April 13, 1943. K. C. BUGG 2,316,555

TERMINAL CONNECTORS AND POSITIONING MEANS THEREFOR

Filed Oct. 31, 1940 2 Sheets-Sheet 1

Fig. 1

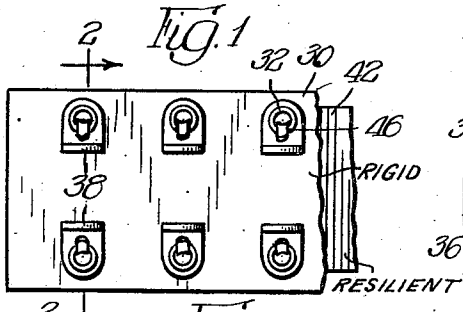


Fig. 2

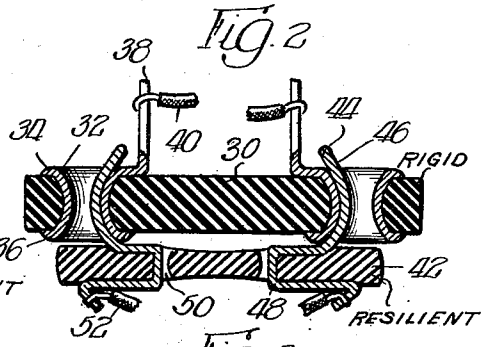


Fig. 3

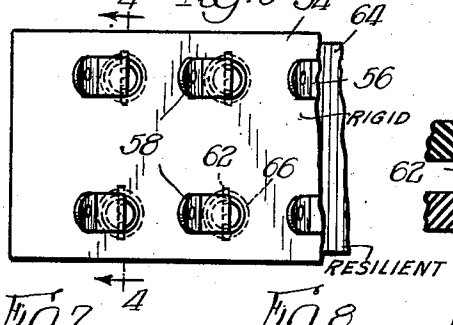


Fig. 4

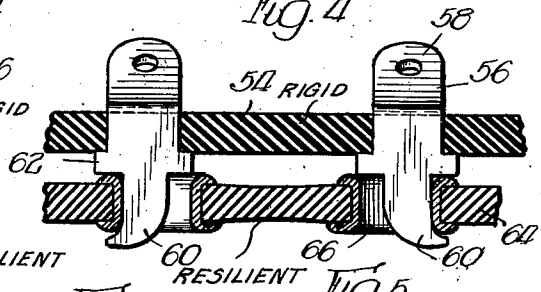


Fig. 7

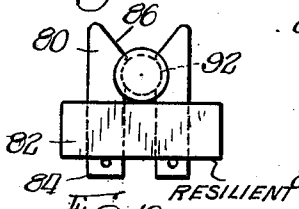


Fig. 8

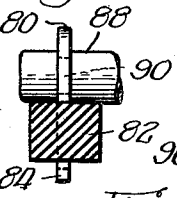


Fig. 9

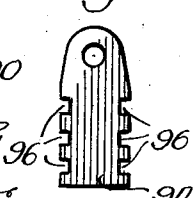


Fig. 5

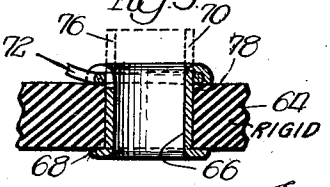


Fig. 6

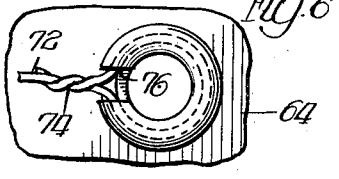


Fig. 10

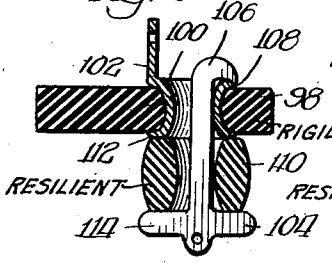


Fig. 11

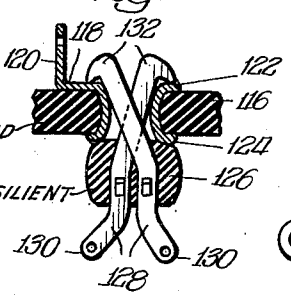


Fig. 12

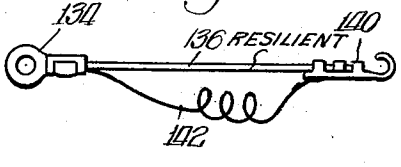
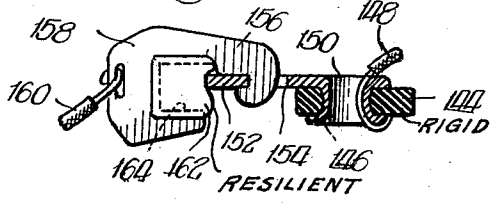


