

United States Patent

[19]

Bury

[11] 3,786,209

[45] Jan. 15, 1974

[54] **SNAP SWITCH WITH PRE-WIRED TERMINALS**

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2,633,510 3/1953 Schellman..... 200/153 J
3,175,067 3/1965 Barcus..... 200/166 CT
2,151,612 3/1939 Morris..... 200/67 C

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[73] Assignee: Molex, Incorporated, Downers Grove, Ill.

[22] Filed: Jan. 3, 1972

[21] Appl. No.: 215,022

[52] U.S. Cl..... 200/67 C, 200/166 CT

[51] Int. Cl..... H01h 13/26

[58] Field of Search..... 200/67 G, 166 CT,
200/67 C, 153 J

[56] References Cited

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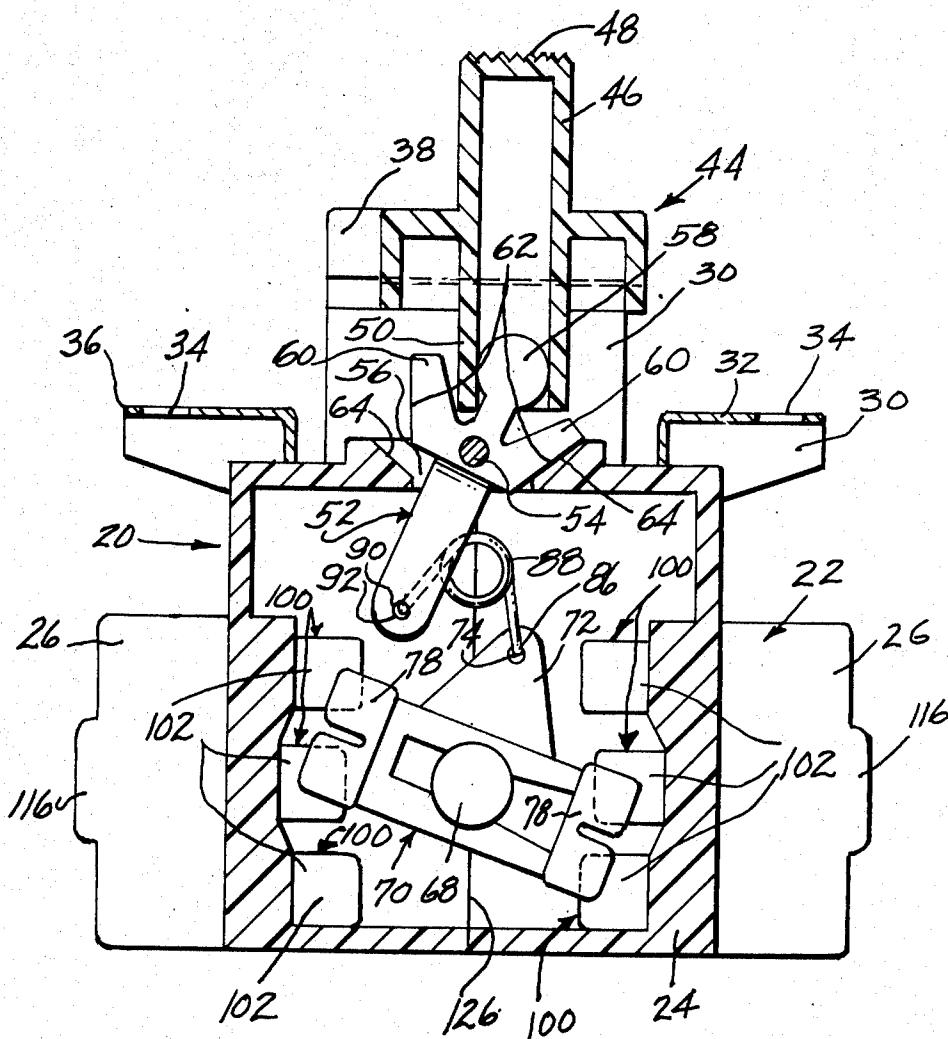
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Primary Examiner—David Smith, Jr.
Attorney—Roy H. Olson et al.

[57] ABSTRACT

Spade type terminals are crimped on to the ends of lead wires. After such crimping the terminals are inserted into the housing of a switch and lock in place. The switch is provided with a toggle actuator to effect movement of a movable switch contact with a snap action between the inserted terminals serving as fixed contacts.

