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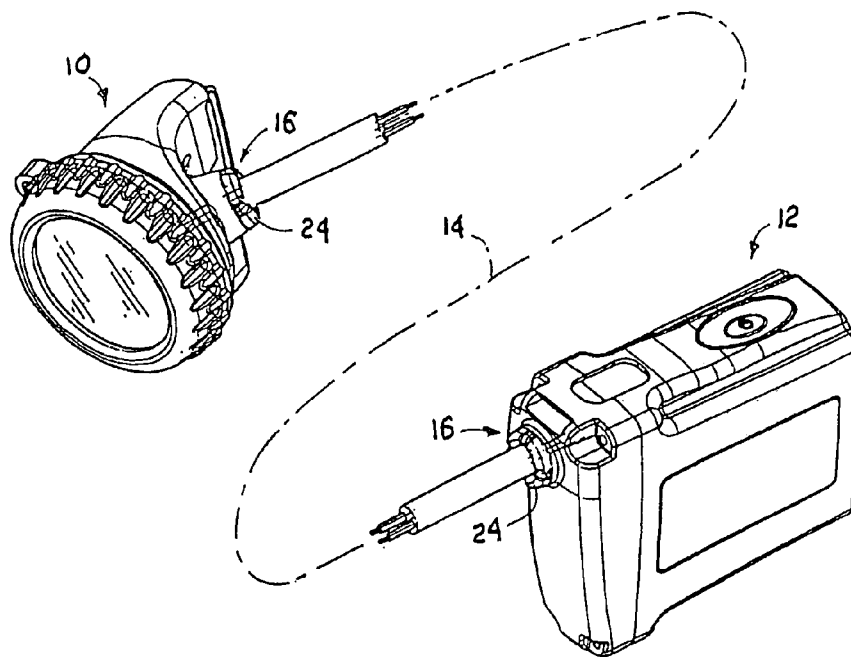
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(54) Title: CAP LAMP CABLE ATTACHMENT ARRANGEMENT



(57) Abstract: This invention relates to a cap lamp and battery pack cable attachment arrangement which includes a length of flexible cable which electrically connects the cap lamp to the battery pack, and a cable gland component on at least one end of the cable for releasably physically and electrically connecting the component to a complementary gland component on either the cap lamp or battery pack to provide a moisture-proof cable gland across the releasable connection.

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CAP LAMP CABLE ATTACHMENT ARRANGEMENTFIELD OF THE INVENTION

[0001] This invention relates to a cable and an arrangement for releasably attaching the cable to a cap lamp and/or to its battery pack.

5 BACKGROUND TO THE INVENTION

[0002] The light source in modern cap lamps is one or more high intensity light emitting diodes which are operated by control circuitry in the lamp housing. The cap lamp battery pack includes charging microprocessor circuitry.

10 [0003] The cap lamp and its battery pack are connected to each other by a flexible cable the ends of which are releasably attached to the lamp and battery pack.

[0004] In deep level underground mines miners work in a hostile high temperature and humid environment in which moisture may destructively come into contact with the electric circuitry in both the cap lamps and their battery packs through the removable cable connections connecting the two together.

15 OBJECT OF THE INVENTION

[0005] It is the object of this invention to provide a cable and a moisture-proof arrangement for releasably attaching the cable to a miner's cap lamp and/or to its battery pack.

SUMMARY OF THE INVENTION

[0006] A cap lamp and battery pack cable attachment arrangement according to the invention comprises a length of flexible cable which electrically connects the cap lamp to the battery pack, and a cable gland component on at least one end of the cable for
5 releasably physically and electrically connecting the component to a complementary gland component on either the cap lamp or battery pack to provide a moisture-proof cable gland across the releasable connection.

[0007] Both ends of the cable may carry a cable gland component and both the cap lamp and the battery pack may include a complementary gland component for releasable
10 attachment to the cable gland cable components.

[0008] The or each cable gland cable component may include a pair of electrical contact sockets which are each electrically attached to a cable conductor, a cylindrical plug of resiliently compressible material in which the contact sockets are partially embedded and which surrounds an end portion of the cable, the or each complementary gland component
15 includes a cylindrical socket into which two electrical pins project in the axial direction of the socket and which are engageable in the electrical cable sockets when a cylindrical plug on the cable end is pressed into the socket and means for moving the cable gland components towards each other to radially expand the cable plug into moisture-sealing contact with the electrical connections in the gland.

20 [0009] The portion of the cable over which a portion of the compressible plug is located may be bonded to the plug and may include an outwardly projecting formation which

extends across the interface between the cable and plug to inhibit the cable from being pulled from the plug.

