July 30, 1957 E. A. HEPPNER 2,801,398

ELECTRICAL CONNECTOR

Filed April 4, 1955

Fig. 1.

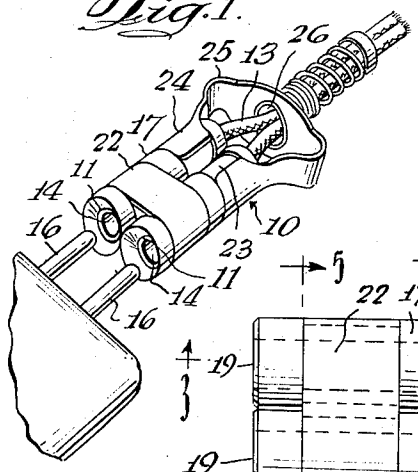


Fig. 6.

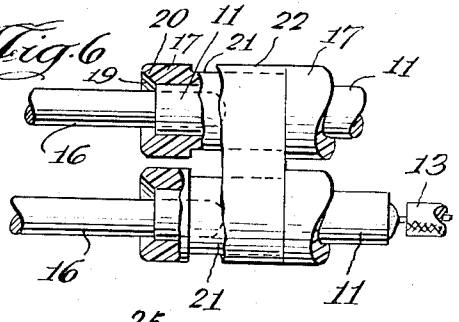


Fig. 2.

Fig. 3.

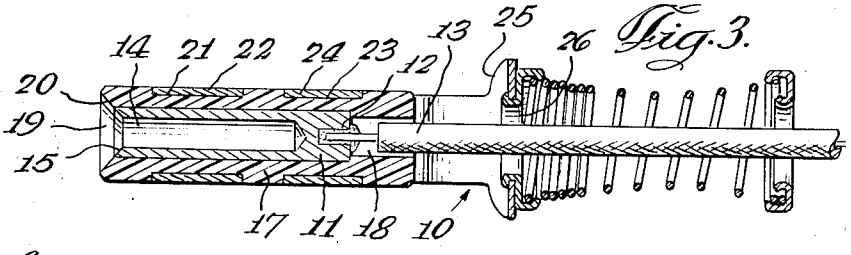


Fig. 4.

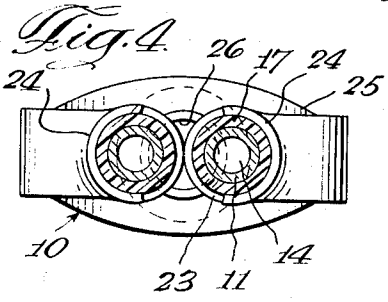
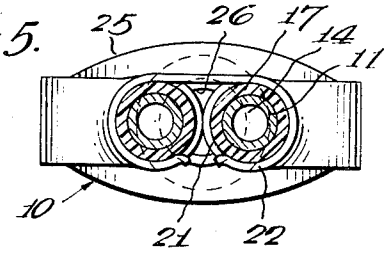


Fig. 5.



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2,801,398

ELECTRICAL CONNECTOR

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3 Claims. (Cl. 339—191)

This invention relates to an electrical connector and, more particularly, to an electrical connector wherein the contact members are capable of relative separating movement.

The general object of this invention is to develop a new and improved electrical connector of the character described.

A more particular object of this invention is to provide an electrical connector wherein a spring clip biases the contact members together and is insulated from any electrical contact.

A further object of this invention is to produce an electrical connector having housings circumjacent the contact members and forming an hermetical seal obstructing the passage of water, water vapor or other corrosion-producing material along the surface of the contact members.

Of the electrical connectors now in use, the most common one consists of a pair of female contact members, each of which consists of two parts biased toward each other by means of a spring. This spring normally is an integral part of the electrical connection. These parts engage a male plug and are biased against the plug holding the connector in position relative to the plug. Because of the required movement of the spring and contact parts, the housing that surrounds the contact members cannot form a tight seal between the housing and the contact members. The contact parts are relatively thin to permit the use of small springs and a compact housing unit.

The common device described above has several features which detract from its usefulness. Since relatively thin contact parts are employed the increased amount of current which newer appliances require develops excessive heat in the thin contact parts. Also, when used around sinks or stoves there is a tendency for the connector to become damp from condensation or from carelessness in allowing connectors to be immersed in water. This combination of heat and moisture causes the contact members to corrode thus reducing their useful life.

Normally, the springs are formed of cooper-plated spring steel. The combination of heat and moisture causes the copper plating to oxidize, increasing the electrical resistance and generating more heat which, in turn, causes more oxidation, resulting in a progressive deterioration which eventually heats the steel sufficiently to draw the temper from the spring making the connector useless.

Also of importance is the fact that the male prongs are oxidized by the dampness and heat and after three or four connectors are worn out, the appliance, in which the male plug is usually located, must be sent back for repairs.

In the present invention a spring clip is employed that is insulated from electrical contact and also insulated from any heat that might be generated by electrical resistance. Therefore, loss of temper will not occur and the deterioration, even after protracted use, is negligible. Since the spring clip does not conduct electrictiy, it need

not be plated with a material such as copper and would, therefore, not be as susceptible to oxidation. Another feature of the present invention is that the contact member may be of a relatively large size and, therefore, can conduct a relatively high current without developing detrimental heat.

A further feature of this invention is the use of a housing member that can be in close contact with the contact member so as to hermetically seal the surface of the contact member, thus, preventing the passage of water, water vapor or other material along the surface of the contact member to the electrical conduit. This seal is not possible with the common connector because of the movement of the parts.

Other and further objects and features of the invention will be readily apparent from the following description and drawings in which:

Fig. 1 is a perspective view of the assembled connector showing male prongs about to contact with the connector;

Fig. 2 is a top plan view of the electrical connector of this invention;

Fig. 3 is a horizontal section taken along the line 3—3 of a contact member of Fig. 2;

Fig. 4 is a vertical section taken along line 4—4 of Fig. 2;

Fig. 5 is a vertical section taken along line 5—5 of Fig. 2; and,

Fig. 6 is a partial top plan view including a partial section showing male prongs received within the connector.

While this invention is susceptible of embodiments in many different forms, there is shown in the drawings and will herein be described in detail one specific embodiment with the understanding that the present disclosure is to be considered as an exemplification of the principle of the invention and is not intended to limit the invention to the embodiment illustrated. The scope of the invention will be pointed out in the appended claims.

Referring now to the drawings, an electrical connector **10** is provided with a pair of substantially-cylindrical contact members **11** having a relatively small recess **12** for receiving an electrical wire **13**. The wire is either soldered to the contact or swaged within the recess. The contact member **11** is further provided with a relatively large cylindrical recess **14** having an outwardly-tapered open end **15** to receive a male prong **16** to make an electrical connection.

The contact members are each enclosed with a separate and substantially-cylindrical insulator housing **17** which is circumjacent each contact member **11** and closely fits the exterior surface thereof to form an hermetical seal between said surface of the contact member and the interior surface of the housing. Each housing is provided with a recess **18** for receiving the electrical wire **13** and has an aperture **19** that is conterminous with the recess opening **15** of the contact member. The aperture **19** has an outwardly-tapered surface **20**.

The housing members **17** have annular recesses **21** forming a seat for a spring clip **22** which partially surrounds the housings and resiliently urges them together. The exterior diameter of the housings are such that when their exterior surfaces are urged into contact with each other by the spring clip, the recesses **14** will be spaced apart a distance less than the normal distance between male plugs. The clip **22** permits relative separating movement between the housings to a distance substantially equal to the distance between said male plugs. Thus, when the male plugs are inserted within the recesses **14**, the recesses will be spaced apart and the spring will bias them together, clamping the connector on the male prongs. The outwardly-tapered surfaces **15** and **20** are provided so that the prongs can be easily inserted within

the recesses while camming the contact members apart. The housings are provided with another annular recess **23** receiving a U-shaped clamp **25** having semi-cylindrical ends **24** which fit within the recesses **23**. This clamp **25** is provided to maintain the housings in their planar alignment. The clamp **25** is provided with a hole **26** for guiding the electrical wires **13**.

In attaching the electrical connector of this invention to a male plug, it is first placed adjacent the prongs of the male plug so that the recesses in the contact members are substantially aligned with the prongs. The connector is then forced onto the prongs, the prongs contacting the tapered surfaces of the housings camming the housings apart. As the connector is forced further onto the prongs, the prongs contact the tapered surfaces of the contact members and finally enter the recesses. The spring clip resiliently urges the housings together thereby urging the surfaces of the recesses against the prongs. Thus, the connector is held in position on the prongs. When thus in position, the biasing action of the spring clips forces the interior surfaces of the recesses against the exterior surfaces of the prongs thereby providing electrical contact along the full length of the prongs. This relatively large area of contact is advantageous in reducing heat generated by electrical resistance and reducing the wear on the contact members and prongs.

The electrical current flows from the electrical conduit through the contact members into the prongs and finally into the male plug. No electrical current flows through the spring clip since the spring clip is insulated from the contact members by the housings.

These housings also act as insulators in obstructing the passage of heat from the contact member to the spring clips. Thus, the damage from oxidation is slight even when the clips frequently contact water.

What is claimed is:

1. A female electrical connector comprising: a pair of contact members, each member being provided with a recess for receiving a male plug; a pair of separate elongated housings of insulating material, each housing being circumjacent a contact member and having a hollow portion at one end terminating in an opening, said contact member being adapted to be secured to an electrical conduit at a point within the hollow portion and spaced from said opening; an insulated electrical conduit extending through the opening and into the hollow portion and having an uninsulated end secured to said contact member at said point; each of said housings having an aperture at the other end substantially conterminous with the recess in the contact member; and a spring clamping means surrounding said housings and mounting them in parallel relationship, said housings thereby being resiliently urged into contact with each other, the thickness of the housing walls being such that when the housings are in parallel contacting relationship the recesses are spaced apart a distance less than the normal distance between male plugs, said clamping means permitting relative separating movement between the housings to permit them to move apart against the bias of said clamping means to space said recesses apart a distance substantially equal to the distance between said male plugs.

2. A female electrical connector comprising: a pair of substantially cylindrical contact members, each member being provided with a substantially cylindrical recess for receiving a male plug, each of said contact members being provided with an outwardly-tapered surface adjacent the opening of the recess; a pair of separate elongated substantially cylindrical housings of insulating material, each housing being circumjacent a contact member and forming a substantially hermetical seal with its associated contact member, each housing having a tubular portion at one end terminating in an opening, said contact member being adapted to be secured to an electrical conduit at a point within the tubular portion and spaced from said opening; an insulated electrical conduit extending through the opening and into the tubular portion and having an uninsulated end secured to said contact member at said point; each housing having an aperture at the other end substantially conterminous with said opening in the recess in the contact member and having an outwardly-tapered surface being substantially a continuation of the tapered surface of the contact member, said tapered surfaces serving to guide the prongs of a male plug within said recess; a spring clip substantially in the form of an interrupted loop surrounding said housings adjacent the apertures and being incontiguous with the contact members for resiliently urging the housings into contact with each other, and a U-shaped spring clip having semi-cylindrical ends contacting the surface of the housings adjacent the openings for resiliently holding the housings in parallel alignment, the sum of the radii of the housings being slightly less than the normal distance between the centers of the prongs of the male plug so that when urged together by the spring clips the recesses are spaced apart a distance slightly less than the normal distance between male plugs, said spring clips permitting relative separating movement between the housings to permit the recesses to move apart a distance substantially equal to the distance between said male plugs.

3. A female electrical connector comprising: a pair of contact members, each member being provided with a recess for receiving a male plug, each of said contact members being provided with an outwardly-tapered surface adjacent the opening of the recess; a pair of separate elongated housings of insulating material, each housing being circumjacent a contact member and having a hollow portion at one end terminating in an opening, said contact member being adapted to be secured to an electrical conduit at a point within the hollow portion and spaced from said opening; an insulated electrical conduit extending through the opening and into the hollow portion and having an uninsulated end secured to said contact member at said point, each housing having another aperture at the other end substantially conterminous with said opening in the recess in the contact member and having an outwardly-tapered surface being substantially a continuation of the tapered surface of the contact member, said tapered surfaces serving to guide the prongs of a male plug within said recess; and a spring clamping means surrounding said housings and mounting them in parallel relationship, said housings thereby being resiliently urged into contact with each other, the thickness of the housing walls being such that when the housings are in parallel contacting relationship the recesses are spaced apart a distance less than the normal distance between male plugs, said clamping means permitting relative separating movement between the housings to permit them to move apart against the bias of said clamping means to space said recesses apart a distance substantially equal to the distance between said male plugs.

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