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3,304,380

MULTIPLE MICROSWITCH

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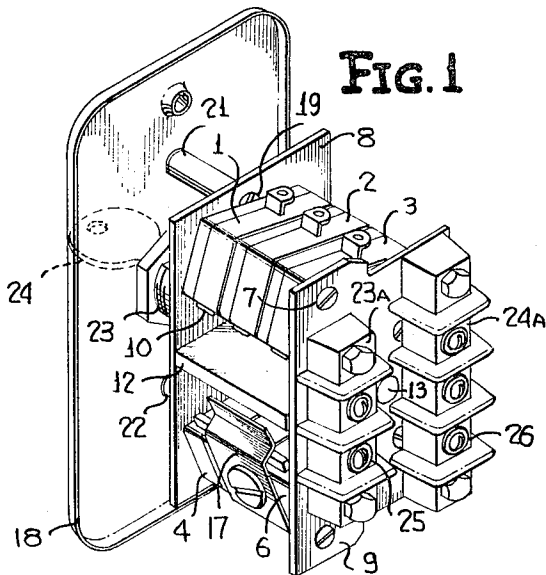


FIG. 1

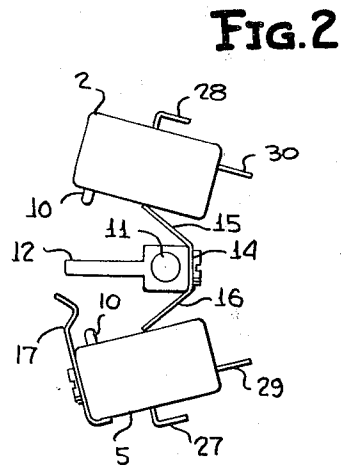


FIG. 2

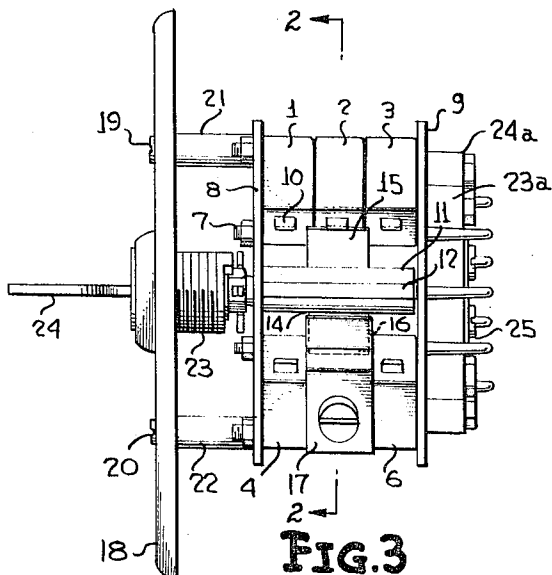


FIG. 3

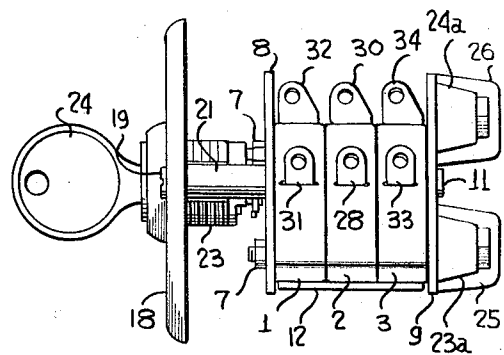


FIG. 4

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MULTIPLE MICROSWITCH

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This invention relates to switch actuators and more particularly to micro switch actuators wherein the actuator acts against pressure to actuate a first bank of switches and locks into place to actuate a second bank of switches.

In many applications it is necessary to operate one group of switches in an intermittent mode of operation or to lock the actuator in a given position to continuously actuate a second group of switches. One such application is in the operation of electric motor controls wherein it is necessary for the operator to have control of the motor when running in a first direction, while operation in a second direction may be unattended and stopped automatically. No switch-actuator combination is presently available which will actuate one bank of switches while pressure is applied to the actuator in one direction and will actuate a second bank of switches and lock in place when pressure is applied in a second direction.

Briefly describing the preferred embodiment of the present invention, two banks of microswitches are situated on either side of a rotating arm which may be rotated in a first direction to actuate a first bank of switches and rotated in a second direction to actuate a second bank of switches. The rotating arm is spring biased away from both banks of switches. Means are provided, such as a spring latch, to hold the rotating arm in position when it has actuated one of the banks of switches, while actuation of the other bank of switches is non-locking requiring that torque be applied to the rotating arm to overcome the bias of the spring.

