Nov. 3, 1953 K. E. BONDURANT 2,658,130

TERMINAL

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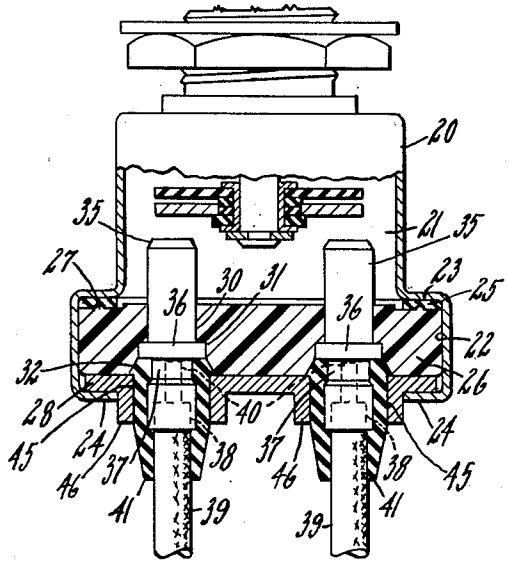


Fig. 1

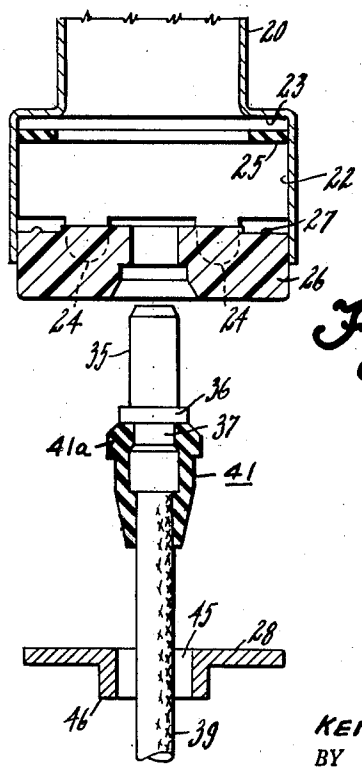


Fig. 2

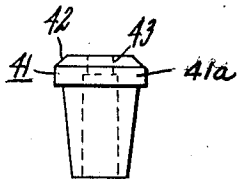


Fig. 3

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This invention relates to terminals and a method of mounting the terminal in an apertured wall of a casing. Terminals of this character have to pass through a wall for the casing in such a manner as to make a sealed joint with the wall.

Heretofore it has been the practice to embed a terminal or terminals in an insulating closure which closes one end of a casing and so that portions of the terminals extend into the case to form stationary contacts to be bridged by a movable contact and portions of the terminals extend rearwardly of the closure and are adapted to have electrical conductors connected to them. These electrical connections are commonly subjected to deterioration particularly when the connections are subjected to various moisture conditions containing salt.

In many instances the electrical apparatus of the type under consideration has a cylindrical metal case the rear rims of which have projecting spaced tangs that are bent over against the outer face of the closure to hold the plate in assembled relation with the case. In such electrical apparatus the closure carries through terminals having one end within the housing and having the other extending outside the casing which are electrically connected with the conductors. In order to protect the contacts within the housing and the connections outside the housing between the terminal and the conductor from deteriorations or corrosion due to exposure to atmosphere containing salt, the rear end of casing was covered or potted with a body of insulating material about the casing, terminals and cables. This practice of enclosing the connections with a body of insulating material is obviously unhandy and costly and therefore objectionable.

It is the purpose of the present invention to provide a closure and terminal construction and arrangement suitable for use with a casing which must be sealed against entrance of moisture between the terminal and closure into the casing and at the same time form a moisture seal about the fixed connection between the terminal and the cable outside the casing.

It is a further purpose of the invention to provide a novel method of securing a terminal to a closure for a casing which must be sealed against entrance of moisture and to provide a seal about the connection.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of the present invention is clearly shown.

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In the drawing:

Fig. 1 is a side elevational view of a switch apparatus having the electrical connections between the terminal post and the cable seal against entrance of moisture portion of the switch being shown in section.

Fig. 2 is an exploded view of a modified form showing details of each of the separate parts shown in Fig. 1 and illustrates a method of assembling the parts.

Fig. 3 is a side view of a yieldable bushing used in the present invention.

