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(54) Electrical conductor connectors

(57) An electrical cable connector (10) comprises a body (12) and a cover (14) which fit together around a cable core (62). The cover (14) is slid sideways onto the body (12) such that respective pairs (54 and 58, 56 and 60) of engagement surfaces are brought into an overlapping configuration. A cutting screw (26) in the cover (14) is tightened and cuts into the cable core (62). As the cutting screw cuts downwards it forces the body (12) and cover (14) to engage and lock together and then it cuts into the conductor (70) of the core (62) and establishes a conducting path between the core (62) and a small domestic cable (64).

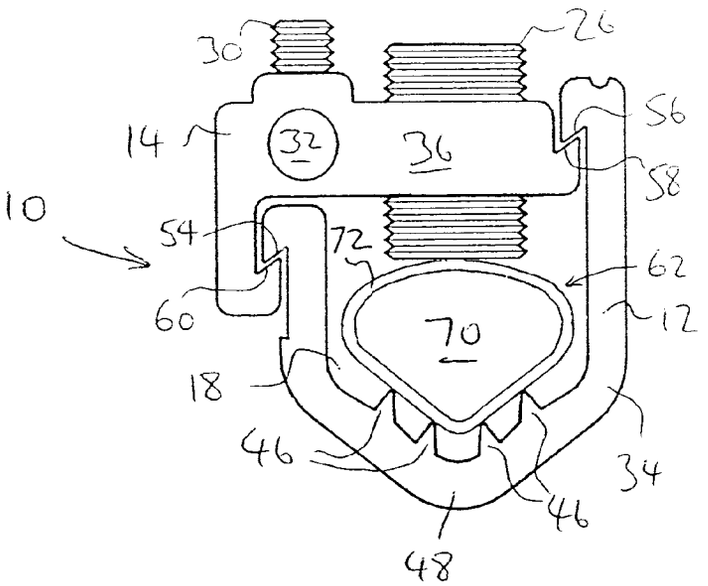

FIG. 5.

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Description

This invention relates to electrical conductor connectors and is particularly, but not exclusively, related to connectors for connecting one or more service cables to a main cable.

A known connector comprises a generally cylindrical connector body having a longitudinal through bore. A cable core is inserted into each end of the bore and clamped with a respective clamping bolt which bites down onto the cable core in the bore. A problem with this connector is that once a first cable is clamped into one end of the bore it can be difficult to bend a second cable to a sufficient degree to allow its core to be inserted into the other end of the bore.

This problem led to the development of a connector comprising a connector body having a bore along a first part of its length and an open channel along another part of its length. Once a first cable is clamped into the bore a second cable is laid in the open channel onto which a cover is placed to create a "bore" for the second cable. In one embodiment of such a connector the cover is slid onto the connector body direction parallel to the longitudinal axis of the connector body. In another embodiment (described in GB 2286728), the cover is held onto the connector body with a resilient sleeve which is pushed laterally onto the connector body and snaps in place. A disadvantage with both of these embodiments is that it is difficult to disengage a cover from its respective connector body once the cover is in place. With a longitudinal sliding fit the cover may snag on insulation present adjacent an end of the connector. With a lateral snap fit the resilience of the sleeve holds the sleeve in place against removal.

It is an object of the invention to provide an improved connector which alleviates these problems.

According to a first aspect the invention provides an electrical conductor connector comprising a conductor receiving channel and a cover, the channel having a longitudinal axis along which the conductor is adapted to lie, the channel and the cover being adapted to fit together to enclose a part of a conductor, in which at least one engagement surface on the channel and at least one engagement surface on the cover are brought into overlap by movement of the cover across the conductor receiving channel in a lateral direction with respect to the longitudinal axis of the channel.

Preferably the connector is for joining one electrical conductor to another electrical conductor.

The term enclose may mean that the channel and the cover extend all the way around the part of the cable. Alternatively it may mean that they extend partially around the part of the cable.