It is an object of the present invention to provide a switch actuator having a non-locking position which will actuate a first bank of switches only while pressure is applied to the actuator and having a locking position for actuating a second bank of switches when sufficient pressure is applied to the actuator to latch it in place adjacent the second bank of switches.

An additional object of the present invention is to provide a switch actuator which may be operated by means of a key to prevent unauthorized persons from using the device.

Yet another object of the present invention is to provide a switch actuator which is simple in construction and inexpensive to manufacture.

Still another object of the present invention is to provide a switch actuator which can be made to actuate banks of switches composed of any number of switches.

Another object of the present invention is to provide a switch actuator and switch combination which is applicable for controlling a reversible electric motor wherein the motor is turned off by a limit switch when rotating in a particular direction.

The above and still further features, objects and advantages of the present invention will become apparent upon consideration of the following detailed description of a specific embodiment of the invention, especially when taken in conjunction with the accompanying drawings, wherein:

FIGURE 1 is a view in perspective of a preferred embodiment of the switch actuator of the present invention;

FIGURE 2 is a sectional view taken along line 2-2 of FIGURE 3;

FIGURE 3 is a side view of the preferred embodiment of the switch actuator of the present invention;

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FIGURE 4 is a top view of the preferred embodiment of the switch actuator of the present invention.

Proceeding now more particularly by reference to the accompanying drawings, FIGURE 1 illustrated a switch actuator according to the present invention. Switches 1, 2, and 3 form a first bank of switches and switches 4, 5, and 6 form a second bank of switches each of the banks being held in place by screws 7 which secure inner end plate 8 and outer end plate 9 in a stack with the switches. The switches 1 to 6 are provided with actuating buttons 10 extending from the switch casings to move contacts within the casings upon application of pressure to the buttons. The switch actuator mechanism is located between the switch banks and includes a rod 11 having a flat elongated arm 12 extending therefrom. Rod 11 is supported in hole 13 in outer end plate 9 and a similar hole in inner end plate 8. Attached securely to rod 11 is a spring 14 having a first extension 15 coming into contact with the first bank of switches 1, 2, and 3 and a second extension 16 coming into contact with the second bank of switches 4, 5, and 6. Spring 14 biases arm 12 away from both the first bank of switches 1, 2, and 3 and the second bank of switches 4, 5, and 6 so that arm 12 normally is positioned midway between the two switch banks and out of contact with either of them. When the rod 11 is turned toward the first bank of switches the arm 12 is prevented from moving freely by the spring extension 15, such that a continuous torque must be applied to the rod 11 to maintain contact between the arm and the button actuators of the first switch bank. When rod 11 is turned toward the second bank of switches the arm 12 is again prevented from moving freely by the spring extension 16. A spring clip 17 is attached to the second bank of switches in such a manner as to intercept the arm 12 and lock it in place with the switches of the second switch bank actuated. The arm 12 requires pressure be applied to it to force it against the bias of spring extension 16 and into latched position with the spring clip 17. Thus to actuate the first bank of switches 1, 2 and 3 torque must be continuously applied to rod 11 to move arm 12 against the bias of spring extension 15 the arm 12 returning to its normal or neutral position between the two switch banks upon removal of the applied torque. To actuate the second bank of switches 4, 5, and 6 torque is applied to rod 11 to move arm 12 against the bias of spring extension 16 and to engage the spring clip 17 to latch the arm 12 in an actuating position. Thus, spring clip 17 locks arm 12 in position for actuating the second bank of switches until forcibly released, while no such locking position is available for actuating the first bank.

The combination of switch banks secured together with end plates 8 and 9 with the switch actuator mechanism consisting of the rod 11 and the arm 12 rotatably mounted in the end plates 8 and 9 is secured by means of screws 19 and 20 and spacers 21 and 22 to a wall plate 18. The latter is adapted to be secured to a wall or panel, the switch mechanism extending through a hole therein. To prevent unauthorized tampering, a key operated lock mechanism 23 may be coupled to the rod 11 such that the rod may be rotated only by operating the lock mechanism with a key 24. Of course, other suitable means may be used to rotate rod 11, such as a knob or a handle. Secured to the outside face of the outer end plate 9 are terminal strips 23a and 24a which have binding posts 25 and 26 to which the external wiring for the switch banks may be secured.