Referring to Fig. 1 of the drawings, 20 designates a casing of an electric switch, such as a starting switch adapted to be mounted on an instrument panel or suitable support of an automotive vehicle. The bore 21 of the casing is enlarged at 22 to provide a continuous abutment or shoulder 23. The rim of the enlarged portion of the casing is provided with a plurality of spaced tongues or tangs 24. A gasket 25 of non-porous yieldable material such as rubber or other suitable yieldable material is positioned within the enlarged portion of the casing, seating on the abutment 23. The gasket 25 is held in place by a body 26 of insulating material having an annular bead 27 on its inner face. A pressure plate 28 abuts the outer face of the body 26. The plate 28, body 26 and the gasket 25 are held firmly in place within the casing 20 by bending over the tangs 24 against the outer face of the plate 28.

It will be understood that when the tangs 24 are bent over the plate 28 the bead 27 will be forced into the gasket 25 forming an annular depression in the gasket 25 and the gasket will be compressed between the abutment or shoulder 23 and the inner face of the body 26 to form a fluid tight seal thereat to prevent moisture, which may creep past the periphery of the body 26 and the inner walls of the enlarged portion 22, from entering into the bore 21.

The body 26 is provided with a pair of counterbored openings 30 to provide a shoulder 31. An annular beveled seat 32 is formed on the outer face of the body around each enlarged portion of each opening. A plurality of terminal studs 35 are mounted in the body 26. The medial portion of each terminal post 35 is provided with a collar 36 and an annular groove 37 below the collar. The lower end of each post 35 has a counterbore 38 to receive the end of a cable 39. The cable shown consists of a con-

ductor having a layer of insulation. This insulation is stripped from the end portion 40 of the conductor which is staked or otherwise fastened into the smaller bore so as to seal the conductor to the post. Two staking operations are required one to seal and the other to form an electric connection.

The lower end of the terminal post 35 is encompassed by a sleeve 41 of rubber-like resilient compressible insulating material. The sleeve 41 may be constructed of natural rubbers, any known synthetic rubber, or suitable plastics which offer resistance to deterioration by oil or various moisture conditions containing salt. The sleeve 41 is threaded on the cable and over the lower end of the terminal posts as viewed in Fig. 2. The sleeve is slipped over the cable 39 and post 35 to form a tight seal. This is facilitated by use of a suitable lubricant. The lower end of the bushing is slightly larger than the bore of the sleeve 41 so that it provides a good seal.

Referring to Fig. 3 the upper end of the sleeve has a head 41a having a beveled portion 42 so that it will register with the beveled seat 32 in the body 26. The upper end of the bore in the sleeve is restricted as at 43 that will snap into the groove 37 formed on the terminal post 35. The lower end of the bore will fit snugly over the lower end of the terminal and also grip the portion of the insulation of the cable 39. The lower end of the sleeve is tapered so as to facilitate entrance into the opening 45 in the plate 28 surrounded by flanges 46 extending below the lower face of the plate 28.

In assembling the parts 23, 26, 28 and subassembly including the terminal post 35, cable 39 and sleeve 41, the operation may be carried out as follows: The gasket 25 and body are placed within the enlarged portion 22 of the casing 20. The subassembly including the post 35, cable 39 and sleeve 41 is then assembled so that the contact portion 35 is passed through the opening 30 until the flange or roller 36 engages the shoulder. It will be noted the contact post 35 extends beyond the inner face of the body 26. The plate is slipped over the cables 39 and then by suitable fixtures, not shown, support the housing 20 and by movable member, not shown. The plate 28 is moved into the enlarged portion of the casing until gasket is sufficiently compressed to form a fluid-tight seal between it and the abutment 23 and between the gasket and the body 26. While the gasket is being compressed the collar 36 will engage the shoulder 31 and the sleeve 41 will be compressed between the collar 36 and the plate 28. Since the rubber sleeve cannot expand radially outward between the closure and terminal and between the sleeves of the plate and the terminals the sleeve within the flanges will be placed under considerable pressure forcing the sleeve in sealing engagement with the cable below the end of the terminals. Thus an effective seal is accomplished so that no moisture, air or foreign matter can pass along the inner surface of the sleeve to the connection between the cable and terminal post. Such a sealed connection will hold against either vacuum or pressure within reasonable limits.

It will be apparent that the invention above described, while providing a seal between the cable and terminal and between the flange and bushing and between the bushing and closure and also the proper insulation between the terminal and the plate it also allows for a certain amount of flexibility between the sleeve and the cable.

