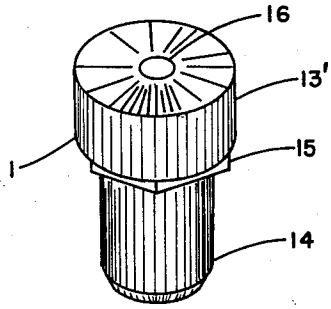
July 31, 1962 R. U. CLARK 3,047,653

UNITARY HIGH TORQUE RESISTANT ELECTRICAL TERMINALS

Filed Feb. 14, 1961

FIG. 3



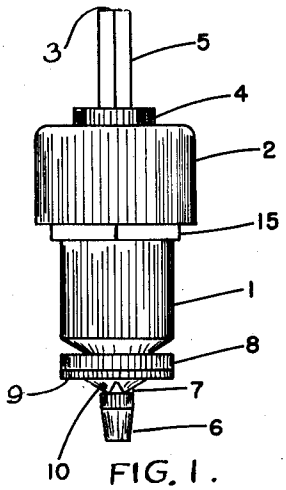


FIG. 1.

FIG. 4

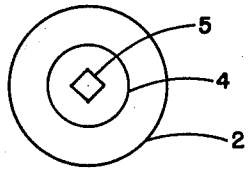
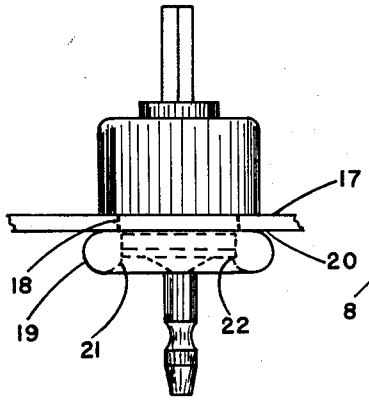


FIG. 2

FIG. 5



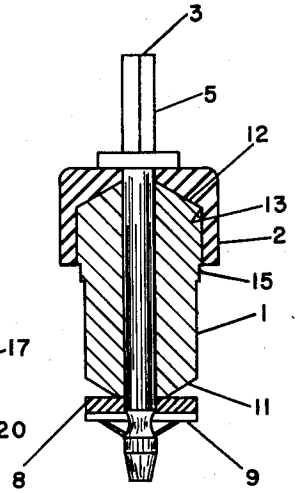
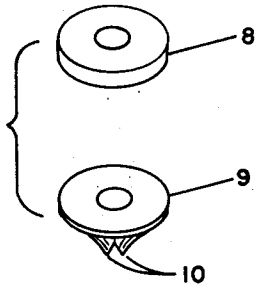


FIG. 6



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United States Patent Office 3,047,653 Patented July 31, 1962

3,047,653

UNITARY HIGH TORQUE RESISTANT ELECTRICAL TERMINALS

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Filed Feb. 14, 1961, Ser. No. 89,294
1 Claim. (Cl. 174—153)

This invention relates to improvements in hermetically sealed electrical terminals and has for its purpose the provision of such a terminal in a very simple but effective form. More specifically the device makes use of a new structure that may be considered unitary, in that the entire terminal, consisting of a resilient elastomeric insert, an insulating cap, an electrode, an intermediate insulating washer, and a push-on compressing grip nut or grip washer may be made up in preassembled form, then placed by the user in a suitable hole in a panel, bulkhead, or the like, and then by being suitable, in so far as the insert member is concerned, for compression, such compression may be applied to lock the terminal firmly in the panel in hermetically sealed relation therewith.

Further advantages of the present device are that it may be mounted in various hole configurations in the panel in such a manner as to offer very high resistance to any turning force that may be applied to its electrode, also to mechanical shock in any direction of application. Its surfaces which would normally be exposed to variable weather or like conditions are of a rigid or semi-rigid nature. It can be machine mounted with a single stroke, being suitable for gang mounting, and can be fabricated with keying surface configurations at one end of the electrode and at the external juncture of the insert and cap, so that before the terminal is compressed, it may be fed into keying relation with the hole in the panel into which it is to be assembled, and will lock thereinto upon being compressed.

The present terminal is comprised of a shouldered insert of tubular configuration having a major diameter section, a minor diameter section, and an intermediate lock-in section and having conical convex terminations at each end. A cap encompasses the major diameter section, and an electrode passes axially through the cap and the insert and emerges through the minor diameter end, at which point there is applied a suitable insulating washer followed by a push-on nut. An annular groove may be cut a short distance from the last mentioned end of the electrode into which the push-on nut may ride to better lock it in place during the pre-assembly into unitary form. The same end of the electrode is tapered from its extremity outwardly toward the groove to aid ready assembly to the unitary form.

Turning now to the drawing which forms a part of this specification—

FIGURE 1 shows a plan view in elevation of the unitary terminal unassembled, but in pre-assembled make-up.

FIGURE 2 shows a partially cut away view in section of the same terminal in elevation.

FIGURE 3 is a perspective view of the insert.

FIGURE 4 is a top plane view of the terminal.

