

Feb. 24, 1970

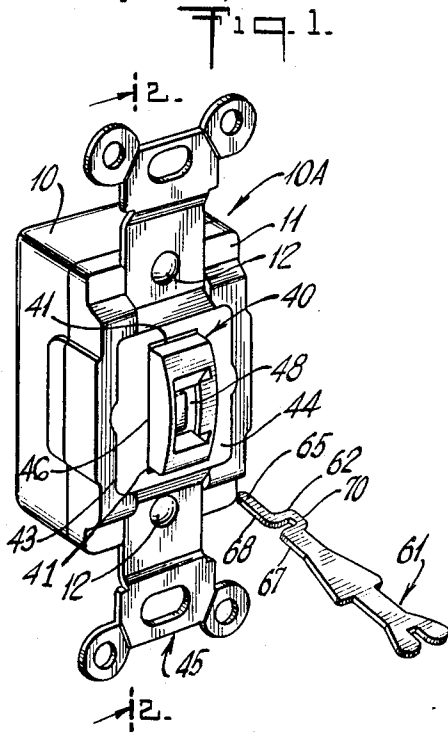
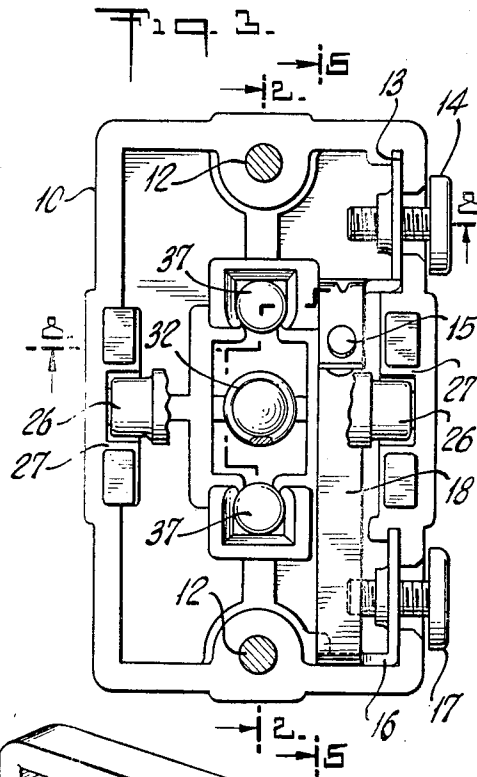
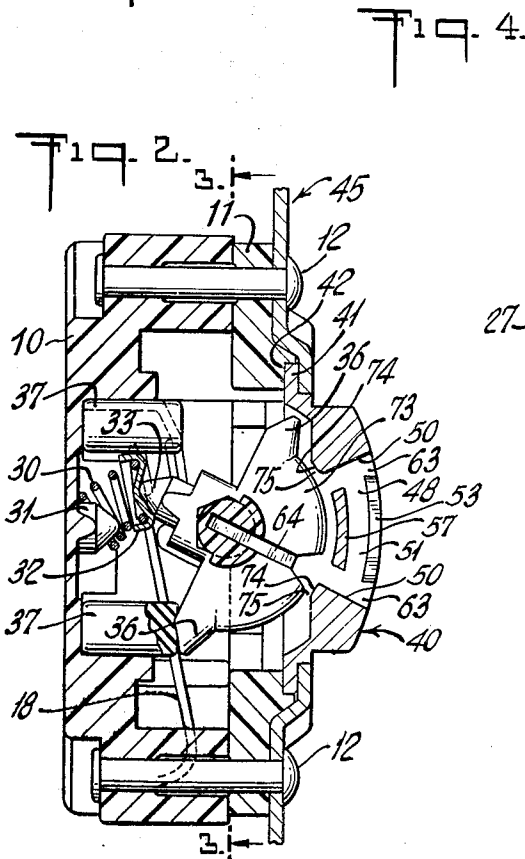
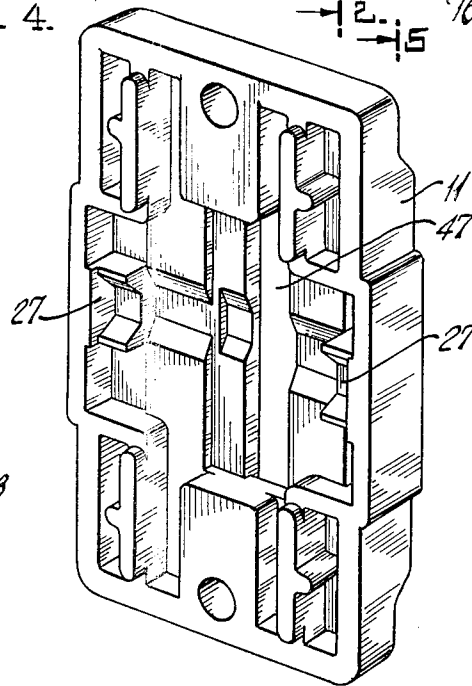
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3,497,646

