping position has been reached, without the clamp pressure being relaxed on the cable armour. The locking surfaces of the body and the sleeve are effectively permanently maintained in the armour clamping position of the two components unless a considerable parting force is applied to separate the clamping surfaces.

Preferably, the first ridge projects radially inwardly relative to the bore. In this case, the second ridge projects radially outwardly to provide the interference between the two.

Preferably, the locking surfaces on the ridges are annular abutting surfaces in planes generally perpendicular to the axis of the bore.

Preferably, the locking surface on the first ridge on the sleeve faces generally towards the cable inlet side of the gland body. In this case the first ridge may include a chamfered surface opposite the locking surface, which chamfered surface is arranged to urge the first ridge to ride radially outwardly and over the second ridge towards the armour clamping position in which the locking

surfaces are engaged.

Preferably, the body and the sleeve have co-operating radially outer and inner tapered surfaces, respectively, between which the cable armour is clamped.

Preferably, the or each of the first and second ridges is angularly continuous.

Preferably, the sleeve is threadedly engagable with the body to draw the co-operating surfaces into the armour clamping position.

Preferably, the co-operating surfaces between which the cable armour is clamped are separable from the sleeve and the gland body. In this case the sleeve can be removed from the gland body without disturbing the armour clamping. For example, the sleeve may include an annular insert mounted on an annular ledge in the sleeve by which the insert is drawn into the armour clamping position by the sleeve. Similarly, the gland body may also comprise an annular insert mounted on an opposing annular ledge in the body on which at least the other clamping surface is defined. Preferably, both the first and second ridges are also defined on the respective inserts of the sleeve and the body.

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

Figure 2 is a partial longitudinal cross-section of a cable gland according to the invention; and

Figure 3 is a scrap section of a part of the gland

in Figure 1.

Referring to the drawings, a flameproof cable gland comprises a gland body 10 which has a central bore 12. A cable 14 has an outer insulating and protective layer 16 and a radially inner sheath of braided armour wire 18 and an inner core 20 containing the conducting elements (not shown). The gland of Figure 2 is not shown complete with seals, but it will be appreciated by the skilled person that seals similar to those illustrated in Figure 1 will be incorporated on either end of the gland to provide the seal on the outer sheath and the inner core.

At the cable exit end (to the left hand side in Figure 2) the gland body 10 is formed with a first threaded portion 22 for receiving the seal for the inner core 20 referred to above. A hexagonal flange 24 for a spanner is formed adjacent the first threaded portion 22. A coaxial circular section column projects away from the side of the flange opposite the first threaded portion 22. This column is formed with an annular recess 25 before a second threaded portion 26 of the gland body 10.

The bore 12 has a first smaller diameter portion 28 extending from the cable exit end to about halfway along the second threaded portion 26. This portion 28 is joined to a coaxial second larger diameter portion 30 by a plane shoulder 32. The end of the gland body 10 axially coincides with the end of the second threaded portion 26 at a plane end face 34.

A first annular wedge member 36 is received on the shoulder 32 and within the second larger diameter portion 30 of the bore 12. The first wedge member 36 projects

from the end of the gland body towards an inlet end of the gland (to the right hand side in Figure 2). The first wedge member 36 is formed with a rectangular sided annular channel 38 and a radially outer conical surface, constituting an inner wedge 40 tapering inwardly toward the inlet end of the gland. The wedge 40 is separated from the channel 38 by an annular radially outwardly projecting ridge 42.

A second wedge member 44 cooperates with the first wedge member 36 to clamp the armour wire relative to the gland. The second wedge member 44 has a circular section cylindrical outer surface 46. The radially inner surface comprises a radially inwardly projecting annular ridge 48 having an annular chamfered edge 50 facing the exit end of the gland and a plane annular shoulder 52 which are joined by a radially inner annular surface 54 running parallel to the bore 12.

An outer conical wedge surface 56 is defined on the radially inner surface of the second wedge member 44. The second wedge member 44 has a cylindrical portion 58 extending from the conical wedge portion towards the inlet end of the gland and an end face 59 in a plane perpendicular to the axis of the bore 12.

A clamping sleeve 60 has a threaded region 62 by which it is received on the second threaded portion 26 of the gland body 10. A plane cylindrical section in a surface of the sleeve defines a recess 64 which cooperates with the recess 25 in the gland body 10 between the flange 24 and the second threaded portion 26 to create an annular housing for a sealing O-ring 68.

The external surface of the sleeve 60 opposite the threaded region is hexagonal in section to receive a spanner. The end of the sleeve 60 extends axially from the threaded region defining a circular section bore 70 of a smaller diameter than the recess 64 on the opposite end of the sleeve 60. The bore 70 is connected to a smaller coaxial inlet bore 72. An annular shoulder 74 in the sleeve defining the transition between the two bores projects radially perpendicularly to the axis of the bores. The flat surface 59 of the wedge member 44 is received on the shoulder 74 in the recess defining the bore 70.

It will be appreciated that the cable on which the gland is to be used is prepared by cutting away the outer insulation 16 and preparing the braided armour wire 18 by cutting it back so that sufficient extends beyond the outer insulation and flaring this exposed portion so that it is easily introduced onto the wedge surface of the first wedge member 36.

As the sleeve 60 is drawn onto the gland body 10 by engagement of the threads, the wedge members 36 and 44 are initially free of each other, being mounted in their respective recesses in the gland body 10 and the sleeve 60. Eventually the axial movement of the sleeve brings the chamfered edge 50 on the second wedge member 44 into contact with the inlet side of the ridge 42 on the first wedge member 36. Further axial movement of the sleeve 60 forces the ridge 48 to expand slightly, assisted by the chamfered edge, in the radial direction to ride over the ridge 42. When the ridge 48 is past the ridge 42 it snaps radially inwardly so that the first and second wedge members are locked together by the abutting

engagement of the ridges. Relative axial movement of the wedge surfaces relative to one another also causes them to bite on the fanned armour wire which is laid between the two wedge surfaces.

