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C. E. BURT ET AL

2,845,512

PRESSURE SWITCH

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Fig. 1

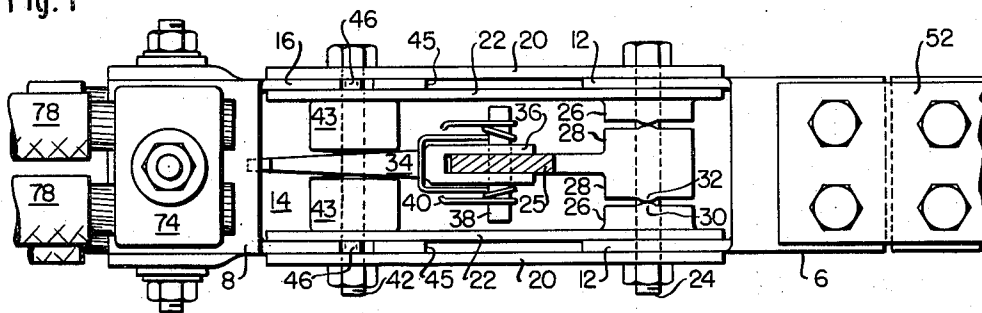


Fig. 2

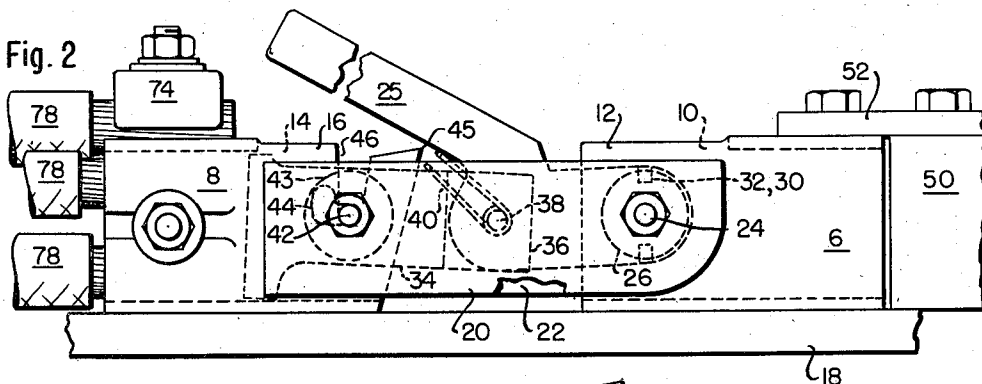


Fig. 5

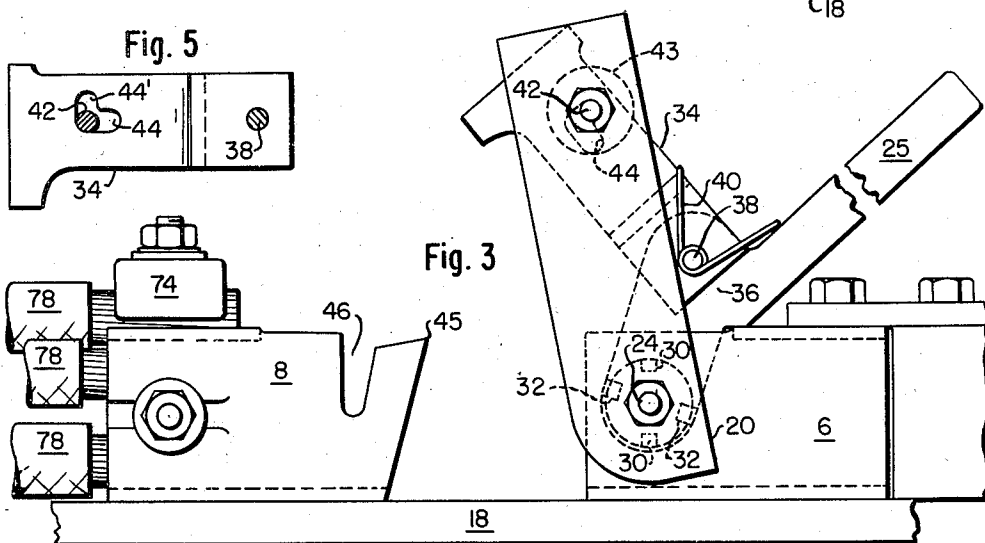


Fig. 3

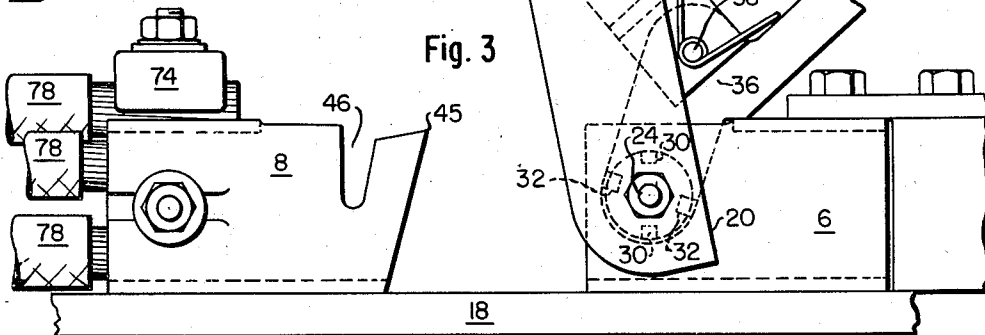


Fig. 4

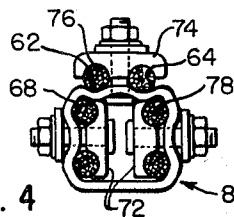
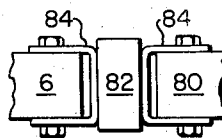


Fig. 6



Fig. 7



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PRESSURE SWITCH

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6 Claims. (Cl. 200-162)

The present invention relates to pressure switches and more particularly to switches of high current capacity in which the contact surfaces are maintained under considerable pressure when closed.

One of the objects of the present invention is to provide a pressure switch by which adequate contact pressure may be applied when the switch is closed, but in which the pressure is readily relieved when the switch is to be opened.

Another object of the invention is to provide a high-current switch having simple and effective means for connecting conductors thereto.

With these and other objects in view as will hereinafter appear, one of the principal features of the invention comprises a switch in which the body is made of standard rectangular or square hollow tubing. The elements are mounted in such a manner as to apply high contact pressure at the pivot points and at the ends of the blades, through the medium of camming or wedging devices conveniently operated by a manual handle.

The square tubular construction is advantageous not only because of simplicity in formation of the switch proper, but also in the means for connecting conductors thereto. For example, in the case of bus bars also formed of hollow tubing the connections are easily made by means of fish plates. For circular conductors, such