TAMPER-PROOF KEY-OPERATED ELECTRIC SWITCH

Filed April 18, 1968

2 Sheets-Sheet 1



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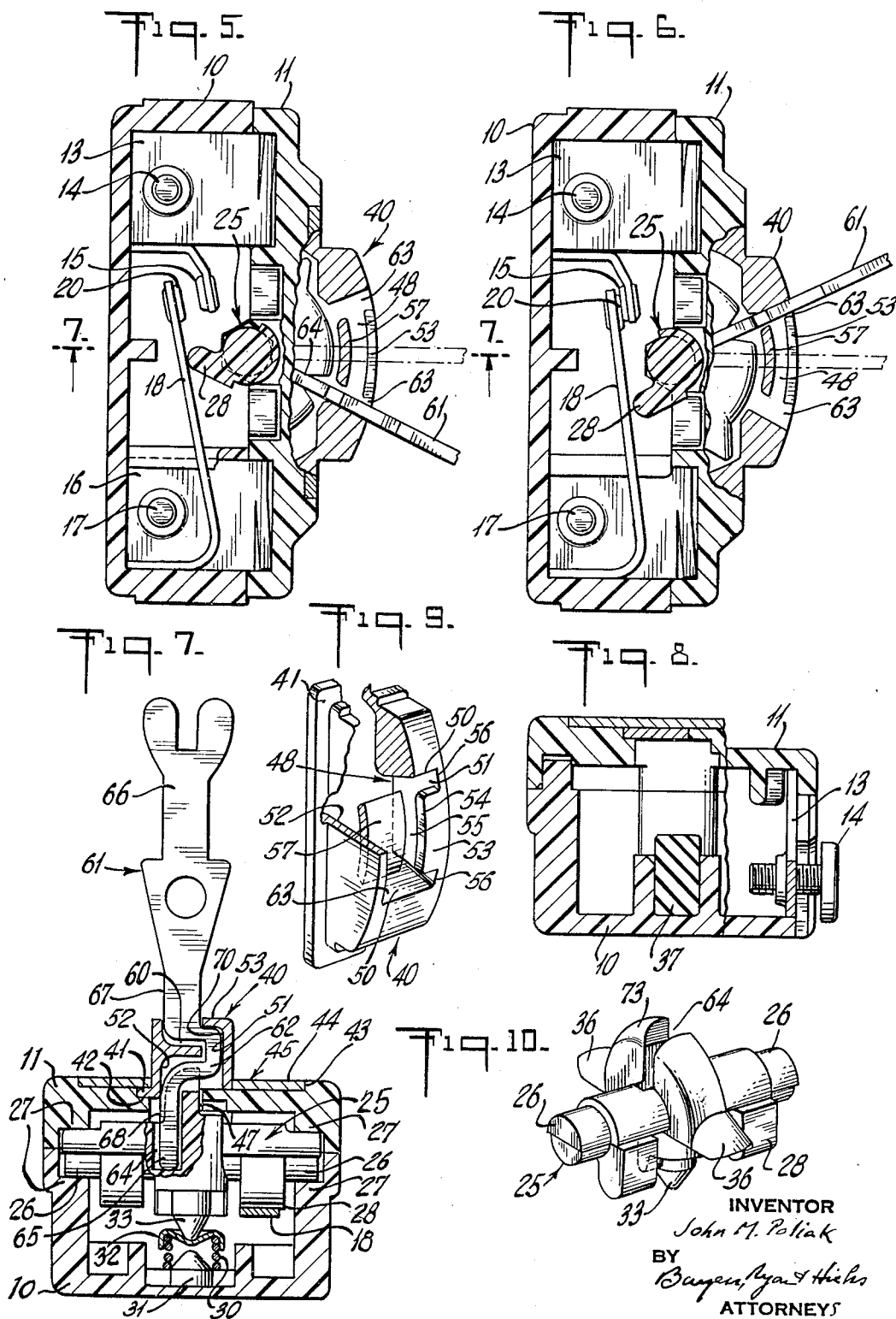
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TAMPER-PROOF KEY-OPERATED ELECTRIC SWITCH

