

Nov. 15, 1960

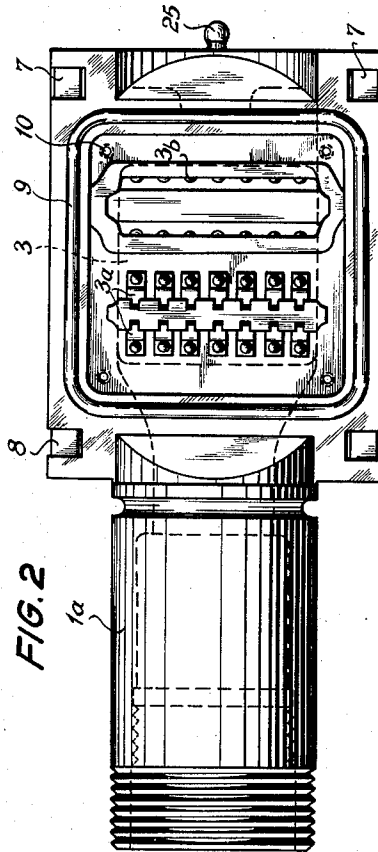
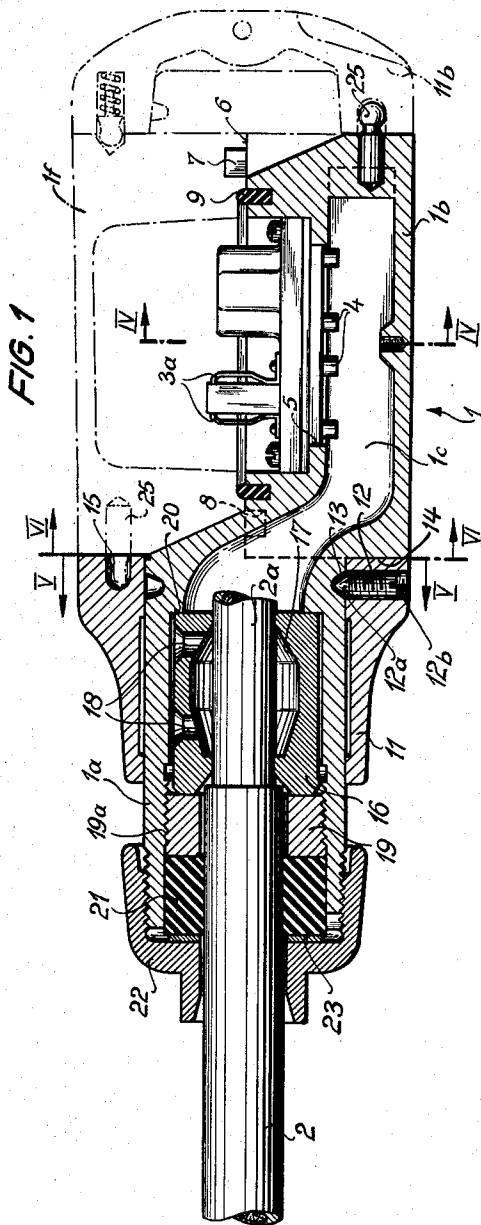
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2,960,675

COUPLERS OF THE PLUG AND SOCKET TYPE

Filed Feb. 7, 1957

4 Sheets-Sheet 1



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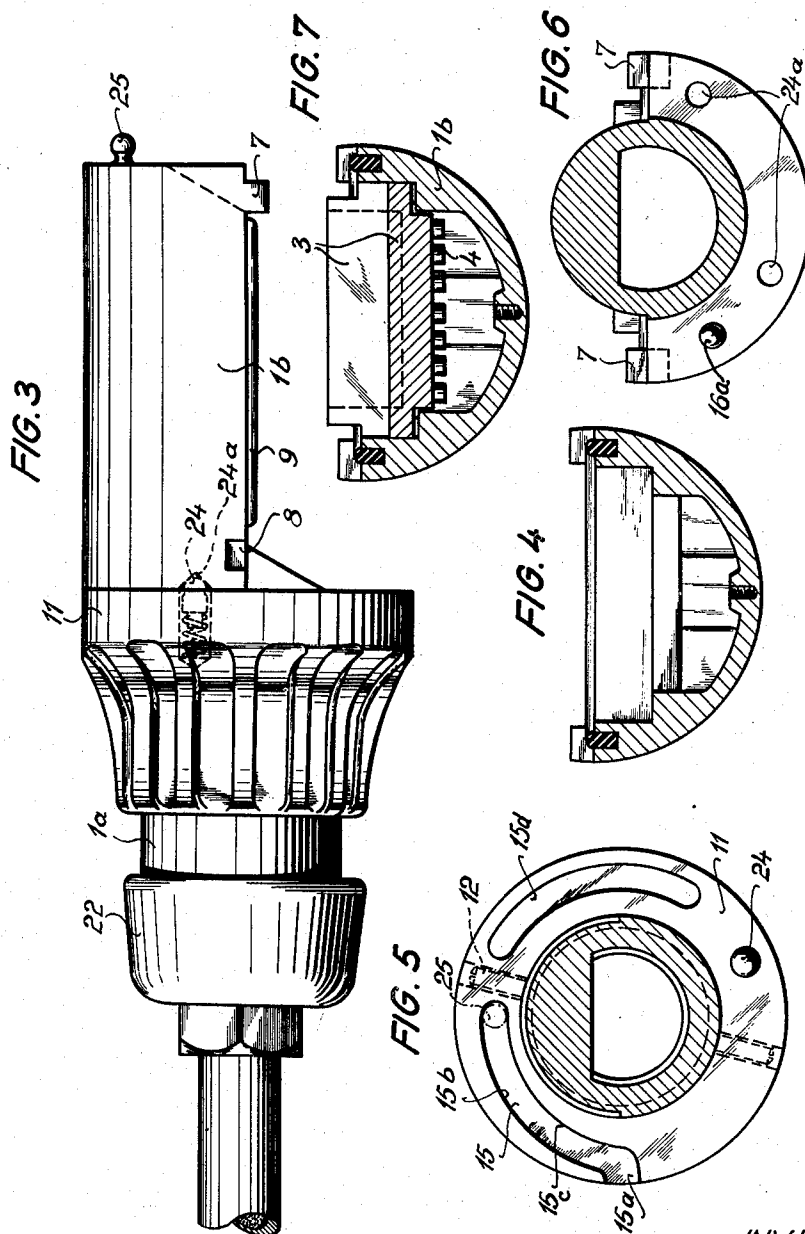
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COUPLERS OF THE PLUG AND SOCKET TYPE

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4 Sheets-Sheet 2



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COUPLERS OF THE PLUG AND SOCKET TYPE

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4 Sheets-Sheet 3

FIG. 8

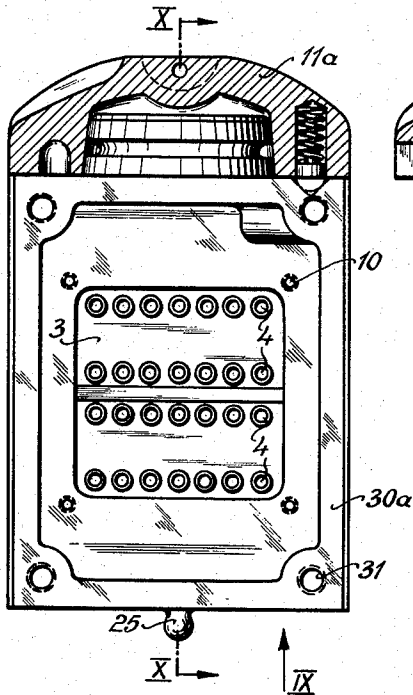


FIG. 10

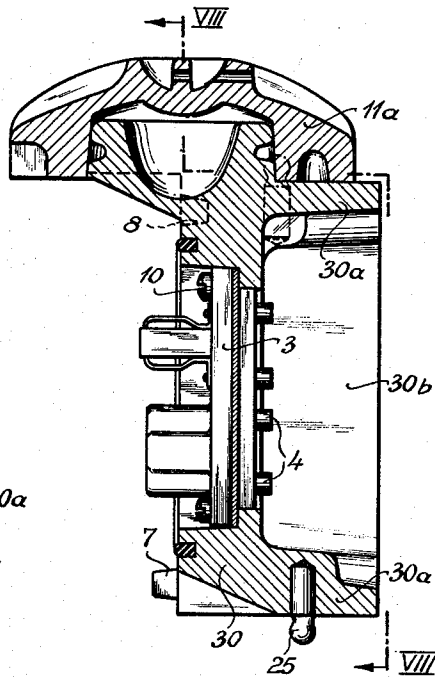
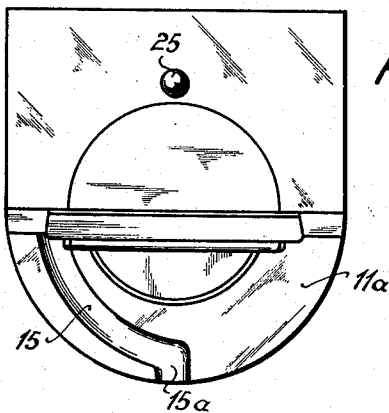


FIG. 9



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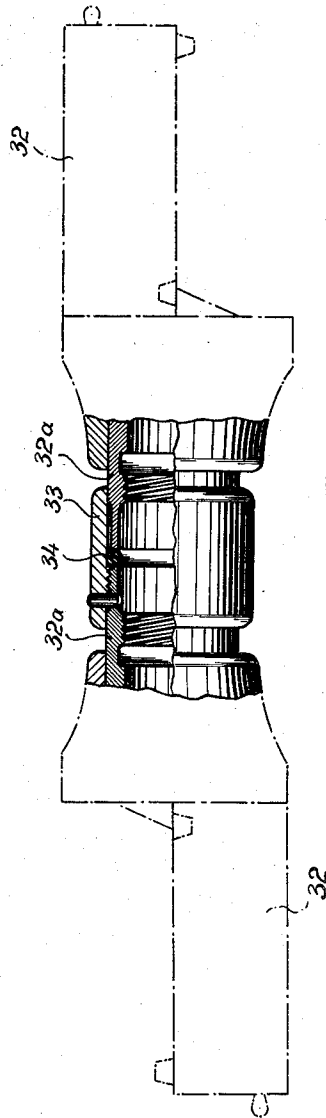
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COUPLERS OF THE PLUG AND SOCKET TYPE

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4 Sheets-Sheet 4

FIG. 11



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COUPLERS OF THE PLUG AND SOCKET TYPE

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11 Claims. (Cl. 339—49)

This invention relates to couplers of the plug and socket type for telephone cables, in which the pins and the sockets are arranged perpendicularly with respect to the cable axis.

Couplers of the plug and socket type for telephone cables are usually so constructed that both the plugs and the sockets align with the axis of the cable. Among other factors this has the disadvantage that the connecting means must necessarily be of rugged construction to hold the two co-operating halves of the coupler together against the pull of the cable.

Couplers have therefore already been developed in which both the plugs and the socket are arranged perpendicularly with respect to the cable axes. However, the objection to this type of coupler is that the cable ends are relatively offset so that a pull acting on the coupler tends to cant the device in a manner liable to deform it, or at least to kink the cables where they enter the coupler.

It is the object of the present invention to avoid these defects. Furthermore, it is proposed by the invention to construct the coupler in such a way that it is easy and simple to handle and that its internal parts are protected from the influence of the weather.

The invention therefore relates to cable coupling devices, i.e. couplers of the plug and socket type for telephone cables, in which the pins and the sockets are disposed perpendicularly with respect to the cable axis, and consists in that the two halves in the form of cable connectors which combine to form the coupler have offset co-operating ends so that the axes of the cable ends entering the coupler halves will substantially align in the plane of the parting surface between the two co-operating offset parts of the coupler which carry the pins and/or sockets. The connection between the two halves of the coupler is conveniently secured by at least one rotatable but axially not displaceable locking ring mounted on one of the co-operating halves and forming a bayonet catch with one or more projections or the like on the other co-operating half of the coupler. Preferably one locking ring is arranged concentrically about the cable axis on each of the co-operating halves of the coupler, each locking ring having a surface which co-operates with a pin on the other member, for example in the form of a sector of a spiral. When each locking ring is arranged to engage a pin on the other co-operating half of the coupler by means of a groove in the form of a spiral, the locking ring may be used both for locking and for separating the coupler halves, a desirable feature because the large number of plugs and sockets incorporated in the coupler often offer considerable resistance to their disconnection.