7 Claims, 17 Drawing Figures



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FIG. 1

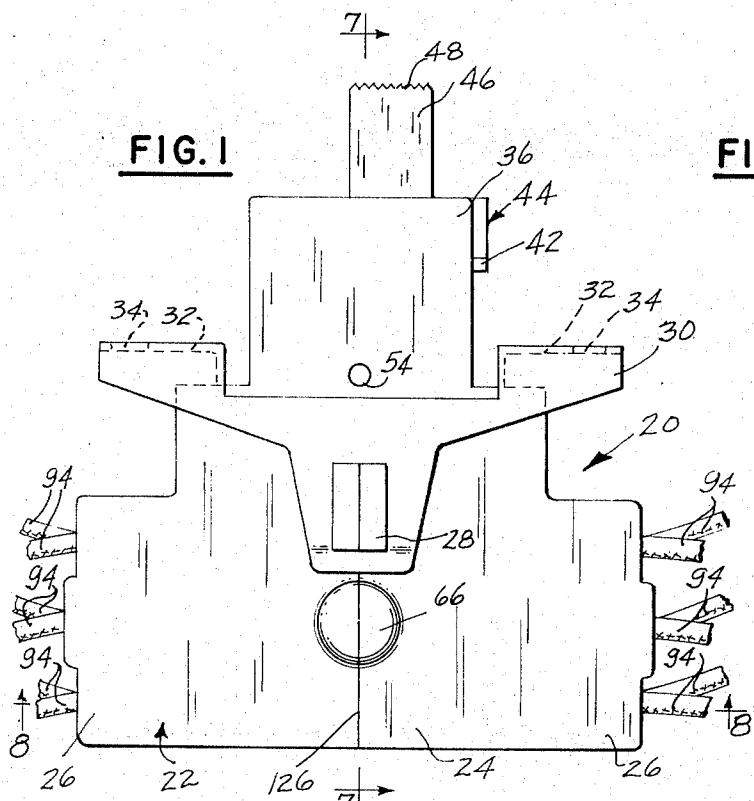


FIG. 2

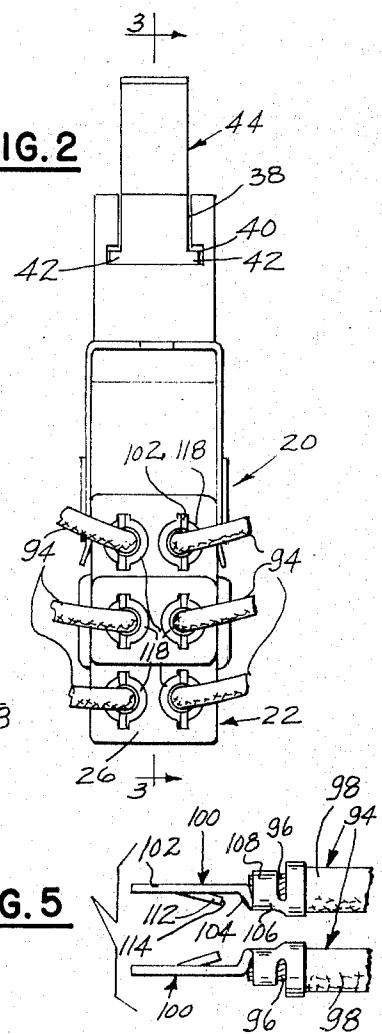


FIG. 3

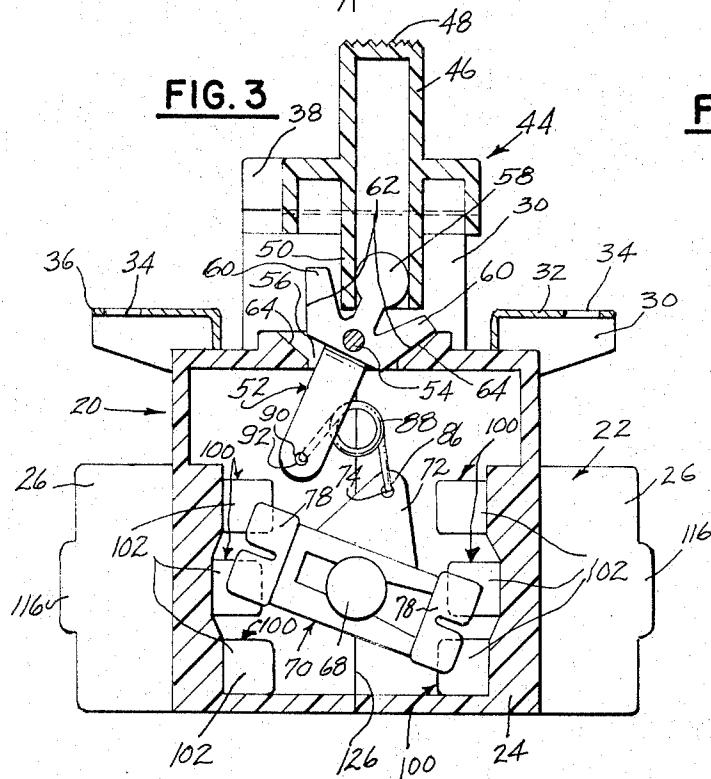


FIG. 5

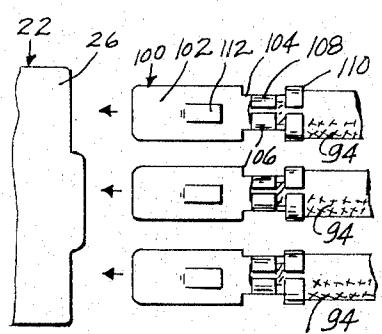


FIG. 4

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FIG. 6

