May 27, 1947. E. G. WALSH 2,421,045

SOLDERLESS CONNECTION

Filed Sept. 19, 1945

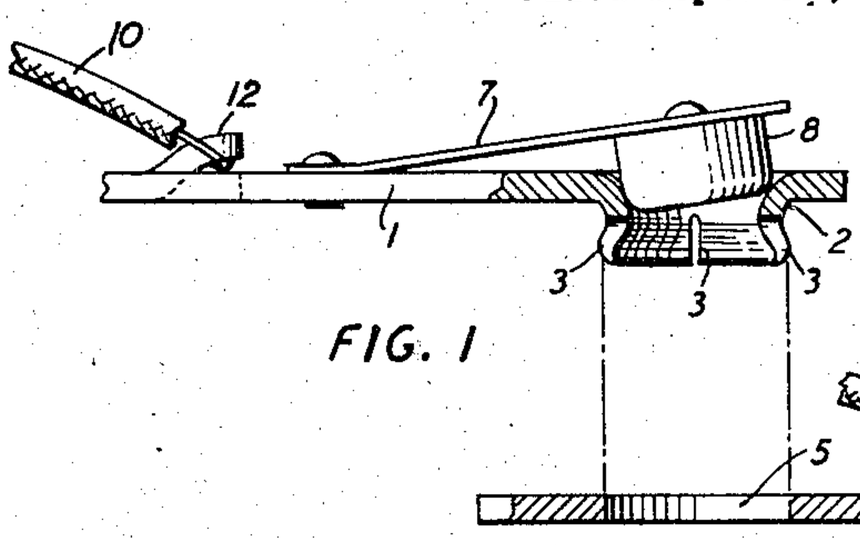


FIG. 1

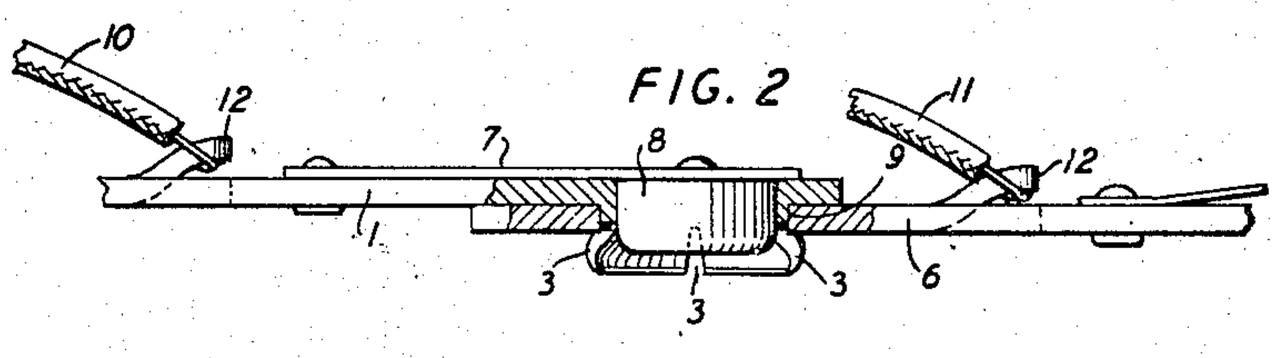


FIG. 2

FIG. 3

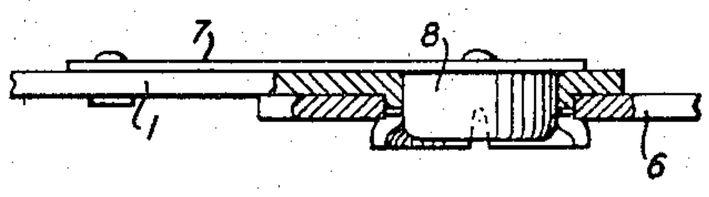


FIG. 4

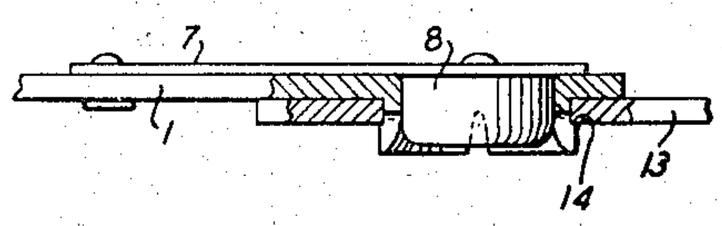


FIG. 5

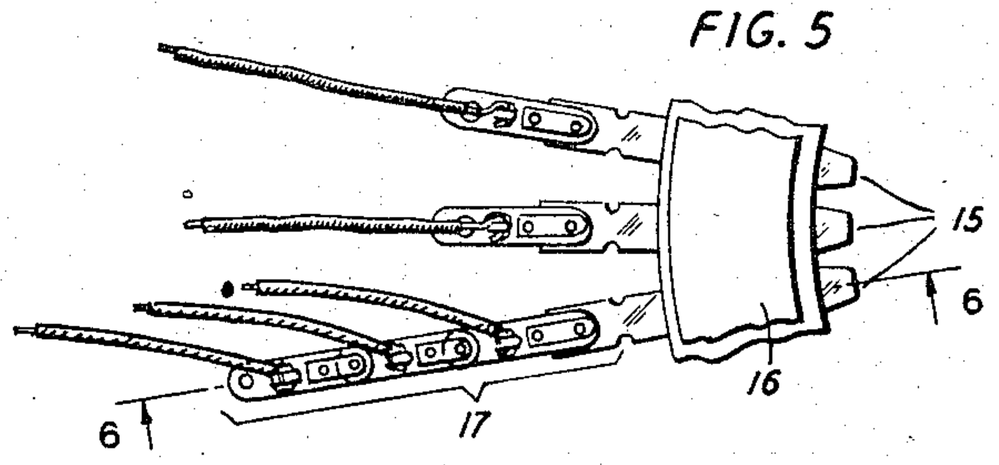
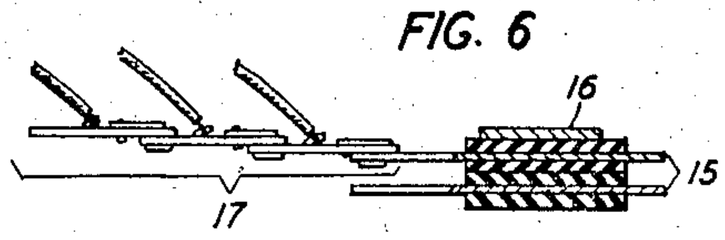


FIG. 6



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SOLDERLESS CONNECTION

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5 Claims. (Cl. 173—324)

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This invention relates to connectors and particularly to improvements in connectors for electrical circuits.

An object is to simplify such connecting means and their manipulation.

Heretofore, various types of fasteners or electrical connectors have been used in which a pin is driven into the hollow end of an electrical conductor inserted in an opening in a plate to expand this hollow end to electrically bind the conductor to the plate. Other fastening means have been provided in which split tubular rivets are secured to plates and in which a terminal may be inserted, the split ends of the tubular rivets being bent inwardly so that the terminal when inserted will engage the ends to make a tight electrical connection therewith. Still other fastening means have been used to secure various members together in which a split socket or expansion rivet is inserted in an opening in the members and in which a plug may be inserted to separate the split ends of the rivets to bind said members together.

This invention relates to connectors of this general type for establishing connections between electrical conductors or between electrical conductors and electrical terminals.

A feature of this invention is a connector in the form of a clip to which an electrical conductor is attached and having an eyelet extruded therefrom at one point and having an aperture provided at another point and a spring member secured to said clip provided with a knob or extension which when the spring is pressed against the clip enters into the eyelet and expands it. These connectors may be employed for establishing multiple connections between conductors by having the eyelet of one clip inserted in the aperture of another clip and expanded by the associated extension or knob being inserted in the said eyelet to secure said clips together. This connector may also be used for establishing connections between the attached conductor and a terminal or similar member provided with an aperture by inserting the eyelet in the aperture of said terminal and expand it by the knob.

