March 29, 1960 J. O. ROESER 2,930,865

TOGGLE SWITCH

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Fig. 1.

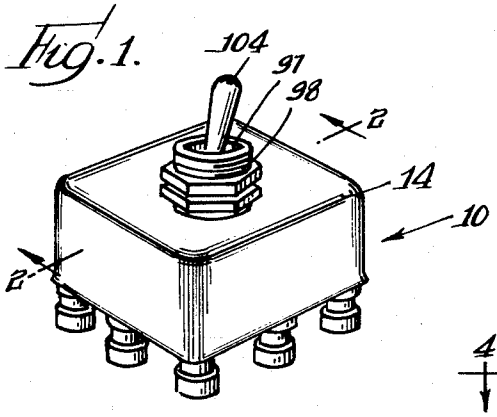



Fig. 2.

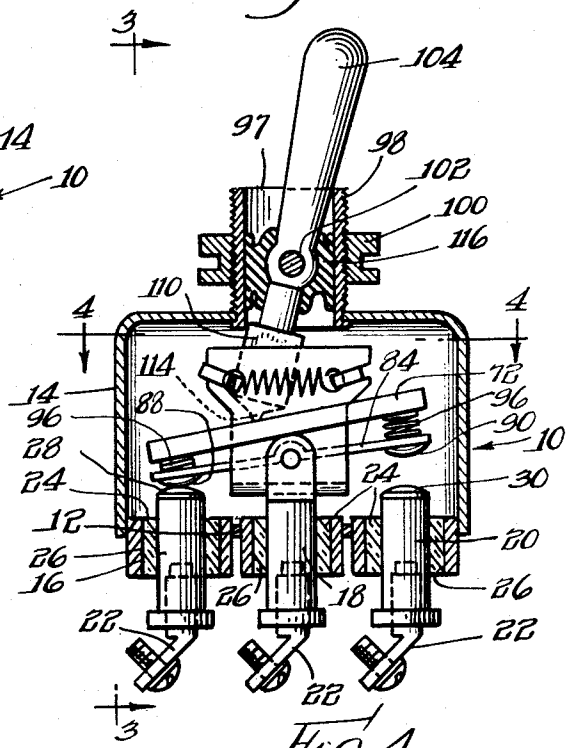



Fig. 3.

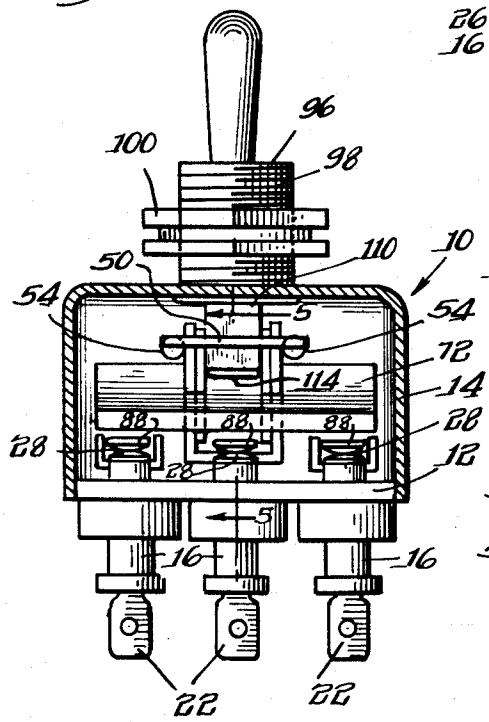
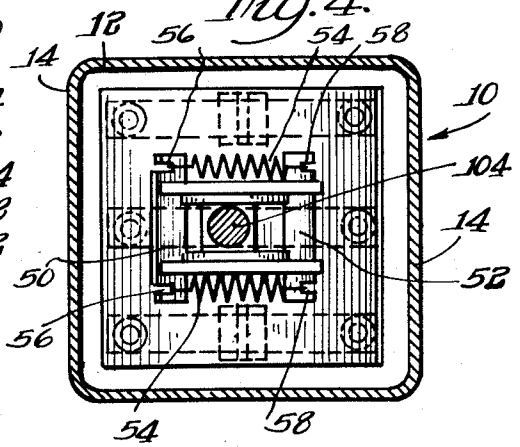



Fig. 4.




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Fig. 5.

