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3,430,191

CONNECTOR CLIP

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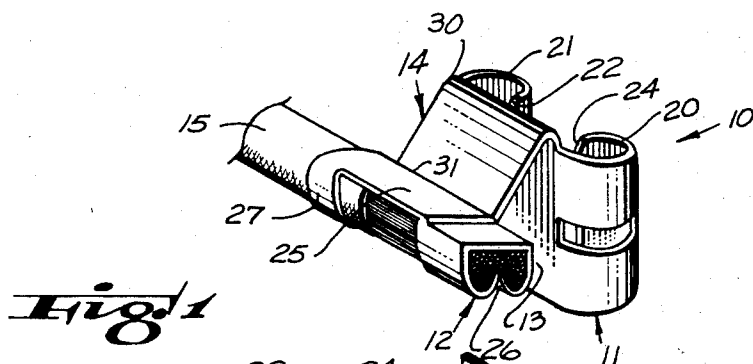


Fig. 1

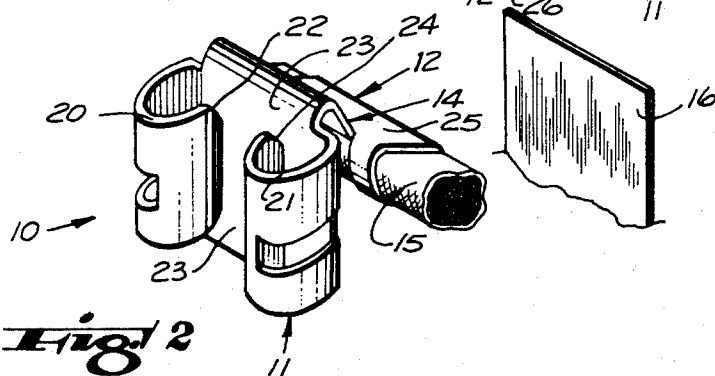


Fig. 2

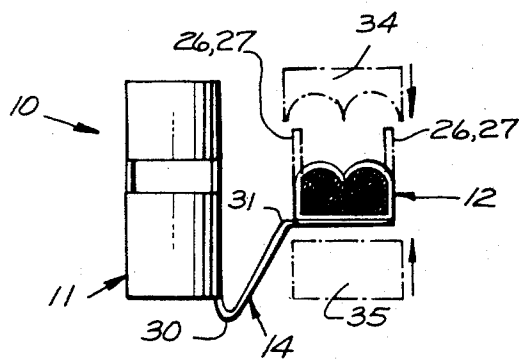


Fig. 3

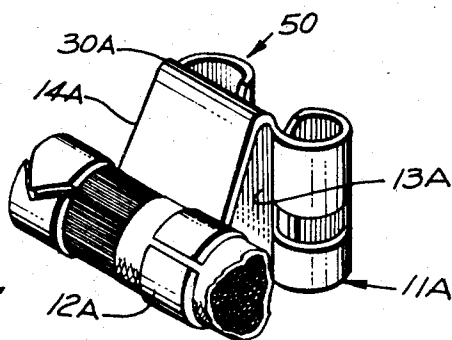


Fig. 4

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3,430,191

CONNECTOR CLIP

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3 Claims

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ABSTRACT OF THE DISCLOSURE

A flag-type electrical connector having a female receptacle and a lead wire gripping ferrule attached to the receptacle by a shank. The shank is bent to shorten the maximum dimension of the clip, to expose both ends of the receptacle for application to a male terminal and to expose the ferrule arms for engagement by crimping dies.

This invention relates to a female terminal clip for making electrical connection to a male terminal and more particularly, the invention is directed to the reduction in the overall dimensions of such clips, particularly those clips which are known in the art as flag-type connector clips.

The flag-type connector clip comprises a female receptacle which is movable into engagement with a male terminal in a first direction and has connected to the female receptacle a lead wire which projects at right angles to the direction of application to the male terminal. The invention will be described in reference to a spade-type flag connector, that is, a connector clip which has a flat female receptacle adapted to receive a male terminal in the form of a flat spade as contrasted to a cylindrical pin-type male terminal.