The essential elements of the actuator mechanism are shown in FIGURE 2 which is a sectional view taken along line 2-2 of FIGURE 1. Rod 11 has arm 12 attached thereto and is biased to a central position by a spring 14 having spring extensions 15 and 16 butted against switches

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2 and 5 respectively. Switch 2 has a contact button 10 for making contact between terminals 28 and 30 when arm 12 depresses contact button 10. Similarly, switch 5 has a contact button 10 for making contact between terminals 27 and 29 when arm 12 depresses contact button 10. Attached to switch 5 is a spring clip 17 which latches arm 12 in position adjacent contact button 10 of switch 5 in a manner that depresses the contact button 10 of switch 5.

To operate switch 2 rod 11 is rotated so that arm 12 moves into contact with contact button 10 of switch 2 against the bias of spring extension 15. When it is desired to operate switch 2 torque must be maintained on rod 11 to keep arm 12 in contact with contact button 10 of switch 2 since spring extension 15 continually tends to return arm 12 to a neutral position between switch 2 and switch 5. When it is desired to operate switch 5 rod 11 is rotated against the bias of spring extension 16 until spring clip 17 latches arm 12 in switch operative position against contact button 10 of switch 5. To deactivate switch 5 rod 11 is rotated to move arm 12 away from switch 5 until arm 12 is freed from spring clip 17. Spring extension 16 will move arm 12 back to a neutral position between switches 2 and 5 when arm 11 is released from spring clip 17.

FIGURE 3 shows a side view of the switch actuator in combination with the switches it is to actuate. The first bank of switches 1, 2 and 3 and the second bank of switches 4, 5 and 6 form a stack of elements bolted together with inner end plate 8 at one end of the stack and outer end plate 9 at the other end of the stack. The inner end plate 8 and the outer end plate 9 have holes therein to support the rod 11 bearing arm 12 in a position between the switch banks. The rod 11 and arm 12 are maintained in a neutral position between the switch banks by the spring 14 having spring extensions 15 and 16. The switch banks and the switch actuating mechanism is secured to a wall plate 18 by screws 19 and 20 and spacers 21 and 22. A key operated lock 23 is coupled to the rod 11 so that the rod 11 may be rotated by operating the lock with a key 24. Mounted on the outer end plate 9 are terminal strips 23a and 24a having binding posts 25 and 26 to which leads from the switch banks may be secured.

FIGURE 4 is a top view of switch actuator and switch combination. In addition to the features shown in FIGURE 3 FIGURE 4 shows the lead terminals of the bank of switches 1, 2 and 3. Switch 1 has terminals 31 and 32, switch 2 has terminals 28 and 30, and switch 3 has terminals 33 and 34.

The concept of the switch actuator of the present invention includes an element which is movable in opposite directions and biased toward a neutral position. In one direction of movement the bias only acts on the actuator to return it to a neutral position, thus constant pressure on the actuator is necessary to keep it in position to actuate a switch. In a second direction of movement the bias acts to return the actuator to a neutral position, but a latch retains the actuator in position to actuate a switch without the necessity of applying pressure to the switch actuator. The preferred embodiment of the present invention shows the switch actuator moved in a circular arc. However, any kind of motion such as linear, helical, spiral, etc. would be effective if operated against a bias tending to return the actuator to a neutral position.

Having thus shown and described one embodiment of this invention, it is to be understood that various modifications, adaptations, and alterations may be applied to the form shown without in any manner departing from the spirit or scope of the present invention except as limited by the appended claims.

What I claim is:

1. In combination, a first bank of switches, a second bank of switches, said first and second banks of switches being separately located, a switch actuating element,

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means supporting said switch actuating element in a position from which the separately positioned switches may be actuated, means biasing the switch actuating element to a neutral position, and means attached to said second bank of switches for latching the switch actuating element in operative contact with the second switch bank, wherein the switch actuating element is an arm extending from a rotatable shaft, including a rotary motion producing key operated lock mechanism wherein the switch actuating element and the rotatable shaft are rotated by means of the key operated lock mechanism.

2. In combination, a switch actuating element, switch means actuatable by said switch actuating element, means biasing said switch actuating element away from said switch means, and means for latching said switch actuating element in operative contact with said switch means, wherein said switch actuating element is an arm extending from a rotatable shaft, including a rotary motion producing key operated lock mechanism wherein the switch actuating element and the rotatable shaft are rotated by means of the key operated lock mechanism.

3. A switch actuating device comprising, a switch actuating element movable in opposite directions, means biasing the switch actuating element to a neutral position, means supporting the switch actuating element between separately positioned switches for actuation thereby, and means for latching the switch actuating element in operative contact with one of the separate switches whereby movement of the switch actuating element in a first direction requires continual force to actuate a switch and movement of the switch actuating element in a second direction requires a force until the switch actuating element latches to the means for latching and is held in operative contact with a switch, wherein the switch actuating element is an arm extending from a rotatable shaft, including a rotary motion producing key operated lock mechanism wherein the switch actuating element and the rotatable shaft are rotated by means of the key operated lock mechanism.

4. A microswitch assembly, comprising
a first array of microswitches,
a second array of microswitches,
a rotatable shaft,
a switch actuator secured to said shaft for rotation therewith,
said switch actuator including an arm extending in a direction at right angles to the axis of said shaft,
means securing the microswitches of said arrays of microswitches in two adjacent spaced-apart columns extending parallel to said axis of said shaft,
each of said microswitches including an actuating button extending toward said switch actuator,
means supporting said shaft so that said arm is located intermediate said arrays of microswitches and in actuating relation to all said actuating buttons,
said actuating buttons being so spaced with respect to each other and with respect to said arm that rotation of said arm through a relatively small angle in one sense causes said arm to impinge on the buttons of one of said arrays of microswitches and that rotation of said arm through a relatively small angle in a sense opposite to said one sense causes said arm to impinge on the buttons of the other array of microswitches, and

spring means normally biasing said shaft so that said arm is located in non-impinging relation to all said actuating buttons.

5. The combination according to claim 4 wherein said spring means is a substantially U-shaped leaf spring having a base and having arms extending from said base, and wherein said base is secured to said shaft for rotation, said arms respectively extending to contact with said arrays of microswitches, respectively.

6. The combination in accordance with claim 5 wherein is included only one releasable spring latch for said

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arm, said releasable spring latch being positioned releasably to secure said arm when said shaft is rotated through one only of said relatively small angles.

7. The combination in accordance with claim 5 wherein is further provided two end plates disposed in parallel relation with each other and in perpendicular relation to said axis of said shaft, and means securing said micro-switch columns between said end plates.

8. The combination in accordance with claim 7 further comprising rows of electrical terminals secured to one of said end plates and means connecting said terminals to contacts of said microswitches.

9. The combination of claim 8, further comprising a substantially planar spring latch having a V-shaped bend at one end, means for securing said spring latch to one of said columns of microswitches such that said one end extends towards said arm and that the base of said V-shaped bend is substantially but movably disposed in the path of said arm when said shaft is rotated through only one of said relatively small angles.

10. In combination, a first bank of switches, a second bank of switches, said first and second banks of switches being separately located, a switch actuating element, means supporting said switch actuating element in a position from which the separately positioned switches may be actuated, means biasing the switch actuating element to a neutral position, and means attached to said second bank of switches for latching the switch actuating element in operative contact with the second switch bank, wherein the switch actuating element is an arm extending from a rotatable shaft, and further including a rotary motion producing mechanism wherein the switch actuating element and the rotatable shaft are rotated by means of said mechanism.

11. In combination, a switch actuating element, switch means actuable by said switch actuating element, means biasing said switch actuating element away from said

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switch means, and means for latching said switch actuating element in operative contact with said switch means, wherein said switch actuating element is an arm extending from a rotatable shaft, and further including a rotary motion producing mechanism wherein the switch actuating element and the rotatable shaft are rotated by means of said mechanism.

12. A switch actuating device comprising, a switch actuating element movable in opposite directions, means biasing the switch actuating element to a neutral position, means supporting the switch actuating element between separately positioned switches for actuation thereby, and means for latching the switch actuating element in operative contact with one of the separate switches whereby movement of the switch actuating element in a first direction requires continual force to actuate a switch and movement of the switch actuated element in a second direction requires a force until the switch actuating element latches to the means for latching and is held in operative contact with a switch, wherein the switch actuating element is an arm extending from a rotatable shaft, and further including a rotary motion producing mechanism wherein the switch actuating element and the rotatable shaft are rotated by means of said mechanism.

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