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WATERPROOF RUBBER COVERING FOR CORD CONNECTORS

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8 Claims. (Cl. 173—328)

This invention relates to new and useful improvements in electrical connectors and has particular relation to a waterproof rubber covering for cord connectors.

An object of the invention is to provide a waterproof covering for a connector and which covering is made effective to provide a fluid tight seal simply by the application of the connector to a complementary connector.

Another object is to provide a connector covering as stated and which covering also serves as a protector or shock absorber to absorb mechanical shocks such as result from dropping the connector on a floor or knocking it against an object or the like.

Other objects and advantages will become apparent from a consideration of the following detailed description taken in connection with the accompanying drawing wherein a satisfactory embodiment of the invention is shown. However, it will be understood that the invention is not limited to the details disclosed but includes all such variations and modifications as fall within the spirit of the invention and the scope of the appended claims.

In the drawing:

Fig. 1 is a view partly in elevation and partly in longitudinal section and showing in a detailed relation a pair of cord connector devices having coverings according to the present invention;

Fig. 2 is an end elevational view looking into the exposed or front end of a connector device in the form of a receptacle and including a covering according to the present invention, the view being indicated by the line 2—2 of Fig. 1;

Fig. 3 is an end elevational view looking into the exposed or front end of a connector device in the form of an attachment plug cap and including a covering according to the present invention, the view being indicated by the line 3—3 of Fig. 1;

Fig. 4 is a transverse sectional view taken substantially along the line 4—4 of Fig. 1;

Fig. 5 is a detail sectional view taken substantially along the line 5—5 of Fig. 1;

Fig. 6 is a detail sectional view taken substantially along the line 6—6 of Fig. 4;

Fig. 7 is a sectional view through the body of the receptacle device of the connector, the view being taken substantially along the line 7—7 of Fig. 4;

Fig. 8 is a sectional view taken substantially along the line 8—8 of Fig. 3;

Fig. 9 is a detail sectional view illustrating the initial engagement of the sealing portions of a pair of coverings;

Fig. 10 is a view similar to Fig. 9 but showing the relationship of the sealing portions of a pair of coverings when said portions are in full engagement forming a seal; and

Fig. 11 is an elevational view looking into the front or open end of one of the coverings employed.

In the accompanying drawing, the waterproof covering of the present invention is illustrated as applied to an attachment plug cap 18 and a plug 16 for use in flexible connections leading to electrical attachments or portable devices such as are used in factories, garages, or the like. While the covering is particularly applicable to flexible connections for use in garages and other places where the connection is likely to suffer from rough usage it is to be understood that the invention is not limited to the particular embodiment disclosed.

As shown, the cap 16 includes a body 17 of insulating material and carried by and extending outwardly from said body are a pair of contact blades or fingers 18 each at its free end having a lateral extension 18a and including a base portion 19 secured to the body 17 as by a rivet or the like 20. Further, each contact base portion 19 carries a binding screw 21 for connecting a wire 22 of a cord or cable 23 with its respective blade or finger. A metal shell or casing 24 encloses the body 17 and this shell or casing in its rear wall has an opening 25 aligning with the cable opening 26 through the body 17. Shell 24 is used to mount a cord clamp generally designated 27 on the body 17 and such cord clamp includes a pair of L-shaped sections 28 and 29 each having an arm 30 extending through the opening 25 in the shell and an arm 31 extending radially of said opening and located between the end 24a of shell 24 and the body 17 of the cap so that they are held by the end wall 24a from pulling away from the body. An ear or lug 32 extends laterally from each edge of each of the arms 30 of the clamp 27 and screws 33 connect said ears or lugs.

It will be understood that the clamp sections 28 and 29 are movable toward and from one another and that the cord 23 to the cap 16 passes between the arms 30 of the clamp sections. Therefore, on tightening of the screws 33 the 50 clamp sections are drawn toward one another and the arms 30 thereof engage opposite sides of the cord 23 and may be drawn tightly against the same so that any pull on the cord will be transmitted to the body and shell by the clamp 55.
and will not pull the wires of the cord loose from the binding screws.