According to a second aspect the invention provides a method of connecting a conductor to an electrical conductor connector comprising the steps of:

laying a conductor along a conductor receiving channel; and

moving a cover across the conductor receiving channel in a lateral direction with respect to a longitudinal axis of the conductor such that at least one engagement surface on the channel and at least one engagement surface on the cover are brought into overlap by the lateral movement of the cover.

The part of the conductor may be a region along its length or may be at an end. In either case it may refer to exposed cable core. Alternatively the part of the conductor may be a cable core substantially coated with insulation.

Preferably the conductor is a cable.

Preferably the channel is defined by a floor and two side walls. Preferably there is an engagement surface on an upper region of each wall. Preferably one engagement surface runs along a region of an inside face of one wall such that the engagement surface overlies the channel and the other engagement surface runs along an outside face of the other wall such that it does not overly the channel.

Preferably the cover is moved across the channel for one side wall to the other.

Preferably the cover has a clamping member which is adapted to clamp the conductor against the floor of the channel. Preferably the clamping member is a threaded screw. In this embodiment, screwing the threaded clamping member may cause clamping of the conductor.

The clamping member may be a cutting screw, in which case screwing the clamping member may cause it to cut through insulation on the conductor and establish electrical contact between the conductor and the clamping member.

Preferably the engagement surfaces are brought into engagement by an upward movement of the cover with respect to the channel. Preferably this upward movement occurs after the engagement surfaces are overlapping. Preferably the upward movement is caused by the clamping member acting on the conductor. In this case engagement of the cover and channel occurs as a result of screwing the clamping member into the conductor.

Preferably the connector is for joining together two conductors. One of the conductors may be connected to the cover.

Preferably the connector is a service connector for connecting a service cable to a main distribution cable. Alternatively the connector may join a main distribution cable to another main distribution cable. In another embodiment the connector may be a straight or in-line connector for jointing of conductor ends.

Preferably the channel and cover fit together loosely. They may be caused to lock fixed with respect to one another by the action of the clamping member acting on a conductor received in the channel. Preferably the clamping member is mounted on or in the cover. In such

an embodiment releasing the clamping member from clamping the conductor will loosen the channel and cover into a loose fit. It may cause them to disengage.

Preferably the channel and the cover are conductive. Preferably the channel and the cover are in electrical contact with each other. Advantageously when the channel and cover are fitted together external surfaces of the connector have an insulating layer.

An embodiment of the invention will now be described, by way of example only, in which:

Figure 1 shows a perspective view of a connector according to the invention;
Figure 2 shows another perspective view of the connector partially cut away to reveal more detail;
Figure 3 shows yet another perspective view of the connector revealing more detail;
Figure 4 shows a schematic side view of the connector;
Figure 5 shows another schematic side view of the connector;
Figure 6 shows the connector connected to cables;
Figure 7 shows a perspective view of another connector according to the invention; and
Figure 8 shows a perspective view of yet another connector according to the invention.

Figure 1 shows a perspective view of a connector 10 having a body 12 and a cover 14. The body 12 and the cover 14 fit together and define an aperture 16 through which passes a cable which lies in a channel 18. The cover 14 has apertures 20, 22, 24, a threaded portion of which carry respective threaded screws 26, 28, 30. The cover 14 also has an aperture 32 which is adapted to receive an end of a cable.

The body 12 and cover 14 each comprise integral metal parts 34, 36 which have a plastic insulating coating 38. The coating covers only "external" regions of the parts 34, 36 and does not cover internal metal faces of the apertures 16 and 32 nor the threaded portions of apertures 20, 22 and 24.

Figure 2 shows the connector 10 with the insulating coating 38 partly cut away to reveal screws 26, 30 and the parts 34, 36. It can be seen that the screws 26, 28, 30 are sunk in formations 40, 42 which are comprised of the insulating coating 38. This isolates the screws 26, 30 to some extent from external contact when the connector is being handled. Interlocking between parts 34, 38 can also be seen.

Figure 3 shows the connector 10 with the insulating layer 38 fully removed to reveal more detail of the parts 34, 36. Also the presence and relative positions of the screws 26, 28 and 30 can be seen.

