June 10, 1952 H. W. BATCHELLER 2,600,190

ELECTRIC CONNECTOR FEMALE MEMBER

Filed May 8, 1950

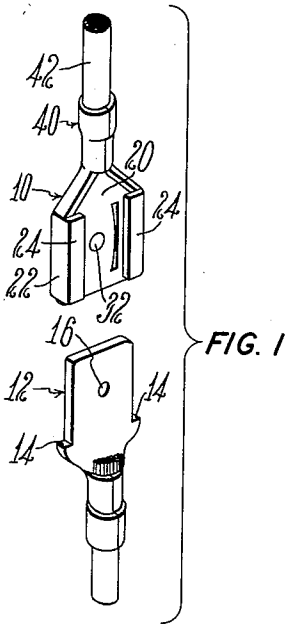



FIG. 1

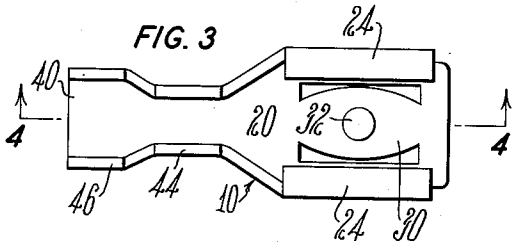



FIG. 3

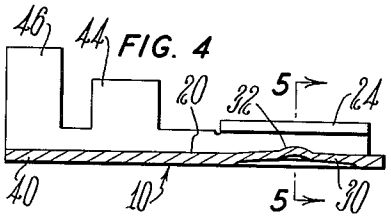



FIG. 4

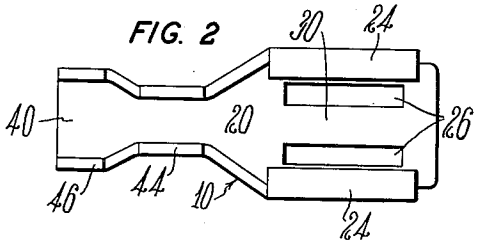



FIG. 2

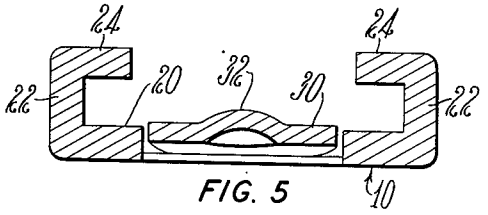



FIG. 5

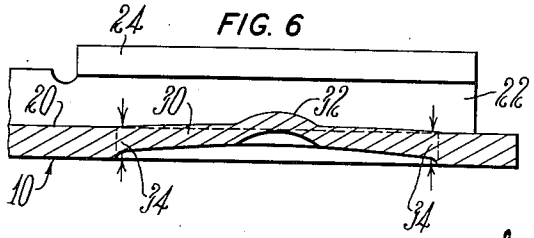



FIG. 6

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## ELECTRIC CONNECTOR FEMALE MEMBER

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Application May 8, 1950, Serial No. 160,666

5 Claims. (Cl. 173—363)

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This invention relates to an improved female member of an electric connector, the other member of which may be essentially a rectangular tongue having a central recess in one or both faces thereof.

The chief function of an electric connector is to furnish a current-carrying joint having as small an electrical resistance as possible. Resistance at a joint depends on the area and efficiency of the surfaces of the connector members which are in mutual contact.

One important factor in the conductivity at a joint is the pressure between the surfaces of the connector members which are in mutual contact. Hence the members of an electric connector should be designed so that the mutually contacting faces will press firmly against each other not only when the members are first connected but also after they have been disconnected and reconnected a large number of times. Since the members of a connector are subject to thermal expansion and contraction, a resilient pressure between the members is desirable. Where the pressure depends on the resilience of some element or elements of the connector, the permanence of the elasticity of such elements is of great practical importance.

According to the present invention, an improved female member of a connector is provided, similar in some respects to the connector member described in my copending application, Serial No. 119,840, filed October 6, 1949, but having a resilience which is considerably more permanent and durable, that is, being capable of pressing against the complemental member with substantially unabated force after a far larger number of connections and disconnections of the members.

Female members of electric connectors such as are hereinafter described are preferably made of sheet metal which is sufficiently malleable to permit the formation of sharp angular bends without the occurrence of cracks or the necessity of annealing. Such metals, however, usually have a relatively low elastic limit unless they are subjected to a cold swaging treatment. Such treatment greatly increases the hardness and resilience of the metal.

In making my improved connector member, a suitable blank is cut from malleable sheet or strip metal, such as half-hard brass, half-hard bronze or soft steel, which is made harder and far more resilient by cold swaging. The wings of the blank are bent sharply upwardly and inward to form a channel with overhanging flanges

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to receive and hold the male member of the connector. Two parallel longitudinal slots are cut through the floor of the channel, forming a central strip. This strip is struck by a die shaped to arch it upward so that it is slightly above the rest of the channel floor and to flatten it in varying degrees from a maximum at its middle to a minimum at its ends where it joins end portions of the floor of the channel. In the swaging operation, the metal flows laterally to increase the width of the strip in accordance with the decrease in thickness. Hence the swaged strip has a maximum width at its midpoint tapering to nearly the initial width at its ends. The die is also preferably shaped to form a small dome at the central point of the strip to enter a corresponding depression in the male member which is thrust into the channel.

