

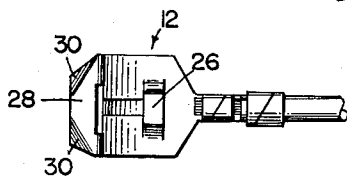
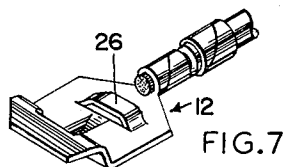
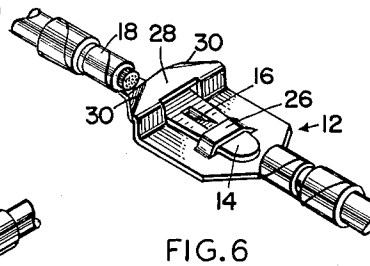
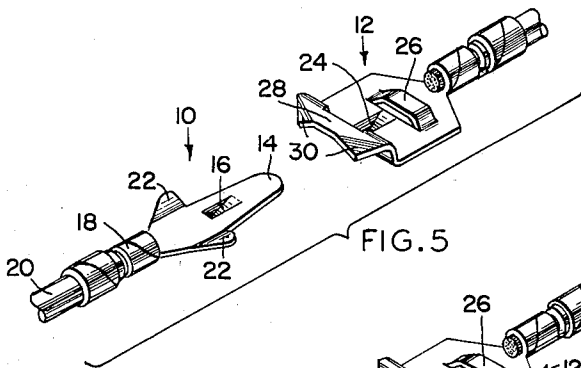
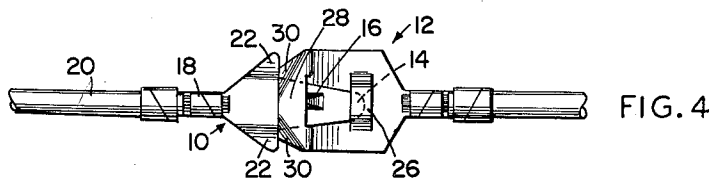
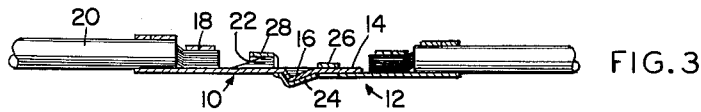
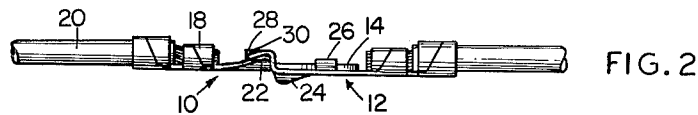
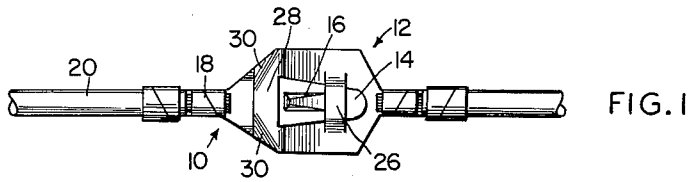
Nov. 20, 1962

C. G. RUTTER
MALE-FEMALE CONNECTOR

3,065,451

Filed July 26, 1960

2 Sheets-Sheet 1



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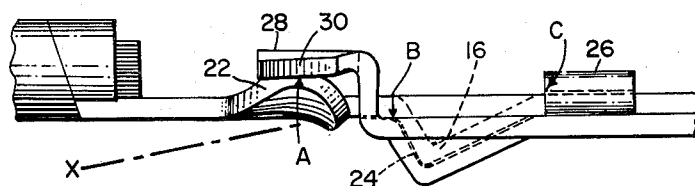


FIG. 9

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3,065,451

MALE-FEMALE CONNECTOR

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This invention relates to electrical connectors, and more particularly to a male-female combination thereof.

In the design of a male-female combination electrical connector, two principal problems are presented. The first problem is the more obvious one of providing a connector which will establish and maintain a firm electrical contact under compression and with low electrical resistance. A typical use for connectors of this sort is in machinery such as household washing machines; and under conditions of use in which the machine vibrates constantly, it will be seen that the electrical contact made by the connector must be capable of holding a firm low resistance contact over an extended period of use. The second, and perhaps less obvious, problem is that of providing a connector which, together with being capable of making a firm, secure electrical contact while in use, it also adaptable for ready connection and disconnection. Accordingly, it is a general object of my invention to provide a male and female combination electrical connector which is particularly suited for both of these purposes.