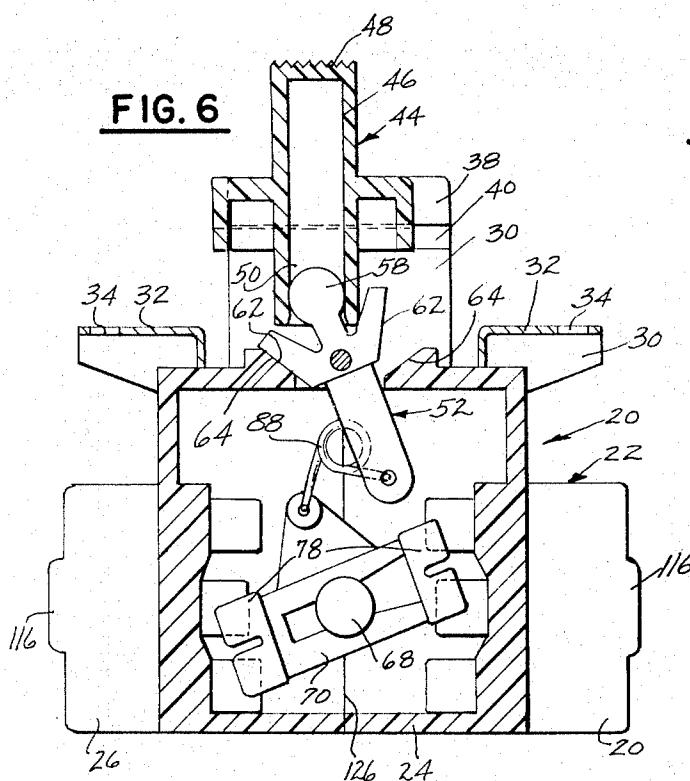


FIG. 7

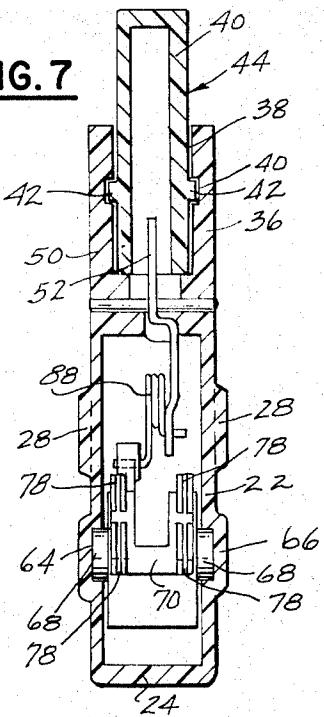


FIG. 8

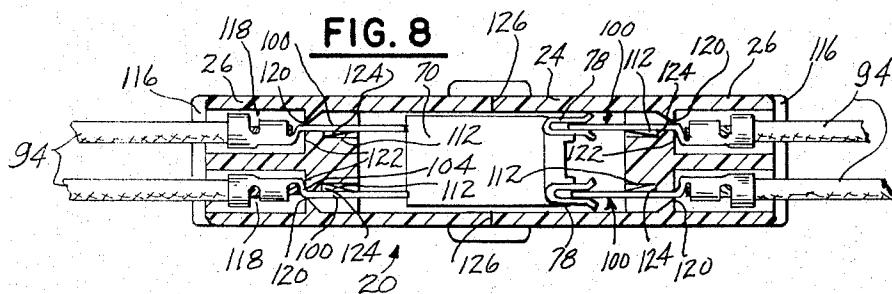


FIG. 10

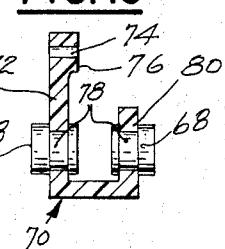


FIG. 11

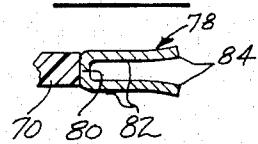
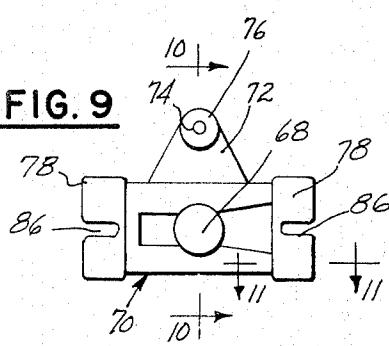


FIG. 9