Installation of the connector will now be described with reference to Figures 4 and 5. These figures show side views of the parts 34, 36. The insulating coating 38 is not shown in these figures for ease of explanation. It is to be noted that from a side view, both the parts 34, 36 (and thus the body 12 and the cover 14) are substantially non-symmetrical.

The connector 10 is of a kind known as a service connector and is used to connect a small cable (for example a small domestic cable to supply a house) onto a large main distribution cable. In order to limit the amount of disruption caused by connecting the small cable, the connection is made when the main cable is live and is effected without cutting the main cable. Conventionally the main cable is buried underground. Once excavated and stripped of insulation a three-core arrangement (for a three phase supply) is exposed. The cores are each separately insulated. The cores are separated and the body 12 is slid underneath an insulated core from which power is to be taken (denoted by the numeral 62). The core has a central conductor 70 insulated by a layer of insulation 72. The core 62 lies in the channel 18 with its insulation 72 sitting on ribs 46 which run along the channel 18. The channel 18 is defined by a floor 48 and two side walls 50, 52.

The cover 14 is then slid across the body 12 as shown in Figure 4 from one side (in the direction denoted 66), moving in a direction from one side wall 50 to the other 52. As the cover 14 moves sideways across the body 12 latching surfaces 54, 56 on the body 12 overlap with latching surfaces 58, 60 on the cover 14 such that pairs of latching surfaces 56 and 58, 54 and 60 overlap. It will be appreciated that placing and moving the cover 14 does not have to be exclusively in a sideways manner. All that is required is that the pairs of latching surfaces are brought into proximity and a final movement of the cover 14, having a sideways component, brings the pairs of latching surfaces into correspondence. It should also be noted that there is a substantial clearance between the pairs of latching surfaces at this stage of installation and the body 12 and the cover 14 fit together loosely.

Referring now to Figure 5 the screw 26 is screwed down onto the core 62. The screw 26 is a cutting screw and it being screwed down has three effects. Firstly, the screw 26 clamps down on the core 62. Secondly, as the screw is screwed down further the cover 14 is forced upwardly with respect to the body 12 such that eventually the pairs of latching surfaces 56 and 58, 54 and 60 are brought into engagement. This is shown in Figure 5. Thirdly, once the latching surfaces are engaged the screw 26 cuts into the insulation 72 of the core 62 until it comes into electrical contact with the conductor 70. Therefore fully screwing down the screw 26 fixes the body 12 and cover 14 with respect to each other and the assembled connector 10 with respect to the core 62.

The purpose of the ribs 46 will be explained. When the screw 26 is tightened and clamps progressively onto and into one side of the insulation 72 the ribs bite into the other side of the insulation 72 and are forced nearly, but not quite, into contact with the conductor 70 such that the non-yielding conductor 70 is supported on the ribs 46 although not in electrical contact therewith. With-

out the ribs 46, the core 62 would sit on the floor 48 of the channel 18 and over the course of time the insulation 72) would flow out of the region separating the conductor 70 and the floor 48 under the action of clamping pressure over this region. As a result, over time the core 62 would become loose in the connector 10. By localising the contact (that is the ribs 46 biting into the insulation 72) the insulation 72 is not squeezed out from between the conductor 70 and the floor 48 and thus the core 62 is firmly gripped in the connector 10.

Usually before electrical connection is made between the core 62 and the screw 26, the small domestic cable is stripped of insulation at one end and inserted into aperture 32, and then clamped with the screw 30. The small domestic cable may be clamped to the cover 14 before the cover 14 is slid onto the body 12. In this way the small domestic cable and connector 10 are electrically neutral until the screw 26 cuts fully through the insulation 72 on the core 62.

The core 62 is normally electrically live during connection and the screw 26 is tightened with a specially made tool having an insulated handle.

Since the parts 26, 28, 30, 34 and 36 are comprised of metal there is an electrically conductive path between each screw 26 and 28 and screw 30. Therefore, if the small domestic cable has been clamped into the cover, electrical connection between it and the conductor 70 will occur when the screw is fully tightened. The insulating coating 38 keeps all of the electrically live parts insulated against contact. Accordingly the connector 10 is very safe to use.

