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[56]

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UNITED STATES PATENTS			
3,194,930	7/1965	Nielsen et al. ....	200/158
2,963,561	12/1960	Bridges.....	200/166 E X
1,740,640	12/1929	Austin .....	200/162
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[54] **KNIFE SWITCH**

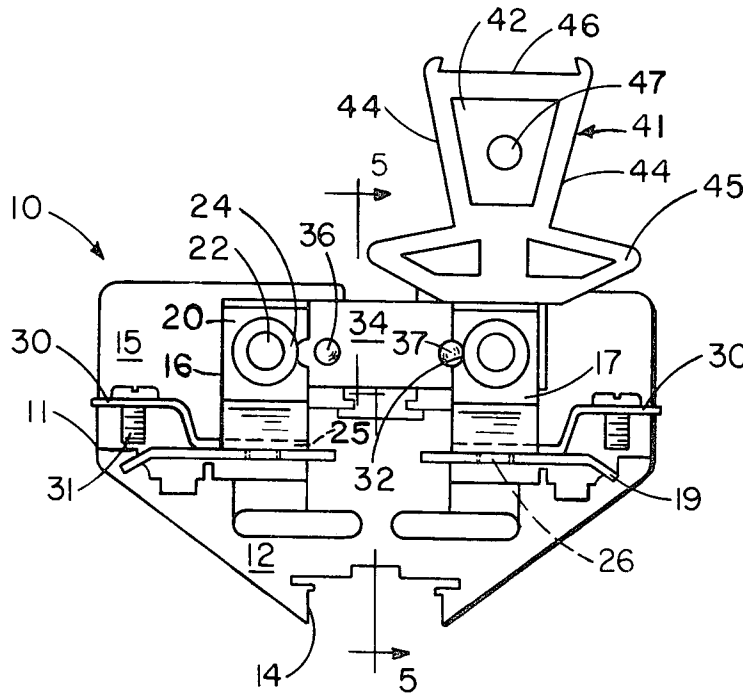
8 Claims, 6 Drawing Figs.

[52] U.S. Cl. .... **200/166SD,**  
 200/166 H, 200/169 R, 200/162

[51] Int. Cl. .... **H01h 1/50**

[50] Field of Search ..... 200/166  
 SD, 166 H, 162, 169 R, 166 E, 170 R, 170 A, 158

**ABSTRACT:** The blade of a knife switch adapted for use on channel mounted terminal block equipment is provided with bosses which interfere with engaging surfaces on identically formed blade receptacles to retain the blade against vibrationally caused motion while in either its closed or open position.