It is now possible to release the sleeve 60 from the gland body 10 for inspection purposes without risking a degradation in the tightness of the clamp on the armour wire. The locked clamping members provide an effectively permanent engagement with the armour wire unless a considerable parting force is applied to drive the second wedge member back. Even then the first wedge member must be held securely before this can be done.

The interference between the two ridges amounts to about 0.25 mm when the wedge members are first brought together. The dimensions of the gland will vary according to the size of cable to which it is being fitted. As an example, the range of glands illustrated in Figure 1 are able to accept cable diameters between 8.4 mm and 78 mm depending on size.

The wedges are made of conventional cable gland brass although other electrically conductive suitably rugged materials could be used. Similarly the gland body and sleeve are also made of brass.

The first wedge member is illustrated as being a separate unit from the rest of the gland body. However, it will be appreciated that this could be incorporated as part of a unitary gland body structure to equal effect.

It is the ridge 48 on the second wedge member that is more disposed to yield than the ridge 42 on the first

wedge member because of the tendency of the material to expand more readily radially outwardly as the ridges pass one another. It would be possible to introduce slits in the ridge 48 to encourage it to expand radially outwardly. Similarly, it would be possible to encourage the ridge 42 to contract radially inwardly by providing spacing slits in the first wedge member such that the ridge 42 defines prongs more able to flex radially inwardly. However, providing such slits would involve additional machining costs.

CLAIMS.

1. A cable gland for an armoured cable, comprising : a gland body having a bore through which the cable passes; an armour clamping sleeve which is engageable with the gland body from a cable inlet end thereof, the sleeve and the body having cooperating surfaces between which the cable armour is clamped when the sleeve is engaged with the body in an armour clamping position; the gland further comprising a first radially projecting ridge on the sleeve which is an interference fit with a second oppositely radially projecting ridge on the body, the ridges having locking surfaces which are engaged when the sleeve is in an armour clamping position.

2. A cable gland as claimed in claim 1, wherein the cooperating clamping surfaces are formed on clamping parts of the gland body and/or the sleeve that are separable from the rest of the body and/or sleeve.

3. A cable gland as claimed in claims 1 and 2, wherein the sleeve is formed with an annular shoulder which bears on one end of the clamping part associated with the sleeve to draw it into the armour clamping position in relation to the clamping part associated with the body.

4. A cable gland as claimed in any of the preceding claims, wherein the first ridge projects radially inwardly relative to the bore, and the second ridge projects radially outwardly relative to the bore, to provide the interference between the two.

5. A cable gland as claimed in any one of the preceding claims, wherein the locking surfaces on the ridges are annular abutting surfaces in planes generally perpendicular to the axis of the bore.

6. A cable gland as claimed in any one of the preceding claims, wherein the locking surface on the first ridge on the sleeve faces generally towards the cable inlet side of the gland body.

7. A cable gland as claimed in any one of the preceding claims, wherein the first ridge includes a chamfered surface opposite the locking surface, which chamfered surface is arranged to urge the first ridge to ride radially outwardly and over the second ridge towards the armour clamping position in which the locking surfaces are engaged.

8. A cable gland as claimed in any one of the preceding claims, wherein the body and the sleeve have co-operating radially outer and inner tapered surfaces, respectively, between which the cable armour is clamped.

9. A cable gland as claimed in any one of the preceding claims, wherein the or each of the first and second ridges is angularly continuous.

10. A cable gland as claimed in any one of the preceding claims, wherein the sleeve is threadedly engagable with the body to draw the co-operating surfaces into the armour clamping position.

11. A cable gland as claimed in any one of the preceding claims, wherein the co-operating surfaces between which the cable armour is clamped are separable from the sleeve and the gland body.

12. A cable gland as claimed in any one of the preceding claims, wherein the sleeve includes an annular insert mounted on an annular ledge in the sleeve, by which the insert is drawn into the armour clamping position by the

sleeve.

13. A cable gland as claimed in claim 12, wherein the sleeve further includes an annular insert mounted on an opposing annular ledge in the body on which at least the other clamping surface is defined.

14. A cable gland as claimed in any one of the preceding claims, wherein both the first and second ridges are also defined on the respective inserts of the sleeve and the body.

15. A cable gland substantially as specifically described, with reference to figures 2 and 3.

Patents Act 1977
Examiner's report to the Comptroller under Section 17
(The Search report) -13-

Application number
GB 9306593.6

Relevant Technical Fields

(i) UK Cl (Ed.M) H2E (EDGB, EGAA, EGBA)

(ii) Int Cl (Ed.5) H01R; H02G

Search Examiner
J A WATT

Date of completion of Search
23 JUNE 1994

Databases (see below)
(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii)

Documents considered relevant following a search in respect of Claims :-
1-15

Categories of documents

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P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages		Relevant to claim(s)
X	GB 0246694 A	(KIRK ET AL) Figure 2 and lines 68-86, page 2	1 at least
X	EP 0159121 A1	(FRANCAISE DES ISOLANTS) Figures 5 and 6 and line 21, pages 2-12, page 3	1 at least
X	WO 90/15454 A1	(RAYCHEM) Figures 1-15 and lines 15-37, page 22	1 at least
X	US 4834675 A	(LRC ELECTRONICS) Figures 2B, 3 and 9 E-H	1 at least
X	US 3264602 A	(AMP) Figures 1-3	1 at least

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