Nov. 27, 1962 K. M. HAMMELL 3,066,275

ELECTRICAL CONNECTION DEVICE

Filed March 11, 1959

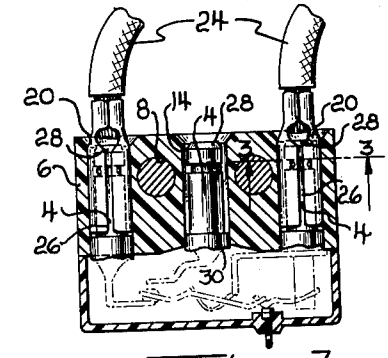


Fig. 2

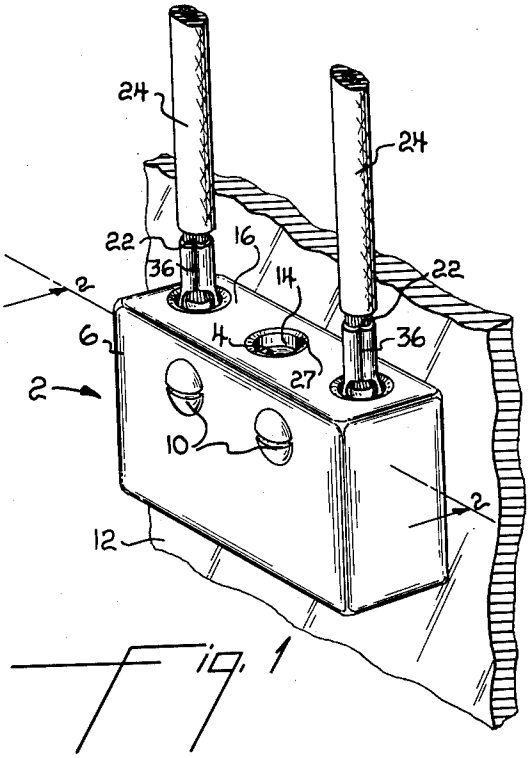


Fig. 1

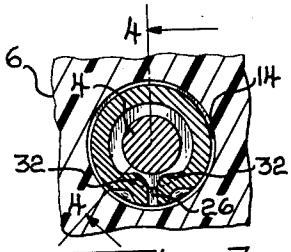


Fig. 3

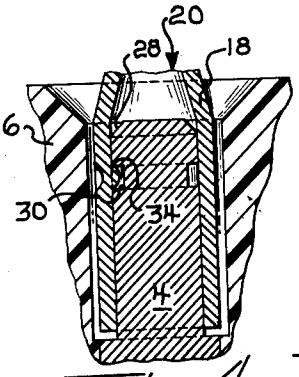


Fig. 4

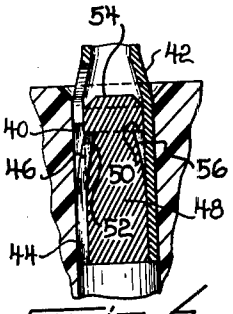


Fig. 6

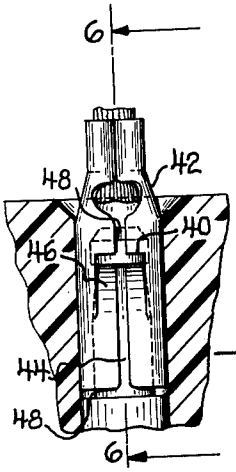


Fig. 5

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ELECTRICAL CONNECTION DEVICE

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The present invention relates to separable electrical terminal connections, and more particularly to connections for miniaturized electrical devices such as a switch or the like.

Continued emphasis on miniaturization of the electrical device in general has, of course, correspondingly reduced the allotment of space and material for the terminal connections by which lead wires are brought to the device. It has been common practice to terminate such devices, for example, by exterior terminal posts to which lead wires are brought and attached by wrapping, soldering or by connector components. Limited space renders wrapping and soldering slow and difficult whereas the available material and space have limited connector components to relatively flimsy structures incapable of withstanding significant stresses, especially stresses applied by the lead wire laterally of the terminal post.

