Oct. 19, 1948. S. N. BUCHANAN ET AL 2,451,800

TERMINAL CLIP FOR ELECTRICAL CONDUCTORS

Filed Nov. 15, 1946

Fig. 1.

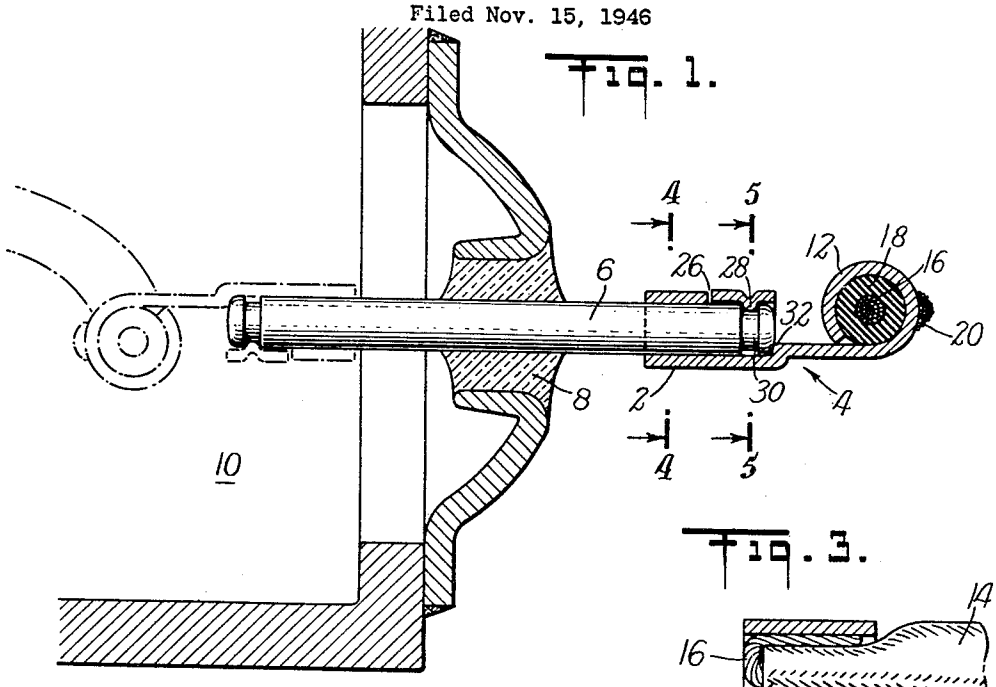


Fig. 3.

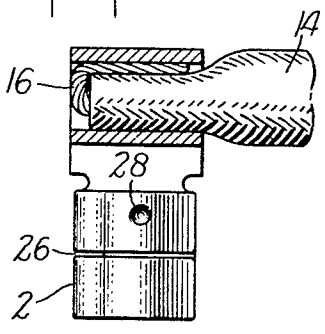


Fig. 2.

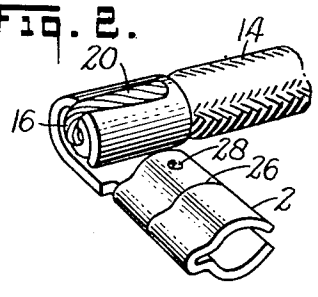


Fig. 4.

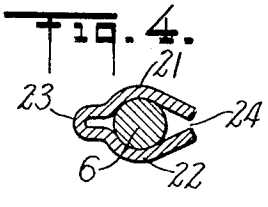


Fig. 6.

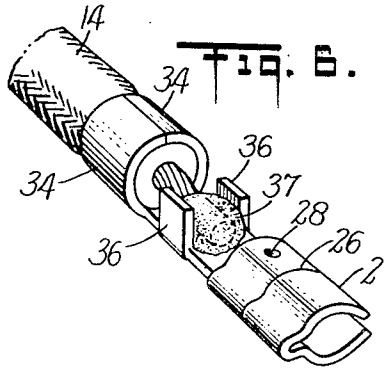
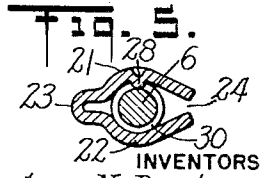


Fig. 5.