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2 Sheets-Sheet 2



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3,497,646

TAMPER-PROOF KEY-OPERATED ELECTRIC SWITCH

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U.S. Cl. 200—42

9 Claims

ABSTRACT OF THE DISCLOSURE

The invention relates to a tamper-proof key-operated electric switch of the AC type. The switch has a concealed operating member which is rockable about an axis between circuit-make and circuit-break extreme positions thereof. The operating member has a slot formed therein which is accessible in said extreme positions, for insertion of the end section of an operating key therein. Baffles carried by a lock block access to the switch mechanism in intermediate positions of the operating member. The baffles which define a U-shaped passageway, also block the insertion of an operating key in the key slot in intermediate positions of the operating member, and prevent angular movement of the operating member between its extreme positions by means of an operating key which is not of the proper configuration. The key for operating the switch of the present invention has a U-shaped turn which provides opening through which the baffles pass in angular movement of the operating member and the inserted key between said extreme positions.

The present invention relates to a tamper-proof key-operated electric switch and it relates, more particularly, to a tamper-proof operating mechanism for use with an electric switch of the AC type.

An object of the present invention is to provide a new and improved tamper-proof switch of the type described, adapted to be operated by a specially designed key and constructed to prevent unauthorized operation by such devices as nails, wires, screw drivers, knives and the like.

Another object of the invention is to provide a tamper-proof operating mechanism for an electric switch which may be effectively employed with a switch mechanism of the AC or quiet type. Such a switch mechanism requires considerably less force to move the switch mechanism between their "on" and "off" positions than in the case of the usual "snap" action switch mechanism and hence, additional precautions must be taken to prevent unauthorized operation of the switch.

In accordance with the present invention, the objectives described are accomplished by providing a tortuous or irregularly shaped passageway through which an operating key must pass in the movement of an operating member between "extreme" or "on" and "off" positions thereof with access to the operating member being blocked except at the "on" and off" positions thereof.

These and other objects and advantages of the invention will be better understood from the following description and the accompanying drawings, in which:

FIG. 1 is a perspective view of a tamper-proof switch embodying the present invention and shown in conjunction with a key for operating the switch;

FIG. 2 is a longitudinal section of the switch taken approximately along the lines 2—2 of FIG. 1 and FIG. 3 and showing the switch in circuit-break position and without the key;

FIG. 3 is a longitudinal section of the switch taken along the lines 3—3 of FIG. 2;

FIG. 4 is a perspective of the cover of the housing for the switch;

FIG. 5 is a longitudinal section of the switch in circuit-break position taken along lines 5—5 of FIG. 3 and shown with an end of the key inserted in the operating lever;

FIG. 6 is a longitudinal section of the switch corresponding to FIG. 5, but with the operating lever at its other extreme or circuit-make position;

FIG. 7 is a transverse section of the switch taken on lines 7—7 of FIG. 5;

FIG. 8 is a transverse section of the switch taken on lines 8—8 of FIG. 3;

FIG. 9 is a perspective view of the dome for the switch shown in FIG. 1 with certain parts broken away to reveal the internal structure of said lock; and

FIG. 10 is a perspective view of the operating lever for the switch shown in FIG. 1.

Generally speaking, the switch illustrated is a "two-way" switch of the AC or quiet type where a movable contact is moved into and out of engagement with an opposing contact by means of a cam carried on an angularly movable operating lever. Examples of this type of switch are shown and described in U.S. Patent No. 2,725,438 of Nov. 29, 1955, and U.S. Patent No. 3,030,479 of Apr. 17, 1962.

It will be understood that the present invention may be employed with a "three-way" switch or with a "snap" action type of switch if desired.