Figure 6 shows the connector 10 fully installed connecting the core 62 to a small domestic cable 64. Although in this embodiment only one cable 64 is connected into the connector 10 via aperture 32, there is a corresponding aperture (not shown) on the other side of the cover 14 into which another cable may be clamped by screw 28. Therefore two domestic cables may be connected to the same core 62. Alternatively this may provide a means of connecting a cable which approaches the connector 10 from the right hand side (as viewed in Figure 6) or from the left hand side, thus allowing more flexibility in use.

It should be noted that if the body 12 and the cover 14 need to be disengaged from the core 62, as the screw 30 is released the force holding the body 12 and cover 14 into engagement is also released and they readily disengage. The invention provides a connector having rapid and easy disconnection as well as installation.

Although in the foregoing reference has been made to a domestic cable, this refers to one embodiment only. The invention has general applicability in any circumstance when electrical current is transferred from one electrical conductor to another electrical conductor.

An alternative embodiment of the invention is shown in Figure 7. This shows an in-line connector 80 having a body 82 and a cover 84. The body 82 and cover 84 fit together by means of engagement surfaces which operate in an manner similar to the embodiment described above. However the connector 80 is for connecting the ends of cables (for example main distribution cables) together. With the cover removed an end of each cable is placed in opposite ends of a channel 86 lying along the length of the body 82 and the cover 84 placed on the body 82. Tightening of clamping screws 88, 90 causes the body 82 and cover 84 to engage and lock. The clamping screws cut through insulation on the cables and establish electrical connection in the same manner as the embodiment described above. Electrical connection from one cable to another is through screws 88, via cover 84, and through screws 90 (or in the opposite direction). Of course the body 82 and cover 84 would be insulated in a manner similar to the embodiment described above to obtain electrical isolation. In addition to connecting cable ends, service cables may also be attached to the cover 84 by means of holes 92 and clamping screws 94.

Another embodiment of the invention is shown in Figure 8. This shows a connector 100 for joining two main cables together, a so-called "branch" joint. The principles of inserting cables into a body 102, applying a cover 104, tightening clamping screws 106 and establishing electrical contact are similar to those described above.

Claims

1. An electrical conductor connector (10) comprising a conductor receiving channel (18) and a cover (14), the channel (18) having a longitudinal axis along which the conductor is adapted to lie, the channel (18) and the cover (14) being adapted to fit together to enclose a part of a conductor, in which at least one engagement surface (54, 56) on the channel (18) and at least one engagement surface (58, 60) on the cover (14) are brought into overlap by movement of the cover (14) across the conductor receiving channel (18) in a lateral direction with respect to the longitudinal axis of the channel (18).

2. A connector (10) according to claim 1 characterised in that the channel (18) has two side walls (50, 52) and there is an engagement surface (54, 56) on an upper region of each wall (50, 52).

3. A connector (10) according to claim 2 characterised in that the cover (14) is moved across the channel (18) from one side wall (50) to the other side wall (52).

4. A connector (10) according to any preceding claim (10) characterised in that the engagement surfaces (54, 56, 58, 60) are brought into engagement by an upward movement of the cover (14) with respect to the channel (18).

5. A connector (10) according to any preceding claim characterised in that the cover (14) has a clamping member (26) which is adapted to clamp the conductor against the floor (48) of the channel (18).

6. A connector (10) according to claim 5 characterised in that the clamping member (26) is a cutting screw, which is adapted to cut through insulation on the conductor and establish electrical contact between the conductor and the cutting screw.

7. A connector (10) according to any preceding claim characterised in that the channel (18) and the cover (14) are conductive and in electrical contact with each other.

8. A connector (10) according to any preceding claim characterised in that its external surfaces have an insulating layer (38) when the channel (18) and cover (14) are connected together.

9. A connector (10) according to any preceding claim which is a service connector for connecting a service cable (64) to a main distribution cable (62).