The invention has been illustrated in the accompanying drawings in which

Fig. 1 shows a portions of two connectors in accordance with the applicant's invention before they are fastened together;

Fig. 2 shows these two connectors secured together in accordance with the applicant's invention;

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Figs. 3 and 4 show slight modifications of these members;

Fig. 5 shows the applicant's invention applied to a terminal bank; and

Fig. 6 shows a cross-section taken on line 6—6 of Fig. 5.

Referring now to these drawings the portion of the clip member 1 shown in Fig. 1 is flat and has an extruded eyelet 2 at one end. This eyelet at its open extruded end is shown split in sections by slots 3 and these sections are slightly flared out with the outside dimension at this flared out end slightly larger than the inside diameter of an opening 5 in the opposite end of another clip member 6. On the upper flat side of the clip 1 is secured a spring 7 which at its free end is provided with a knob 8. To assemble the clip 1 to clip 6 the eyelet 2 is inserted in the opening 5 and as the outer free end of this eyelet is slightly larger than this opening 5, the clip 1 may be held loosely in connection with clip 6. Then the spring 7 may be depressed by hand or otherwise so that the knob 8 enters the eyelet and thereby slightly expands the eyelet so that the outer surface of the eyelet at points 9 will closely engage the inside surface of the aperture 5, while the lower free end of the eyelet will be slightly flared out around the lower circumferential edge of the opening 5. It should be noted in Fig. 2, that the knob 8 has actually to some extent at least expanded the whole eyelet and thereby caused the connection between the eyelet and the clip 6 to be firm and tight as required in electrical connections while the outer end of the eyelet is flared over to hold the clips in this position. The slot 3 expedites this flaring out of the outer free end of the eyelet. By this means an electrical connection may thus be established between the conductor 10 secured to clip 1 and conductor 11 secured to clip 6. These conductors may be connected to the clips by wrapping them over the hooks 12 punched out from the clips and then soldered to these hooks.