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Patented Oct. 19, 1948

2,451,800

UNITED STATES PATENT OFFICE

2,451,800

TERMINAL CLIP FOR ELECTRICAL CONDUCTORS

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Application November 15, 1946, Serial No. 710,172

3 Claims. (Cl. 173—269)

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This invention relates to electrical connectors and more particularly to friction-type terminal clips for making releasable electrical connections.

In accordance with the invention, an electrical connector is provided having particularly high resiliency and long life. This connector is a unitary structure advantageously fabricated from a single piece of resilient conducting material by simple stamping and bending operations. It is thus readily constructed and the characteristics of the completed connector render it particularly useful in high speed assembly operations.

Accordingly, it is an object of this invention to provide an improved friction-type releasable connector characterized by long life, excellent electrical contact, and ease of operation, and which may be economically manufactured by mass production methods.

It is a further object to provide an improved structure for making a firm electrical connection which may be repeatedly attached and released over long periods of time without impairing the efficiency of the connector.

It is a more specific object of this invention to provide a highly resilient terminal clip having a structure capable of providing excellent frictional contact, and automatic positioning together with stop means for preventing misuse of the terminal clip.

The invention accordingly consists in the features of construction, combinations of elements, and arrangements of parts as will be exemplified in the structures hereinafter described and the scope of the application of which will be set forth in the following claims.

In this specification and the accompanying drawings, there is shown and described a preferred embodiment of the invention and various modifications thereof; but it is to be understood that these are not intended to be exhaustive nor limiting of the invention, but on the contrary are given for purposes of illustration in order that others skilled in the art may fully understand the invention and the principles thereof and the manner of applying it in practical use so that they may modify and adapt it in various forms each as may be best suited to the conditions of a particular use.

In the drawings:

Figure 1 shows a terminal clip connected to a flexible cable and releasably clamped by friction to a pin permanently sealed into a separating wall;

Figure 2 illustrates one method of attaching the terminal clip to the flexible cable;

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Figure 3 illustrates an alternate method of attachment;

Figure 4 is a cross section taken on line 4—4 of Figure 1;

Figure 5 is a cross section taken on line 5—5 of Figure 1; and

Figure 6 illustrates a modified form of the terminal clip and the manner of attaching it to the cable.

The receptacle or body portion 2 of a terminal clip, generally indicated at 4 in Figure 1, is frictionally connected to a lead-through pin 6 which is embedded in fusible insulating material 8 that seals an enclosed chamber, generally indicated at 10. A ferrule or cable attaching portion 12 is constructed integrally with the receptacle portion and is shown crimped around a flexible cable 14 having an inner conductor 16 surrounded by an insulating sheath 18. The conductor 16 is shown in Figures 1 and 2 attached to the external portion of ferrule 12, for example, by soldering at 20. The connector thus provides a firm electrical contact between the flexible conductor 16 and the pin 6.

To connect the cable 14 to the ferrule portion of the clip, the insulation adjacent the end of the cable is removed from around conductor 16 and the ferrule 12 is crimped tightly around the insulation 18, thus forming a secure mechanical connection between the cable and connector. The electrical connection is made by turning the inner conductor 16 back along the outside of the ferrule (Figure 2) and attaching it thereto by soldering at 20 or other suitable means. An alternative method of fastening the cable to the ferrule (Figure 3) is to turn the bared portion of conductor 16 back along the outside of the insulating sheath 18 and subsequently crimp the ferrule simultaneously around the cable and the adjacent bared conductor. The connector may thus be fastened to the cable by a simple crimping operation or, if desirable for certain applications, the bared portion of conductor 16 may be soldered to the inner surface of ferrule 12 prior to the crimping operation.

