

June 25, 1963

H. DOZIER

3,095,470

INSULATED ELECTRICAL TERMINAL CONSTRUCTION

Filed March 5, 1962

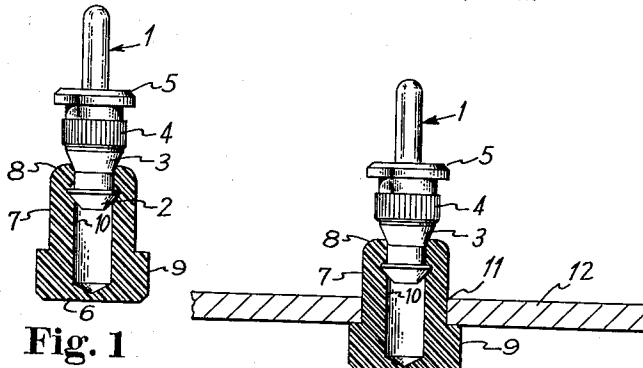


Fig. 1

Fig. 2

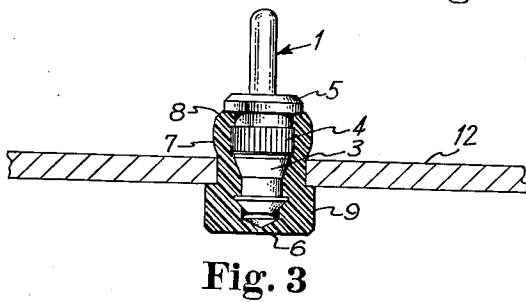


Fig. 3

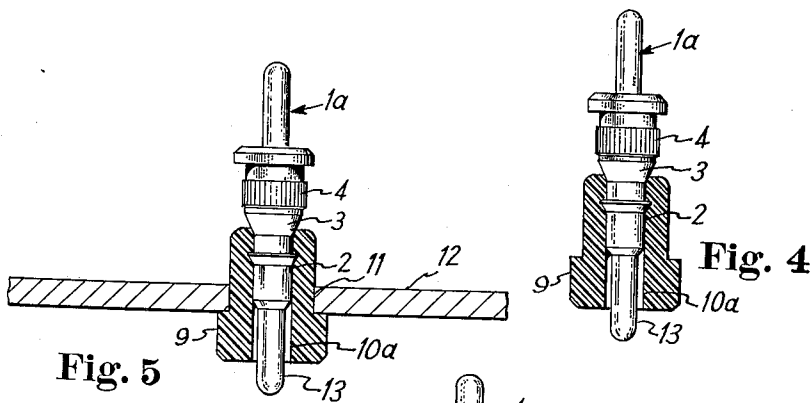


Fig. 5

Fig. 4

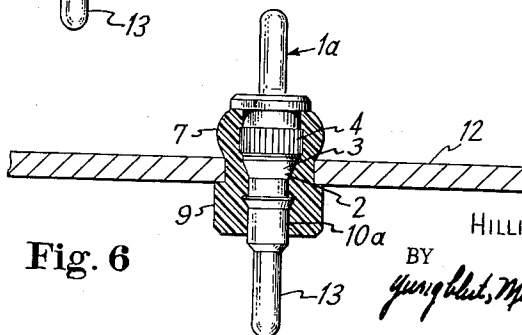


Fig. 6

INVENTOR.
HILLIARD DOZIER,

BY

Young, Blum, Melville, Hansen & Foster

ATTORNEYS.

1

3,095,470

INSULATED ELECTRICAL TERMINAL CONSTRUCTION

Hilliard Dozier, % U.S. Terminals Inc.,
7508 Camargo Road, Cincinnati 43, Ohio

Filed Mar. 5, 1962, Ser. No. 177,581

3 Claims. (Cl. 174-153)

This invention relates to terminals of the type used in the electronics industry to effect connections between various selected wires and components of an electronic device. More specifically, the instant invention relates to an improved terminal assembly which facilitates the attachment of the terminals to a chassis or terminal board and at the same time provides a positive lock between the terminal and the chassis.