About the body 17 is a heavy covering 34 of live rubber. This covering is cylindrical as is the body 11 and the shell 24 and includes a portion 35 extending forwardly beyond the form of the body or the race of the body from which the contact blades 18 extend. At the rear of the body the cover 34 tapers downwardly as at 36 and immediately in the rear of the shell 24 the covering is internally provided with diametrically opposed, laterally receding (see Figs. 1 and 11) receiving the laterally extending lugs or ears 32 of the cord clamp 27. Beyond these recesses the covering continues to taper downwardly and has a hole or opening 38 through which the cord 39 has a forced fit whereby a fluid-tight seal is provided or established between the covering and the cord. Preferably the cord 22 is a heavy rubber covered cord such as is used about garages, factories, etc. and having a tight or forced fit through the opening 38 at the end of the covering 34 forms a seal with the shell at and its free end the portion 35 is provided with a forwardly extending continuous lip 41. This lip 41 as shown is an integral part of the covering 34 and normally or when not in use inclines forwardly and is spaced from the end of the covering by a groove 41a as shown in Fig. 9. The lip 41 has its inner wall 42 tapered so that the lip is thinnest at its free edge. As will later be fully set forth this lip 41 on engaging a corresponding lip of a covering on the plug 16 will form a fluid tight seal therewith so as to prevent moisture entering between the plug and cap.

At the present time the cap including the covering is assembled by having the cord 23 passed through the covering before the covering is on the body of the cap. This leaves the body 17 and the clamp 27 exposed so that the cord may be passed between the arms 30 of the clamp and after the wires 22 of the cord are secured to the binding posts 21 the clamp is tightened on the cord so as to prevent strain on the connections of the wires of the cord with the contact blades 18. Therefore, the covering 34 is drawn forwardly over the clamp and the shell 24 and completely encloses the clamp, the ears 32 thereof being received in the lateral internal recesses 37 of the covering. The contact blades 18 may extend through the open end of the covering but the covering has a good tight fit on the metal shell 24 and cannot easily be moved off the same. The covering is somewhat stretched when over this shell.

The laterally extending ears 32 of the sections of the cord clamp being located in the recess 37 serves to prevent relative turning movement between the covering and the shell 24 and body 17 to which the shell is secured. As shown, the plug 16 includes a body of insulating material made up of sections 43 and 44 each of which is closed is substantially cylindrical. The sections 43 and 44 carry a section 43 44 each with the cord and screws 45 passing through the section 43 and threaded into inserts 46 in the section 44. Carried by the section 44 are contact 47 each including a base portion 48 secured to the section as by a rivet 49 and further each of said base portions carries a binding screw 50 for the securing of the wires 51, of a cord or cable 52, to the respective contacts. From the base 48 of each contact 47 there extends an arm 53 and to each such arm there is riveted or otherwise secured a pair of forwardly projecting contact members 54 preferably of spring metal and projecting into recesses 55 in the section 43. In the forward or front end of the section 43 there are provided entrances in the form of arcuate slots 56 leading to the recesses 55 and an inspection of Fig. 5 will show that the contact members or elements 54 are transversely curved. The section 44 is provided with an opening 57 through its rear wall for the passage of the cable or cord 52 and on said said is a metal shell or casing 58 serving to secure thereto a cable clamp generally designated 59 and corresponding in all respects with the cable clamp 27 of the cap 16.

About the body of the plug 16 is a heavy rubber covering 60 identical with the covering 34 of the cap 16, and the forward portion of which is cylindrical and receives the body section 43 and its shell 58 and also receives a portion of the body section 43. However, as is disclosed the body section 43 extends through the forward end of the rubber covering 60 so that the arcuate entrances or slots 56 in the forward end of the body are exposed to permit of the ready insertion of the contact blades 18 of the cap 15 through said slots and into engagement with the elements 54 of the contacts 47 of the plug. At the rear of the shell 58 of the plug the heavy rubber covering 60 is provided internally with lateral recesses 61 arranged to receive the laterally extending ears 32 of the cord clamp 59 whereby turning movement of the covering relative to the body of the plug is prevented.

At the rear end the portion 62 of the covering is provided with a hole or opening 63 through which the cord 52 has a forced fit whereby a fluid tight seal is established between the cord and the walls of said opening 63. These walls form a continuous flexible lip 64c to grip the cord. At its forward end the covering 60 is provided with a continuous lip 64 integral with the remainder of the covering and which normally inclines forwardly of the covering and spaced from it by groove 64a, and is tapered so as to be thinnest at its outer or free edge. This lip 64 extends along the lip 41 of the covering 34 and has its taper on its rear or inner wall 65 as in the case of the wall 42 of the lip 41.