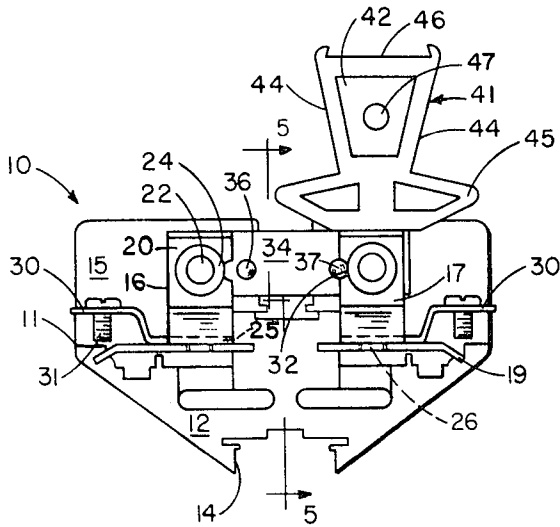


FIG. 1

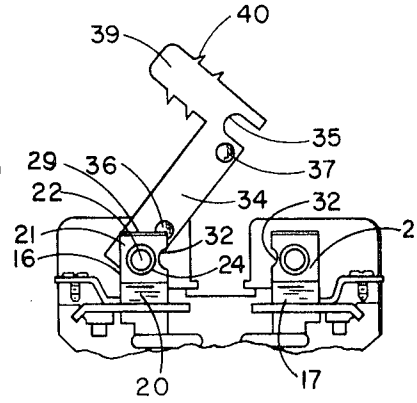


FIG. 3

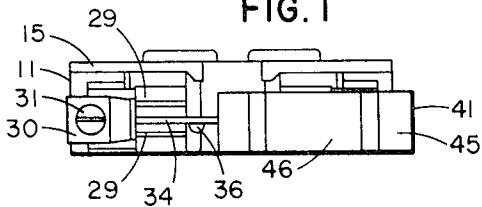


FIG. 2

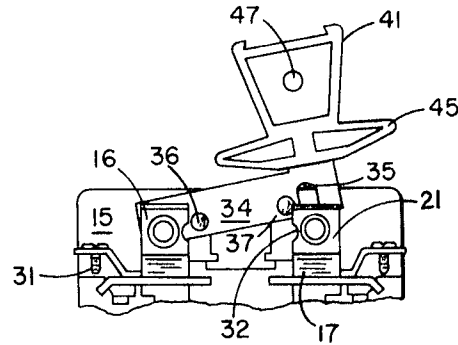


FIG. 4

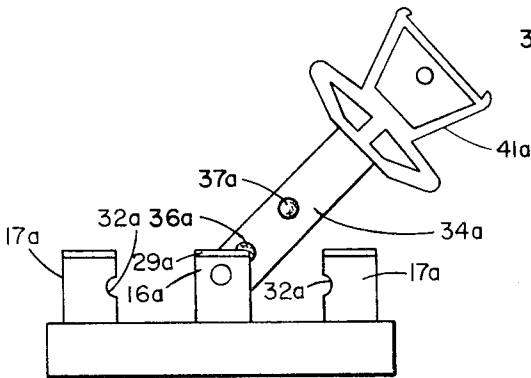


FIG. 6

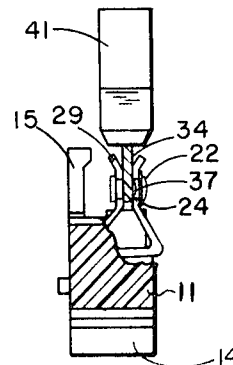


FIG. 5

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## KNIFE SWITCH

This invention relates to knife switches, and particularly to a knife switch for use in terminal blocks of the disconnecting type. For the purposes of illustration, the invention is shown as embodied in a terminal block adapted for incorporation in an electrical terminal strip of the type disclosed in U.S. Pat. No. 2,981,922 of Hermon L. Van Valkenburg and Erik J. Nielsen, issued Apr. 25, 1961, its use with other terminal blocks and for other purposes being readily apparent from the illustrative example.

In installations utilizing terminal strips of the character disclosed in the above-mentioned patent, it is desirable at times to open the circuit between the terminals of the block temporarily. It may be necessary to service or inspect equipment connected through the block to its source of power or controlled by a circuit running through the block. It may also be necessary to create a temporary open circuit to facilitate spot-checking of currents in the circuits.

As the hazards of breaking a circuit by disconnecting a wire from its terminal are well known, knife switches are generally used to break a circuit and eliminate the danger of having loose, live wire ends exposed. However, knife switches pose the added danger that, while one is working on the line, vibration imposed upon the block from extraneous sources may cause closure of the knife switch with consequent injury to personnel and equipment. Also, vibration may cause a knife switch to open, shutting down a part of the operating equipment and causing inconvenience and possible injury.

For these reasons, knife switches have been provided with means to retain the switch blade in its open and closed positions. Such a device is disclosed in U.S. Pat. No. 3,194,930 of Erik J. Nielsen and Robert D. Boley, issued July 13, 1965, and is quite successful in accomplishing the object set forth in the patent. However, this and other devices of this nature have inherent limitations which are overcome by the knife switch of the present invention.

The knife switch of the present invention provides detent means, integrally formed in the knife blade and blade receptacles, for holding the switch blade in the closed and open positions. The detent means are formed in metal for durability, reliability and long wear and can cooperate with blade receptacles formed identically for economy.

A first boss on the switch blade rests in a slot provided in a contact receptacle while the switch is in the closed position. To open the switch, the boss must be forced between the jaws of the contact receptacle. A second boss is moved through the jaws of a hinge receptacle when the switch is opened and engaged by the hinge receptacle to prevent inadvertent reclosing.

