ELECTRICAL LOCKING CONNECTOR
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This invention relates to electrical connectors and has for an object to provide a simple and effective connection whereby a locking connection for the attachment plug cap may be used with a connector or receptacle formed of relatively soft, resilient, rubber-like material, and in which for this purpose a fiber or other relatively hard and rigid insert plate is molded in the resilient rubber-like material and cooperate with interlocking means of the contact blades of the connector cap for securing the cap against withdrawal from the connector or similar receptacle.

With the foregoing and other objects in view we have devised the construction illustrated in the accompanying drawings forming a part of this specification. It is, however, to be understood the invention is not limited to the specific details of construction and arrangement shown, but may embody various changes and modifications within the scope of the invention.

In this drawing:

Fig. 1 is a side view of a connector embodying this invention, with a portion broken away to more clearly show the construction;

Fig. 2 is a partial side elevation and partial longitudinal section thereof, the section being substantially on line 2—2 of Fig. 3;

Fig. 3 is an end view of the connector body showing the blades of the attachment plug cap in section in the locking position, the plane of the section being substantially on line 3—3 of Fig. 4;

Fig. 4 is a partial side elevation and partial longitudinal section, the section being substantially on line 4—4 of Fig. 5;

Fig. 5 is a plan view of the locking plate or insert, and

Fig. 6 is an edge view thereof.

This improved electrical connector is shown as applied to a connector and cap for use in flexible connections leading to electrical appliances for supplying electric current thereto, but it is to be understood the invention is not limited to this type of device and is equally adapted for use in stationary outlet receptacles, caps and the like.

In the device shown the receptacle portion 10 of the connector comprises a body portion 11 of molded, relatively soft resilient rubber-like material, and can be, for example, either natural or artificial rubber, and a head member 12 which may be of the same or a similar material connected to the body member 11 by suitable longitudinally extending screws 13. The body member 11 is provided with chambers or recesses 14 of any suitable number, depending on the number of contacts to be used, in the present case there being three contacts, one of which may be a grounding contact. One of these receptacle contacts is shown at 15 and may comprise a pair of spring plates 16 and 17 arranged side by side and adapted to receive between them a contact blade 18 of an attachment plug cap 19. These blades have transverse end portions 20 secured to the end wall of the body 11 provided with suitable means such, for example, as a binding post screw 21 for connecting a lead wire 22 to the contact from a suitable flexible conductor cable 23. A suitable cord clamp or strain relief 24 may be provided for clamping the cable and secured to the end member 12 by lateral feet under the end plate 25.

The body member 11 of molded, relatively soft, resilient, rubber-like material is provided at its lower or outer end with entrance openings leading to the chambers or recesses 14 and the receptacle contacts 15. In the form shown they comprise elongated slots 26, 27 and 28. These slots may be of the same or different lengths or forms for polarizing purposes or to indicate proper position for insertion of the contact blades of the attachment plug caps. In the present case the slot 25 is provided with an offset 29 for entrance of the blade 30 of the cap having an offset 31, this contact being used as a grounding contact, and this offset construction insuring that the cap contacts can be inserted in the connector or receptacle in one position only, with this grounding contact in the opening 28 to engage the grounding contact in the body 11. The conductor contacts of the cap, shown at 18, are adapted for insertion in the slots 26 and 27 to engage corresponding receptacle contacts 13 in the body member. These contacts 18 preferably comprise a curved relatively narrow portion 32 and a wider or overhanging free end portion 33 providing an overhanging locking shoulder 34. As a locking means to cooperate with the outer or engaging end portions or shoulders to retain the cap against withdrawal from the connector or receptacle there is molded within the rubber-like body 11 a relatively hard and rigid insert or locking plate 35. This may be of any suitable nonelectrical conducting material, such, for example, as pressed fiber impregnated with "Bakelite" or some similar plastic material, or it could be a suitable plastic plate. It is molded in the molded body member 11, and is of less diameter than the diameter of the body 11 so as to be completely enclosed within the rubber-like material of the body, and is located between the receptacle or stationary contacts 15 and the entrances to the slots 26, 27 and 28. This plate or insert is also provided with openings in alignment with the slots 26, 27 and 28 for passage of the contact blades 18 and 30 of the attachment plug cap, and although these openings may be of different shapes it is preferred that they be of substantially the same shape as the slots 26, 27 and 28, as indicated at 36, 37 and 38 respectively. This insert plate is also provided with openings 39 adjacent its opposite edges for passage of the securing screws 13, and these openings are preferably open on one side, as indicated at 40, through the edge of the plate so that when this insert plate is molded in the rubber-like material of the body member 11, this material will flow into the open sides of these openings, anchoring and locating the plate in a given position in the body member, and thus accurately locating the openings 36, 37, 38 and the openings 39 for the connecting screws 13, which may pass through the end member 12 and be threaded into the end plate 25, as indicated at 41 to secure the body 11 and end member 12 together after connecting the conductor wires in the cable 23 to the binding screws 21. The openings 39 may be also countersunk to receive the heads 42 of the screws.

