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E. H. LITTLE

2,184,780

SWITCH

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Fig. 1

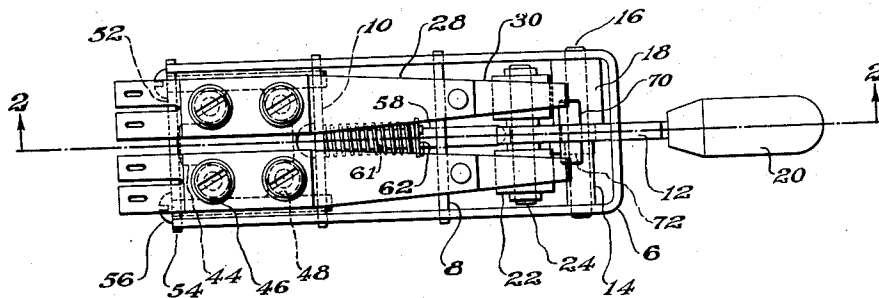


Fig. 2

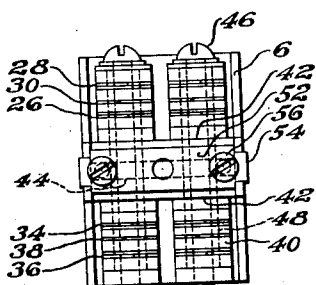
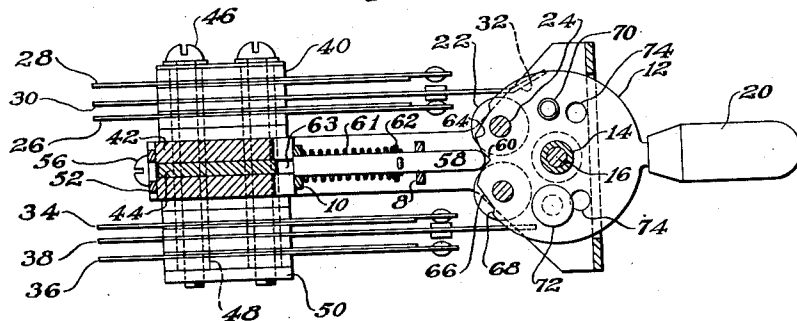


Fig. 3

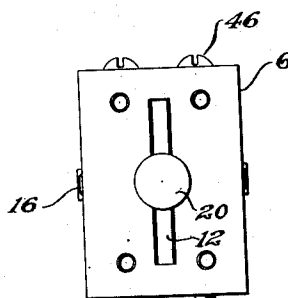


Fig. 4

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UNITED STATES PATENT OFFICE

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SWITCH

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2 Claims. (Cl. 200—1)

The present invention relates to switches and more particularly to so-called cam switches in which one or more movable contacts are operated by a cam or similar device.

One object of the present invention is to provide a cam switch having provision for selective operation of contacts under either locking or non-locking conditions, and arranged to prevent overrunning of the switch parts upon a restoring movement to normal position.

Another object is to provide a contact group assembly which is attachable to and removable from the switch frame as a unitary structure, without disturbing the adjustment of the contacts.

With these and other objects in view, as will hereinafter appear, the present invention comprises the switch hereinafter described and particularly defined in the claims.

In the accompanying drawing illustrating what is now considered the preferred form of the invention, Fig. 1 is a plan view of the switch; Fig. 2 is a sectional elevation on line 2—2 of Fig. 1; Fig. 3 is a rear elevation; and Fig. 4 is a front elevation of the switch.

The switch illustrated in the drawing comprises a metal frame 6, U-shaped in plan, the side arms of which are maintained in proper spaced relation by spacers or struts indicated at 8 and 10, the struts being provided with ears extending through suitable slots in the frame and riveted over. Pivoted at the front end of the frame is a cam plate 12 of generally circular form. The cam plate is mounted on a hub 14 which is pressed on a shaft 16. The shaft with its assembled cam plate and hub is free to oscillate in the side walls of the frame. The hub is provided at one side with an enlarged portion 18 between one side of the cam plate and the frame to act as a spacer and to maintain the cam plate in a proper position. The front of the plate 12 extends through a vertical slot in the front of the frame and carries at its outer end a handle 20. Near the rear of the plate and on opposite sides of the median line are mounted cam rollers 22 of insulating material. The rollers are supported on shafts 24 which are pressed in the plate 12. As shown in Figs. 1 and 2 the rollers are four in number, there being one on each side of the plate both above and below the median line. The rollers are constructed to operate the movable contacts of four switch groups.

The switch members include four groups of contacts, two above and two below the median line of the switch. As shown in Fig. 2 the two

upper groups are of the locking type and the two lower groups are of the non-locking type, that is to say, upon operation of the switch with respect to the upper groups, the plate 12 is locked until manually restored, whereas when the switch is operated on the lower groups it is not locked but immediately returns to normal position upon release of the switch handle. The upper or locking groups each comprise fixed contact springs 26 and 28 and an intermediate or movable contact spring 30, the front end of which is bent upwardly as indicated at 32. Each of the lower groups comprises fixed contact springs 34 and 36 and a straight intermediate or movable contact spring 38. The ends of the movable contact springs 30 and 38 lie adjacent to the respective actuating rollers 22.