In conventional terminals, the terminal pin or electrode is mounted in an insulator composed of a relatively hard and yet distortable material, such as tetrafluoroethylene sold under the trademark Teflon. The insulator has a cylindrical body which is beveled at one end and carries an enlarged flange or head at its opposite end, the cylindrical body of the insulator being adapted to be press fitted into an opening in the terminal board which is slightly smaller in diameter than the cylindrical body of the insulator. In order to facilitate the insertion of the slightly larger insulator into the opening, the periphery of the opening is coined or beveled to receive the insulator which is forced through the opening until its enlarged head portion seats against the terminal board. The terminal is held in place by the gripping engagement of the annular wall surface of the opening encircling the slightly larger diameter insulator, the insulator being distorted or pinched inwardly by the wall of the opening. While terminals of the character just described are in widespread use, they possess certain disadvantages. Being very small, the terminals are difficult to handle, particularly in properly aligning them for press fitting into the opening in the terminal board; and, of course, the opening in the terminal board must be beveled in order to permit the insertion of the insulator. Since in many devices the terminals are intended to be inserted from both sides of the terminal board, it is necessary that both sides of the openings be beveled. Such beveling operations add to the cost of the unit. In addition, the press type terminal does not provide a positive lock insuring permanent retention of the terminal in the terminal board.

In another form of terminal assembly currently in use, a positive lock is achieved by flaring the free end of the insulator outwardly after it has been inserted in the terminal board. In this form of terminal, the insulator is provided with a tapered bore extending completely there-through with the smaller end of the bore at the free end of the insulator. The terminal pin or electrode is a separate part and is not inserted until after the insulator had been pressed into the opening in the terminal board. The pin is inserted from the flanged or head end of the insulator and as it is inserted, a tapered head portion forming a part of the pin is wedged into the tapered bore, thereby causing the free end of the insulator to flare outwardly. While this construction provides a positive lock in that the tapered head on the pin acts to maintain the flared condition of the terminal, the handling and assembling of the several parts is objectionable in that it is time consuming and requires constant vigilance to be certain that the parts being assembled are properly matched.

In contrast to the foregoing, a principal object of the instant invention is the provision of a terminal composed of an electrode and insulator which are pre-assembled so as to comprise a one piece unit in the hands of the user, the size of the insulator being slightly smaller than the opening into which it is to be fitted, thereby permitting

2

its rapid exertion in the terminal board without press fitting, the construction being such that upon axial displacement of the electrode, a positive lock will be effected between the terminal and the board.

5 Still a further object of the instant invention is the provision of a terminal construction of the character described which eliminates the necessity for beveling the opening in the terminal board, the terminal being capable of being inserted from either side of the board with equal effectiveness.

10 Still a further object of the instant invention is the provision of a terminal construction which is equally applicable to both the feed thru and stand-off types of terminals, which construction embodies a positive non-slip lock effective to securely mount the terminal to the terminal board.

The foregoing together with other objects of the invention which will appear hereinafter or which will be apparent to the skilled worker in the art upon reading this specification, are accomplished by those constructions and arrangements of parts of which certain exemplary embodiments shall now be described.

Reference is made to the accompanying drawings wherein:

25 FIGURE 1 is a vertical sectional view of a stand-off type of terminal constructed in accordance with the instant invention.

FIGURE 2 is a vertical sectional view similar to FIGURE 1 illustrating the insertion of the terminal in the terminal board prior to locking displacement of the electrode.

FIGURE 3 is a vertical sectional view similar to FIGURE 2 but illustrating the parts in the locked condition.

FIGURE 4 is a vertical sectional view of a terminal of the feed-thru type.

FIGURE 5 is a vertical sectional view illustrating the terminal of FIGURE 4 inserted in the terminal board prior to axial displacement of the electrode.

FIGURE 6 is a vertical sectional view similar to FIGURE 5 illustrating the terminal in locked condition.

Referring now to FIGURE 1 of the drawings, the terminal comprises a terminal pin or electrode 1 formed from a conductive metal and machined to define a tapered bore engaging shoulder or barb 2 and a larger tapered expansion shoulder 3 which terminates in an enlarged milled or knurled body part 4 mounting an annular cap 5. The insulator 6 has a cylindrical body portion 7 terminating at one end in a beveled edge 8 and at its opposite end in an enlarged head 9. A bore 10 extends inwardly from the beveled end of the cylindrical body 7, and in the embodiment illustrated terminates short of the opposite end of the insulator. Preferably, the insulator will be formed from a relatively hard yet distortable material, such as Teflon or other material possessing the required dielectric properties.

The electrode and insulator will be factory assembled, the terminal being shipped to the user in the condition illustrated in FIGURE 1 wherein it will be seen that the tapered bore engaging shoulder 2 is enlarged in the bore 10 with the periphery of the shoulder in biting engagement with the wall surface of the bore and with the lowermost extremity of the expansion shoulder 3 substantially coinciding with the mouth of the bore. As will be evident, the periphery of the shoulder 2 is of somewhat larger diameter than the diameter of the bore 10, and the expansion shoulder 3 is of still larger diameter. As a non-limiting example of the relative dimensions of the parts, the bore 10 will have a diameter of .060 inch, the locking shoulder 2 will have a diameter of .040 inch at its lowermost end and a diameter of .080 inch at its periphery, whereas the expansion shoulder 3 will have a diameter of .060 inch at its lowermost end and a diameter

of 0.93 inch adjacent the milled or knurled body part 4.