In Fig. 3 the clips 1 and 6 have been assembled with the same type of plug or knob 8 and spring 7 but with the outer free end of the eyelet somewhat differently formed so that it will hug the outer lower rim of the opening 5 in a tight and secure manner.

In Fig. 4 the same general eyelet is provided in clip 1 except that in this case it may be somewhat shorter and if the metal of the clip 1 is considerably softer than, for example, the metal of a terminal 13, the outer free end of the eyelet will be partly embedded in and around the lower

circumferential edge of the opening 5 in this terminal 13 as shown at the point 14. The insertion of the knob 8 into the opening of the eyelet 2 may be made by hand if the material of the clip is soft enough for this purpose whereas if it is somewhat harder, a suitable pair of pliers or similar tool may be used for this operation of forcing the knob 8 into the eyelet and pressing the walls of the eyelet into the inner surface of the opening 5. The knob 8 may be made of any suitable material even in some instances of a hard rubber composition or plastic material.

In Fig. 5 an arrangement is shown in which a series of terminals 15 are assembled in a semicircular terminal bank 16 such as is well known in the telephone art. The outer ends of these terminals 15 may be provided with openings such as 5 in the clips and in these openings may be inserted clips such as 1 by merely pressing the eyelets into the holes first and then pressing the knob into the eyelets. These operations may be done very quickly and with the assurance the proper electrical connections are established.

It is, of course, evident that if it is desired to connect a plurality of conductors together, clips like 1 may be assembled in a cascade formation as shown in Figs. 5 and 6 where three such clips are shown connected together by the insertion of the eyelet of one clip into the aperture of another. These three clips with their conductors are then connected to a terminal as shown at 17 in Figs. 5 and 6. Thus, the applicant's invention may be used for a variety of purposes where it is desired to make connections between conductors temporarily or permanently and in places where it is more convenient to use this method in preference to soldering or welding of conductors directly together or to terminals in inaccessible places as in terminal banks where it is difficult to solder conductors directly to the terminals. The applicant's invention is also readily applicable for use in the establishing of circuit connections for testing purposes and where connections are likely to be changed often, it being a simple matter to separate the clips by merely pushing the knobs out of the eyelets and then twisting the eyelet out of the apertures.

What is claimed is:

1. A fastening device for connecting an electrical conductor to a terminal member having an aperture therein comprising a clip member having an extruded eyelet for insertion in said aperture, a conductor attached to said clip member, a spring member attached to said clip and a knob attached to said spring formed to fit and enter into said eyelet to expand it in said aperture to securely hold the clip connected to the terminal to establish an electrical connection.

2. A fastening device comprising a clip member having an extruded eyelet and an aperture, a spring member attached to said clip, a knob attached to said spring formed to fit and enter into said eyelet to expand it, an electrical conductor attached to said clip whereby multiple electrical connections may be established between the conductors attached to a plurality of such clip members by having the eyelet of one clip inserted in the aperture of another clip and expanded by the associated knob when inserted in said eyelet.

3. A fastening device for electrical conductors comprising a clip member having an extruded eyelet therein and having its free end slip to form a plurality of flexible prongs and a separate aperture in said clip of an inside diameter slightly smaller than the outside diameter of the extended portion of the eyelet, a spring member attached to said clip having a projection formed to fit and enter into said eyelet to expand it, an electrical conductor attached to said clip whereby electrical connections may be established between conductors of a plurality of clips by first inserting the extended portion of the eyelet of one clip into the aperture of another clip to hold said clips more or less loosely together and then depressing the projection on the spring associated with this eyelet into said eyelet to expand it and thereby separate the prongs to firmly grip the side of the clip aperture to attach and connect said clips together to establish an electrical connection between the attached conductors.

4. An electrical connector comprising a flat rectangularly shaped metal strip having an eyelet extruded from one end thereof and an aperture located at the opposite end thereof, an electrical conductor connected to said strip, a flat spring secured to said strip between the aperture and the eyelet, a knob secured to the free end of said spring formed to fit and enter into the eyelet when the spring is pressed against said strip to expand said eyelet when said eyelet is inserted in the aperture of another such strip to establish a tight electrical connection between the conductors of said strips.

5. An electrical connector for connecting an electrical conductor to a terminal member having an aperture, comprising a clip member having an extruded eyelet for insertion in said aperture, a conductor attached to said clip member, a spring attached to clip, a knob attached to said spring formed to fit and enter into said eyelet to expand it in said aperture to partly embed the inner edge of said aperture in the outer surface of the eyelet to securely hold the clip member in electrical connection with said terminal for the establishing of an electrical connection between said conductor and said terminal.

EDWARD G. WALSH.