The contact springs of the several groups are mounted between blocks of insulating material 40. The four groups are mounted on metal blocks or plates 42 which extend horizontally between the arms of the frame at the rear thereof. Between the blocks 42 is a spacer plate 44 of the general shape indicated in dotted lines in Fig. 1. The contact groups are mounted in place on the blocks 42 by screws 46 which extend through suitable openings in the contact springs and the blocks, and are insulated from the contact springs by bushings 48. The screws are threaded into tapped plates 50 at the bottom. The entire contact assembly is supported by means of a strap 52 having ears 54 seated in suitable recesses at the ends of the frame. Longitudinal screws 56 extend between the strap 52 and the strut 10, the latter being tapped to receive the screws. The spacer plate 44 is of a thickness approximately equal to the diameter of the screws and, as shown in Fig. 1, it lies between the screws, its corners being cut out to partially surround the insulating bushings 48. The entire contact assembly therefore is removable and attachable as a unit. This is an important feature since it permits inspection of the contacts without disturbing their adjustment.

The cam plate 12 cooperates with a detent plunger 58 to hold the plate normally in the position shown in Fig. 2. The plate has a deep angular notch 60 in which the end of the plunger is normally seated. The plunger is mounted to reciprocate in openings in the struts 8 and 10 and is normally urged in a forward direction by a coil spring 61 which bears at the rear against the strut 10 and at the forward end against a washer 62 held in place on the plunger by any suitable means such as a cotter pin. Imme-

diately in the rear of the plunger 58 the blocks 42 are recessed as indicated at 64 to permit rearward movement of the plunger.

The cam plate on both sides of the notch 60 is provided with inclined surfaces 64 at a reentrant angle. Adjacent to the surfaces 64 the plate is formed with surfaces 66 on which the end of the detent plunger may ride when the plate is moved to a locking position. These surfaces terminate in stop shoulders 68. Adjacent to the shoulders 68, the surfaces 66 are approximately perpendicular to radii drawn from the axis of the cam plate.

The cam plate is provided with openings to receive pins for determining the extent of movement thereof and the pins are of different sizes depending on whether locking or non-locking operation is called for. Two such pins are shown at 70 and 72, the former being of small diameter to permit of considerable clockwise motion of the cam plate from its central position before the pin strikes the front wall of the frame. The pin 72 has an enlarged portion so that the counter-clockwise movement of the cam plate is considerably more limited. The plate also has holes 74 immediately adjacent to the front wall of the frame to permit insertion of a pin and thus prevent any movement of the cam in one direction or the other.

When the handle 20 is pressed downwardly to turn the cam plate clockwise, a considerable degree of movement is permitted before the pin 70 strikes the front wall of the frame. This degree of movement is such that the detent plunger contacts approximately with the lower stop shoulder 68. The switch is now "locked", first because the longitudinal axis of the plunger is perpendicular to the surface 66 and also because the upper rollers lie under the outwardly bent ends 32 of the contact springs. Both the detent spring 61 and the contact spring 30 resist a return movement. The switch may be restored to its original position by manually moving the handle upwardly.

To operate the lower contact groups the handle is moved upwardly, or counter-clockwise. The pin 72 strikes the front wall of the casing at about the time the end of the detent plunger is in contact with the corner between the two surfaces 64 and 66. Furthermore the pressure of the flat springs 38 against the lower rollers 22 is such as to urge the parts toward normal position. This is the "non-locking" condition, and upon release of the handle the switch is immediately restored to its original position.

An important feature resides in the fact that

any restoring movement of the switch cannot result in overrunning, which might result in operation of the opposite contacts. The danger of overrunning is greatest when the switch is returned from a locked position, since this is usually accomplished by quickly flipping the end of the handle. According to the present invention, the reentrant surfaces 64 serve to guide the plunger 58 toward the notch 60. The plunger then seats positively in the notch and restrains the cam plate from any movement beyond the median position.

The switch is adaptable to a wide variety of contact group combinations with a small number of standard parts. For example, all of the groups may be made of the same character, that is locking or non-locking. Although two upper and two lower groups are shown, one or more of these may be omitted. Furthermore, although each group has been shown as including a single movable contact operable between two fixed contacts, the actual contact arrangement may be modified in desired manner, depending on the electrical functions to be performed.

The invention having been thus described, what is claimed is:

1. A switch comprising a frame, contact members, a pivoted cam plate having means for operating the contact members, the cam plate having in its edge a deep notch, reentrant surfaces of less steepness leading to the notch from opposite sides thereof, and detent-retaining surfaces oppositely inclined from said reentrant surfaces, a spring pressed detent normally received in the notch and adapted to be guided into the notch by said reentrant surfaces upon a return movement of the plate, and stop means carried by the plate to abut the frame and thereby to limit the operating movement of the cam plate.

2. A switch comprising a frame, contact members, a pivoted cam plate having means for operating the contact members, the cam plate having in its edge a deep notch, reentrant surfaces leading to the notch from opposite sides thereof, and detent-retaining surfaces oppositely inclined from said reentrant surfaces, a spring pressed detent normally received in the notch and adapted to be guided into the notch by said reentrant surfaces upon a return movement of the plate, and selective stops carried by the plate and arranged to engage the frame to limit operating movement of the plate and to permit locking or non-locking operation thereof by determining the position of the detent with respect to said surfaces.

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