10. A method of connecting a conductor to an electrical conductor connector (10) comprising the steps of:

laying a conductor along a conductor receiving channel (18); and
moving a cover (14) across the conductor receiving channel (18) in a lateral direction with respect to a longitudinal axis of the conductor such that at least one engagement surface (54, 56) on the channel (18) and at least one engagement surface (58, 60) on the cover (14) are brought into overlap by the lateral movement of the cover (14).

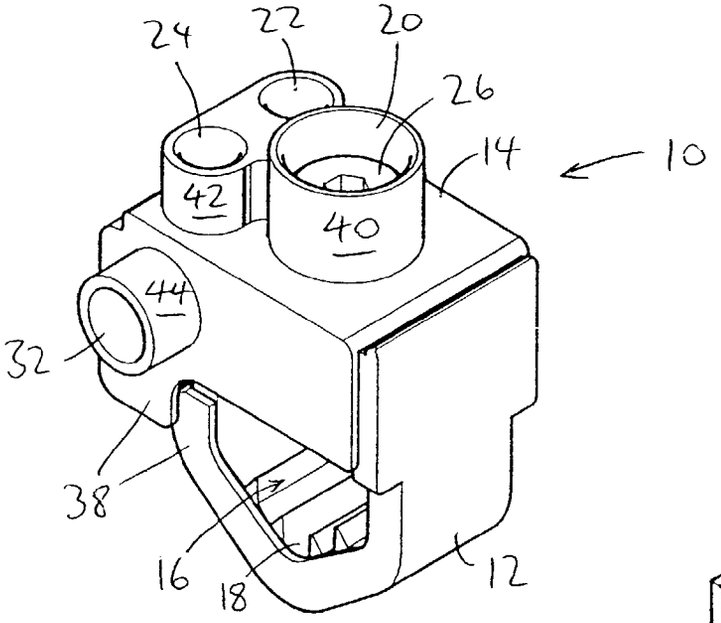

FIG. 1.

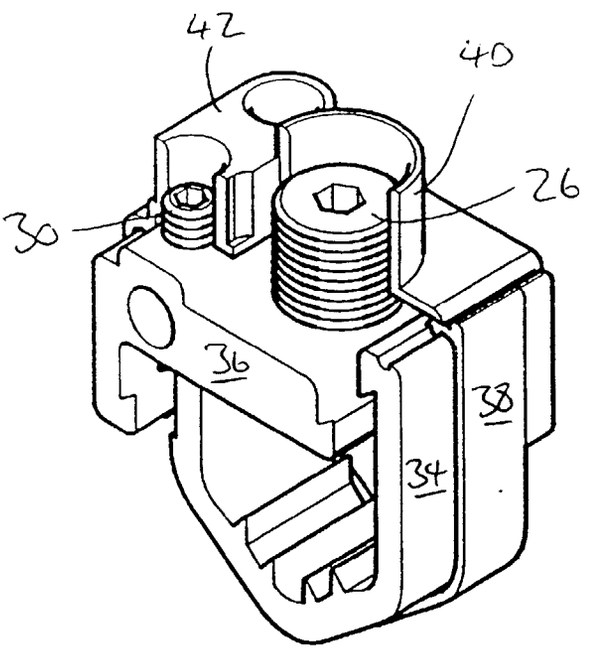

FIG. 2.

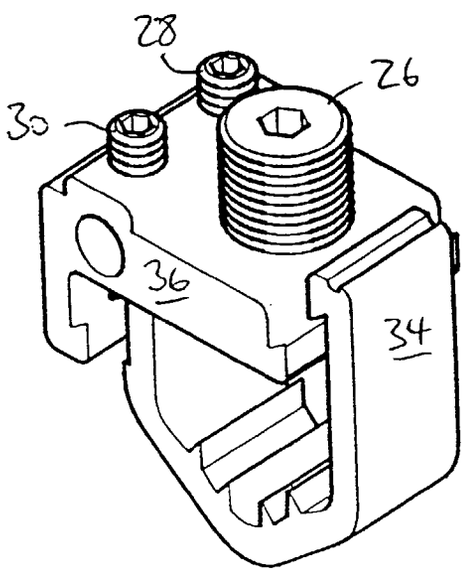

FIG. 3.