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FIG. 14

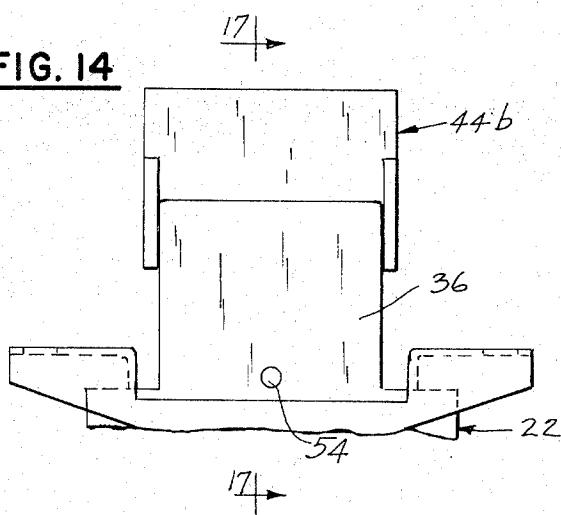


FIG. 15

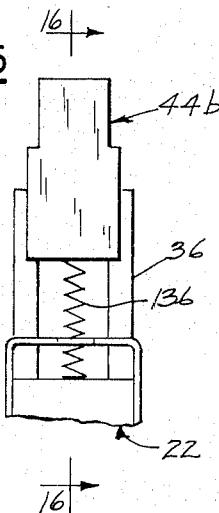


FIG. 16

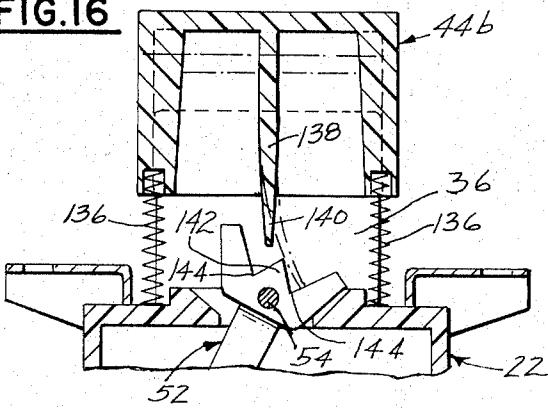


FIG. 17

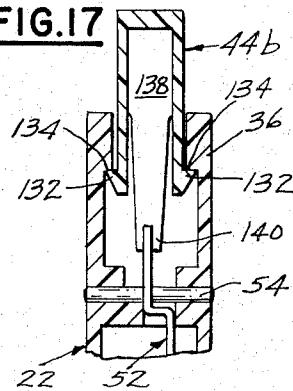


FIG. 12

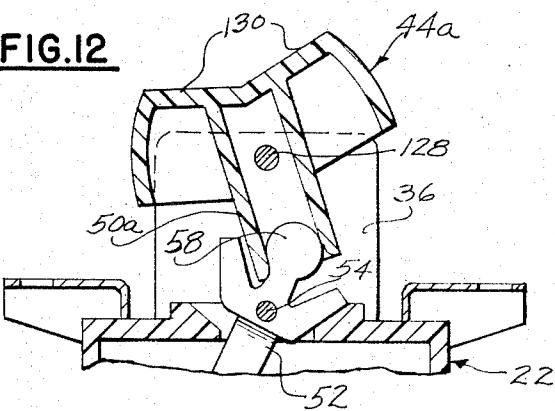
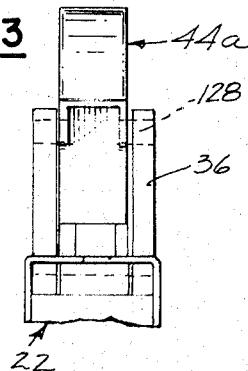