Referring now to the drawings in detail, there is a switch 10A of the AC or quiet type which comprises a hollow body or base 10 and a cover 11, both made of insulating material and secured together by rivets 12 to form a housing for the switch mechanism. The switch mechanism comprises a terminal plate 13 secured to a side wall of the back at one end thereof and having a terminal screw 14 and a fixed contact 15 attached thereto. A second terminal plate 16 is secured to the side wall of the base at the opposite end thereof and has a terminal screw 17. A resiliently flexible brush or contact-engaging arm 18 is attached to the second plate and carries a contact 20 at its movable end which is positioned in opposing relation to the fixed contact 15 and is movable into and out of engagement therewith. The flexible arm 18 is biased so that its resilience will maintain the movable contact in circuit-making engagement with the fixed contact 15, as shown in FIG. 6.

For movement of the flexible arm 18 out of circuit-making position, there is provided an angularly movable operating lever 25 having trunnions 26 which are journaled in bearings 27 formed in complementary portions by the side walls of the housing base 10 and cover 11. This permits the operating lever 25 to be rocked about a fixed axis in operation of the switch. A cam 28 carried by the operating lever 25 and extending downwardly therefrom engages the flexible contact arm 18. In one angular position of the lever 25, as shown in FIG. 5, the cam 28 forces the resilient contact arm 18 downwardly and separates the contact 20 at the end thereof from engagement with the fixed contact 15. In the other extreme angular position of the lever 25, as shown in FIG. 6, the movable end of the resilient arm 18 is permitted to rise and bring the movable contact 20 into engagement with the fixed contact 15.

The operating lever 25 is biased towards its extreme angular ("on" and "off") positions by a compression spring 30, supported at one end on a centrally located anchor post 31 extending upwardly from the bottom wall of the housing base. A retaining cup 32 at the other or free end of the spring receives the end of a cone shaped projection 33 extending downwardly from the center of the operating lever 25. Angular movement of the lever

25 about its axis causes the compression spring 30 to swing about the anchor post 31, and to exert a biasing force against the cone-shaped extension 33 carried by the lever, which urges the lever to one or the other of its extreme positions. Wings 36 on the toggle lever 25 engage either of two rubber pads 37 supported on the bottom wall of the housing base 10 in the extreme positions of the operating lever 25. The rubber pads 37 serve as stop members and as bumpers to quiet the action of the switch mechanism.

As noted, the switch construction so far described is of the alternating current type and does not form part of the present invention.

A protective or locking device comprising a dome 40 is provided to protect the switch mechanism described against unauthorized operation or tampering. The locking device is constructed to receive a special key for moving the operating lever selectively into its extreme or circuit-make or break positions. The dome may be made of metal, and has a flanged base 41 retained in a recess 42 of corresponding contour in the outer face of the housing cover. A second recess 43 surrounds the recess of the dome flange 41 and receives the intermediate section 44 of a mounting strap 45 which is secured to the base 10 and cover 11 by means of the end rivets 12 and has an aperture 46 through which the dome 40 extends. Portions of the strap which overlie the flange 41 of the dome, retain the dome in position on the cover.

The dome 40 is open at its base for communication with the operating lever 25 through an opening 47 in the cover 11 and has a keyway 48 formed therein. The keyway 48 which extends lengthwise is arcuate and has end walls 50 in planes radial with respect to the axis of the operating lever 25 and opposed parallel side walls 51 and 52. At the outer or upper end of one side wall 51 and extending therefrom towards the other side wall 52 is an arcuate baffle 53, concentric with the axis of the operating lever 25. This baffle 53 is spaced from the opposing side wall 52 and from the end walls 50 of the dome 40 to define a U-shaped opening 54 in the outer arcuate face of the dome. This key-opening 54 has a medial section 55 and end sections 56.

Extending from the side wall 52 of the dome 40 to the opposite side wall 51 and radially spaced inwardly from or beneath the outer baffle 53 is a second arcuate baffle 57, concentric with the axis of the operating lever 25. The outer edge of the second baffle 57 is spaced from the side wall 51 and its ends are also spaced from the end walls 50 of the dome 40. By this arrangement, the baffles 53 and 57 are staggered at different radial levels, thus interrupting the continuity of the keyway 48 along its radial depth in the region of said baffles, and also along its arcuate length in said region. The baffles 53 and 57 thus form a rectangular U-shaped turn 60 in the keyway 48 along its depth and a key 61 having a corresponding rectangularly U-shaped offset 62 can be moved angularly between the ends of said passageway.