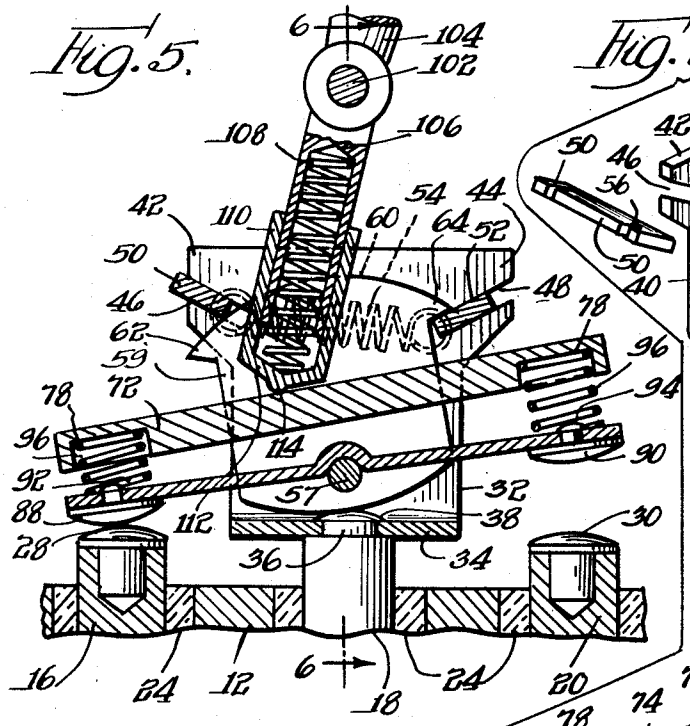



Fig. 7.

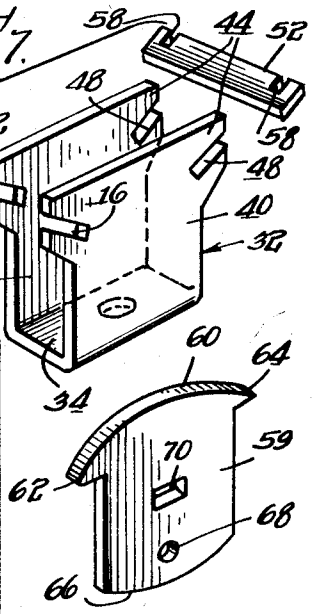
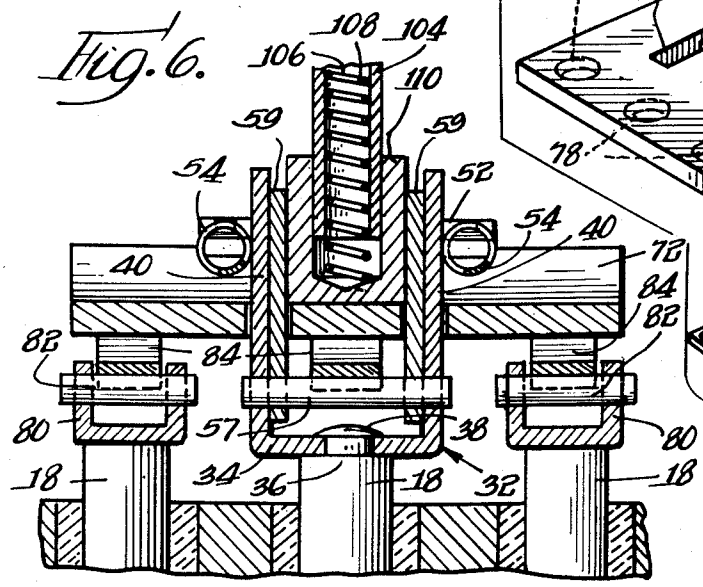
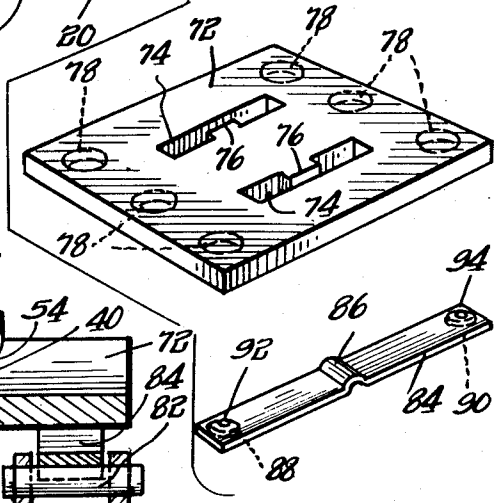



Fig. 6.




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2,930,865

# TOGGLE SWITCH

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Application July 24, 1957, Serial No. 673,798

8 Claims. (Cl. 200—70)

This invention is concerned with an electric switch of the snap switch or toggle switch type.