FIG. 13



SNAP SWITCH WITH PRE-WIRED TERMINALS**BACKGROUND OF INVENTION**

Crimp connection of terminals to lead wires is well known. In a case of miniature switches the space available for terminals often makes crimping in place very difficult. Accordingly, it has been proposed heretofore to crimp terminals on to lead wires, and thereafter to insert the terminals into the housing of a switch to latch in place and serve as the fixed contacts for the switch, see for example Stanley V. Horecky U.S. Pat. No. 3,501,599 and Bruno Baumanis U.S. Pat. No. 3,488,460.

For many types of installations a certain degree of in-positive action in switching can be tolerated. However, in other installations teasing of the contacts cannot be tolerated.

OBJECTS AND SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide a snap action switch in which terminals are crimped on to the lead wires and are thereafter inserted into the switch housing for engagement by a movable contact.

More particularly, it is an object of the present invention to provide such a switch utilizing spade type terminals and further employing a toggle mechanism for effecting snapping of the movable contact from one position to another.

In accordance with the present invention the switch is provided with a toggle mechanism. This may be operated by a slide member, a rocker, or by a push button. The movable contact is provided with shorting bar sections at either ends. Three sets of spade type terminals are crimped on to the ends of lead wires, and thereafter are inserted into slots provided therefor in the housing. The terminals are provided with resilient lances for latching them in place upon insertion. The terminals are positioned for engagement in pairs by the shorting bar contacts of the movable switch contact, and serve as fixed contacts for the switch.

SUMMARY OF THE DRAWINGS AND DETAILED DISCLOSURE

The invention will best be understood with reference to the following description when taken in connection with the appended drawings wherein:

FIG. 1 is a side view of a switch constructed in accordance with the principles of the present invention, the manual operating member being a slide;

FIG. 2 is an end view of the switch of FIG. 1;

FIG. 3 is a longitudinal sectional view therethrough as taken substantially along the line 3—3 in FIG. 2;

FIG. 4 is a fragmentary front view showing the terminals crimped on to the lead wires prior to insertion in the switch housing;

FIG. 5 is a top view of the terminals of FIG. 4;

FIG. 6 is a longitudinal view similar to FIG. 3 showing the parts in a different position of operation;

FIG. 7 is a cross-sectional view taken substantially along the line 7—7 of FIG. 1;

FIG. 8 is a horizontal upwardly looking section as taken substantially along the line 8—8 in FIG. 1;

FIG. 9 is a detail view of the movable switch member;

FIG. 10 is a cross-sectional view through the movable switch member as taken along the line 10—10 of FIG. 9;

FIG. 11 is a fragmentary longitudinal sectional view on an enlarged scale as taken substantially along the line 11—11 in FIG. 9;

FIG. 12 is a fragmentary longitudinal sectional view similar to the top portion of FIG. 3 showing a modification of the invention utilizing a rocker member as the manually operable switch actuator;

FIG. 13 is a fragmentary end view of the embodiment of FIG. 12;

FIG. 14 is a fragmentary side view of a further embodiment of the invention utilizing a push button as a manually operable actuator;

FIG. 15 is an end view of the embodiment of FIG. 14;

FIG. 16 is a fragmentary longitudinal sectional view as taken substantially along the line 16—16 in FIG. 15; and

FIG. 17 is a fragmentary cross-sectional view as taken substantially along the line 17 in FIG. 14.

Turning now in greater particularity to the drawings, and first to FIGS. 1—8, there will be seen a snap action switch 20 constructed in accordance with the principles of the present invention. The switch comprises a molded plastic housing 22 having a generally rectangular central body 24. Integral end portions 26 extend in opposite directions from the central body and are of lesser height than the central body.