Normally or when not engaged the lips 41 and 64 incline forwardly in such manner that their outer or thin edges are foremost and as shown each lip is ring-like whereby it is continuous. To close a circuit between the wires of the cords 23 and 52 the blades 18 of the cap are passed through the openings 56 of the plug and the plug and cap are then forced together to carry the blades 18 between the recesses 41 of the respective contacts 47 of the plug. This is accomplished by a relative longitudinal movement of the cap and plug and as the cap and plug are forced together the lips 41 and 64 are engaged and forced one against the other. Initially the outer or free edges of these lips engage as shown in Fig. 9 and as more of the cord 23 or the cable 52 is forced into the lips are forced flat against one another as shown in Fig. 10 forming a fluid tight seal. This is possible since the forward or outer faces 66 of the respective lips are perfectly flat the taper of the lips being accomplished by tapering their rear walls 42 and 65 respectively.

The recesses 55 in the plug body section 43 are
5.0 2,127,544 tend laterally with respect to the entrance slots 56 so as to provide shoulders 67 (see Fig. 6). Wires on the bodies, 15 and 16, can have been brought together by a longitudinal movement and the blades 18 have been brought into engagement with the contacts 47 and the lips 41 and 64 are together forming a seal as in Figs. 1 and 10 the cap and plug may be given a relative turning movement to carry the extensions 18a of the blades 18 into positions below the shoulders 67 of the body section 43. With the contact blades thus located it will be apparent that the cap and plug will be locked together against separation by relative longitudinal movement so that any pull on the cord will not separate the connector devices and break a circuit. After the parts have been locked together as described it is necessary that the two devices comprising the cap and plug be given a relative turning movement to carry the extensions 18a of the contact blades from beneath the shoulders 67 of the body of the plug before the contact blades may be withdrawn through the entrance slots 56.

From the foregoing description it will be apparent that the coverings for the devices 15 and 16 have a fluid tight joint with the respective cords 23 and 52 and that on said devices being forced together the lips 41 and 64 of the respective devices are brought into engagement first as in Fig. 9 and then, on further movement of the devices toward one another, as in Figs. 1 and 10 so that lips are flat against one another providing a fluid tight seal between the two devices. The coverings are of relatively heavy live rubber so as to effectively absorb any shock such as would result when the connector is dropped on a floor or knocked against a hard object. Additionally, the internal recesses in the coverings receiving the laterally extending ears 33 of the respective cord clamps 27 and 59 cooperate therewith to lock the coverings of the respective devices to the bodies thereof so as to prevent any relative turning movement between the devices and bodies whereby on the coverings being gripped and turned to carry the blades 18 to and from locked position with respect to the plug there will be no likelihood of the lips being torn from the bodies. It is also pointed out that when the two devices are locked together by the locating of the blade extensions 18a beneath the shoulders 67 there is no danger of the seal between the lips 41 and 64 being broken by a pull on the cord of one of the devices. However, it is apparent that on a simple longitudinal movement of the devices toward one another, to carry the blades 18 into engagement with the contacts 47, the lips 41 and 64 of the coverings of the respective devices 15 and 16, will be forced fiat against one another and being forced from their normal inclined positions will form an effective fluid-tight seal. Therefore, this water-tight cover is not limited to use with connectors which are turned relative to each other to lock them together, but is also adapted for use on connectors which are engaged by merely inserting the blades in the receptacle and forcing the cap and receptacle together, and with this latter type of device gives a very effective waterproof seal. Also, even with the connector shown it is not necessary to turn the elements of the connector to locking position to secure this seal as it is secured by merely forcing the two members of the connector together.

Having thus set forth the nature of my invention, what I claim is:

1. Means for making detachable electrical connections comprising two devices each of said devices including a body, a contact carried by each body and said contacts adapted to be brought into engagement on said devices being forced together, a rubber covering about each of said bodies having an opening for conductors connected with said contacts, and each of said coverings having a continuous forwardly and outwardly inclined lip with an annular groove between the outer portion of the lip and the body of the covering to permit the lip to yield toward the body the outer surface of said lips being tapered, and said lips being positioned so that as the devices are forced together the lips are forced together and yield inwardly to cause the tapered surfaces to seal upon each other to form a seal.

2. Means for making detachable electrical connections comprising two devices each of said devices including a body, a contact carried by each body and said contacts adapted to be brought into engagement on said devices being forced together, a rubber covering about each of said bodies, a continuous forwardly inclined rubber lip on one of said coverings having an outwardly inclined substantially flat surface to engage the end of the other covering to form a seal, said lip being of an outer diameter substantially that of the covering, there being an annular groove between the free edge of the lip and the body of the covering so that as the devices are forced together said lip may yield toward said body and be pressed against the other covering by the resilient action of the lip.