The outer edge of the upper baffle 53 extends over the outer edge of the inner baffle 57 to cover entirely any gap or opening between the overlapping portions of the baffles, thus preventing the insertion of a straight instrument such as a nail, wire or knife from the outside of said dome into the switch mechanism.

The ends of the baffles 53 and 57 are spaced from the end walls 50 of the dome 40 to provide key-entrance openings 63 which extend radially to the operating lever 25 and permit the insertion of the key therethrough.

The operating lever 25 is provided with a slot 64 of small cross-sectional area, extending radially with respect to the axis of said lever and located so that said slot will be in radial alignment with one of the key entrance openings 63 in either of the extreme angular circuit-breaking positions of the operating lever. The lever slot 64 forms with either key entrance opening 63, when

in radial registry therewith, an uninterrupted radial keyhole section for the insertion of the key 61 through said keyhole section and into said lever slot, and is small enough to receive snugly therein the end section 65 of the key when said key is so inserted.

The key 61 is made of flat metal stock and comprises a handle section 66, the offset section 62 having the U-turn conformation to circumvent the baffles 53 and 57 as the lever 25 is moved angularly by the key between its extreme positions, and the end section 65 for insertion into the slot 64 in the operating lever 25. The edges 67 and 68 of the key 61 flanking the offset section 62 of the key on the one side thereof are in alignment with each other and are parallel to the edge 70 on the base of said offset section on the other side of the key, and the distance between the opposite sides of the key in these regions is just slightly less than the distance between the opposed side walls 51 and 52 of the keyway 48 at the end sections 63 of said keyway, to permit easy entry of the key into said key sections.

As has been noted, the switch described is of the AC type, and therefore the force required to operate this switch is much less than that required to operate a snap action type switch. Such a switch is easier to tamper with because of its greater ease of operation. The staggered baffles 53 and 57 at different levels of the dome as described above effectively prevent the swinging of a key along the keyway 48 between extreme positions, unless the key has the proper configuration enabling it to skirt around said baffles. A straight elongated element such as a nail, wire or knife, inserted through the small cross-sectional area of the lever slot 64 in the operating lever 25 in one extreme position thereof, will be blocked by the baffles 53 and 57 in any attempt to rotate the lever by such an instrument to its other extreme position.

The staggered baffles 53 and 57 also shield the switch mechanism and prevent engagement of such mechanism by any instrument other than a key specially designed as described. The operating lever 25 has a sectorial flange 73 containing the radial key slot therein centrally between the radial sides thereof and having a radius large enough to space said flange from the inner surfaces 74 of the end walls of the dome 40 by gaps 75 having a depth small enough to prevent the unpermitted insertion of a foreign tool into said gaps in directions to push the toggle lever about its axis.

What is claimed:

1. A tamper-proof key-operated electric switch comprising a switch mechanism operable into circuit-make and circuit-break positions and including a lever rockable about an axis between stop position for operating said switch mechanism into either of said circuit-controlling positions when said lever reaches the corresponding stop position, said lever having means for receiving a turning key by which said lever can be rotated about said axis between said stop positions, a key lock for said switch mechanism protectively shielding said lever and defining a key slot with opposite end sections in position opposite said key receiving means when said lever is in a corresponding stop position to permit the lever in said corresponding stop position to receive a turning key inserted in the corresponding end section of said key slot, said key lock comprising baffle means in said key slot between said end sections of the key slot for shielding said lever and for normally blocking passage of a key along said key slot and between said end sections, said baffle means defining a U-shaped turn in said key slot along its radial depth relative to the axis of said lever, and a key to operate said switch mechanism, said key having a U-shaped portion aligned with said U-shaped turn and defining openings through which said baffle means can pass in movement of the key through said key slot in operation of the switch.

2. A switch as described in claim 1, wherein said key lock comprises a hollow structure having side walls

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and end walls defining said key slot, and said baffle means comprises a first baffle extending from one side wall toward the other side wall and being spaced from said other side wall and from the end walls of said key slot, and a second baffle extending from said other side wall toward said one side wall and being spaced from said one side wall and from the end walls of said key slot, said second baffle being spaced radially inwardly from said first baffle in relation to the axis of said lever, said baffles defining a U-shaped turn in said key slot along its radial depth, said key having a U-shaped turn corresponding to the U-shaped turn in said key slot and defining openings in the key which clear said baffle means during passage of the key along said key slot.