Fig. 13



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TERMINAL CONNECTORS AND POSITIONING MEANS THEREFOR

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Fig. 14.

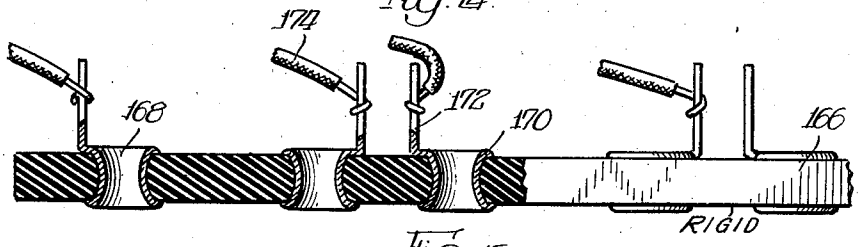


Fig. 15

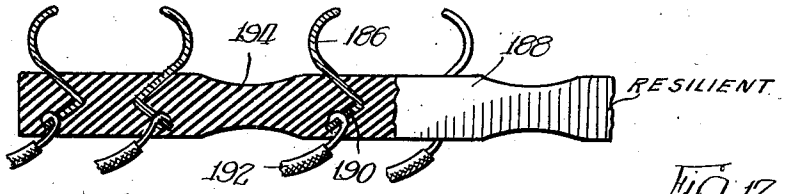


Fig. 16

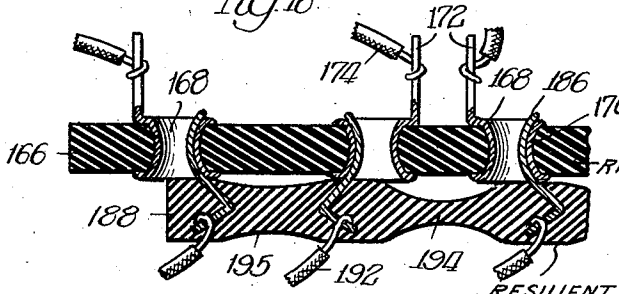


Fig. 17.

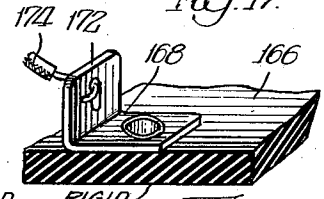


Fig. 18.

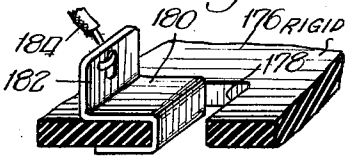


Fig. 19

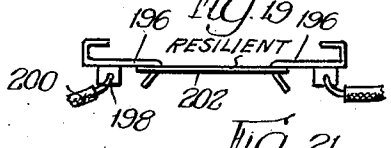


Fig. 20

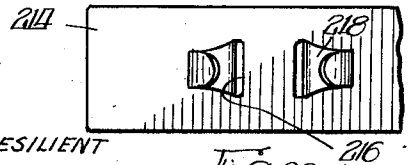


Fig. 21

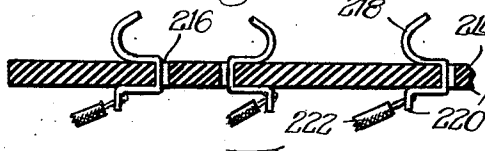


Fig. 22

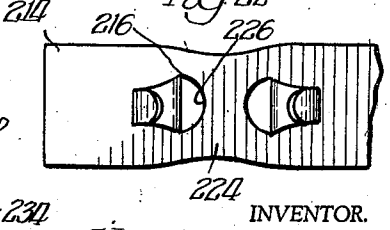
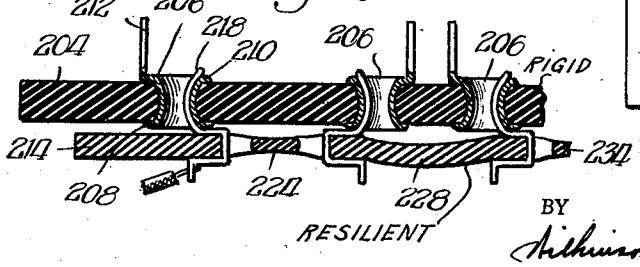