as stranded copper conductors, a clamping arrangement to be hereinafter described in detail may be used and forms, itself, one of the principal features of the invention. The construction is preferably such that whether bus bars or circular conductors are used, a "straight through" assembly is formed whereby the current flows through the conductors and the switch body in a substantially straight path without turning of corners in such a way as to tend to open the switch by magnetic forces.

Other features of the invention comprise certain features of construction and combinations and arrangements of parts hereinafter described and particularly defined in the claims.

In the accompanying drawings,

Fig. 1 is a plan view of a switch according to the present invention, showing two different types of connections thereto;

Fig. 2 is a side elevation of the switch shown in Fig. 1;

Fig. 3 is a view similar to Fig. 2 but with the switch open;

Fig. 4 is an end elevation of one form of connector, shown on a reduced scale;

Fig. 5 is a sectional view of the wedge member; and

Figs. 6 and 7 are detail side and plan views of a fuse block connection.

The illustrated embodiment of the invention comprises a switch body, preferably in the form of a hollow square, comprising two lengths of standard hollow square copper tubing, shown generally at 6 for one end thereof and at 8 for the other end. As shown in the drawings, the part 6 is the pivot end of the switch and is at the right, while

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part 8 is the jamb portion and is at the left. The pivot end of the switch body 6 has its top wall cut away at 10 while the side walls are continued toward the left as indicated at 12. For the jamb end of the switch the top wall is cut away at 14, while the side walls continue inwardly as indicated at 16. The side walls 12 and 14 constitute the fixed blades of the switch.