One object of the invention is to provide an improved self-locking toggle switch in which a novel construction well suited for economical manufacture provides an automatic locking of contacts in closed position and at the same time preserves a firm retention of the switch control lever in either of its two extreme positions.

It is a further object of this invention to provide a toggle switch mechanism in accordance with the foregoing objects wherein there may be substantially any number of contacts.

Other objects of this invention are to provide a toggle switch which is rugged and trouble free in operation, which is economical to fabricate, and wherein the contacts are resiliently held in closed position by long life coil springs.

Other and further objects of the present invention will be apparent when consideration is given to the following description and the accompanying drawings wherein:

Fig. 1 is a perspective view of a switch embodying the principles of this invention;

Fig. 2 is a longitudinal, vertical sectional view through the switch as taken along the line 2—2 in Fig. 1;

Fig. 3 is a cross sectional view as taken along the line 3—3 in Fig. 2;

Fig. 4 is a horizontal sectional view taken along line 4—4 in Fig. 2;

Fig. 5 is a vertical, longitudinal sectional view through the operating parts of the switch as taken along the line 5—5 in Fig. 3;

Fig. 6 is a cross sectional view as taken along the line 6—6 in Fig. 5; and

Fig. 7 is a fragmentary, exploded perspective view showing certain of the operating parts of the switch.

Referring now in greater particularity to the drawings, and first to Figs. 1–4, there will be seen a switch identified generally by the numeral **10**. The switch includes a metal base **12** and a sheet metal housing **14** sealed thereto. The base **12** is provided with a plurality of terminal posts, these posts being arranged in groups of first position terminal posts **16**, common terminal posts **18**, and second position terminal posts **20**. The terminal posts **16**, **18** and **20** all are internally threaded at their lower ends for receipt of terminals **22**. The terminal posts are insulatedly mounted in the base **12** by means of glass inserts **24** which are fused to the posts in apertures **26** through the base. At their upper ends, the first position terminal posts **16** are provided with contacts **28**, while the second position terminal posts **20** are provided with contacts **30**. These contacts preferably comprise silver, or some other suitable contact material, and may be set into the upper ends of the posts.

In the illustrative example there are three rows of posts, each row comprising a first position terminal post, a common terminal post, and a second position terminal post, although there may be less than this number, or there may be more.



The centermost of the common terminal post **18** is provided with a large yoke **32** (see also Figs. 5–7). The yoke comprises a horizontal web **34** receiving a reduced section **36** at the upper end of the post **18**, and peened over as at **38** to hold the yoke in place. The yoke further includes a pair of upstanding support plates or flanges **40** at the opposite edges of the web **34**. The flanges **40** are provided adjacent their upper ends with pairs of corresponding projections **42** and **44** having diagonal slots **46** and **48**, respectively, therein. Locking bars or plates **50** and **52** are respectively received in the slots **46** and **48**, and are urged toward one another by coil springs **54** stretched between the bars **50** and **52** and anchored in recesses **56** and **58** therein.

A pivot pin **57** extends across the yoke **32** between the flanges **40** along the center line thereof, and parallel to the web **34**. A pair of locking or pivot plates **59** are provided thereon against the inner faces of the flanges **40**. Each of the lock plates **59** is provided with an arcuate upper end **60** defining a convex cam surface extending between the outer tips of teeth or shoulders **62** and **64** projecting from the corners of the lock plates for cooperation with the locking bars **50** and **52**, respectively. Each of the locking plates **59** further is provided with an arcuate lower edge **66**, and with an aperture **68** spaced thereabove for receiving the pin **57**. In addition, each plate **59** is provided with a horizontal slot **70** along its center line, and generally near its midsection.

A fiber plate **72** is provided with longitudinal slots **74** receiving the locking plates **59**, and also fitting over the flanges **40**. Along the transverse center line of the fiber plate **72**, there is provided a pair of lugs or tongues **76** projecting into the slots **74**, and designed to interfit with the slots or apertures **70** in the locking plates **59**, whereby to hold the locking plates to the fiber plate. It will be understood that the locking plates are assembled with the lugs or tongues **76**, and then the fiber plate **72** is moved down over the flanges **40** of the yoke **32**. The flanges thus hold the locking plates **59** securely on the tongues or lugs **76**. The slots **74** are long enough to pass over the outward projections **42** and **44** of the flanges **40**, and also to allow movement relative to the flanges, as will be brought out hereinafter. The fiber plate is provided with a plurality of recesses **78** in its under face. These recesses are positioned similarly to the terminal posts **16** and **20**.