The detent means used in the present invention also provide a quick-opening snap-action for the switch. The switch is secured against vibrational movement in its open and closed positions and yet may be quickly, safely and reliably thrown when desired. The detent means of the present invention may be used with any desirable handle and may obviously be adapted for use in double-pole and double-throw switches.

FIG. 1 is a front view of a single throw terminal block knife switch embodying the present invention, the switch being in its closed position;

FIG. 2 is a top plan view of the knife switch of FIG. 1;

FIG. 3 is a fragmentary front view of the knife switch of FIG. 1 with the switch in its open position and with a switch handle removed;

FIG. 3 is a fragmentary front view of the knife switch of FIG. 1 showing the switch being moved into its closed position;

FIG. 5 is a fragmentary cross-sectional view of the knife switch taken generally along the line 5-5 of FIG. 1; and

FIG. 6 is a front view of a double-throw knife switch in accordance with the present invention.

Referring to the drawings, a terminal block 10 comprises a molded body 11 of electrically insulating material, such as nylon or synthetic organic plastic. The body 11 has a base 12 with a slot 14 arranged to receive a supporting rail (not

shown) for supporting the body 10 as a part of an electrical terminal strip such as described in the aforementioned U.S. Pat. No. 2,981,922. The block 10 has an upright barrier wall 15.

Mounted in spaced relation on the body 11 are a pair of blade receptacles, preferably identical in form and construction and adapted to function respectively as a pivot receptacle 16 and a contact receptacle 17. Each of the receptacles 16, 17 includes a mounting pad 19 for insertion in slots provided in the body 11. A jaw portion 20 of each receptacle, formed of electrically conductive material, has upstanding leg portions 21 inwardly tensioned by a spacing limiting rivet 22 and cooperating spring washer 24. A bight portion 25 of each jaw portion 20 is formed with a downwardly depending unitary hollow rivet portion 26 which is inserted into a corresponding tapered aperture in the mounting pad 19 and upset to affix the jaw portion 20 to the mounting pad 19. The legs 21 may have outwardly flared edges or end portions 29. A terminal portion 30 of each receptacle 16, 17 is preferably formed integrally with the jaw portion 20 and is bored to accept a terminal clamp 31 for securing the exposed end of a conductor (not shown).

In accordance with this invention, slots 32, preferably semicircular in shape, are provided for a purpose to be described, on an inner edge of each leg portion 21 of the jaw portion 20, the upper edge of each slot 32 defining an abutting surface or shoulder.

A switch blade 34 is formed of conductive material and is pivotally attached between the leg portions 21 of the pivot receptacle 16 by insertion of the rivet 22 through an aperture (not shown) in the blade 34. A recess 35 is provided in the blade 34 to accommodate the rivet 22 in the contact receptacle 17 when the switch is in its closed position (FIG. 1).

In accordance with this invention, bosses 36 and 37 are punched on the blade 34 and positioned to interact with the receptacles 16, 17 respectively, in a manner to be described.

The blade 34 preferably has a laterally edgewise projecting portion 39 (FIG. 2), at the end portion opposite the pivot, provided with barbs 40 for attachment of a handle member 41 which is formed of plastic or other insulating material. The handle member 41 preferably has a top portion 42 of generally rectangular cross section with two opposed sides canted outwardly toward the top to provide gripping surfaces 44. A laterally extending base portion 45 on the handle member 41 protects the user against contact with the conducting portions of the switch. The top portion 42 may be provided with a recessed cavity 46 at its end portion adapted to display circuit information and a lateral aperture 47 therethrough to facilitate switch coupling.

The operation of the knife switch is as follows. When the terminal block 10 is installed on a supporting rail (not shown) and conductors are secured by the terminal clamps 31, the circuit is completed when the switch is in its closed position (FIG. 1) and open-circuited when the switch is in its open position (FIG. 3).

The leg portions 21 of the blade receptacles 16 and 17 grasp the blade 34 in a tight frictional engagement. When the blade 34 is being moved to its closed position, as is shown in FIG. 4, one of the legs 21 engages the boss 37 resisting insertion of the blade 34 into the jaw 20. A force must be applied to the handle member 41 sufficient to cause the boss 37 to spread the leg portions 21 against the inward force exerted by the spring washer 24. When the blade 34 is in its closed position, shown in FIG. 1, the boss 37 rests in the slot 32 in the contact receptacle 17 releasing the leg portions 21 which are pressed inwardly against the surface of the blade 34 by the spring washer 24 and rivet 22 for optimum electrical contact (see FIG. 5).