While the embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. In an electrical unit comprising; a casing having a continuous internal abutment; a body of insulating material; a ring of yieldable material under compression disposed between the abutment and the body, said body having at least one counterbored opening therein to provide a shoulder; a terminal having one end extending through the opening and having a collar engaging the shoulder the other end of the terminal providing spaces below the collar between the terminal and the body; a cable having an electrical connection with said other end of terminal; a plate having a sleeve portion separated from said other end of the terminal and the cable by a substantial clearance; a flanged bushing of yieldable compressed material disposed about said other end of the terminal and the adjacent end of the cable, said bushing completely filling the spaces between the terminal and body and the spaces between the sleeve of the plate and the terminal; and means including associated portions of the casing to associate the plate with the casing and for keeping the yieldable ring and the bushing under compression and also for maintaining the lower end of the bushing in sealing engagement with the cable.

2. In an electric switch construction, the combination of a tubular casing having an enlarged portion at one end to provide a continuous internal abutment; a movable contact supported within the casing; a sealing gasket adjacent the abutment; a body of insulating material having a pair of stepped bores to provide internal shoulders; a conducting element for each bore, said elements extending through the bores and having an end forming switch contacts adapted to be engaged by the movable contact and having a radially extending annular flange positioned in the larger portion of their respective bores and having the other end provided with a socket; a cable extending into each socket and electrically to their respective element; a bushing of resilient non-porous insulating material surrounding each socket end of the elements and a portion of the cables, said bushings having a head at one end extending into the larger portion of stepped opening of the body; a plate having a pair of flanged openings to receive the other ends of the bushing; and means including portions of the casing engaging the plate for compressing the gasket into sealing engagement with the abutment and the body and for compressing both bushings in sealing relation against both elements and cables to prevent fluid creepage to said electrical connections.

3. In a switch construction the combination of a tubular casing having an internal continuous abutment; a body of insulating material located within the casing; a gasket member of compressed yieldable material disposed between the abutment and body; a terminal associated with the body and having one end exposed beyond the inner face of the body and having the other end provided with a socket which is exposed beyond the outer face of the body; a cable having one end encompassed by the socket end of the terminal and electrically connected to the terminal within the confines of the socket; a plate located within the housing, said plate providing at its outer face sleeve-like flanges, a bushing member of yield-

able material highly compressed surrounding the socket portion of the terminals and portions of the cable and completely filling the space between the flange and the terminal and causing one end of the bushings to grip the cables to prevent fluid creepage to said electrical connection; and means including associated portions of the housing for holding the plate in position and for keeping all of the yieldable members under compression.

4. In a sealing arrangement for an electrical apparatus comprising a tubular casing having an internal continuous abutment; a body of insulating material located within the casing; a resilient gasket disposed between the abutment and body; a terminal associated with the body and having one end exposed at the inner face of the body and having the other end exposed beyond the outer face of the body, said body being formed with tapered seat surrounding the terminal; an insulated conducting wire electrically connected to the terminal; a plate located within the casing having a flange opening; a grommet surrounding the other end of the terminal and portions of the insulated wire, said grommet being made of rubber-like material with one end forming an enlarged seating portion and the other end forming a tapered sleeve portion, there being an annular shoulder between the ends of the said grommet, said tapered portion passing through the flanged opening and the enlarged portion being seatable on the edge of the opening in said plate and also extending into said seat of the body surrounding said terminal; and means including associated parts of the casing for holding the plate in position and also to deform the gasket and the grommet to produce a sealing relationship between the gasket, the abutment, and the body, and also a sealing relationship between the grommet, the body, the terminal, and the insulated wire.

5. In a sealing arrangement for an electrical apparatus comprising a tubular casing having an internal continuous abutment; a body of insulating material having a stepped bore to provide an internal seat located within the casing; a resilient gasket disposed between the abutment and the body; a terminal extending through the bore of the body and having one end exposed within the casing and having the other end exposed outside the body, said terminal having a collar contacting the seat in the body; an insulated conducting wire electrically connected to the terminal; a plate located within the casing having a flanged opening; a flanged grommet surrounding the other end of the terminal and portions of the insulated wire, said grommet being made of yieldable rubber-like material and having the flange seated against the collar of the terminal and having portions passing through the flanged opening of the plate; and means to draw up said plate in firm engagement with the body and also to deform the gasket and the grommet to produce a sealing relationship between the gasket, the abutment, and the body, and also a sealing relationship between the grommet, the body, the terminal, and the insulated wire.

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