The inner surface of the receptacle portion 2 of the terminal clip defines a longitudinal cavity for receiving and frictionally gripping pin 6. The cross-sectional shape of the pin receiving cavity is illustrated by Figures 5 and 6. This cavity is formed by two oppositely-disposed internally-concave wall portions 21 and 22 integrally connected by a U-shaped looped portion 23 which provides increased resiliency permitting greater freedom of movement of the wall portions and insuring a longer useful life for the

terminal clip. The edges of the wall portions 21 and 22 parallel to the axis of the internal cavity are parallel to each other and may be advantageously spaced apart to leave a longitudinal opening 24 along the side of the receptacle opposite the looped portion 23. At least one transverse slit 26 through the thickness of the receptacle wall 21 extends across one of the walls and through the looped portion 23. This transverse cut provides increased resiliency and minimizes distortion of the friction gripping surfaces such as might be caused by misalignment of the clip when it is being attached to pin 6 or by lateral forces applied to the ferrule portion after the clip is in position.

An internal boss 28 is produced by indenting the external surface of the clip. This boss is adapted to rest in a reduced portion 30 of the pin 6, thus further assuring good electrical contact and exerting a snap action which insures proper positioning of the pin 6 in receptacle 2.

The ferrule 12 is offset from the receptacle portion to form an inwardly projecting shoulder 32 which serves as a stop to limit the distance pin 6 may be inserted into the receptacle.

An alternative ferrule construction is shown in Figure 6 in which the cable 14 and the receptacle portion 2 are in axial alignment. A pair of upwardly extending ears 34 are crimped tightly around the outside of cable 14. The inner conductor is secured to the clip between ears 36 e. g. by solder 37 after which these ears are crimped downwardly over the solder to increase the mechanical strength of the connection. The receptacle or body portion 2 of the clip is substantially as described in the first embodiment.

It is thus seen that the releasable terminal clip embodying the invention is well adapted to attain the features of excellent electrical contact, long life, ease of operation and has the economic advantage of manufacturing simplicity.

As many possible embodiments may be made of the above invention and as many changes might be made in the embodiment set forth, it is to be understood that all matter hereinbefore set forth or shown in the accompanying drawing is to be interpreted as illustrative and not in a limited sense.

We claim:

1. A friction-type terminal clip of unitary construction for releasably connecting a flexible conductor having an outer insulating sheath to an electrically conductive pin, comprising a ferrule portion for mechanically gripping said insulating sheath and electrically connecting said conductor; a receptacle portion integral with said ferrule portion and having oppositely-disposed walls for receiving and frictionally gripping therebetween said pin; a resilient U-shaped loop portion integrally connecting said walls to permit said walls to expand and contract as said pin is inserted into or withdrawn from said receptacle portion; an integral inwardly extending boss on at least one of said walls adapted to frictionally contact a reduced portion of said pin; and a shoulder forming stop means at the juncture of said receptacle portion and said ferrule portion for limiting the distance said pin extends into said receptacle portion.

2. A friction-type terminal clip of unitary construction for releasably connecting a flexible conductor having an outer insulating sheath to an electrically conductive pin having a reduced portion spaced from its end, comprising a ferrule portion for mechanically gripping said insulating sheath and electrically connecting said conductor; a receptacle portion integral with said ferrule portion and having oppositely-disposed walls for receiving and frictionally gripping therebetween said pin; a resilient U-shaped loop portion integrally connecting said walls to permit said walls to expand and contract as said pin is inserted into or withdrawn from said receptacle portion; an integral inwardly extending boss on at least one of said walls adapted to frictionally contact the reduced portion of said pin; and a shoulder spaced longitudinally from said boss and forming stop means at the juncture of said body portion and said ferrule portion.

3. An electrical connector comprising an electrically conductive pin having a reduced portion spaced from its end; and a terminal clip of unitary construction having a ferrule portion for mechanically gripping and electrically connecting an insulated conductor and a receptacle portion for releasably engaging said pin, said receptacle portion having oppositely disposed walls for receiving and frictionally gripping therebetween said pin and a resilient U-shaped loop portion integrally connecting said walls to permit said walls to expand and contract as said pin is inserted into or withdrawn from said receptacle portion; an integral inwardly extending boss on at least one of said walls adapted to frictionally contact the reduced portion of said pin; and a shoulder spaced longitudinally from said boss a distance equal to the spacing of the reduced portion from the end of said pin and forming stop means at the juncture of said body portion and said ferrule portion.

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