[0010] The or each complementary gland component may include an internally threaded socket which is larger in diameter than and coaxial with the unthreaded pin socket and the
5 cable gland moving means may be an externally threaded gland nut which is slidable on the cable and threadedly engageable with the complementary gland component socket and adapted to compress and so to radially expand the cable plug in the gland.

[0011] The or each cable gland may include mating key and keyway formations on the cable gland components to ensure the correct electrical orientation of the pins and pin
10 sockets when the components of the gland are engaged with each other.

[0012] The key may project radially into and in the axial direction of the unthreaded socket of the complementary gland component with its keyway being located in the cylindrical body of the cable plug.

[0013] The key and its keyway may be longer than the length of the pins which project
15 from the base of the unthreaded socket of the complementary gland component to ensure the correct orientation of the pins and pin sockets prior to their contact with each other.

[0014] The invention may additionally extend to the cable per se including the cable gland components which it carries.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] The cap lamp and battery cable attachment arrangement together with the cable of the invention are now described by way of non-limiting examples only with reference to the drawings in which :

- 5 Figure 1 is an isometric view of the cap lamp and its battery pack which are connected to each other by the power cable of the invention,
- Figure 2 is a sectioned side elevation of one end of the power cable of Figure 1,
- Figure 3 is a sectioned side elevation of a female portion of the cable connector on both the cap lamp and its battery pack,
- 10 Figure 4 is an end elevation of the cable of Figure 2, and
- Figure 5 is a sectioned side elevation of the Figure 2 cable end connected to the Figure 3 cable connector.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

[0016] Figure 1 illustrates a cap lamp 10 which is releasably located on a miner's hard hat
15 in use, a battery pack 12 and a cable 14 physically and electrically connecting the battery pack to the lamp by means of cable connector glands shown generally at 16.

[0017] The cable 14, as shown in Figures 2 and 5, is a two-core flexible PVC cable which includes, adjacent each of its free ends, a metal crimp ring 18 which is partially embedded in the cable material. Connector sockets 20 are electrically connected to the cable 14
20 conductors, as shown in Figures 2 and 5.

[0018] The cable gland 16 includes a cylindrical plug 22 which is made from a suitable resiliently compressible thermoplastics material which is injection moulded onto the outer surface of the cable 14 over the crimp ring 18 and the connector sockets, and a gland nut 24 which is slidably located on the cable 14. The opposite end of the cable 14 and its various components are identical to those shown in Figures 2, 4 and 5.

[0019] Both the cap lamp 10 and the battery pack 12 include a female cable connector 26, as shown in Figure 3, which is complementary to the cable 14 gland components and is made integral with the housings of the cap lamp and battery pack, as shown in Figure 1.

[0020] The complementary female connector 26 is shown in Figure 3 to include a threaded socket 28 which is open to the outside of the lamp and battery housings, in which the cable gland nut 24 is threadedly engageable and a coaxial unthreaded socket 30 into which the connector pins 32, which are connected to the relevant electrical circuitry in the lamp and battery pack housings, project.

[0021] Importantly, the socket 30 of the connector 26 includes a radially inwardly projecting key 34 which extends in an axial direction further into the socket 30 than the pins 32, as shown in Figure 3.

[0022] The key 34 is, in use, slidably engaged in a keyway 36 slot in the compressible cable gland plug 22 when it is inserted into the socket 30 of the female connector 26. When doing so it is obviously necessary that the key 34 and its keyway 36 are axially aligned to correctly electrically orient the cable connector DC sockets 20 with the connector pins 32 prior to the connector pins 32 coming into contact with the cable sockets 20.

[0023] The length of the cable gland plug 22 is a little greater than the distance separating the surfaces of the bases of the socket 30 of the female connector 26 and the gland nut 24 when the gland nut is fully engaged in the connector 26 socket.

[0024] To connect the cable 14 to either the cap lamp 10 or the battery pack 12 or both, the cable gland nut 24 is slid rearwardly on the cable from the position shown in Figure 2. The gland compression plug 22 on the cable 14 is then inserted into the socket 30 of the female connector 26 on whichever of the cap lamp 10 or battery pack 12 is being connected to the cable with the key 34 of the connector 26 located in the compression plug keyway 36 and the pins 32 in the cable pin sockets 20. The gland nut is then slid back towards the rear end of the compression plug 22 and screwed into the female connector socket 22 to cause the plug 22 to be radially expanded into pressure contact with the inner surfaces of the socket 30 and the gland nut 24 effectively to seal the cable connections against the passage of moisture across the gland.