The two sections 6 and 8 of the switch body are bolted on a suitable insulating base 18.

There are two movable blades at each side of the switch, namely, an outer blade 20 and an inner blade 22. The movable blades 20 and 22 of each side are pivoted on a bolt 24 which passes through the side walls 12 and all four of the movable blades. The left-hand ends of the movable blades, as indicated in Fig. 1, are adapted to embrace the stationary side walls 16.

A manual operating handle is connected with the inner and outer blades 20 and 22. The handle is shown at 25. Secured to the inner surface of each inner blade 22 is a rotary cam 26. Mounted on the handle and opposed to each cam 26 is a cam 28. As shown in Fig. 1, when the switch is closed the high parts 30 and 32 of the cams 26 and 28 are opposed, thereby spreading the inner blades 22 in an outward direction for contact with the stationary side wall portions 12 of the body 6. On the other hand, upon relative rotary movement between the handle and the switch blades the high points 30 and 32 of the cams are moved to non-opposing positions, thereby relieving the spreading pressure on the blades. It will be observed that the outer blades 20 are maintained a fixed distance apart by the bolt 24; hence the camming action by the cams 26 and 28 acts to spread the inner blades 22 against the side walls 12 and by reason of the resiliency of the latter to spread the latter outwardly and into engagement with the outer blades 20.

The handle is arranged in such a manner that after the blades are in closed position a further movement of the handle brings the cam surfaces 30 and 32 into engagement as indicated in Fig. 1 to give the locking action above described. Upon an opening movement the first action is to release the lock by a clockwise rotation of the handle as viewed in Fig. 2 to relieve the pressure.

The closing motions of the handle is also utilized to provide a pressure contact between the outer ends of the blades 20 and 22 and the side walls 16 of the body part 8. To this end the handle has pivoted to an intermediate part thereof a wedge member 34, the wedge being formed at the right end with a yoke portion 36 which is pivoted on the handle 25 by pin 38. A yoke spring 40 tends to hold the wedge member 34 in a downward position relative to the handle.

The outer blades 22 are constrained at their left-hand ends against spreading by means of a bolt 42. Mounted on the bolt 42 are wedge blocks 43, between which the wedge member 34 may slide, to spread the blades 22 against the walls 16. The wedge member 34 is provided with a slot 44 through which the bolt 42 passes, whereby the member 34 may assume either the locking position of Fig. 2 or the unlocked position of Fig. 3.

Effective arc isolation is attained without the use of auxiliary contacts. To this end, as shown in Figs. 2 and 3, each jamb side wall 16 is formed at its end with a point 45 which constitutes the last point of contact between the side wall 16 and the movable blades as the switch is being opened. The points 45 therefore serve as arcing points to localize the effects of arcing. These points lie above the level of the uppermost parts of the movable blades when the switch is closed, as is apparent from Fig. 2 so that any pitting in the region of the points 45 will not affect the electrical contact between the fixed and movable blades. The localization of arcing effects is enhanced by sloping the end and top walls of the por-

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tions 16, as best shown in Fig. 3, so that the point 45 is at the corner of an acute angle.

To the left of the points 45 each side wall is formed with a vertical slot 46 to accommodate the bolt 42, which as above described passes through the movable blades and supports the blocks 43.

The slot 44, heretofore mentioned, has a vertical portion 44' so that the entire slot is L-shaped, as viewed in Fig. 5. The purpose of the slot is to allow for proper actuation of the switch, without jamming, as will presently be described.

The parts thus far described operate in the following manner: Starting with the closed position of Fig. 2, the bolt 42 is at the end of the horizontal portion of the slot 44. The blades are locked by reason of the fact that the wedge blocks 43 are spread by the wedge member 34 and the cams 26 are spread by the cam 28, as shown in Fig. 1. Opening of the switch is effected by clockwise motion of the handle. The first part of the clockwise motion accomplishes two results: First, it releases the cams 26, 28, and second, it slides the wedge member 24 until the bolt 42 lies at the corner of the L-shaped slot 44, as shown in Fig. 5. Upon further clockwise motion of the handle, both the blades and the wedge member are lifted toward the position of Fig. 3. On the first part of this motion, after the wedge member 34 is moved away from the base of the switch, the spring 40 turns the wedge member counterclockwise relative to the blades, so that the portion 44' of the slot embraces the bolt 42. Continued motion of the handle then brings the blade to full-open position represented by Fig. 3.