3. Means for making detachable electrical connections comprising two devices, each of said devices including a body, a contact carried by each body and said contacts adapted to be brought into engagement on said devices being forced together, a continuous forwardly and outwardly inclined rubber lip on one of said devices to engage the other device to form a seal and of an outer diameter substantially that of the body of the device, there being an annular groove between the free edge portion of the lip and the body to permit the lip to yield inwardly as the devices are forced together and by its resilient action to press against the other device to form the seal.

4. Means for making detachable electrical connections comprising two devices, each of said devices including a body, a contact carried by each body and adapted to be brought into engagement on the front ends of said devices being forced toward one another, a rubber covering about all but the front end of each of said bodies, a cord extending from each body and connected with the contact thereof, said coverings each having an opening, said cords extending through said openings and having forced fits therein to provide liquid seals, and each of said coverings having a continuous forwardly and outwardly inclined lip on the front thereof with an annular groove between the free edge portion of the lip and the body of the covering to permit the lip to yield toward said body, and said lips positioned so that as the devices are forced together the lips are forced together and yield inwardly to cause the outer surfaces of the lips to seal upon each other by their resilient action to form a seal.

5. Means for making detachable electrical connections comprising a pair of devices, each of said devices including a body, a contact carried by each body and said contacts adapted to be brought into engagement on said devices being forced together, a rubber covering about each of said bodies having an opening for conductors connected with said contacts, and each of said coverings having a continuous forwardly and outwardly inclined lip with an annular groove between the outer portion of the lip and the body of the covering to permit the lip to yield toward the body the outer surface of said lips being tapered, and said lips being positioned so that as the devices are forced together the lips are forced together and yield inwardly to cause the tapered surfaces to seal upon each other to form a seal.
said devices including a body, a contact carried by each body and said contacts adapted to be brought into engagement on said devices being forced together by a longitudinal movement, a rubber covering about each of said bodies, a continuous forwardly inclined rubber lip on each of said coverings with an annular groove between the free edge of the lip and the body of the covering to permit the lip to yield toward said body, said lips positioned to engage and be forced against one another so as to be deflected to cause their outer surfaces to seat upon each other to form a fluid tight seal on said devices being brought together by a longitudinal movement to bring the contacts into engagement, cooperating interlocking means on the devices to prevent separation of said devices by a longitudinal movement and maintain said lips in engagement forming said seal, and said interlocking means mounted to become effective to secure the devices together by a relative turning movement of said devices after said lips have been forced together to form said seal and while said contacts are continuously in engagement.

6. Means for making detachable electrical connections comprising two devices, each of said devices including a body, a contact carried by each body and said contacts adapted to be brought into engagement on said devices being forced together by a longitudinal movement, a continuous forwardly inclined rubber lip on one of said devices with an annular groove between the free edge of the lip and the body of the device to permit the lip to yield toward said body, said lip positioned to engage and be forced against the other device so as to be deflected to form a fluid tight seal therewith on said devices being forced together by a longitudinal movement to bring the contacts into engagement, interlocking means on the devices to prevent separation of said devices by a longitudinal movement and maintain said seal, and said interlocking means mounted to become effective on a relative turning movement of said devices.

7. Means for making an electrical connection comprising a device including a body and a contact carried by said body, a continuous forwardly inclined rubber lip on said device with an annular groove between the free edge of the lip and the body to permit the lip to yield toward the body, said lip being of gradually decreasing thickness toward its outer edge and of an outer diameter substantially that of the body of the device, and said lip positioned to engage and be forced against another electrical device having a contact and form a seal with said other device as the contacts of the devices are brought into engagement.

8. Means for making an electrical connection comprising a body carrying one or more contacts to engage contacts of a complementary device, an enclosing casing for said body of live rubber having a cord opening in one end and a tapered end forming a continuous resilient lip to clamp a lead cord extending to said contacts through said opening, said casing being provided on its opposite end with a continuous forwardly inclined resilient lip and an annular groove between the free edge portion of the latter lip and the casing to permit this lip to yield backwardly, and said latter lip being of an outer diameter substantially that of the casing and positioned to engage and be forced against the complementary device so as to be deflected to form a seal therewith by the resilient action of the lip.

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