The slots 26, 27 and 28, as well as openings 36, 37 and 38 are of sufficient length to receive the widened free end portion 33 of the cap blade contacts, and the stationary or receptacle contacts 15 are of sufficient width and so located as to be engaged by the cap contacts as they are inserted in the slots 26, 27 and 28 by rotating them through a small lateral movement between the cap and the body member, thus to close the circuit from the cable 23 to the cap connected cable 23a, the conductor wires in the cable 23a being connected to the respective cap contacts 18 and 30 by any suitable means, such as binding screws 43. The connector can be used with the contacts in engagement in this position the same as any standard...
type of plug-in cap, but if it is desired to lock the cap against removal from the body member all that is necessary is to give a relative turning movement a short distance between the cap 19 and the body 11 to carry the overlapping blades to the position shown in Figs. 3 and 4, to carry the overlapping shoulders 34 to the inner free ends of the cap blades into an overlapping or overlapped position with the insert or locking plate 35, so that these overlapping shoulders 34 interlock and cooperate with this plate to prevent withdrawal of the cap contact from the connector or receptacle contacts by strain on the cable 22. The receptacle contacts 15 are of sufficient width that these turning movements both to and from the locking position are accomplished while the receptacle contacts and the cap contacts are continuously in engagement to maintain the electrical connection, and the length of the slots 26, 27, and 28 in the body member, as well as the openings 36, 37 and 38, in the locking plate, are of sufficient size and width to permit insertion of the cap contacts and then permit the relative turning movement of the cap to shift the overlapping portions of the cap contacts to the interlocking position with respect to the insert plate 35. This plate 35 therefore forms a relatively hard, rigid locking means positively cooperating with the contact blades of the cap to securely retain the cap against withdrawal from the receptacle contacts by strains on the cables, but permits easy unlocking of the cap by mere turning movement in the opposite direction to shift the shoulders 34 of the cap blades from their overlapping or overlapping relation to the insert plate 35 and bring them into alignment with the entrance slots 26, 27 and 28 for removal of the cap from the receptacle in the normal manner.

It will be seen this novel construction provides a simple and effective means for providing a rigid and positive locking connection between the cap and the receptacle members which is effective to make or close the electrical connection between the contacts of the receptacle and the cap by relative longitudinal movement between them, but in which the locking means becomes effective and ineffective by short relative turning movements between the cap and the receptacle while the receptacle and cap contacts are continuously in engagement to maintain the electric circuit.

Having thus set forth the nature of our invention, we claim:

1. In an electrical connector, an insulating body member of resilient rubber-like material enclosing spaced stationary contacts and having an end wall provided with blade contact entrance slots leading to said contacts, an insert plate of rigid insulating material molded and enclosed in said rubber-like material between the contacts and the entrances to said slots so as to be enclosed on all sides by said rubber-like material of the body member, said plate provided with similar slots therethrough in alignment with the first slots, a cap carrying spaced contacts to engage those of the body member by a relative longitudinal movement of the cap and body member, and means on the cap contacts to interlock with the insert plate to prevent longitudinal separation of the cap and body member arranged to become effective and ineffective by relative turning movements between the cap and body member while the contacts of said members are continuously in engagement.

2. In an electrical connector, an insulating body member of molded resilient rubber-like material provided with chambers in which are mounted spaced stationary contacts, said body including an end wall provided with entrance slots leading to said contacts, a locking plate of rigid insulating material molded and embedded in said rubber-like material between the contacts and the entrances to said slots and provided with openings in alignment with the slots, and a cap having spaced contact blades for insertion in said slots to engage the first contacts by a relative longitudinal movement between the cap and body member, said blades having projecting portions at one side thereof adapted to move over and engage the inner side of said plate to prevent separation of the cap and body member, and said slots and openings being of sufficient width to allow lateral movement of the blades by relative turning movements of the cap and body member to bring the projecting portions into alignment with the wall of the plate.

3. In an electrical connector, an insulating body member of resilient rubber-like material provided with spaced recesses and stationary contacts in said recesses, said body including an end wall provided with end wall slots leading to said contacts for insertion of the contact blades of a cap member to engage the first contacts, an insert plate of rigid insulating material molded and embedded in the material of said body member between the stationary contacts and the end wall and having openings in alignment with the entrance slots, and said slots and openings being of a size to permit lateral movement of the contact blades after insertion to carry a lateral extension on the blades into overlapping relation with the plate to prevent separation of the cap from the body member.

4. In an electrical connector, a receptacle structure comprising an end member and a body member of molded resilient rubber-like material secured to the end member by screws passing through the body member, said body member provided with chambers, stationary contacts carried by the body member in said chambers, said body member including an end wall provided with openings leading to said contacts for insertion of the contact blades of an attachment plug cap, a locking plate of rigid insulating material molded and enclosed in said rubber-like material between the contacts and the end wall provided with the entrances to said openings, said plate having openings therethrough and opening through opposite edges for the screws with the rubber-like material in and enclosing the open sides of said openings to position said plate, and said first openings being of a size to permit lateral movement of the contact blades after insertion to cause cooperating shoulder means on said blades to move over and engage the plate and prevent removal of the cap from the body member.

5. In an electrical connector, an insulating body member of resilient rubber-like material provided with chambers in which are mounted spaced stationary contacts, said body including an end wall provided with blade entrance slots leading to said chambers in alignment with the contacts, a locking plate of rigid insulating material molded in the material of the body member between the contacts and the end wall so as to be contained and embedded in this rubber-like material of the body member, said plate provided with similar slots in alignment with the first slots, a cap carrying spaced contact blades adapted to engage the contacts of the body member by a relative longitudinal movement of the cap and body member to insert said blade contacts through the slots, and interlocking means on the cap contacts and the plate at ends of the slots arranged to prevent longitudinal separation of the cap and body member mounted to become effective and ineffective by relative turning movements between the cap and body member while the contacts of these members are continuously in engagement.

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