It will be noted that in full open position, the bolt 42 is seated at the upper end of the slot 44', so that no relative movement between the wedge member and blades is possible. Otherwise, a rapid closing movement of the handle, especially if the blade movement were resisted by friction, might result in a relative movement of the wedge and handle with respect to the blade, and that might cause such relative movement between the cams 26, 28 as to lock the blades in open position. However, because of the slot portion 44', the bolt is seated in the slot in Fig. 3, and motion of the handle causes the wedge member and blades to move together.

As closing is approached, upon a counterclockwise motion of the handle, the bottom of the wedge member 34 strikes the bottom wall of the jamb section 8, whereupon continued movement of the handle brings the blades to closed position. The parts then reach the position of Fig. 5 wherein the bolt lies at the corner of the L-shaped slot 44. Then the final closing movement of the handle slides the wedge member 34 to the left until the bolt is seated at the extreme right end of the slot 44, as shown in Fig. 2.

The "horizontal" and "vertical" portions of the slot are defined as shown in Fig. 2; actually the horizontal portion is better defined as being generally lengthwise of the blades and the vertical portion as generally perpendicular thereto, since the switch is useful in any position.

It will be noted that in fully closed position, the left end of the wedge 34 underlies the top wall of the hollow square 8. In other words, the last portion of the closing movement of the handle causes the left-hand end of the wedge to ride under the top wall, as best shown in Fig. 2. This provides a locking action which prevents accidental opening of the switch except through the use of the handle, as described above.

The connections to the switch are made in simple and effective fashion. Hollow square buses may be used, preferably of the same size as the hollow square body portions 6 and 8 of the switch. One such bus is shown at 50, for the right-hand end of the switch. It is simply butted against the switch parts and is secured thereto in any suitable way as, for example, by fish plates, one of which is shown at 52 in Figs. 1 and 2. Either external plates as shown, or internal plates, may be used. Similar plates may be bolted to the sides of the switch and bus,

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and under such conditions the current distributions are especially favorable, since all parts of the switch contribute to the passage of current and the voltage drop across the switch will be low. Furthermore, this arrangement produces a "straight-through" connection by which the current progresses in a substantially straight direction through the entire assembly so that under high current conditions there are no excessive magnetic forces which would tend to open the switch.

Flat buses, when used, may be readily bolted to the top, bottom or side walls of the body portions of the switch, in the same manner as the plate 52. While a straight-through connection is preferred, it is possible to bring the buses to the switch from the bottom (or rear) if desired.

Another form of connector is shown at the left end of the switch, and is preferred when the conductors leading to or from the switch are in the form of round conductors. The body 8 of the switch then comprises a hollow square which is distorted in such a form as to clamp the conductors. As shown in the end view of Fig. 4, the part 8 is provided at its top and side walls with wave-like surfaces preferably formed by subjecting the square tubing to a pressing operation. Thus the top wall is provided with two concave groove or channel portions 62 and 64 separated by a central convex portion. Each side wall is concave at its upper and lower corners as indicated at 68. The bottom wall is preferably left flat for purposes of mounting. A clamp member 72 is received within the tube to cooperate with each side wall and a clamp member 74 is mounted on the top wall. The clamps have recesses 76 cooperating with the concave portions 62, 64 and 68 of the switch body. Stranded conductors 78 are received between the clamps and the walls in the manner indicated and the clamps are taken up tightly against the conductors. It will be observed that the conductors are crushed into large-surface engagement with the top and side walls of the switch body. The advantages of the "straight-through" connection are also attained by this construction, since the general direction of current flow is approximately along the axis of the switch blades.