Fig. 23



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Patented Apr. 13, 1943

2,316,555

UNITED STATES PATENT OFFICE

2,316,555

TERMINAL CONNECTOR AND POSITIONING MEANS THEREFOR

Kenly C. Bugg, Fort Wayne, Ind.

Application October 31, 1940, Serial No. 363,600

3 Claims. (Cl. 173—328)

This invention pertains to connections, and more particularly to electrical connections and the method of applying terminals and the like in molded substances such as plastics.

In some branches of electrical work it is necessary to make multiple connections. For example, in radio and electric clock and register construction, it is frequently desirable or necessary to have a number of conductors electrically connected to a similar number of terminal members arranged on a terminal board or block. Electrical connections are then made to these terminals as by applying each wire to a terminal and soldering the wire thereto, or each wire may be provided with snap connectors adapted to engage a complementary connector or terminal. In these instances, however, the wires are individually handled at the terminal board.

It has been proposed to have connections such as socket connections or male and female connections between terminal boards to permit ready assembly and disassembly, that is, the pair of terminal boards are each handled and moved to engagement when the male and female members are engaged, but the difficulty with such an assembly is that the sockets or male and female members, where made in multiples, cannot be positioned accurately enough in the rigid terminal boards in mass production to insure that the proper spacing is held. Further, where the individual wires are soldered to the terminals, or where snap fasteners are used, the material and labor is necessarily expensive, which, in highly competitive work, is prohibitive.

Also, where a number of wires are to be electrically connected to a terminal board, it is frequently desirable or necessary to install these wires in a conduit. With present day practice, the wires must be drawn through the conduit and then applied to the terminal board individually, or have the fasteners or connectors placed thereon, after having been brought through the conduit. With the present invention it is contemplated that the wires can be assembled and the contact means placed thereon before drawing the same through the conduit.

In applying terminals or other spaced members to a molded head either transfer dies must be used, or they must be individually applied to the molded members after they are made. Each method is long and expensive, especially where plastics are used, and also there is the danger that accuracy will be lost.

It is therefore an object of this invention to provide terminal connections which are inexpensive to make and readily can be accurately made within present day manufacturing tolerances.

Another object is to provide electrical connections for a terminal board which can be readily applied to a conduit.

Still another object is to provide terminal boards having multiple terminals thereon which are mounted so as to be readily applied to a terminal board having complementary terminals thereon.

Yet another object is to provide terminals resiliently connected so that a good mechanical electrical connection is attained.

A further object is to provide a method of molding terminals and the like in plastics and the like, wherein no transfer dies need be used, and the terminals and the like are positioned by positive and/or resilient means.

With these and various other objects in view, the invention may consist of certain novel features of construction and operation as will be more fully described and particularly pointed out in the specification, drawings and claims appended hereto.

In the drawings, which illustrate embodiments of the device and wherein like reference characters are used to designate like parts—

Figure 1 is a fragmentary top plan view of a terminal board having one form of terminal thereon, and a resilient terminal board provided with complementary terminals engaging therewith;

Figure 2 is an enlarged fragmentary sectional elevation taken substantially in the plane as indicated by the line 2—2 of Figure 1;

Figure 3 is a fragmentary top plan view of terminal boards similar to those of Figure 1, having a modified form of terminal means therefor;

Figure 4 is an enlarged fragmentary sectional elevation taken substantially in the plane as indicated by the line 4—4 of Figure 3;

Figure 5 is a fragmentary sectional elevation through the female terminal of the resilient terminal board shown in Figure 4;

Figure 6 is a top plan view of the connector illustrated in Figure 5;

Figure 7 is a transverse end elevation of a modified form of terminal for a terminal board, and showing the complementary terminal in engagement therewith;

Figure 8 is a sectional elevation taken substantially at right angles to the construction illustrated in Figure 7;

Figure 9 is a top plan view of a connector for multiple terminals;

Figures 10 and 11 are fragmentary sectional elevations through modified forms of single terminal connections;

Figure 12 is a modification illustrating an elongated electrical connector;

Figure 13 is a sectional elevation showing still another modified form of terminal connection of the single wire type;

Figure 14 is an elevation partly in section of a form of terminal board having female terminals applied thereto;

Figure 15 is an elevation partly in section of terminal means adapted for use with the terminal board shown in Figure 14 and showing the male terminal members molded in a resilient terminal board;

Figure 16 is a sectional elevation showing connections made between the terminal board illustrated in Figure 14 and the terminal means illustrated in Figure 15;

Figure 17 is a perspective elevation of one form of female connectors;

Figure 18 is a perspective elevation of another modified form of female connector;

Figure 19 is a modification illustrating a resilient assembly of a pair of single male terminals;

Figure 20 is a fragmentary top plan view of a form of terminal means showing the same applied to a molded or stamped sheet of rubber or other resilient non-conductor;

Figure 21 is a sectional elevation of the connecting means illustrated in Figure 20;

Figure 22 is a figure corresponding to Figure 20 showing the same in stretched position or stretched for contact pressure;

Figure 23 is a sectional elevation showing the connecting means illustrated in Figure 20 applied to a terminal board and illustrating the relative position of the boards where the spacing of the terminals on said boards does not exactly correspond.

Referring first of all more particularly to the construction illustrated in Figures 1 and 2, the terminal board **30** is substantially rigid, being preferably made of a plastic such as Bakelite or hard rubber, and is provided with pairs of spaced female terminals **32** of the well known eyelet or ferrule type, the terminals being fixed as by the shoulders **34** and **36**. The upstanding connecting lugs **38** of the terminals may be electrically connected to the conductors **40**. The molded resilient relatively thin rubber member or sheet **42** provides a terminal board or mounting for the male members **44**, said male members consisting of the spaced arcuate or hook-shaped portions **46** and the channeled portions **48**. Said male members extend through suitable openings **50** provided in the member **42**, and the ends of said terminals are electrically connected to suitable conductors **52**. It will thus be seen that it is only necessary to insert the arcuate members **46** into the respective apertures in the female members **32**, stretching the molded member **42** to permit the insertion, after which the member **42** will cause the arcuate members to interlock with the female members, causing a perfect mechanical electrical connection; after which, if desired, welding or soldering may be applied between the arcuate members **46** and the adjacent portions of the female members **32**.

In the construction illustrated in Figures 3 and 4, a different form of terminal member is shown as applied to the rigid terminal board **54**. In this construction the terminal members **56** disposed in spaced relation extend through said board, having the connecting lugs **58** thereon, the opposite side of the board being provided with the hook-shaped contact members **60** disposed adjacent the shoulder **62**. The resilient relatively thin supporting strip or sheet **64** is provided with the cylindrical female contact or terminal members **66** and the members **66** are preferably applied to the strap **64** as illustrated in Figures 5 and 6. In applying these members to the strip **64**, it will be seen that these members are preferably provided with the shoulders **68**. The members may then be inserted in the apertures provided in the member **64**, the connection end or part to be shouldered assuming the dotted line position as illustrated at **70**. The conductor **72** may then be wound around the cylindrical portion of the member **70** and connected to it as at **74**, the connection being disposed adjacent the cut-out portion **76** of the cylindrical portion **70**. The dotted line portion **70** can then be flanged or shouldered to embrace the conductor **72**, preferably being shouldered sufficiently so that the connector is forced into the rubber or resilient member **64** as at **78**, forming a tight connection. As before, the member **66** can be sprung on the member **60** and the member **64** will retain the same by contact pressure, after which solder may be applied.

It will be seen, therefore, that especially where the terminals on the resilient terminal board are disposed in rows they may be folded as between rows, or the board being a relatively thin resilient sheet may be rolled so that it may be readily slipped through a conduit where the conductors must be conduited. It is then not necessary to first conduit the conductors and then apply the terminals.

In the construction illustrated in Figures 7 and 8, the spaced terminals **80** are mounted in the resilient block **82**, said members being provided with the lugs **84** for electrical connection with suitable conductors, the opposite ends of said members being sloping as at **86** to provide an entrance. The conductor **88** to be electrically connected to the members **80** is preferably notched as at **90** to be received in and interlocked with the slightly arcuate portions **92** of the members **80**, thus forming an effective interlock after being sprung into position.

The terminal **94** (Figure 9) is provided with the spaced cut-out portions or notches **96** oppositely arranged in pairs whereby multiple connections may be made by springing male members **44** such as illustrated in Figure 2, into contact engagement in the notches **96**. In other words, the spaced male members **44** will engage in opposite notches and be resiliently urged into contact engagement with the terminal **94**, and where multiple connections are to be made other male members **44** may be sprung into engagement in other opposite notches **96**.

In the construction illustrated in Figure 10, the terminal board **98** is provided with the female terminal **100**, having the upstanding securing lug **102** thereon. The male terminal **104** may conveniently take the form of the elongated hook **106** adapted to interlock with the shoulder **108** provided on the female terminal. The resilient block **110** engages the opposite shoulder **112** of the female terminal **100** and engages the shoulder **114** of the male terminal **104** to retain the same in interlocked relation with the female terminal.

In the construction illustrated in Figure 11, the terminal board 116 is provided with the female terminal 118 having the soldering or securing lug 120 thereon, said female member being shouldered at 122 and 124. The male terminal member consists essentially of the resilient block 126 and the pair of hook members 128. The hook members are secured in the block and are provided with the securing lugs 130 thereon, said members 128 extending upwardly and crossing, the ends thereof being provided with the hook-shaped members 132 adapted to engage the top portion of the female member. Of course the hooks may be of such shape as to embrace the shoulder 122.

In the construction illustrated in Figure 12, the contact eye 134 is connected to one end of the resilient member 136, and the contact hook 140 is secured at the other end thereof. The contact hook and the contact eye are electrically connected by means of the electrical conductor 142. Thus, where connection is made to a conductor through a contact eye and it is desired to form an electrical connection, the member 136 may be elongated to permit such connection through the member 140.

In the construction shown in Figure 13, the terminal block 144 is provided with the female contact member 146 and the conductor 148 is connected thereto through the aperture 150 provided therein, or a soldering lug may of course be provided. The contact lug 152 is apertured at 154 and is adapted to receive the hook-shaped portion 156 of the male terminal 158. The conductor 160 is secured to the male member 158 and the rubber or resilient block 162 is disposed within the opening 164 provided in the male member 158 whereby when the hook-shaped end 156 is interlocked in the aperture 154, the resilient block retains a tight mechanical electrical connection.

In the construction illustrated in Figure 14, the terminal board 166 is provided with the group of female connecting members 168, said members extending through the rigid terminal board and being shouldered as at 170 and being provided with the upstanding connecting lugs 172 for the electrical conductors 174. These members may also take the shape as illustrated in Figure 18 in which the terminal board 176 is notched or apertured as at 178 and the substantially U-shaped terminal members 180 applied therein. Said members 180 are provided with the upstanding lugs 182 for connection to the conductors 184.

In the form of relatively thin resilient terminal board or sheet shown in Figure 15, the arcuate male members 186 are arranged in pairs facing each other and extending into and being molded in the strip 188 of rubber or other resilient insulating material. Within said strip 188, said members may be flanged as at 190 and connected to the conductors 192. Between pairs of said members 186 there is provided a reduced portion 194, or said portion may be otherwise made more resilient than the portion in which the members 186 are imbedded. The purpose of providing this reduced portion between pairs of terminals is illustrated in Figure 16, where the pairs of members 186 are received in the openings of the members 168 or are placed in contact with the female or complementary terminal members. A condition may arise where the spacing between said pairs does not correspond to the spacing between the pairs of terminals on the terminal board. Thus the reduced portion 194 will elongate to permit the proper connection to be made with the terminals of the rigid terminal board. Of course, enough resilience occurs between the members of the pairs of members 186 to permit their proper application as shown at 195.

In the construction shown in Figure 19, a pair of substantially Z-shaped contact members 196 are shown electrically connected through the lugs 198 to the conductors 200 and said members are connected together by means of the rubber strip 202 for the same purpose as above described.