In the accomplishment of these and other objects of my invention in a preferred embodiment thereof, I provide a male and female member each made of stamped and formed sheet metal. The male member comprises a flat plate having means at the base end thereof for connecting the same to an electrical conductor. Centrally of the male member I provide a projection standing out therefrom. The female member which is likewise composed of a flat metal plate, but the female member has an indentation thereon substantially centrally thereof and dimensioned and arranged to correspond to and mate with the projection on the male member when the male and female members are placed alongside each other. A means for connecting the base end of the female member to an electrical conductor is also provided. The female member carries on it two retaining means as follows: (a) a first retaining means located near the base end of the female member and adapted to receive and hold the tip end of the male member; and (b) a second retaining means on the female member located at the opposite end thereof and spaced longitudinally from the indentation consisting generally in a transverse strap extending across the outer end of the female member and defining beneath it a space dimensioned to receive the male member and retain the same in contact with and against the female member with the projection on the male member fitting into the indentation.

With this arrangement, it will be seen that the indentation on the female member serves the purpose of restraining the male member against longitudinal motion relative to the female member and that the two retaining means serve the purpose of holding the male member in firm contact against the female member. It is a feature of my invention that the longitudinal disposition of the two retaining means serves to distribute bending forces applied to the male member during insertion and disconnection. Moreover, if the male member becomes bent during disconnection, its usefulness can be restored simply by bending it back to its proper or original shape. This is made possible by the spacing of the pressure points and their substantially wide longitudinal separation. I regard this as an important feature of my invention and intend to claim the same broadly.

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Further objects and features of my invention will best be understood and appreciated from a detailed description of a preferred embodiment thereof, selected for purposes of illustration, and shown in the accompanying drawings, in which:

FIG. 1 is a plan view of the male and female members in engagement;

FIG. 2 is a view in side elevation of the elements shown in FIG. 1;

FIG. 3 is a cross sectional view in side elevation of the components shown in FIG. 2;

FIG. 4 is a plan view showing the male member partially inserted in the female member;

FIG. 5 is a view in perspective showing the male and female members in exploded relation;

FIG. 6 is a view in perspective showing the two members connected;

FIG. 7 is a view in perspective of a variation of the female member alone;

FIG. 8 is a plan view of a variation of the female member alone; and

FIG. 9 is an enlarged view of the male and female members connected and showing more in detail the points of contact and pressure.

The preferred embodiment of my invention comprises a male member indicated generally at 10 and a female member indicated at 12. The members 10 and 12 are composed of relatively thin sheet metal selected for its ability to be formed by stamping and still retain a substantial degree of resilience. The male member 10 is provided with a tip end 14, a central portion having a projection 16 located centrally of the male member and with connecting elements 18 at its base for connecting the male member to an electrical conductor. Near the base of the male member 10 I provide a pair of locking ears 22 spaced symmetrically to each side of the center axis of the male member 10. The female member 12 likewise consists of a flat metal plate and is provided centrally with an indentation 24 which is located in corresponding relation to the projections 16 on the male member and is adapted to receive the latter when the connection is made.

In order to hold the male member in engagement with the female member, I provide a first retaining means 26 located near the base of the female member 12 and a second retaining means 28 located at the outer end of the female member 12 spaced longitudinally thereof and substantially separated along the longitudinal axis from the depression 24 indentation. The retaining element 26 consists mainly in the strap of metal which is stamped out of the base portion of the female member 12 and provides an opening dimensioned and arranged to receive the tip end 14 of the male member 10. The retaining element 28 likewise extends transversely of the female member 12 and provides an opening dimensioned and adapted to receive the main body of the male member 10. The retaining element 28 is also provided with a pair of laterally disposed retaining ears 30 which correspond in their position to and interlock with the retaining ears 22.