To facilitate the complete comprehension of the problem to which the present invention is directed, an understanding of the manufacturing of the clips and the devices to which they may be applied is necessary. The ultimate use of the clips may be, for example, to make electrical connection between a motor on the inside of an hermetically sealed compressor, the connection being made by application of the clips to male terminals which form the electrical communications between the inside and outside of the compressor casing. Space requirements within the compressor demand that the clip dimensions be as small as possible. The clips may, of course, be used in many other electrical applications, a great number of which demand that the clip dimensions be maintained as small as possible for obvious reasons of economy of space.

Going further with the compressor example mentioned above, in practice there are a number of stages through which a clip goes before it is ultimately applied to the terminals within the compressor unit. First, a manufacturer of clips forms the clip receptacles from a continuous ribbon or strip of sheet metal. Simultaneously with the formation of the receptacle, the arms which are to form the lead wire engaging ferrule are cut from the ribbon stock. The clips are not at that time severed from each other but remain joined together, either end to end or side by side depending upon the manufacturer's preference, and a strip of such clips is wound on a spool which is shipped to a motor manufacturer.

At the motor manufacturer's plant, the strip of connector clips is fed into a crimping and cut-off machine. An operator feeds a lead wire into the machine and a press comes down upon a connector clip. Substantially simultaneously the press crimps the ferrule forming arms about the end of the lead wire, cuts the clip off the strip and feeds a new clip from the strip position in the crimp-

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ing and cut-off machine. The thus-formed clips are electrically connected to a motor stator and shipped to the compressor manufacturer.

The compressor manufacturer applies the clips to terminal headers of a type to be described in detail below during the assembly of the compressor unit. For reasons which can best be understood by reference to the detailed description of the terminal header, there is a limitation placed upon the orientation of the spade terminals which form a part of the header, the limitation being imposed by the inflexibility of known designs of the connector clips.

Patent 3,222,633, filed Nov. 8, 1962 and issued to the assignee of this application, met the limitation placed on the orientation of the spade terminals by bending the shank between ferrule and receptacle to expose both ends of the receptacle for application to a spade terminal. In the preferred compact form of the patented invention, the bending operation was required after the ferrule was crimped to attach the lead because the bending of the shank positions the ferrule so close to the receptacle that crimping dies cannot engage the ferrule.

It has been the objective of this invention to provide an improved connector clip that not only greatly reduces the longitudinal dimensions of the clip, that is, the dimensions in the direction of application, but also to provide a completely formed clip with its ferrule located for application of crimping dies.

More specifically, the present invention resides in a pair of reverse bends appropriately located in the shank portion of the clip. The shank is bent in one direction to avoid interference from the receptacle in applying the receptacle to a terminal; and is bent in another direction to avoid interference of the receptacle to the application of crimping dies to the ferrule. One bend, which previously was made after crimping at an installation site, is a 160° bend which centers the ferrule portion behind the receptacle. In this position, the connector cannot be placed in a pair of crimping dies because of interference with the clip. A second bend of 70° places the ferrule arms parallel to the web of the receptacle so that the crimping dies move parallel to and are spaced from the web of the receptacle. Thus, the ferrule is free of any possible interference with the receptacle as it is introduced into a pair of crimping dies. This solution shortens the longitudinal dimension of the connector by almost half while retaining the desirable crimping characteristics of prior art terminals.

The features and objects of my invention will become more readily apparent from the following detailed description taken in conjunction with the accompanying drawings in which:

FIGS. 1 and 2 are perspective views showing my invention attached to an electrical lead,

FIG. 3 is an end elevation thereof illustrating the availability of the ferrule for crimping to a lead, and

FIG. 4 is an end elevational view of my earlier connector clip.

The connector clip indicated generally by the numeral 10 in FIGS. 1 and 2 comprises a female receptacle 11 adapted to receive a male terminal or spade 16 in a vertical or longitudinal direction. A ferrule 12 is disposed at a right angle along the back of the receptacle 11 and is integrally joined to the receptacle 11 by a shank 14. A lead 15 is crimped in the ferrule 12 and extends therefrom in a horizontal direction with respect to the vertical orientation of the receptacle 11.