[0025] To release the cable from the cap lamp or battery pack or both the gland nuts are merely unscrewed from the connections 26 and the cable ends withdrawn from the sockets 30 in the female connectors 26.

[0026] With the cable 14 connecting the cable lamp 10 to the battery pack 12 the cable glands 16 are protected by the crimp rings 18, which are positively squeezed in the gland between the cable 14 and the compression member 22 by radial pressure, to guard against separation of the compression member 22 from the cable 14 which otherwise might occur by undue tension being applied to the cable.

[0027] The invention is not limited to the precise details as described above and one end of the cable 14 could be sealingly permanently engaged with the cap lamp or battery pack with only the remaining end of the cable and whichever of the cap lamp or battery pack to which it is to be connected including the female gland component.

CLAIMS

1. A cap lamp and battery pack cable attachment arrangement comprising a length of flexible cable which electrically connects the cap lamp to the battery pack, and a cable gland component on at least one end of the cable for releasably physically
5 and electrically connecting the component to a complementary gland component on either the cap lamp or battery pack to provide a moisture-proof cable gland across the releasable connection.
2. A cable attachment arrangement as claimed in claim 1 wherein both ends of the cable carry a cable gland component and both the cap lamp and the battery pack
10 include a complementary gland component for releasable attachment to the cable gland cable components.
3. A cable attachment arrangement as claimed in either one of claims 1 or 2 wherein
15 the or each cable gland cable component includes a pair of electrical contact sockets which are each electrically attached to a cable conductor, a cylindrical plug of resiliently compressible material in which the contact sockets are partially embedded and which surrounds an end portion of the cable, the or each
20 complementary gland component includes a cylindrical socket into which two electrical pins project in the axial direction of the socket and which are engageable in the electrical cable sockets when a cylindrical plug on the cable end is pressed into the socket and means for moving the cable gland components towards each other to radially expand the cable plug into moisture-sealing contact with the electrical connections in the gland.

4. A cable attachment arrangement as claimed in claim 3 wherein the portion of the cable over which a portion of the compressible plug is located is bonded to the plug and includes an outwardly projecting formation which extends across the interface between the cable and plug to inhibit the cable from being pulled from the plug.
- 5 5. A cable attachment arrangement as claimed in claim 4 wherein the or each complementary gland component includes an internally threaded socket which is larger in diameter than and coaxial with the unthreaded pin socket and the cable gland moving means is an externally threaded gland nut which is slidable on the cable and threadedly engageable with the complementary gland component socket
10 and adapted to compress and so to radially expand the cable plug in the gland.
6. A cable attachment arrangement as claimed in any one of claims 3 to 5 wherein the or each cable gland includes mating key and keyway formations on the cable gland components to ensure the correct electrical orientation of the pins and pin sockets when the components of the gland are engaged with each other.
- 15 7. A cable attachment arrangement as claimed in claim 6 wherein the key projects radially into and in the axial direction of the unthreaded socket of the complementary gland component with its keyway being located in the cylindrical body of the cable plug.
8. A cable attachment arrangement as claimed in claim 7 wherein the key and its
20 keyway are longer than the length of the pins which project from the base of the unthreaded socket of the complementary gland component to ensure the correct orientation of the pins and pin sockets prior to their contact with each other.