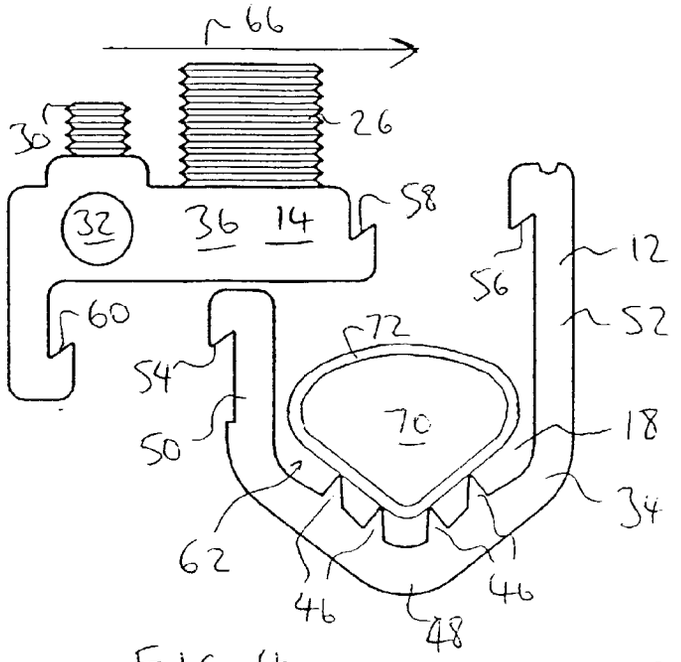

FIG. 4.

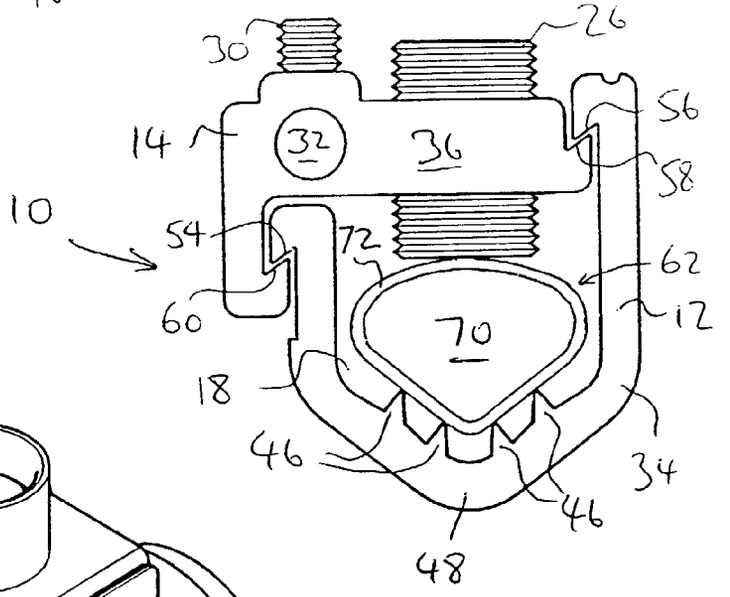

FIG. 5.

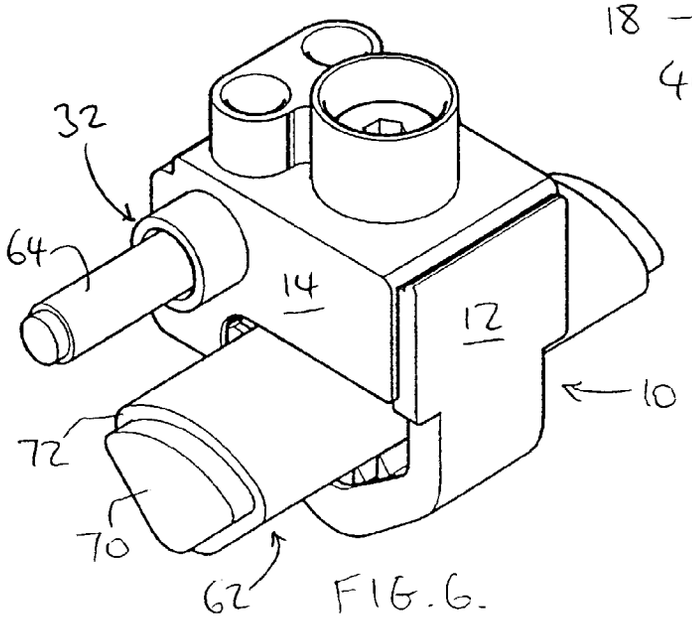

FIG. 6.