In the constructions illustrated in Figures 20 to 23 inclusive, the rigid terminal board 204, as before, is provided with the female terminals 206 extending through said rigid board and being shouldered as at 208 and 210, said members 206 being provided with the upstanding soldering lugs 212 for electrical connection to suitable conductors. The resilient strip 214 for the male terminals is provided with cut-out portions 216 shown in an exaggerated manner in Figure 20 through which the substantially hooked or arcuate pairs of male members 218 are extended. The opposite sides of the male members are provided with the lugs 220 which are adapted to be connected to the electrical conductors 222. When the male members 218 are sprung into place, as illustrated in Figure 23, it will be seen that the portion 224 of the member 214, between the terminals 218 of adjacent pairs of terminals will elongate, and the cut-out portions 216 will likewise change shape as shown at 226 in Figure 22. In some instances buckling will occur between adjacent pairs, as at 228, but this will not affect the electrical connection as the resilient board 214 will be stretched by contact pressure to effect the proper electrical connection.

It is to be understood that I do not wish to be limited by the exact embodiments of the device shown, which are merely by way of illustration and not limitation as various and other forms of the device will of course be apparent to those skilled in the art without departing from the spirit of the invention or the scope of the claims.

I claim:

1. In combination, a substantially rigid insulating member forming a terminal board, pairs of spaced terminals fixed thereto, a relatively thin, resilient insulating sheet forming a resilient terminal board, pairs of terminals complementary to said first named terminals carried by said resilient terminal board and adapted to have interlocking engagement with the corresponding of said first named terminals, engagement of the first pair of terminals on said rigid terminal board by the first pair of terminals on said resilient terminal board causing the other terminals to be properly located for respective engagement, and conductors connected to each of said terminals, the terminals of each pair of said second named terminals being normally spaced apart a distance slightly less than the spacing of the terminals of said first named pairs which are engageable by the terminals of said second named pairs of terminals, whereby when said second named terminals engage the corresponding of said first named terminals the second named terminals are resiliently held in engagement with the corresponding first named terminals by the flexible insulating sheet which is under tension between the terminals of each pair carried thereby to thereby cause a tight electrical connection between engaging terminals.

2. In combination, a substantially rigid insulating member forming a terminal board, pairs of spaced terminals fixed thereto, a relatively thin, resilient insulating sheet forming a resilient terminal board, pairs of terminals complementary to said first named terminals carried by said resilient terminal board and adapted to have interlocking engagement with the corresponding of said first named terminals, engagement of the first pair of terminals on said rigid terminal board by the first pair of terminals on said resilient terminal board causing the other terminals to be properly located for respective engagement, conductors connected to each of said terminals, the terminals of each pair of said second named terminals being normally spaced apart a distance slightly less than the spacing of the terminals of said first named pairs which are engageable by the terminals of said second named pairs of terminals, whereby when said second named terminals engage the corresponding of said first named terminals the second named terminals are resiliently held in engagement with the corresponding first named terminals by the flexible insulating sheet which is under tension between the terminals of each pair carried thereby to thereby cause a tight electrical connection between engaging terminals, said insulating sheet having a reduced portion between adjacent pairs of terminals for the purpose set forth.

3. In combination, a substantially rigid insulating member forming a terminal board, pairs of spaced terminals fixed thereto, a relatively thin, resilient insulating sheet forming a resilient terminal board, pairs of terminals complementary to said first named terminals carried by said resilient terminal board and adapted to have interlocking engagement with the corresponding of said first named terminals, engagement of the first pair of terminals on said rigid terminal board by the first pair of terminals on said resilient terminal board causing the other terminals to be properly located for respective engagement, conductors connected to each of said terminals, the terminals of each pair of said second named terminals being normally spaced apart a distance slightly less than the spacing of the terminals of said first named pairs which are engageable by the terminals of said second named pairs of terminals, whereby when said second named terminals engage the corresponding of said first named terminals the second named terminals are resiliently held in engagement with the corresponding first named terminals by the flexible insulating sheet which is under tension between the terminals of each pair carried thereby to thereby cause a tight electrical connection between engaging terminals, said insulating sheet being of such flexibility as to be adapted to be disposed in a relatively small, narrow shape to permit said conductors being inserted in a conduit after they have been secured to their respective terminals.

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