Among the objects of the present invention is the provision of a separable frictional terminal connection for an electrical device which is simple and economical of space and material, yet rugged so as to be capable of withstanding significant stresses without failure, and fool-proof in assembly and operation. Another object to provide a construction for such a terminal connection wherein the body of the electrical device is arranged as a backing for absorbing stresses applied to the connection.

Other objects and attainments of the present invention will become apparent to those skilled in the art upon a reading of the following detailed description when taken in conjunction with the drawings in which there are shown and described illustrative embodiments of the invention; it is to be understood, however, that these embodiments are not intended to be exhaustive nor limiting of the invention but are given for purposes of illustration in order that others skilled in the art may fully understand the invention and the principles thereof and the manner of applying it in practical use so that they may modify it in various forms, each as may be best suited to the conditions of a particular use.

In the drawings:

FIGURE 1 is a perspective view of an electrical switch incorporating features of the present invention;

FIGURE 2 is a sectional view taken along lines 2—2 of FIGURE 1 with certain part shown in full for purposes of clarity;

FIGURE 3 is a sectional view taken along lines 3—3 of FIGURE 2;

FIGURE 4 is a setional view taken along lines 4—4 of FIGURE 3;

FIGURE 5 is an enlarged fragmentary sectional view similar in aspect to that of FIGURE 2, but of a modified form of the connection; and

FIGURE 6 is a sectional view taken along lines 6—6 of FIGURE 5.

A typical example of an electrical device by which the principles of the present invention may be illustrated is a switch recently introduced commercially under the name Microswitch. With reference to the drawing, the exemplary switch device generally designated at 2 in FIGURE 1, is shown in partial detail in a form modified in accordance with the principles of the present invention.

In general, switch 2 includes a series of cylindrical posts 4 which constitute the terminals of the device, there being three such posts for the exemplary three-way snap

switch shown. The details of the internal contact structure and operating mechanism form no part of the present invention and will not be specifically described. These electrical components of the device, all of miniature proportion, are housed and supported in a block 6 of suitable insulating material such as a phenolic resin, the block having a pair of holes 8 through which a pair of bolts 10 are passed to secure the device to panel 12, representative of the supporting structure of the instrumentality with which the switch device is associated. As made available commercially, the main body of block 6 measures approximately 0.50 inch in length, 0.33 inch in width, and 0.20 inch in depth, illustrating the diminutive size of the device in accord with the trend toward miniaturization.

According to the present invention, a series of parallel cylindrical wells 14 extend inwardly from one end face 16 of block 6. Posts 4 are each supported adjacent its base by the block to extend longitudinally in concentric relation in a well 14 and advantageously recessed below face 16, but spaced from the well sidewalls so that the spring socket portion 18 of connector 20 attached to the bared end or core 22 of lead wire 24 may be inserted longitudinally in the well in a snug fit and resiliently telescoped over the post therein.

Conveniently, each connector 20 is formed from a blank or strip of resilient conductive sheet metal, such as brass, by die stamping and forming techniques well known in the art, socket portion 18 being rolled up to cylindrical form to have an unsecured seam 26 and an internal diameter less than the diameter of posts 4 whereby on telescoping over a post, the socket may expand by opening seam 26. For easy insertion of the socket the edges 27 of wells 14, and posts 4 at their terminal ends 28, are preferably beveled.

Each post adjacent end 28 is preferably provided with an annular groove 30 for receipt of a pair of internal, dome-shaped bosses 32 formed on opposite sides of and adjacent seam 26 at the rearward end of each socket 18. On sufficient depth of insertion of the socket, bosses 32 ride over the end 28 of the post, ultimately to snap into groove 30 to serve as detents, in aid of the frictional grip afforded by the resilient character of the socket, yieldably resisting withdrawal of the connector.