As is seen in FIGURE 2, the terminal is adapted to be inserted in the opening 11 in the terminal board or chassis 12. In the embodiment illustrated the terminal has been inserted from beneath the chassis, although it will be readily apparent that it could just as well be inverted and inserted from above, depending upon which way the terminal is intended to face. In accordance with the instant invention, it is unnecessary to bevel the edges of the opening 11 since the insulator is not press fitted. Rather, the opening 11 will be of slightly larger diameter than the outside diameter of the body portion 7. Again, in an exemplary embodiment, the opening in the chassis will have a diameter of .136/.138, whereas the outside diameter of the cylindrical body part 7 will be .132/.130. It will be evident that the insulator will just nicely yet freely fit within the opening.

Upon being inserted in the opening, the insulator 6 will be supported from beneath, whereupon the electrode 1 will be displaced axially downwardly until the cap 5 seats against the end edge of the insulator, the parts thereby assuming the position illustrated in FIGURE 3 wherein it will be seen that the expansion shoulder 3 and enlarged body part 4 will have been forced into the bore 10, thereby expanding the cylindrical body portion 7 radially outwardly in the manner illustrated. The insulator is thus permanently locked in place by the bulging of the body portion 7 immediately beyond the surface of the terminal board. It will be noted that the cap 5 serves to establish the final position of the electrode relative to the insulator, and in such final position the major portion at least of the milled or knurled body part 4 lies above the surface of the terminal board 12. The cap 5 also serves as a cover for the free end edge of the insulator. The knurled body part 4 of the electrode bites into the insulator and prevents rotation of the electrode relative to the insulator; and in similar fashion the periphery of the shoulder 2 bites into the insulator to prevent withdrawal of the electrode, the edge of this shoulder acting as a barb.

The embodiment of the invention shown in FIGURES 4, 5 and 6 illustrates a feed-thru type of terminal in which end portions of the electrode project outwardly from opposite sides of the insulator. In many respects the terminal is similar to that already described and consequently like parts have been given like reference numerals. However, in this embodiment, the electrode 1a has a body portion 13 which projects downwardly beyond the locking shoulder 2; and the bore 10a in the insulator extends completely through the enlarged head 9 so that the body portion 13 of the electrode may be passed therethrough. As before, the parts will be factory assembled with the electrode inserted in the bore 10a with the expansion shoulder 3 seated at the upper end of the bore in the manner illustrated in FIGURE 5. Subsequent axial displacement of the electrode causes the parts to assume the permanently assembled condition illustrated in FIGURE 6, wherein it will be seen that the enlarged body part 4 enters the bore and expands the insulator radially outwardly to form a bulge effective to lock the terminal in place.

It is to be understood that the size and dimensions of the terminals do not constitute limitations on the invention excepting as to the relative dimensioning of the parts which is required to effect the free insertion of the insulator into the terminal board and the subsequent expansion of the body portion of the insulator to effect locking engagement with the terminal board. Similarly, the precise configuration of the parts does not constitute a limitation upon the invention, particularly the configuration of the distal parts of the electrodes which will be configured in accordance with their intended use. It is, however, essential that no portion of the electrode have a diameter effectively greater than the diameter of the opening in the terminal board since the terminal must

be passed therethrough as an incident of its attachment to the board.

Having thus described the invention in certain exemplary embodiments, what is desired to secure and protect by Letters Patent is:

1. A terminal consisting of an insulator and an electrode, said insulator being formed from a distortable dielectric material and having a cylindrical body portion terminating at one end in an enlarged head, and an axial bore extending inwardly from the free end of said cylindrical body portion to at least within the area of said enlarged head, said electrode comprising an elongated pin inserted in said axial bore from the free end of the cylindrical body portion thereof, said electrode having a barbed shoulder the maximum diameter of which is greater than the diameter of the axial bore in said insulator, a tapered expansion shoulder lying beyond said barbed shoulder, said expansion shoulder having a maximum diameter which is greater than the maximum diameter of said barbed shoulder and terminating at its maximum diameter in an enlarged body part, and an essentially flat cap portion lying beyond said enlarged body part, said cap portion being of larger diameter than said enlarged body part but of no greater diameter than the outside diameter of the cylindrical body portion of said insulator, the axial spacing of said barbed shoulder, said tapered expansion shoulder, and said enlarged body part relative to each other and to said cap portion being such that when the cylindrical body portion of the insulator is inserted in a terminal receiving opening in a terminal board with the enlarged head seated against one face of the terminal board, and the cap portion of the electrode is seated against the free end of the cylindrical body portion of the insulator, the enlarged body part of the electrode lies to the side of the terminal board opposite the enlarged head of the insulator and expands the cylindrical body of the insulator radially outwardly, said tapered expansion shoulder lies in alignment with the circular opening in the terminal board, and said barbed shoulder is in biting engagement with the insulator in the area of the enlarged head thereof and coacts with said cap portion to hold the insulator in axial compression, whereby said terminal is securely locked to the terminal board.