At the upper end of each of the two outermost terminal posts **18** (or, more generally speaking, all of the common terminal posts **18** except for the centermost one) there is provided a relatively small yoke **80** secured in the same manner as the previously described yoke **32**, and having a pivot pin **82** extending thereacross. The pivot pins **82** are aligned with the pin **57**, and are spaced therefrom.

A plurality of rocker arms, one for each of the common terminal posts **18**, is pivoted on the pins **57** and **82** of the respective yokes **32** and **80**. More particularly, each rocker arm **84** comprises an elongated strip or strap of sheet metal having a raised hump or inverted U-shaped section **86** at the center thereof fitting over the respective pivot pin. The rocker arms are provided adjacent their opposite ends with contacts **88** and **90**. And the contacts are provided with upwardly extending studs **92** and **94**. Coil springs **96** are seated in the plurality of recesses **78** and are positioned by the pins **92** and **94**, whereby the rocker arms **84** are resiliently held down on their respective pins **57** and **82**. Furthermore, the contacts **88** are designed to engage the contacts **28**, and the contacts **90** are designed to engage the contacts **30**. Whichever of the pairs of contacts just enumerated is in engagement is resiliently held in this manner by the corresponding springs **96**. As will be observed in Fig. 5,

the springs of the contacting or engaging pair of contacts are compressed more than the springs associated with the opposite contacts.

The upper end of the housing or casing **14** is provided with a cylindrical or tubular fitting **97** having external threads **98** thereon. A nut **100** is threaded on the outer threads of the tubular fitting for clamping the switch **10** in place in a panel or the like. Internally of the fitting, a cross pin **102** is provided. On the cross pin there is pivotally mounted a manually operable actuator **104**, commonly termed a bat handle. The handle is provided at its lower end with a recess **106** in which a spring **108** is compressed. The spring urges a plastic tip **110** outwardly. The plastic tip fits about the lower end of the bat handle, and is provided with a frusto conical nose **112** having a protuberance **114** thereon bearing against the top of the fiber plate **72**.

The tubular fitting **97** is sealed to the casing **14**, and a rubber plug **116** is molded between the inner surface of the fitting and bat handle **104**, whereby to provide a seal at this point. A suitable tubulation (not shown) is provided for evacuating the casing **14** in accordance with known practice, whereby to prolong the life of the switch contacts.

When the bat handle **104** is in a clockwise pivoted position, i.e. with the upper end to the right as in Figs. 2 and 5, the plastic tip **110** thereof holds the fiber plate **72** tipped downwardly to the left. This, in turn, acts through the springs **96**, and holds the rockers **84** tipped downwardly to the left. Accordingly, the movable contacts **88** are resiliently held against the first position fixed contacts **28**, and electrical continuity is established between the terminal posts **16** and **18**, through the contacts, the rockers, the pivots **57** and **82**, and the yokes **32** and **80**. The locking bar **52** engages beneath the teeth **64** of the locking plate **59**, and the fiber plate **72** positively is held tipped downwardly to the left, in the position previously noted.

When it is desired to reverse the circuit conditions, i.e. to move the movable contacts **88** away from the fixed contacts **28**, and to bring the movable contacts **90** into engagement with the fixed contact **30**, the bat handle **104** is moved to the left in a counterclockwise direction. This causes the plastic tip **110** to ride uphill along the fiber plate **72**, the spring **108** compressing. Once the bat handle has passed a dead center position relative to the pivots **102** and **57**, the compressed spring **108** tends to pivot the fiber plate **72** in a clockwise direction. However, the fiber plate cannot move since it is fixed to the locking plates **59**, and the locking plates are held against movement by the locking bar **52**. Upon continued movement of the bat handle, the plastic tip **110** engages the locking bar **52**, and moves it outwardly in its slot **48**, thus freeing the teeth **64** of the locking plates **59**. The locking plates thus are free to pivot in a clockwise direction with the fiber plate **72**, and compressed spring **108** in the bat handle snaps the locking plates and fiber plate pivotally in a clockwise direction to open the contacts **88** and **28**, and to close the contacts **90** on the contacts **30** with a snap action. Meanwhile, the locking bar **50** which has been riding on the arcuate upper end **60** of the locking plates snaps in behind the teeth **62**, and the locking plates cannot thereafter tip back to their counterclockwise limited position, until the locking bars are unlocked by engagement of the tip **110** of the bat handle therewith.