As alluded to above, the rear portion 36 of connector 20 provides for mechanical and electrical attachment to lead wire 24. Preferably connector portion 36 is formed into a wire receiving ferrule from an initially U-shaped cross-sectional configuration, the ferrule being tightly attached to or crimped around core 22 by cold forging techniques conventional in the art as illustrated, for example, in Patent No. 2,600,012, issued June 10, 1952 to James C. Macy.

As thus constructed, it will be appreciated that the terminal connections for the illustrative switch device each consititute a stable and high quality mechanical and electrical connection which may easily and quickly be assembled from simple and inexpensive parts. Further, the component parts of the connection may be made in miniature size, and though individually relatively flimsy, in connection present a rugged structure resistant to mechanical failure. For example, relative to stresses applied to the joints as a consequence of lateral pulls on lead wires 24, the sidewalls of wells 14 act as a backing preventing any significant distortion to sockets 18 or posts 4 while limiting the stress which may be transmitted to the surfaces providing the electrical contact for the connection and tending to separate them. In this connection for the well sidewalls to provide an optimum backing or bearing function, the depth of wells 14 and the inserted length of sockets 18 should at a minimum be equal to 1½D, where

D is the well diameter. In addition, the lateral spacing between a post 4 and the well sidewalls ideally equals the stock thickness of socket 18, but in practice approximates the nominal effective thickness of the sockets, allowing a few mils, up to one-third the stock thickness for example, to admit of tolerance variations. Where the detent action afforded by bosses 32 and groove 30 is desired, however, the spacing between the posts and well sidewalls must, of course, be somewhat greater to permit the bosses to pass over the terminal end of the posts.

A closer approximation or correspondence between the socket stock thickness and the well sidewall-to-post spacing while retaining a detent action may be achieved by providing detent elements on the socket which are independently sprung. Thus, in FIGURES 5 and 6, generally L-shaped slits 40 in the side edges of socket 42 along seam 44 release a pair of inwardly directed resilient prongs or tangs 46 which may be cammed substantially back into coplanar relation with the main body of socket as they pass over the terminal end of post 48, ultimately to spring back for engagement with the forward facing wall 50 of annular groove 52 of post 54. Rearward facing wall 56 of the groove preferably is sloped so as not to interfere with the spring action of the tangs. In this arrangement it will be appreciated that the well sidewall-to-post spacing may be as close to the socket stock thickness as manufacturing tolerances will permit.

Changes in construction will occur to those skilled in the art and various apparently different modifications and embodiments may be made without departing from the scope of the invention. The matter set forth in the foregoing description and accompanying drawings is offered by way of illustration only.

I claim:

In an electrical utilization device incorporating electrical functions carried by a block of rigid insulating material, plural wells extending inwardly from an end face of said block, respective terminal posts supported by said block and extending longitudinally and centrally in said wells, respective connectors for coupling external conductor wires to said posts, each connector including an unsupported spring socket portion of flimsy sheet metal received in and extending substantially the length of a well and resiliently embracing a post, said spring socket portion having a detent spring, the well sidewalls being closely adjacent said socket portion to provide a rigid backing limiting lateral movement of the socket portion to within resilient deformation, each post having a detent shoulder engageable by the detent spring of the socket portion, the detent spring being independently sprung relative to the spring of the socket portion so as to be depressible back to within the effective thickness of the socket portion, the space between the post and the well sidewalls being substantially equal to the effective thickness of the socket portion.

References Cited in the file of this patent

UNITED STATES PATENTS

1,559,683	Douglas	Nov. 3, 1925
2,158,004	Douglas	May 9, 1939
2,384,267	Andersen	Sept. 4, 1945
2,782,391	Kirk	Feb. 19, 1957
2,820,211	Batcheller	Jan. 14, 1958
2,820,213	Sheehan	Jan. 14, 1958