3. A switch as described in claim 2, wherein said baffles are arcuate in a direction extending between said end sections of the key slot and are concentric with respect to the axis of said lever.

4. A switch as described in claim 3, which includes a housing for said switch mechanism having a cover, said cover having an opening therein, said key lock being in the form of a dome supported on said cover and extending over said opening, said key slot and said cover opening conjointly affording access to said key receiving means on the lever by said key at the stop positions of the lever.

5. A switch as described in claim 1, which includes a housing for said switch mechanism having a cover, said cover having an opening therein, said key lock being in the form of a dome, supported on said cover and extending over said opening with side walls and end walls thereon bounding said opening, said end walls having inner surfaces facing said lever, said key slot and said cover opening conjointly affording access to said key receiving means in the lever by said key at the stop positions of the lever, the part of said lever radially opposite the region of said inner surfaces having a radius in relation to the axis of said lever large enough to space said lever part radially inwardly from the inner surfaces of said end walls of the dome by gaps having radial depths small enough to prevent the insertion of a foreign tool passing through said key slot into either of said gaps in directions to urge said lever angularly about said axis.

6. A switch as described in claim 5, wherein said baffle means comprise a first baffle extending from one side wall of the key lock to the other side wall and being spaced from said other side wall and from the end walls of said key slot, and a second baffle extending from said other side wall of the key lock to said one side wall and being spaced from said one side wall and from the end walls of said key slot, said second baffle being spaced radially inwardly from said first baffle in relation to the axis of said lever, said baffles defining a U-shaped turn in said key slot along its radial depth, said key having a U-shaped turn corresponding to the U-shaped turn in said key slot to clear said baffle means during its passage along said key slot.

7. In a tamper-proof key-operated electric switch, the combination comprising a switch mechanism of the quiet

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AC type, said switch mechanism including an operating lever rockable about an axis between a first stop position and a second stop position in operation of said switch mechanism, said stop positions corresponding to "on" and "off" positions of the switch mechanism, said operating lever having a recess formed in an upwardly facing surface thereof for reception of an operating key therein, said key-receiving recess extending radially outwardly from the axis of said lever, a dome-shaped key lock mounted on said switch mechanism and extending over the upwardly facing surface of the operating lever, said key lock having spaced upstanding side walls defining a key slot positioned in opposing relation to the upwardly facing surface of the operating lever, said slot having angularly disposed key-receiving passageways at opposite ends thereof, one of said key-receiving passageways being aligned with the key-receiving recess in the operating lever in the first stop position thereof and the other of said key-receiving passageways being aligned with the key-receiving recess in the second stop position thereof, spaced baffles of arcuate shape extending inwardly from opposite sides of the key slot intermediate said key-receiving passageways, said baffles being disposed at different radial distances from the axis of the operating lever with their ends being in overlapping relation and defining a convolute passageway for accommodating a key of complementary shape in movement of the operating lever between the stop positions thereof.

8. In a tamper-proof key-operated electric switch, the combination as defined in claim 7, wherein the inwardly extending spaced baffles define a U-shaped passageway extending between the key-receiving passageways of the key slot, and the operating key is formed of flat stock having a U-shaped intermediate portion defining openings through which the spaced baffles pass in angular movement of the key and the operating lever from one stop position to the other stop position.

9. In a tamper-proof key-operated electric switch, the combination as defined in claim 7, which includes an operating key dimensioned for insertion through the key-receiving passageways with a lower end thereof extending into the key-receiving recess in the operating lever, said key having a convolute intermediate portion of the complementary shape to the convolute passageway in the key slot, said intermediate portion of the key defining openings aligned with the baffles forming the convolute passageway in the key slot when the lower end of the key is seated in the key-receiving recess in the operating lever.

References Cited

UNITED STATES PATENTS

1,825,325	9/1931	Millermaster et al.	200—42
1,875,225	8/1932	Despard	200—42

ROBERT K. SCHAEFER, Primary Examiner

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,497,646 Dated February 24, 1970

Inventor(s) John M. Poliak

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the drawings, Sheets 1 and 2, change the inventor's name in the heading to - POLIAK -.

In the specification, column 1, line 4, change the inventor's name to - Poliak -.

Column 4, line 51, pluralize "position".

SIGNED AND
SEALED
JUL 28 1970

(SEAL)

Attest:

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Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents