Nov. 9, 1965 J. F. DUFFIELD 3,217,286

PIN-TYPE ELECTRICAL CONNECTOR

Filed March 4, 1964

FIG. 1

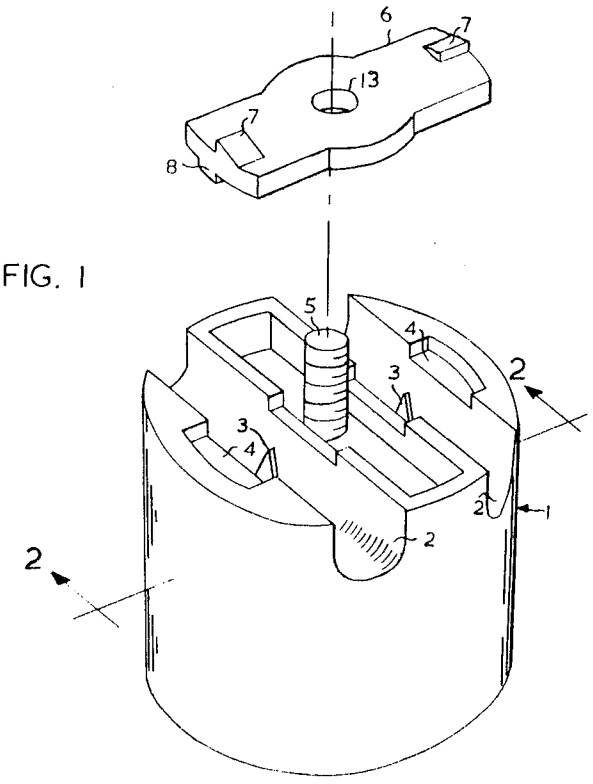


FIG. 2

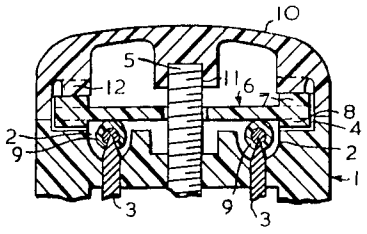


FIG. 3A

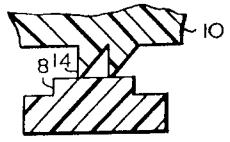
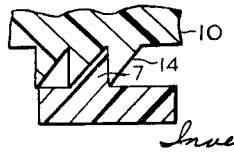


FIG. 3B



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PIN-TYPE ELECTRICAL CONNECTOR

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8 Claims. (339—99)

This invention relates to electrical connectors of the insulation piercing type. Such connectors have particular utility in the provision of electric lamp sockers to a two-conductor cable at locations spaced from the ends of the cable. In such arrangements, electrical connection is made with the conductors by piercing the insulation by means of spikes associated with the connectors.

It is presently recommended by some authorities that such electrical connectors should be so constructed that once they have been fitted to cables they are irremovable from the cables. This is because it is felt that the piercing of the insulation on the cables renders the cable hazardous after removal of such a connector. To this end, it has been necessary to evolve a pin-type electrical connector provided with a locking device effecting a locking action such that the pin-type electrical connector may only be removed by destruction of the entire connector.

The connectors of this type which have previously been proposed have various disadvantages. Frequently they have been of such a complicated structure, that they could not be inexpensively manufactured. Also, they have generally been constructed in such a manner as to permit inadvertent locking together of the parts of the connector before it has been connected to a cable. When this occurs, the connector must be discarded, unless some release mechanism is provided and the presence of such a release mechanism is a negation of the original intent in manufacturing the connector.

It is an object of this invention to provide an electrical connector of the insulation piercing type, which is provided with a non-releasable locking device operable on connection of the connector with a cable and which is of relatively simple construction.

It is a further object of the invention to provide such a connector provided with a non-releasable locking device which is operable only upon connection of the connector with a cable so that inadvertent non-releasable locking of the parts of the connector together prior to connection of the connector to a cable is not possible.

Accordingly, the invention provides an insulation-piercing electrical connector comprising; a cable receiving body, at least one cable piercing spike associated with said body, a locking member adapted to overlie said spike in non-rotatable relationship with said body, and a cap adapted to retain said locking member against said cable and to ensure that the said spike remains in proper electrical connection with the cable.

The invention further provides an electrical connector comprising; a cable-receiving body, at least one cable-piercing spike associated with said body, a locking member engageable with said body to overlie said spike in non-rotatable relationship with said body, a cap engageable with said body to exert pressure upon said locking member, pawl means carried by one of said locking member and said cap, ratchet means carried by the other of said locking member and said cap, said pawl means and said ratchet means being engageable with each other to prevent disengagement of said cap from said body only when a cable received by said body is disposed between said body and said locking member to be pierced by said spike and to exert resilient pressure on said locking member in opposition to the pressure exerted on said locking member by said cap.

A preferred embodiment of the invention is illustrated in the accompanying drawings in which:

FIGURE 1 is an isometric view of the body of an electrical connector showing an associated locking bar displaced therefrom;

FIGURE 2 is a section of part of the body shown in FIGURE 1 in which a pair of cables, and the locking bar and a cap are assembled thereon;

FIGURE 3*a* shows the cooperation of the locking bar and cap in a non-locking position; and

FIGURE 3*b* shows the locking bar and cap, in cooperation, in the locking position.

Referring now to the drawings, FIGURE 1 shows the body of the electrical connector, generally indicated at **1**. The body includes a pair of cable receiving slots **2**, each slot having an upwardly projecting spike **3**, adapted to penetrate the insulation of the conductors received in the slots **2**, thereby to provide electrical connection with the conductors. Each of the spikes **3** are connected to appropriate parts of the connector associated with the lamp contacts or other connecting facility of conventional type, which have been omitted from the drawings for the sake of clarity and which need not be described here, since they are not part of the present invention.

Transverse to the cable-receiving slots is a locking bar slot **4** recessed into the top surface of the body **1**. The locking bar slot **4** is intermediate of the outer surface of the connector body and is adapted to receive a locking bar to be hereinafter described. The body includes screw means **5** which may be molded into the body or received into a drilled and tapped aperture within the body.

Cables **9** are received by slots **2** and retained therein by means of a locking bar **6** which is received into the locking bar slot **4** and overlies the cables **9** as shown in FIGURE 2. The locking bar **6** includes an aperture **13** through which is passed the screw means **5**. On one face of the locking bar **6** are a pair of pawls **7**, one adjacent each end of the locking bar, and, as shown in FIGURE 1, each of wedge shaped configuration. On the opposite face of the locking bar **6** are a pair of shoulders **8** disposed one adjacent each end of the locking bar. The locking bar **6** is adapted to be placed over the cable and received in the locking bar slot with the shoulders **8** facing the body of the connector and the pawls **7** facing outwardly or can be inverted, so that the shoulders **8** face outwardly and the pawls **7** face the body.

FIGURE 2 shows a cap **10** in position over the locking bar **6**, the cap **10** and locking bar **6** combining to bear down on the cables **9**. Recessed, on the underside of the cap **10**, is an annular ratchet **12** having teeth **14** as shown in FIGURES 3*a* and 3*b*. The cap **10** is provided with a threaded bore **11** to engage screw means **5**. Referring now to FIGURES 3*a* and 3*b*, it is seen that when the locking bar **6** is placed in position over the cables, with the pawls **7** remote from the body **1** of the connector, as shown in FIGURE 3*b*, the pawls **7** cooperate with the teeth **14** of the ratchet **12** in such a manner as to permit the cap **10** to be screwed onto the body **1** but to prevent rotation of the cap in the unscrewing angular sense. The insulated cables **9** themselves provide the resiliency necessary to maintain the ratchet teeth and pawls in cooperation with each other.

Without the cables **9** in position in the slots **2**, it is possible that the cap may be unscrewed. The relative proportions of the body **1**, the locking bar **6**, and the cap **10** are so chosen that when the cap **10** is screwed onto the body **1** in the absence of a cable, the teeth **14** of the ratchet **12** do not contact the pawls **7** on the locking bar. It will be appreciated that the presence of a cable is therefore necessary to provide a resilient upward pressure on

the locking bar. Thus, it is not possible to effect premature locking of the locking device without the presence of the cable. Once the cables have been placed in position, the locking bar placed over the cable with its pawls **7** on the face of the bar remote from the body and the cap **10** screwed down onto the locking bar, the pawls **7** and the teeth **14** engage one another and the assembled connector may only be removed from the cable by destruction of all or part of the connector.

In FIGURE 3*a*, the locking bar is shown upside down in relation to its position shown in FIGURE 3*b* and in this position the ratchet teeth **12** on the cap are free to slide over shoulders **8**, thereby providing no positive locking means. This is to permit use of the connector in such a manner that it may, if desired, be used without the non-releasable locking feature.

Various modifications are clearly possible within the scope of the invention. For example, the upper and lower faces of the locking bar **6** may include pairs of cable receiving slots similar to those shown in the body **1**. These slots may then be used in lieu of the slots **2** in the body which may then be formed without cable receiving slots **2**, being merely provided with protruding spikes **3**. In this embodiment, the cables may be retained in position by the locking bar itself. The invention may also be applied to other forms of female connectors such as lampholders and other devices designed to provide "tapping off" facilities.

The body **1**, may, of course, have only one cable receiving slot **2**, or, alternatively, the locking bar **6** may contain only one cable-receiving slot. Similiarly, the locking device would function perfectly well with only one pawl **7** or one shoulder **8**.

It is possible to retain screw **5** in the body in any manner which would prevent rotation of the screw **5** in relation to the body, in which case, the screw cap will receive the remote end of screw **5** in threading and rotatable cooperation. Conversely, the screw **5** may be fixedly retained in the aperture **11** of the cap **10** and the body adapted to receive the free end of screw **5** in threading and rotatable cooperation.

In most cases the connectors of the inventon will be provided with two cable-piercing spikes, but it is possible that in some situations, connectors with only one such spike would be useful.

The locking bar **6** might, if desired, be disc-shaped or cruciform and other means of preventing relative rotation between the locking bar and the body of the connector could be adapted such as shoulders projecting from the connector body.

I claim:

1. An electrical connector of the insulation-piercing type, comprising:

(i) an electrically non-conductive body having at least one first slot formed in an outer face thereof, said slot having at least one insulating-piercing spike therewithin said first slot being adapted to receive an insulated cable, at least one second slot formed in the same outer face of said body, said second slot being angularly disposed in relation to the said first slot,

(ii) a locking bar having one end positioned in said second slot to overlie a cable, received by said first slot, said bar having a first side and a second side and being reversible to provide a first position wherein said first side is directed towards said outer face of said body and a second position wherein said second side is directed towards said outer face, said locking bar having on said first side a ratchet pawl, and having a shoulder on said second side,

(iii) a cap rotatably secured to said body and overlying said bar and having a counterbore to receive said bar therewithin, said counter-bore including a serrated annulus forming a ratchet and engaging said pawl when said locking bar is in said second position, thereby to permit rotation, of the said cap relative to said body only in one angular sense, and engaging said shoulder when said locking bar is in said first position thereby to permit rotation of said cap relative to said body in either of two opposite angular senses.

2. The connector of claim **1** wherein said locking bar is provided with an aperture through which passes clamping means to cooperate with said body and said cap thereby to provide clamping action between the said cap and the said bar and between the said bar and the said body.

3. The connector of claim **2** wherein said body includes an aperture in said outer face thereof and said clamping means comprises a male member having a first portion fixed in said aperture and an externally threaded second portion projecting from said body, said second portion being passed through said aperture in said bar, and said cap having an internally threaded aperture to receive and cooperate with the said second portion.

4. An electrical connector of the insulation piercing type comprising:

(a) a cable-receiving body provided with at least one slot adapted to receive a cable and equipped with at least one cable-piercing spike,

(b) a locking member being disposed transverse to said slot and overlying said spike in non-rotatable relationship with said body,

(c) a cap rotatably secured to said body and overlying said locking member and

(d) means for preventing disengagement of said cap from said body only when a cable received by said body is disposed between said body and said locking member to be pierced by said spike.

5. The connector of claim **4** wherein said body includes a slot for receiving said locking member and preventing relative rotation betwen said body and said locking member.

6. The connector of claim **4** wherein said locking member includes a cable-receiving slot.

7. The connector of claim **4** wherein said means comprises pawl means carried by said locking member and ratchet means carried by said cap.

8. An electrical connector comprising:

(a) a cable-receiving body provided with two cable-receiving slots adapted to receive a cable therein,

(b) each of said slots equipped with a cable-piercing spike,

(c) a locking member being disposed transverse to said slots and overlying said spikes in non-rotatable relationship with said body,

(d) a cap rotatably secured to said body and overlying said locking member and

(e) means for preventing disengagement of said cap from said body only when a cable received by said body is disposed between said body and said locking member to be pierced by said spikes, said means comprising

(f) pawl means carried by one of said locking member and said cap, and

(g) ratchet means carried by the other of said locking member and said cap.

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