It is a particular advantage if the coupler is so contrived that it has the shape of a body of revolution about the cable axis, a form of construction in which both co-operating members may be identically congruent bodies.

The invention relates not only to couplers in which

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the co-operating halves are connected with the ends of two cables, but also comprises associated appliance terminal boxes, mounted for instance on a mobile distributor panel or the like for making cable connections. The invention also relates to associated intermediate connectors for insertion between two lengths of cable. For instance, if it is desired to connect an odd number of cable lengths the order of the conductors in the cable at the end of the line will be reversed in relation to their order at the beginning, an undesirable feature. By inserting an intermediate connector the order of the conductors wires at the end of the line will be the same as at the beginning. Finally, the invention also relates to protective caps for covering the co-operating members of the coupler before the coupled cable lengths are wound on to a drum and thus to protect the otherwise exposed and sensitive contact elements of the connectors from damage, as well as from dirt, and moisture.

Further features of the invention will be referred to in the course of the following description of an embodiment of the invention and in the patent claims.

In the drawings which represent an illustrative example of the invention,

Figure 1 shows an axial longitudinal section through one half of the coupler with the associated protective cap indicated by a dotted outline;

Figure 2 is a plan view of the same but with the locking ring 11 and the cap 22 omitted;

Figure 3 is a side view of the same without the internal assembly 3,

Figure 4 is a section taken on the line IV—IV in Figure 1 with the internal assembly omitted,

Figure 5 is a section taken on the line V—V in Figure 1,

Figure 6 is a section on the line VI—VI in Figure 1,

Figure 7 is the section shown in Figure 4 with the internal assembly in place,

Figure 8 is an appliance cable coupler shown partly in section, partly in side elevation, as indicated by VIII—VIII in Figure 10,

Figure 9 is a view of the same in the direction indicated by arrow IX in Figure 8,

Figure 10 is a section on the line X—X in Figure 8, and

Figure 11 is an intermediate connector, shown on a smaller scale.

The body of each cable connector constituting half of the cable coupling device has an offset portion. The end 1a is cylindrical and concentric with the axis of the relative cable end 2, whereas the end 1b is adapted for the reception of an inserted unit 3 which carries, on the one hand, seven pairs of contact springs 3a and, on the other hand, seven pairs of contact pins 3b. When the two halves of the coupler are fitted together each pair of pins 3b in one half of the coupler will embrace one pair of springs 3a in the other half of the coupler. Each spring and each pin is connected with a contact sleeve 4 and the individual wires of the cable 2 which, though not shown in the drawing, pass into the cavity 1c and are soldered or screwed on to the said sleeves. The inserted assemblies 3 are held in position by screws 10 or the like. The centre axis of the assembly 3 and of the relative recess 5 in the end 1b of the coupler is at right angles to the axis of the cable end 2. The produced axis of cable 2 passes through the surface 6 on to which the identical co-operating half of the coupler can be placed. To transmit the pull of the cable from one half of the coupler to the other, the end of each half of the coupler is equipped with pins 7 adapted to engage with corresponding recesses 8 in the co-operating half of the coupler. Moreover, a gasket 9 encircles the re-

cess 5, the gaskets associated with each half of the coupler fitting closely together when the coupler is connected and thus forming a tight joint which seals the hollow created by the two coupler halves. The external shape of the coupler is such that in addition to the two ends 1a being of cylindrical shape the two offset portions 1b, when fitted together, likewise combine to produce a cylindrical outer surface about an axis which coincides with the axes of both cable ends 2. In other words, the axis of the coupled cables will exactly align. The two halves of the coupler including their inserted inner assemblies are thus completely congruent.