It will be observed that the connector shown in Fig. 4 eliminates the need of bolted lugs, since the conductors are crushed directly into good electrical contact with the switch body. When connections to the corners only are desired, especially in switches of the smaller sizes, pre-distortion of the body member is not necessary, since the conductors may be fitted into the corners, and the screw clamps may be used to crush the conductors into tight contact.

In Figs. 6 and 7 we show a fuse block connection to which the switch is especially well adapted. The body 6 is shown as separated from the tubular bus 80. The fuse comprises a block 82 having straps U-shaped 84 which are bolted to the switch body and the bus. This provides a simple and accessible arrangement for securing the fuse, without the necessity for special connections. It will be observed that the advantages of the straight-through arrangement are preserved.

In most installations, the same type of connection will be used at both ends, and it will be understood that the showing of different types at opposite ends is for illustrative purposes only. With any form of connection, the parts may be installed with exceptional facility, since no soldered joints or lugs or other connections are required. The switch is readily adapted to new or existing installations whether flat, tubular or round buses or connectors are used. Although the preferred form of the invention has been shown, it will be understood that the invention is not limited to the particular form of the invention shown and described, but may be modified in ways that will be familiar to those skilled in this art.

Having thus described the invention, I claim:

1. A pressure switch comprising fixed and movable blades, a pivot for the movable blades, a handle for operating the movable blades, cooperating cams carried

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on the pivot by the handle and movable blades, a wedge member pivoted on the handle and mounted for sliding movement relative to the movable blades, wedge blocks cooperating with the wedge member and carried by the movable blades, and means operated by continued angular movement of the handle after conclusion of the closing movement of the movable blades to cause relative motion of the wedge member and blocks to apply contact pressure to the blades.

2. A pressure switch comprising fixed and movable blades, a pivot for the movable blades, a handle for operating the movable blades, cooperating cams carried on the pivot by the handle and movable blades, a wedge member pivoted on the handle and mounted for sliding movement relative to the movable blades, wedge blocks carried by the movable blades and spread apart by the wedge member upon continued angular movement of the handle after a closing movement of the blades, and a bolt-like member passing through the blades and wedge member, the wedge member having a slot to receive the bolt-like member and with a portion to permit relative locking movement between the wedge member and blades on a closing movement, and with a portion to seat the bolt-like member on an opening movement to prevent relative sliding between the wedge member and blades.

3. A pressure switch comprising fixed and movable blades, a pivot for the movable blades, a handle for operating the movable blades, cooperating cams carried on the pivot by the handle and movable blades, a wedge member pivoted on the handle and mounted for sliding movement relative to the movable blades, wedge blocks carried by the movable blades and spread apart by the wedge member upon continued angular movement of the handle after a closing movement of the blades, and a bolt-like member passing through the blades and wedge member, the wedge member having an L-shaped slot to receive the bolt-like member, said slot having a portion generally lengthwise of the blades and a portion generally perpendicular thereto, whereby motion of the wedge

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member with the first of the slot embracing the bolt-like member results in a relative locking or unlocking movement of the wedge member with respect to the blades, and seating of the bolt-like member in the other portion of the slot prevents a relative sliding motion of the wedge member and blades.

4. A pressure switch comprising two hollow tubular body members of rectangular cross-section, each body member having at one end a complete four-sided hollow portion and at the other end having a part of its top wall removed to leave a flat bottom wall and flat side walls, said side walls constituting stationary switch blades, insulating support means, means for securing the body members directly upon the insulating support means, movable blades pivoted on the side walls of one of said body members and adapted to close on the side walls of the other of said body members, wedging means operated by the closure of the movable blades to press the movable blades into pressure engagement with the both of said body members, and connector means secured directly to the complete end portions of said tubular body members.

5. A switch as defined in claim 4, in which at least one of the body members has its complete end portion formed with longitudinal channels, conductors received in the channels, and clamping means are secured to said body member and engage the conductors.

6. A switch as defined in claim 4, in which a tubular conductor of similar shape to the tubular end portion of one of the body members is disposed longitudinally adjacent to the end thereof, and a connecting plate is provided to secure the conductor to the body member.

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