Projections 28 on the front and back faces of the central body serve to mount a generally channel-shaped metal mounting structure 30 having an upper web 32 with apertures 34 therein for receipt of fasteners such as screw fasteners for mounting the switch.

The central body 24 has an upstanding integral superstructure 36 with a longitudinal passage 38 therein having a dovetail undercut 40 providing a slideway. Lateral flanges 42 of a manually operable slide 44 are received in the slideway 40 to guide the manually operable member 44 in longitudinal sliding movement. The member 44 has an upstanding central portion 46 with a ribbed or knurled top surface 48 for engagement by a thumb or other finger of an operator. The member 44 also is provided with hollow, downwardly opening depending central section 50.

A generally upright rocker member 52 of sheet metal construction is pivoted on a transverse pin 54 and extends through an opening 56 in the top of the central body 24. The operator 52 is provided at its upper end with a ball 58 received in the depending hollow portion 50 of the manually operable member 44 as is best seen in FIGS. 3 and 6. Outwardly of the ball 58, the rocker 52 is provided with diverging upstanding arms 60 having inclined outer surfaces 62 alternately engageable with oblique stop surfaces 64. The central body 24 is provided with a pair of opposed internal recesses 66 receiving pivot members 68 of a rocker 70. As best may be seen in FIGS. 3, 9 and 10, the rocker 70 comprises an elongated channel-shaped section of plastic material having a triangular upper extension 72 with an aperture 74 in a boss 76 at the upper extremity thereof. The pivot members 68 are provided with relatively small diameter central shanks 78 which snap into recesses 80 in the sidewalls of the channel-shaped rocker. Pairs of channel-shaped contact members 78 preferably are secured to the opposite ends of the rocker 70 by means of lances (not shown) or by any other suitable means,

such as an adhesive, or such as by projections integral with the rocker member extending through apertures in the contact members 78 and heat softened and pressed into enlargements whereby to hold the contacts in place. As best may be seen in FIG. 11, each contact 78 is channel-shaped, comprising a narrow web 80 and parallel flanges 82 diverging at the outer ends at 84. A slot 86 (FIG. 9) in each flange provides for independent resilience of the opposite ends of the channels, the contact 78 being formed of suitable contact metal.

One end 86 of a coiled over-centering spring 88 extends through the hole 74 in the top of the flange extension 72, the other end 90 thereof extending through a hole 92 in the lower end of the rocker 52.

As the manually engageable operator 44 is longitudinally shifted back and forth, it rocks the rocker 52 and causes the spring 88 to over-center, whereby to snap the rocker 70 back and forth between the positions of FIGS. 3 and 6.

Turning attention now to FIGS. 4 and 5, lead wires are shown at 94, and in the illustrative example there are six such wires at each end of the housing, being in horizontally spaced pairs of three, the three of each pair being disposed above one another in a common plane for installation in the housing. Each feed wire comprises a conductor 96, which may be stranded or solid, and conventionally of copper. The conductor 96 in each instance is covered with insulation 98, which conventionally is of a thermal plastic nature.

Each lead wire 94 has a terminal 100 crimped on the end thereof. Each terminal comprises spade-like body 102 with an integral offset 104 connecting it to a ferrule or barrel 106 having arms 108 for crimping on to the conductor 96, and arms 110 for crimping on to the installation, such crimp connections being known in the art. A resilient lance or tang 112 is struck from the body and has a free end 114 spaced from and confronting the offset 104.

Each end portion 26 is provided substantially midway from top to bottom with an enlargement or protuberance 116. Cavities 118 are provided in end portions 26 and in the protuberances 116, there being a total of six such cavities in either end of the housing in horizontally spaced sets of three each. Due to the protuberances 116 the central of these cavities 118 are spaced outwardly further from the housing body 24. Each cavity as seen particularly in FIG. 8, is provided with a narrow aperture 120 at its inner end thereby forming a substantially right angle shoulder 122 engageable by the terminal offset 104 to limit the depth of insertion of each terminal. Forwardly of each shoulder 122 there is an oppositely disposed internal right angle shoulder 124 engaged by the corresponding rearwardly struck lance or tang 112 to prevent retraction of the terminal. With the terminals inserted as aforesaid, the bodies 102 thereof extend into the position shown in FIGS. 3, 6 and 8 so that diagonally opposed pairs thereof may be spanned by the movable contact 78 on the rocker 70. As will be apparent, the channel-shaped contacts 78 grip resiliently on opposite sides of the terminal bodies 102, forming therewith respective movable and fixed contacts which engage with a wiping motion so as to rub off surface corrosion, dirt, etc. The limit position of the rocker 70 in either FIG. 3 or FIG. 6 is determined by engagement of the web 80 of the contact with the end of the central terminal body 102.