The switch now is secured in its closed position by the shoulder defined by the upper edge of the slot 32 against vibrational motion since a significant force is required to move the boss 37 through the legs 21 for insertion of the blade 34 and a still larger force must be applied to the handle member 41 to pull the boss 37 through the jaw portion 20 for removal

of the blade 34. Upon release of the blade 34 by the contact receptacle 17, the larger force applied to the handle member 41 provides a quick-breaking action for the switch.

The force required for opening the switch causes the boss 36 to be pulled through the jaw portion 20 of the pivot receptacle 16. Thus, when the blade 34 is in its open position, as shown in FIG. 3, the blade is secured against vibrational movement by the engagement of the boss 36 by the outwardly flared end portion 29 on the pivot receptacle 16. To close the switch, a force must be exerted on the handle member 41 sufficient to cause the boss 36 to spread the leg portions 21 against the inward force of the spring washer 24. The force needed to open and close the switch is determined by the position of the bosses 36 and 37.

It should be apparent to one skilled in the art that other detent means can be provided on the jaw portions 20 which are structurally equivalent to the slot 32. For example, a change in dimension of the jaw portion 20 may accommodate an aperture on the leg portion 21 instead of the slot 32 to retain the boss 37. Alternatively the leg portion 21 could be punched convexly outward to create a boss larger than the boss 37 and in which the boss 37 could be held in the closed position of the switch.

The adaptability of the detent means of the knife switch of the present invention is shown in FIG. 6 wherein a double throw knife switch is illustrated having a pivot receptacle 16a holding a blade 34a for engagement with contact receptacles 17a. Any suitable handle 41a may be used. A boss 37a is aligned to engage a slot 32a on either contact receptacle 17a and a boss 36a will engage either side of the end portion 29a of the pivot receptacle 16a. In this manner the detent means serves to hold the switch in any of two open and two closed positions. It should also be clear that this detent means is adaptable for use in double-pole switches including double-pole double-throw switches.

I claim:

1. A knife switch comprising a base of insulating material, a first blade receptacle and a second blade receptacle mounted in spaced relation on said base, a switch blade having two end portions and being rotatably attached at one end portion to said first blade receptacle and having an open position,

wherein the other end portion of the blade is removed from the second blade receptacle, and a closed position, wherein the other end portion of the blade is received in the second blade receptacle, and cooperating detent means on said blade and blade receptacles for selectively holding the blade in said open and closed positions.

2. A knife switch in accordance with claim 1 wherein said cooperating detent means comprises a boss on said blade and means on said second blade receptacle cooperating with said boss to hold the blade in the closed position.

3. A knife switch in accordance with claim 2 wherein said means on said second blade receptacle comprises a shoulder formed on said second blade receptacle.

4. A knife switch in accordance with claim 1 wherein said cooperating detent means comprises a boss on said blade and means on said first blade receptacle cooperating with said boss to hold the blade in the open position.

5. A knife switch in accordance with claim 4 wherein said means on said first blade receptacle comprises an edge of said first blade receptacle.

6. A knife switch in accordance with claim 1 wherein said cooperating detent means comprises a first boss and a second boss on said blade, first retaining means on said first blade receptacle cooperating with said first boss to hold the blade when the blade is in the open position, and second retaining means on said second blade receptacle cooperating with said second boss to hold the blade when the blade is in the closed position.

7. A knife switch in accordance with claim 6 wherein said first retaining means comprises an edge on said first receptacle and said second retaining means comprises a shoulder formed on said second blade receptacle.

8. A knife switch in accordance with claim 7 including a third blade receptacle mounted on said base in spaced relation with and aligned with said first and second blade receptacles and wherein said blade has a second closed position, in which the other end portion of the blade is received in the third blade receptacle, and a shoulder is provided on said third blade receptacle cooperating with said second boss to hold the blade when the blade is in the second closed position.

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