FIGURE 5 is a side elevational view of the terminal mounted in a panel.

FIGURE 6 is and exploded perspective view of the insulating washer and push-on nut.

In FIGURE 1 an elastomeric insert is shown at **1**, capped by a cup shaped insulator **2**, an electrode **3** passing axially through both **1** and **2**. Said electrode is provided with a flange **4**, a rectangular extension **5** at one end of the flange, the balance of said electrode being round in cross-section and slightly tapered at the unflanged end of the round section at **6** and with an annular groove close to said tapered end at **7**. There is also shown a round insulating washer at **8** and a push-on nut at **9**.

The push-on nut **9** has prongs at **10** which fit into the annular groove **7**.

In FIGURE 2 the mating relation of the parts of FIGURE 1 is shown more clearly, and the conical end sections of the insert **1** are shown at points **11** and **12**, cone extremity **11** being adjacent the insulating washer **8** and cone extremity **12** nesting into mating conical recess **13** in the cup shaped insulator **2**. Electrode flange **4** is shown pressing against the insulator **2** thus forming or providing a stop against the pressure exerted by the insulating washer and push nut **8** and **9** axially of the insert. In FIGURE 1 it will be noted that the rectangular extension **5** of the electrode **3** is shown with its rectangular cross-section in register with the intermediate section of the insert, its resilient intermediate section also being of rectangular cross-section with its sides being parallel to the corresponding sides of the rectangular electrode cross-section.

In FIGURE 3 the insert **1** is shown having a major diameter **13**, a minor diameter **14**, an intermediate section **15** which latter is of rectangular cross-section in a plane perpendicular to the longitudinal axis of the insert, said axis being a hole **16** thru which the electrode **3** FIGURES 1 and 2 normally passes.

FIGURE 4 shows the rectangular cross-sectional configuration of the section **5** of the electrode.

FIGURE 5 shows the terminal mounted in a hole in a panel member **17** at the point **18** the terminal being fully compressed to provide a rigid assembly. It will be seen that the minor diameter section of the insert has been greatly expanded radially to form a doughnut configuration as at **19** and that in so doing this section of the insert pressed against the panel at **20** causes high uniform compression of the intermediate section of the insert into the mating hole in the panel and at point **21** the inner section of the doughnut formation rolls over the partially exposed section of the push-on nut to partially swallow same at the end of the encasing insert at **22** thus locking the "speed nut" as the push-on nuts are sometimes known, so as to prevent rotation independently of the insert.

FIGURE 6 shows the wafer like insulating washer **8** which is of a reinforced resinous or rubber like material such in nature that it will bond upon compression and/or heat to one side of the push-on nut **9** and the compressed minor diameter end of the elastomeric insert. This unusual combination of insulating washer and push-on nut improves the anchorage of the push-on nut to the electrode, and since the teeth **10** of the push-on nut **9** are twisted alternately in different directions to prevent the push-on nut from rotating in respect to the electrode, upon compression of the terminal in the panel and since the said teeth also bite into the electrode, due to the back pressure from the insert, upon compression, a well locked terminal assembly can be obtained. The insulating washer also serves to protect the highly stressed elastomeric insert from being cut by any sharp edges on the push-on nut.

One of the important features incorporated in the present invention is the use of a conical end shape on the minor diameter section of the elastomeric insert. It has been discovered that by forming this cone termination on the insert at an angle of 45 degrees in respect to the axis of the insert that a maximum of friction between the parts desired to be anchored is obtained, and the intermediate section of the said insert becomes uniformly compressed to a very high degree, so much so, that a virtually unyielding anchorage to the panel is obtained, also the insert's smaller end assumes a doughnut like or O ring like configuration giving maximum assembly strength.

The length of the intermediate section of the insert in the direction of its axis, it has been discovered, should be equal to 1.1 times the thickness of the panel in which the

terminal is to be mounted in order to obtain maximum compression of the lock-in intermediate section without distorting the elastomeric doughnut formed when the terminal is assembled into the panel with which it is to be used.

Having described my invention I claim:

A unitary electric terminal for lock-in use in an opening in a mounting panel comprising an elastomeric insert having a major diameter tubular section, a minor diameter tubular section, each of said sections having a convex conical termination, an intermediate tubular insert section having a keyable configuration and a predetermined length of 1.1 times the thickness of said mounting panel, a cup-like rigid insulating cap encompassing said major diameter section of said insert, a flanged rod-like electrode having a keyable termination on one end that lines up in planes parallel to the keyable outline of the intermediate insert section, said electrode having a remaining section of round cross-section shank terminating in a taper

at its free end, an annular groove around said shank adjacent said taper, a bonding insulating washer on said shank adjacent said minor diameter section of said insert at the conical termination thereof, a push-on nut having oppositely twisted teeth adjacent said washer and adapted to bite into said round section of said electrode shank when said push-on nut is compressed against said minor diameter section of said elastomeric insert to form a nut encasing elastomeric doughnut, and a uniform highly compressed intermediate insert section within the opening in the panel.

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