To hold the two halves of the coupler firmly together each half is equipped with a locking ring 11 which co-operates with a pin 25 on the co-operating half of the coupler. The locking ring 11 can be rotated on the cylindrical part 1a and is secured against axial displacement by a grub screw 12 in ring 11. The tapering end 12a of the grub screw engages a correspondingly tapering trough-shaped groove 13 in the coupler and thereby prevents the locking ring from shifting in the axial direction whilst permitting the ring to be rotated. The taper end of the grub screw 12a also permits the position of the locking ring on the coupler body 1a to be adjusted, more particularly it allows the locking ring to be pushed more or less tightly against the shoulder 14 on the body of the coupler or to leave a greater or lesser clearance between ring and shoulder. This clearance should be as small as possible to prevent penetration by moisture. On the other hand, the locking ring should not be forced too tightly against the shoulder and thereby prevented from freely rotating. The hole containing the grub screw may be sealed with a suitable cement 12b to prevent the screw from working loose once the correct position for the ring has been set. As illustrated more particularly in Figure 5 the locking ring is further provided with a spiral groove 15 which has an entrance at 15a on the outside surface of the ring, which permits the pin 25 to slip into the groove 15 when the two halves of the coupler are fitted together. The locking ring 11 is further provided with a cylindrical groove 15d for the reception of another pin 16a on the co-operating half of the coupler, as will be seen by reference to Figure 6. The cylindrical part 1a of each half of the coupler holds the cable after this has been stripped of its rubber sheathing or the like and its metal braiding which takes the tensile load has been bared. The bared end 2a is held in a cable sleeve 16 of which the interior has a recess 17 with tapering ends. This tapered recess is filled with soft solder or some other suitable medium such as a synthetic resin introduced through openings 18. The cable sleeve 16 is retained in the cylindrical interior of the body of the coupler 1a by means of a nut 19 with an external thread 19a for tightening the sleeve against a projecting shoulder 20 in the body of the coupler. At the entry end the cable is sealed by an elastic ring 21 pressed by a screw-on cap 22 and a washer 23 against the nut 19 so that the resultant expansion of its radial section will ensure the formation of a tight joint between the cable 2 and the cylindrical inner wall of the end 1a of the coupler half.

The locking ring is adapted to be rotatable through an angle of at least 90°. A spherical elevation 24 may be provided for engagement with a co-operating depression 24a in the body 1b of the coupler when the locking ring 11 is in its end position.

When the two halves of the coupler have been fitted together the pull of the cable will be transmitted exclusively through the projecting pins 7. The locking means 11, 25 are entirely relieved of the load. The two coupler halves are locked together by turning the two locking rings 11 into the position in which they will be retained by the spherical elevations (which engage with the depressions 24a). In this position the two halves

are pressed firmly together so that the gaskets 9 form a tightly sealed joint. Disconnection of the coupler is facilitated by turning back the two locking rings 11, the pins 25 bearing not against the side 15b of groove 15 which produces the compressive load but against the opposite side 15c of the groove 15.

The individual wires which emerge freely from the end 2a of the cable extend through the cavity 1c to the points 4 where they are soldered on to the contact springs. To prevent the wires from being shaken about in this cavity it is advisable to fill the latter with a foamed material. This can be done either by inserting cut strips of foamed material into the cavity 1c, or by injecting the foamed material after the cable has been secured and the wires soldered to the sleeves, and by allowing the material to solidify with the formation of small bubbles.

It will be readily understood that the illustrated embodiment can be modified in various ways. For instance the invention would permit the two coupler halves to be secured by means of a single locking ring arranged with its axis coinciding with the centre axis of the recess 5. In this case the pins 25 would have to be located accordingly. However, such an arrangement would open to the objection that it would not permit the two coupler halves to be identical in every respect since one half would have to carry the locking ring and the other half would carry the pins.

Alternatively, the illustrated form of construction might be modified in that the pins 25 were not arranged to engage the groove 15 in the radial direction but constructed to be displaceable in the axial direction with respect to the coupler and to be brought into engagement with the groove after the two halves had been fitted together, whereupon a turn given to the locking ring would press the two halves together in the manner already described. For separating the two halves of the coupler the locking ring would then first be turned back, whereupon it would be necessary for the pins 25 to be retracted.

The protector cap 1f indicated in dotted lines in Figure 1 is substantially equipped with similar connecting means as those incorporated in the coupler proper, but it naturally contains no internal assembly. However, with due regard to the purpose of the cap 1f the locking ring takes the form of a cup 11b.