For a more complete understanding of the invention reference may be had to the following description and to the drawing, of which—

Figure 1 is a perspective view of the two members of an electric connector, the female member embodying the invention;

Figure 2 is a plan view of a partly made member, on a large scale;

Figure 3 is a plan view of a completed member;

Figure 4 is a section on the line 4—4 of Figure 3;

Figure 5 is a section on the line 5—5 of Figure 4; and

Figure 6 is a portion of Figure 4 shown on a larger scale.

The invention is embodied in the female member 10 of an electric connector, the male member 12 being a simple rectangular tongue of sheet or strip metal having shoulders 14 to limit the penetration of the member 12 into the member 10 and having in its opposite faces central dimples or depressions 16.

The female member 10 may conveniently be made from a blank of sheet or strip metal which is malleable so that it can be sharply bent without cracking or annealing. Such metal for example may be half-hard brass, half-hard bronze, soft steel, or other suitable alloys which acquire hardness and substantially increased resilience and elastic limit when swaged cold. The blank is cut to shape from sheet or strip stock and portions of the blank are sharply bent up and inward to form a channel having a floor 20, side walls 22, and inturned flanges 24 which overhang portions of the floor 20. Two longitudinal slots 26 are cut through the floor 20, these slots being parallel and spaced apart as indicated in Figure 2 to define a strip 30, the ends of which

are integrally joined with the end portions of the floor **20**. The strip **30** is then swaged by a heavy blow struck by a suitably shaped die when the strip is resting on an anvil, the die and anvil not being shown. The die and anvil are so shaped as to swage the strip **30** into the form illustrated in Figures 3, 5, and 6. This shape is characterized by a varying thickness of the strip from a maximum at the ends thereof to a minimum at the midpoint thereof, as illustrated in Figure 6. The swaging operation also arches the strip upward so that it curves upward from both ends to the midpoint. The swaging operation also forms a small dome **32** at the midpoint of the strip, the diameter of this dome or rounded protuberance being approximately the same as that of the recesses **16** in the member **12**. When the midportion of the strip **30** is thinned in the swaging operation the metal is compacted and hardened by the blow but the thinning operation necessarily causes a flow or displacement of some of the metal laterally. Hence the strip is widened by the swaging blow in accordance with the degree of thinning, the maximum width occurring at its midpoint where there is maximum thinning of the strip. Hence the width of the strip increases progressively from the ends to the midpoint, as indicated in Figure 3. The swaging operation results in a resilience in the strip **30** which, as exhaustive tests have proved, is relatively permanent so that a very large number of connections and disconnections can be made without causing any appreciable permanent distortion of the strip. This feature is of great practical importance since the useful life of a connector member of this kind depends upon the number of times the strip will return to its original swaged shaped when released after such temporary distortion as is caused by the insertion or removal of the member **12**.

By way of example and not by way of limitation, actual dimensions of the connector member shown in Figure 6 may be as follows. The metal stock of which the member is made has a thickness of .0254''. When the strip **30** is swaged to the shape indicated in Figure 6, the thickness of the strip close to its ends, as at **34**, may be approximately .02''. This thickness decreases progressively from the ends of the strip to a minimum of approximately .15'', this being the thickness of the strip at the dome **32**. The dome itself may have the same thickness of metal. The width of the strip correspondingly varies from a minimum at the end which is slightly greater than the original width of the strip **30** to a maximum at the midpoint of the strip where the sides of the strip nearly touch the opposing sides of the slots **26**.



The member is provided with an extension **40** to receive the end of the wire **42**, tongues **44** and **46** being provided on the extension to be wrapped around the stripped end and adjacent insulated portion of the wire respectively as shown in Figure 1 so as to secure the connector member to the wire.

I claim:

1. An electric connector member comprising a piece of malleable sheet metal having portions sharply bent upward and inward to form a channel with overhanging flanges, said channel having two longitudinal parallel slots therethrough defining a central strip, said strip being upwardly arched and progressively thinner, wider and harder from its ends to its midpoint.

2. An electric connector member comprising a piece of malleable sheet metal having portions bent upward and inward to form a channel with overhanging flanges, said channel having two longitudinal slots therethrough spaced to define a central strip, said strip being upwardly arched and progressively thinner, wider and harder from its ends to its midpoint and having a small domed protuberance at its midpoint.

3. An electric connector member having a plane sheet metal portion with two parallel slots therethrough defining a central strip which is arched out of the plane of said portion and is progressively wider and thinner from its ends to its mid point.

4. A connector member as in claim 3, having side walls with inturned flanges, said central strip having a boss at its mid point.

5. An electric connector member comprising a piece of malleable sheet metal having a plane portion with two parallel slots therethrough defining a central strip, said strip being arched out of the plane of said portion and being progressively wider, thinner and harder from its ends to its mid point.

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## REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

| Number | Name | Date |
|---|---|---|
| 1,946,713 | Rowley | Feb. 13, 1934 |
| 1,995,115 | Douglas | Mar. 19, 1935 |
| 2,371,469 | Rogoff | Mar. 13, 1945 |