The clip is formed by the central web 13 whose lateral edge portions terminate in C-shaped jaws 20 and 21. The jaws 20 and 21 have edges 22 which face the front surface 23 of a web 13 and are spaced therefrom a

distance slightly less than the thickness of the male terminal to which they are to be applied. The upper and lower ends of the edges 22 are rounded as at 24 to form a flared opening at each end of the receptacle which facilitates the introduction of the male terminal into the space between the edges 22 and the surface 23.

The ferrule 12 includes a flat web 25 which is an integral extension of the shank 14. The ferrule also includes a pair of arms 26 adapted to be crimped to the conductor and a pair of arms 27 adapted to be crimped about the lead wire insulation. Prior to the crimping of the arms, the arms extend integrally from the ferrule web 25 in a direction perpendicular to the plane of the web as shown in broken lines in FIG. 3.

As best seen in FIG. 3, the shank 14 is an integral extension of the web 13 and is bent as at 30 through an angle of approximately 160° and at 31 in the reversed direction through an angle of approximately 70°. With the shank bent as shown, the ferrule 12 lies centrally of the receptacle. Its web 25 is perpendicular to the web 13 and presents the ferrule arms 26, 27 parallel to and spaced from the web 13 to permit the application of die halves 34 and 35 to engage the ferrule 12 without interference from the clip 11 (FIG. 3). The specific 160° and 70° angles are not critical although it is valuable as a practical matter that the difference between the angles be 90° so that the ferrule web 25 lies perpendicular to the receptacle web 13.

This feature can be more fully appreciated when one considers the problem of crimping a lead in my early clip 50 illustrated in FIG. 4. Clip 50 is identical to the clip 10 of FIGS. 1-3 except for a reversal of the ferrule position and the forming of only a single bend in the shank. The clip 50 has a receptacle 11A integrally connected to a ferrule portion 12A by a strap 14A. The strap 14A is bent as at 30A through an angle of approximately 180° to place the ferrule 12A behind the rear wall 13A of the clip 11A. The ferrule 12A of this clip 50 is not accessible to be crimped by a pair of crimping dies.

Through the two changes over the earlier clip, the desirable features of the earlier clip have been retained while permitting crimping after forming the clip. These features principally include the reduction in the height of the clip and the permitting of right and left hand application of the clip to a terminal. The first of the changes, that is, the additional 70° bend adjacent to ferrule web, presents the ferrule arms and web in a proper attitude with respect to the receptacle for crimping. This change alone might suffice. However, the accessibility of the ferrule for engagement by the crimping dies and preserving the central location of the ferrule have been attained through the reversal of the position

of the ferrule on the shank 14. This reversal of the position of the ferrule may perhaps be best understood by comparing FIGS. 1 and 4 and visualizing the respective clips without the bends in the shank 14 or 14A. In the clip of the earlier invention, before bending the shank, the ferrule overlies the receptacle; whereas in the present clip, before bending the shank, the ferrule forming arms are disposed on the opposite side of the shank. With this change the ferrule arms closest to the receptacle lie generally at an obtuse angle with respect to the shank, thereby permitting them to be freely engaged by the crimping die 34 as best shown in FIG. 3.

What is claimed is:

1. A female connector for making a plug-on electrical connection to a male terminal comprising,
 - a receptacle including a flat web having its side edge portions terminated in C-shaped jaws which are adapted to grip a male terminal between said jaws and said web,
 - a shank forming an integral extension of said web, lead wire-engaging ferrule means terminating said shank,
 - said ferrule means having a web integral with said shank and arms projecting approximately perpendicularly from said web to receive a lead wire,
 - said shank having a first bend adjacent the receptacle web of greater than 90° which disposes said ferrule means centrally of and adjacent the surface of said web on the opposite side from said jaws,
 - said shank having a second bend less than 90° adjacent the ferrule web, the difference between the angles of the first and second bends being approximately 90°, to place said ferrule web in a plane perpendicular to the plane of said receptacle web.
2. A connector according to claim 1 in which said first bend is approximately 160° and said second bend is approximately 70°.
3. A connector according to claim 1 in which said ferrule arms adjacent said receptacle lie in a plane which is at an obtuse angle to the plane of said shank.

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U.S. CI X.R.

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