Although not specifically discussed heretofore, the housing is formed as two mirror-image portions butted together along a vertical line 126, and secured by means of the mounting clip or structure 30. Similarly, for simplicity of molding, the superstructure 36 may be molded as a separate piece and suitably secured to the remainder of the housing, although this is not essential.

A modification of the invention is shown in FIGS. 12 and 13. Most of the parts are identical with those heretofore shown and described, and hence are not again described, being identified by the same numerals for purposes of identification. The distinguishing feature is that the manually engageable operator 44 is a rocker member, pivotally mounted by integral bosses 128 in the superstructure 36, having a hollow depending portion 48 receiving the ball 58, and at its upper edge having two manually engageable surfaces 130 at an obtuse angle to one another for rocking back and forth under the thumb.

A further embodiment of the invention is shown in FIGS. 14-17. Most of the parts again are exactly the same, being shown only in part, and being identified by the same numerals as used heretofore. The distinguishing feature of the invention of FIGS. 14 and 16 is that a vertically operable push button 44b comprises the manually engageable operator. The push button is vertically slideable up and down on the superstructure 36, having teeth 132 on the lower ends thereof locking beneath shoulders 144 to limit upward movement of the push button. Springs 136 resiliently urge the push button up to its limit of vertical movement. The push button 44b is hollow, and is provided centrally thereof with a flexible tongue 138 tapered nearly to a point at the lower end as indicated in 140. The rocker 52 has a triangular shaped projection 142 at the top end thereof rather than the ball 58, otherwise, being shaped the same as heretofore described. When the push button moves down to position as shown in FIG. 16, it will engage the notch 144 to the left of the triangular projection 142, and the tongue 138 will flex to the left as the operator is rocked in a counterclockwise direction. On a succeeding (or preceding) depression of the push button the tongue 138 will fall into the notch 144 to the right of the upper projection 142, and will rock the operator in a clockwise direction with the tongue flexing to the right as shown in broken lines in FIG. 16.

In each example of the present invention terminals are applied to wires (sometimes referred to as pre-terminated wires), the terminals then being inserted into complementary openings in the ends of a switch housing. The terminals then form fixed contacts engageable with a snap-action floating contact for completing electric circuits.

These specific examples of this invention as herein shown and described are for illustrative purposes only. Various changes in structure will no doubt occur to those skilled in the art, and will be understood as forming a part of the present invention insofar as they fall within the spirit and scope of the appended claims.

The invention is claimed as follows:

1. An electric snap switch comprising a housing having a cavity therein, a rocker pivotally mounted in said cavity, a switch operator pivotally mounted from said housing and disposed at least in part in said cavity, a coiled overcentering spring having one free end connected to said operator and the other free end connected to said rocker, such that upon pivotal move-

ment of said operator, said rocker will be moved back and forth between two rest positions with a snap action, at least two series of apertures extending through said housing and communicating with said cavity, each said series including at least three apertures with respective apertures of each series being in alignment with the apertures of the other series and diametrically opposed substantially in a common plane, and at least two series of substantially flat blade-type terminals preassembled with lead wires and inserted in said apertures with at least portions thereof extending into said cavity substantially in said common plane, said terminals and said housing having complementary structures latching said terminals in said housing, said rocker having a pair of electric contact means thereon substantially in said common plane and each said contact means having sufficient width such that in one or the other of said rest portions each contact will engage the center terminal of the series of terminals associated therewith and one or the other of the two aligned terminals of said series.

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2. A snap switch as set forth in claim 1 and further including a manually engageable member movably mounted on said housing and interconnected with said operator for moving said operator in response to manual movement of said member.

3. A snap switch as set forth in claim 2 wherein the manually engageable member comprises a slide member.

4. A snap switch as set forth in claim 2 wherein the manually engageable member comprises a rocker.

5. A snap switch as set forth in claim 2 wherein the manually engageable member comprises a push button.

6. A snap switch as set forth in claim 1 wherein the rocker electric contact is channel-shaped and has a pair of flanges embracing said terminals.

7. A snap switch as set forth in claim 6 wherein outer portions of said flanges are turned out to facilitate embracing said terminals.

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