Thus it will be seen that the male and female members are connected by inserting the tip end 14 of the male member 10 into the female member passing under the retaining means 28 and with the tip end 14 then lodging under the retaining element 26. As the male member is pushed further and further in, the projection 16 commences to ride up onto the portion of the female member indicated at B in FIG. 9. At that time the retaining elements 26 and 28 will be pressing against the male member on the opposite side thereof substantially at the points A and C shown in FIG. 9. This action causes a bending or flexing in male member 10, but since the

points A and C are widely separated on the horizontal axis of the male member 10, these bending forces are not concentrated at a single spot so as to permanently deform the metal, but rather these forces are distributed along the longitudinal axis from the male member 10 and the bending is accomplished without exceeding the elastic limits of the metal. It will be understood, of course, that the female member 12 likewise bends but to a less extent and helps accommodate the passage of the projection 16 over the point indicated at B. Once the projection 16 passes this point, it snaps down into the depression 24 in the female connector and the male member 10 is then located in place in the female member 12 with the resilience of the male member pressing on one side thereof against the female member at points A and C and on the other side thereof at point B. The separation of the ears 22 and 30 from the center axis of the connector also serves to distribute these bending forces laterally at the point A.

An extremely firm contact of low electrical resistance is the result, and it is likewise so secure that it is virtually proof against inadvertent or accidental opening up. On the other hand, when it is desirable to disconnect these two elements the male member 10 may be pulled in the reverse direction, causing the projection 16 to ride upwardly over the point B and release the connection. In one form of my invention shown in FIGS. 6, 7, and 8, the mating rear wall of the projection 16 and forward wall of the depression 24 are vertically disposed. In this embodiment the locking connection is more secure and when disconnection is desired, the male member 10 may be bent downwardly to an angle shown for convenience by the dotted line X in enlarged FIG. 9. This simply releases the pressure between the locking ears 22 and 30, and the male connector can then be simply removed from the female connector. Such bending need not exceed the elastic limit or permanently distort the male member 10, but if such permanent distortion accidentally takes place the male member may be restored to its former or proper condition by simply bending it back again to make its main body straight as it was before. This may be done easily with the longitudinal disposition of elements shown. Re-insertion can then be made without substantial loss. Of course, repeated bending of this sort would break the male member 10, but contacts of this type are not opened and closed with any great frequency because such becomes necessary only when the major components of the machine to which these elements are attached need replacement.

In the preferred embodiment of my invention herein shown it will be seen that the locking ears 22 slide slightly under the locking ears 30, and therefore, contribute to some extent to the resistance against longitudinal motion between the two elements. On the other hand, it will be understood that the depression 24 with the projection 16 fitting therein, provides the principal resistance to longitudinal relative motion of the two members.

Since numerous minor modifications of the preferred embodiment of my invention as herein shown will be readily apparent to those skilled in the art, it is not my intention to confine the invention to the precise form

herein shown, but rather to limit it in terms of the appended claims.

Having thus described and disclosed a preferred embodiment of my invention, what I desire to claim and secure is:

1. An electrical connector combination comprising: a male member including a first flat plate, means at a first end of said first plate for connecting said first plate to an electrical conductor, a downwardly extending depression in said first plate located longitudinally and transversely substantially centrally thereof and an upwardly extending lug disposed at each side of said first plate between said depression and said means for connecting said first plate to an electrical conductor; a female member including a second flat plate of greater width than said first plate, means at a first end of said second plate for connecting said second plate to an electrical conductor, a downwardly extending depression located longitudinally and transversely substantially centrally thereof and of substantially the same dimension as said downwardly extending depression in said first plate, a first upstanding strap member located transversely of said second plate between said depression and said means for connecting said second plate to an electrical conductor, a second upstanding strap member located transversely of said second plate at a second end thereof opposite said first end, and an ear on said second strap member at each side thereof and at the lateral extremities thereof in position for abutting relation respectively with said lugs on said male member when the same is in the fully inserted position in said female member; whereby insertion of said male member longitudinally within the straps of said female member causes engagement of said depression in said first plate with said depression in said second plate and compression of said lugs on said male member under said ears on said female member with said compressive forces being distributed across the full width of said male and female members.

2. An electrical connector combination as defined in claim 1 further characterized by said male member being generally tapered away from said first end thereof and said first and said second strap members on said female member being dimensioned to correspond to the width of said male member when said male member is inserted in said female member.

3. An electrical connector combination as defined in claim 2 wherein said depression in said male member is provided toward the said first end of said first plate with a wall generally normal to the plane of said first plate and said depression in said female member is provided toward the said second end of said second plate with a wall generally normal to the plane of said second plate.

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