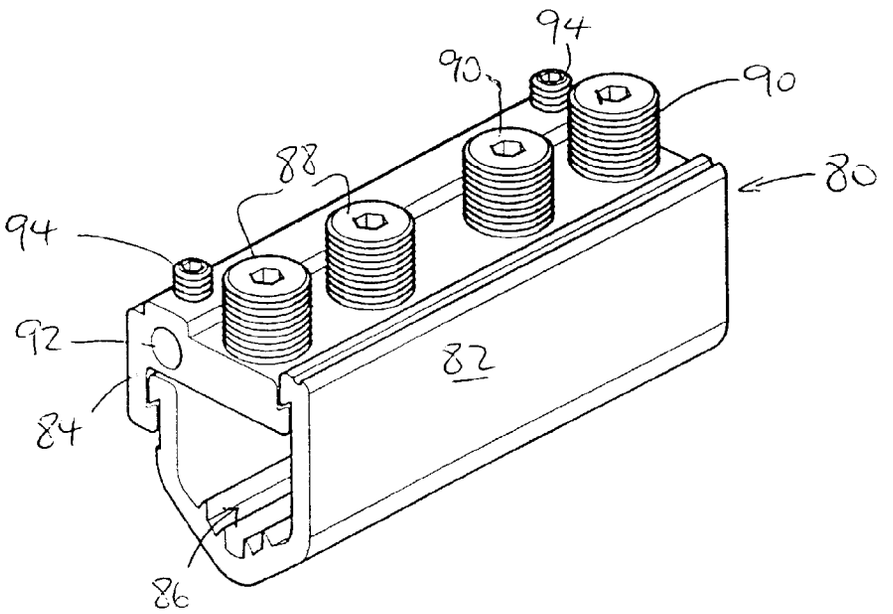

FIG. 7.

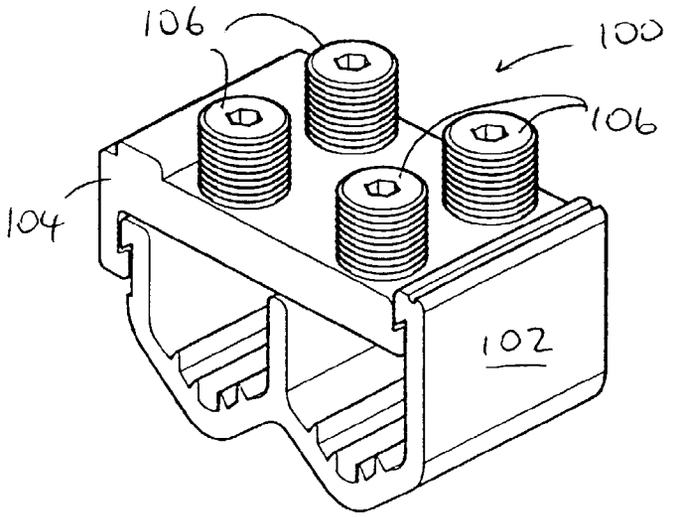

FIG. 8.

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 97 30 2719

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X Y	DE 565 745 C (SIEMENS) * page 2, left-hand column, line 10 - right-hand column, line 60; figure 3 *	1-5,7,9, 10 6	H01R4/36
Y A	DE 27 36 786 A (FELTEN & GUILLEAUME) * page 5, paragraph 2; figure 2 *	6 1,2,5,10	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

H01R

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	12 August 1997	Alexatos, G

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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