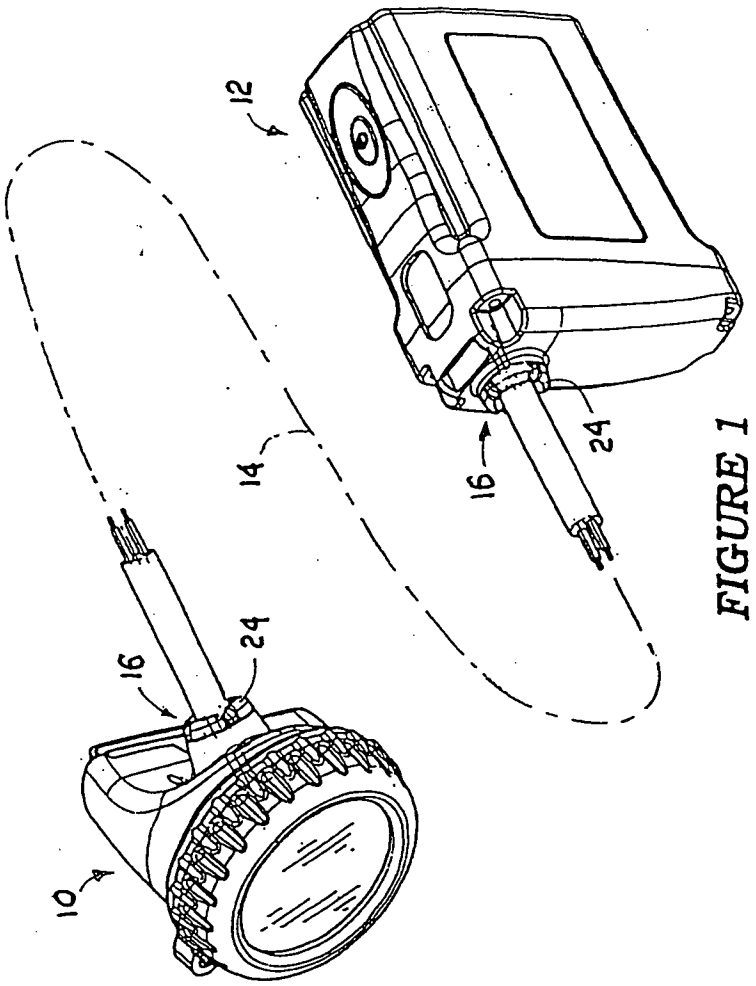
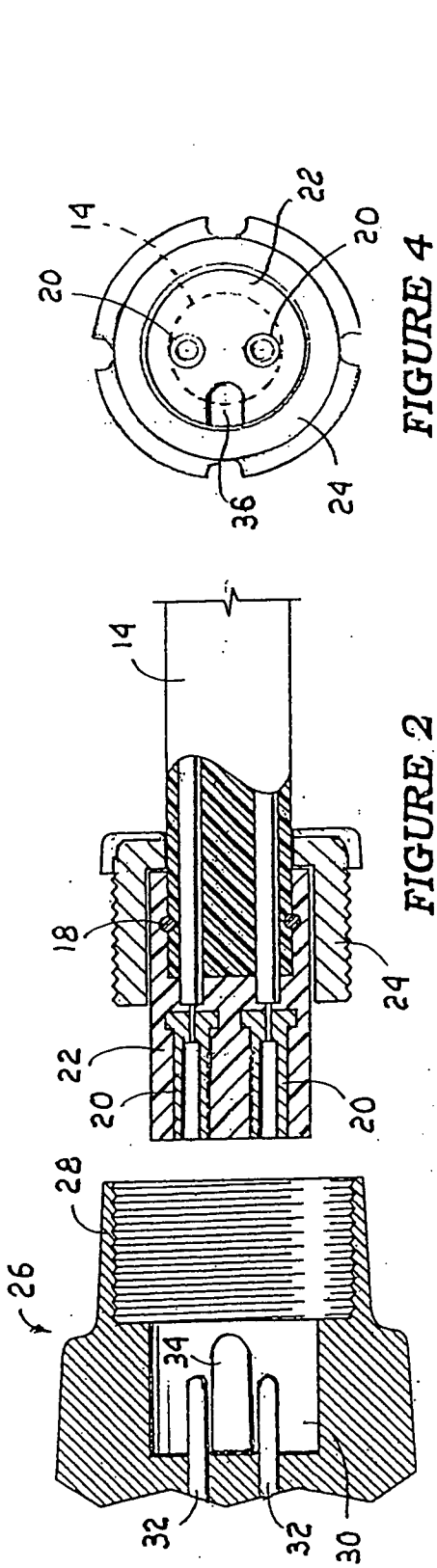


FIGURE 1

FIGURE 2

FIGURE 3

FIGURE 4

FIGURE 5

FIGURE 1

INTERNATIONAL SEARCH REPORT

International application No
PCT/ZA2008/000001

A. CLASSIFICATION OF SUBJECT MATTER
INV. H01R13/52

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H01R F21V

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 121 292 A (LEVITT SAFETY LTD [CA]) 10 October 1984 (1984-10-10)	1
Y	page 4, line 4 - line 14; figures 1,2	2-8
Y	US 3 945 701 A (BOEKE UWE ET AL) 23 March 1976 (1976-03-23)	2-8
Y	column 3, line 10 - line 47; figure 4	
Y	EP 1 465 295 A (FAN BEN [TW]) 6 October 2004 (2004-10-06)	6-8
A	paragraph [0013] - paragraph [0014]; figure 2	
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	page 3, line 13 - line 26 page 6; last line - page 7, last line ; figures 1,2	
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Further documents are listed in the continuation of Box C.

See patent family annex.

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INTERNATIONAL SEARCH REPORT

International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 101 41 052 A1 (DBT AUTOMATION GMBH ESSEN [DE] DBT GMBH [DE]) 3 April 2003 (2003-04-03) paragraph [0001] abstract; figure 1	1-8

INTERNATIONAL SEARCH REPORT

Information on patent family members

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