In the coupler for appliances illustrated in Figures 8 to 10 the reference numerals correspond with those used to indicate the equivalent parts in Figures 1 to 7. The body 30 of the appliance coupler, likewise fitted with an internal assembly 3, is however, provided with a foot 30a which has an open base and which can be pushed on to a distributor board or the like. To this end four holes 31 serve for the reception of screws for securing the body 30. The locking cup 11a roughly corresponds with the locking cup 11b (Figure 1 in dotted outline), since no provision need be made for the passage of a cable, the cable connections entering the cavity 30b in the coupler foot directly from the distributor board or the like.

The intermediate connector or interconnector shown in Figure 11 comprises two members 32 each of which roughly corresponds with a plug and socket coupler as shown in Figures 1 to 3. These two members are interconnected by the intermediate connector 33 proper. A tight joint at the two cylindrical ends 32a of the bodies 32 is created by a sealing ring 34. A cable not specially shown passes through the cylindrical ends 32a and connects the internal assemblies, likewise not shown, inside the two members 32.

I claim:

1. A cable connector having two end portions of which one comprises a chamber adapted to accommodate a cable sleeve and the other comprises a flat face containing the prolonged axis of the cable sleeve, a recess

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in said face and a projection extending outwards from said face adapted to engage with a corresponding recess of another cable connector, electrical contact members supported in the end portion having the flat face, and a locking ring rotatably but axially immovably supported on the end comprising the chamber, said ring being provided with a flat radial surface at right angles to the axis of the ring, and with a spirally curved groove in said radial surface.

2. A cable coupling device including a cable connector having two end portions of which one comprises a chamber adapted to accommodate a cable sleeve and the other comprises a flat face containing the prolonged axis of the cable sleeve, a recess in said face and a projection extending outwards from said face, electrical contact members supported in the end portion having the flat face, a locking ring rotatably but axially immovably supported on the end comprising the chamber, said ring being provided with a flat radial surface at right angles to the axis of the ring, and with a spirally curved groove in said radial surface, and a second connector having a flat face adapted to lie in contact with that of the first connector, a projection adapted to enter the recess of the first connector during movement of the two flat faces towards and into contact with one another, a recess adapted to receive the projection of the first connector during said movement, electrical contact members adapted to enter into sliding engagement with those of the first connector during said movement, a flat end surface on the second connector and at right angles to said flat face of the second connector, a pin projecting outwards from said end surface and adapted to co-operate with the groove, when the ring is rotated, so as to move the projections, recesses and contacts of the two connectors into engagement with one another in a direction at right angles to the axis of the cable sleeve.

3. A connector as claimed in claim 1, comprising spring-loaded retaining means extending from said flat radial surface and adapted to engage depressions in the end portion having the flat face to hold the locking ring in its two end positions.

4. A connector as claimed in claim 3, wherein said spring-loaded retaining means is a ball.

5. A cable connector having two end portions of which one comprises a chamber adapted to accommodate a cable sleeve and the other comprises a flat face containing the prolonged axis of the cable sleeve, a recess in said face and a projection extending outwards from said face adapted to engage with a corresponding recess of another cable connector, electrical contact members supported in the end portion having the flat face, a locking ring rotatably but axially immovably supported on the end comprising the chamber, said ring being provided with a flat radial surface at right angles to the axis of the ring, and with a spirally curved groove in said radial surface, comprising a threaded hole in the locking ring, a grub screw threaded into said hole and having a tapering point, and a circular groove formed in the connector and adapted to receive the tapering point of the grub screw, said groove having a tapering trough-shaped radial sectional shape corresponding to the shape of the point of the grub screw.

6. A cable connector having two end portions of which one comprises a chamber adapted to accommodate a cable sleeve and the other comprises a flat face containing the prolonged axis of the cable sleeve, a recess in said face and a projection extending outwards from said face adapted to engage with a corresponding recess in another cable connector, a flat end surface at right angles to said face, and a pin projecting outwards from said flat end surface, electrical contact members supported in the end portion having the flat face, and a locking ring rotatably but axially immovably supported on the end comprising the chamber, said ring being provided with a flat radial surface at right angles to the axis of the

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ring, and with a groove in said radial surface, said groove comprising a spirally curved first portion and a shorter second portion extending to the outside edge of the ring.