2. A stand-off terminal consisting of an insulator and an electrode, said insulator being formed from a distortable dielectric material and having a cylindrical body portion terminating at one end in an enlarged head, and an axial bore extending inwardly from the free end of said cylindrical body portion and terminating within the area of said enlarged head, said electrode comprising an elongated pin inserted in said axial bore from the free end of the cylindrical body portion thereof, said electrode having a barbed shoulder at its leading end the maximum diameter of which is greater than the diameter of the axial bore in said insulator, a tapered expansion shoulder lying beyond said barbed shoulder, said expansion shoulder having a maximum diameter which is greater than the maximum diameter of said barbed shoulder and terminating at its maximum diameter in an enlarged body part, and an essentially flat cap portion lying beyond said enlarged body part, said cap portion being of larger diameter than said enlarged body part but of no greater diameter than the outside diameter of the cylindrical body portion of said insulator, the axial spacing of said barbed shoulder, said tapered expansion shoulder, and said enlarged body part relative to each other and to said cap portion being such that when the cylindrical body portion of the insulator is inserted in a terminal receiving opening in a terminal board with the enlarged head seated against one face of the terminal board, and the cap portion of the electrode is seated against the free end of the cylindrical body portion of the insulator, the enlarged body part of the electrode lies to the side of the terminal board opposite the enlarged head of the insula-

5

tor and expands the cylindrical body of the insulator radially outwardly, said tapered expansion shoulder lies in alignment with the circular opening in the terminal board, and said barbed shoulder is in biting engagement with the insulator in the area of the enlarged head thereof and coacts with said cap portion to hold the insulator in axial compression, whereby said terminal is securely locked to the terminal board.

3. A feed-through terminal consisting of an insulator and an electrode, said insulator being formed from a distortable dielectric material and having a cylindrical body portion terminating at one end in an enlarged head, and an axial bore extending completely through both said cylindrical body portion and said enlarged head, said electrode comprising an elongated pin inserted in said axial bore from the free end of the cylindrical body portion thereof, said electrode having a barbed shoulder the maximum diameter of which is greater than the diameter of the axial bore in said insulator, a tapered expansion shoulder lying beyond said barbed shoulder, said expansion shoulder having a maximum diameter which is greater than the maximum diameter of said barbed shoulder and terminating at its maximum diameter in an enlarged body part, and an essentially flat cap portion lying beyond said enlarged body part, said cap portion being of larger diameter than said enlarged body part but of no greater diameter than the outside diameter of the cylindrical body portion of said insulator, the axial spacing of said barbed shoulder, said tapered expansion shoulder, and said enlarged body part relative to each

6

other and to said cap portion being such that when the cylindrical body portion of the insulator is inserted in a terminal receiving opening in a terminal board with the enlarged head seated against one face of the terminal board, and the cap portion of the electrode is seated against the free end of the cylindrical body portion of the insulator, the enlarged body part of the electrode lies to the side of the terminal board opposite the enlarged head of the insulator and expands the cylindrical body of the insulator radially outwardly, said tapered expansion shoulder lies in alignment with the circular opening in the terminal board, and said barbed shoulder is in biting engagement with the insulator in the area of the enlarged head thereof and coacts with said cap portion to hold the insulator in axial compression, whereby said terminal is securely locked to the terminal board, said electrode including a distal portion in advance of said barbed shoulder projecting outwardly from said axial bore beyond the enlarged head of said insulator.

References Cited in the file of this patent

UNITED STATES PATENTS

2,806,080	Corey	Sept 10, 1957
2,918,521	Abrams	Dec. 22, 1959
2,919,300	Carlson	Dec. 29, 1959
2,995,617	Maximoff et al.	Aug. 8, 1961

FOREIGN PATENTS

219,304	Australia	Dec. 10, 1958
827,984	Great Britain	Feb. 10, 1960