7. A cable coupling device comprising two connectors each having two end portions of which one comprises a chamber adapted to accommodate a cable sleeve and the other comprises a flat face containing the prolonged axis of the cable sleeve, a recess in said face and a projection extending outwards from said face adapted to engage with a corresponding recess in another cable connector, a flat end surface at right angles to said face, and a pin projecting outwards from said flat end surface, electrical contact members supported in the end portion having the flat face, and a locking ring rotatably but axially immovably supported on the end comprising the chamber, said ring being provided with a flat radial surface at right angles to the axis of the ring, and with a groove in said radial surface, said groove comprising a spirally curved first portion and a shorter second portion extending to the outside edge of the ring, in which the flat faces of the two connectors are adapted to lie in contact with one another and the projection of each connector is adapted to enter the recess of the other connector during movement of the two flat faces towards and into contact with one another, and the electrical contact members of the two connectors are adapted to enter into sliding engagement with one another during said movement, and the pin on each connector is adapted to enter the first portion of the groove on the ring of the other connector through the second portion of said groove and to co-operate with said first portion, when the ring is rotated, so as to move the projections, recesses and contacts of the two connectors into engagement with one another in a direction at right angles to the axes of the cable sleeves.

8. A cable connector as claimed in claim 6, further including a terminal connector adapted to be attached to a terminal box and co-operate with the cable connector, said terminal connector having a flat face adapted to lie in contact with that of the cable connector, a projection adapted to enter the recess of the cable connector during movement of the two flat faces towards and into contact with one another, a recess adapted to receive the projection of the cable connector during said movement, electrical contact members adapted to enter into sliding engagement with those of the cable connector during said movement, a flat end surface at right angles to said flat face, a pin projecting outwards from said end surface, and a rotatable but axially immovable locking ring provided with a flat radial surface at right angles to the axes of the ring and with a groove in said radial surface, said groove comprising a spirally curved first portion and a shorter second portion extending to the outside edge of the ring, and the pin on each connector being adapted to enter the first portion of the groove in the ring of the other connector through the second portion of said groove and to co-operate with said first portion, when the ring is rotated, so as to move the projections, recesses and contacts of the two connectors into engagement with one another in a direction at right angles to the axis of the cable sleeve.

9. A cable connector as claimed in claim 6, further including a protective cap adapted to co-operate with the cable connector, said cap having a flat face adapted to lie in contact with that of the cable connector, a projection adapted to enter the recess of the cable connector during movement of the two flat faces towards and into contact with one another, a recess adapted to receive the projection of the cable connector during said movement, a flat end surface at right angles to said face, a pin projecting outwards from said surface and a rotatable but axially immovable locking ring provided with a flat radial surface at right angles to the axis of the ring and with a groove in said radial surface, said groove comprising a spirally curved first portion and a shorter second

portion extending to the outside edge of the ring, and the pin on the connector and that on the cap being adapted to enter the first portion of the groove in the ring of the cap and in that of the ring of the connector, respectively, through the second portion of said groove and to cooperate with the first portion, when the ring is rotated, so as to move the projections and recesses of the cap and connector into engagement with one another in a direction at right angles to that of the cable sleeve.

10. A cable connector comprising two interconnector halves, a tubular member mechanically interconnecting said halves, and a short length of cable enclosed within said halves and said tubular member, in which each interconnector half comprises a flat face containing the prolonged axis of said length of cable, a recess in said face and a projection extending outwards from said face, a flat end surface at right angles to said face, a pin projecting outwards from said end surface, a cavity in the flat face, electrical contact members supported in the cavity and electrically connected to said length of cable, and a rotatable but axially immovable locking ring provided with a flat radial surface at right angles to the axis of the ring and with a groove in said radial surface, said groove comprising a spirally curved first portion and a shorter second portion extending to the outside surface of the ring.

11. An interconnector comprising two interconnector halves, a tubular member mechanically interconnecting said halves, and a short length of cable enclosed within said halves and said tubular member, in which each interconnector half comprises a flat face containing the prolonged axis of the length of cable, a recess in said face and a projection extending outwards from said face adapted to engage with a corresponding recess in a mating half, a cavity in the flat face and electrical contact member supported in the cavity and electrically connected to the length of cable.

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