Thus, it will be seen that the switch cannot be "teased." No matter how much the handle **104** is jiggled back and forth, the fiber plate and the movable contacts controlled thereby cannot move until the handle has moved a sufficient distance to move the locking bar to unlocked position. At this time the contacts and fiber plate snap from one position to another, and the opposite locking bar moves into locking position. The positive lock precludes faulty operation, and a sudden, snap action is produced which materially extends the life of the contacts, and avoids setting up transient electrical disturbances caused by arcing between contact points.

Various changes in structure will no doubt occur to those skilled in the art, and are to be understood as forming a part of this invention insofar as they fall within the spirit and scope of the appended claims.

The invention is claimed as follows:

1. A self-locking toggle switch comprising, in combination, a bat lever supported for pivotal movement about a transverse medial axis, a pair of spaced supports perpendicular to said lever axis and embracing one end of said lever, a pair of pivot plates pivotally supported about a transverse axis parallel to said lever axis for swinging movement between two switching positions, an insulating plate located between said pivot plate and lever pivot axes and mounted on said pivot plates for swinging movement therewith, yieldable pressure means on said one end of said lever engaging said insulating plate, said support plates defining two aligned pairs of detent slots located on opposite sides of a center line between said pivotal axes, two detent bars slideably mounted in said respective pairs of slots for sliding movement toward and away from said center line and extending transversely across both pivot plates in embracing relation thereto, spring means urging said detent bars toward each other to engage said pivot plates, each of said pivot plates defining locking shoulders on opposite sides thereof respectively engageable by said respective detent bars when the pivot plates are in said respective switching positions to hold said pivot plates and said insulating plate against swinging movement between said switching positions by pressure applied to said insulating plate by said lever pressure means, one end of said lever upon being swung across said center line being engageable with the shoulder engaging detent bar to shift the latter out of engagement with the coacting locking shoulders to free said pivot plates for switching movement by the force of said lever pressure means on said insulating plates, each pivot plate defining on one edge thereof a cam surface convex toward said lever axis and extending between the outer tips of the shoulders on the pivot plate to hold each detent bar after disengagement thereof in an outwardly displaced ineffective position until said pivot plates have swung back to the switching position in which the detent bar re-engages its coacting shoulders, and electrical switch means connected for operation by said insulating means.

2. A self-locking toggle switch comprising, in combination, an operating lever supported for pivotal movement about a transverse medial axis, a pair of pivot plates pivotally supported about a transverse axis parallel to said lever axis for swinging movement between two switching positions, a lever actuated switching element located between said pivot plate axis and said lever pivot axis and mounted on said pivot plates for swinging movement therewith, yieldable pressure means on said one end of said lever engaging said switching element to actuate the latter, means defining detent slots located on opposite sides of a center line between said pivotal axes, two detent bars slideably mounted in said slots for sliding movement toward and away from said center line and extending transversely across one of said pivot plates in embracing relation thereto, spring means urging said detent bars toward each other to engage said one pivot plate, said one pivot plate defining locking shoulders on opposite sides thereof respectively engageable by said respective detent bars when the pivot plates are in said respective switching positions to hold said pivot plates and said switching element against swinging movement between said swinging positions by pressure applied to said switching element by said lever pressure means, said one end of said lever upon being swung across said center line being engageable with the shoulder engaging detent bar to disengage the latter from the coacting locking shoulder to free said pivot plates for

switching movement by the force of said lever pressure means on said switching element, said one pivot plate defining on one edge thereof cam surfaces facing toward said lever axis and extending toward each other from the outer tips of said shoulders to hold each detent bar after disengagement thereof in an outwardly displaced ineffective position until said pivot plates have swung back to the switching position in which the detent plate re-engages its coacting shoulder, and electrical switch means connected for operation by said switching element.

3. A self-locking toggle switch comprising, in combination, a bat lever supported for pivotal movement about a transverse medial axis, a support yoke including a pair of support plates, a pair of pivot plates, pivot means extending between said support plates and pivotally supporting said pivot plates about a transverse axis parallel to said lever axis for swinging movement between two switching positions, an insulating plate located between said pivotal axes of said lever and said pivot plates and mounted on both pivot plates for swinging movement therewith, yieldable pressure means on said one end of said lever engaging said insulating plate, said support plates defining two aligned pairs of detent slots therein, two detent plates slidably mounted in said respective pairs of slots for sliding movement toward and away from each other and extending transversely across both pivot plates in embracing relation thereto, spring means urging said detent plates toward each other to engage said pivot plates, one of said pivot plates defining locking shoulders on opposite sides thereof respectively engageable by said respective detent plates when the pivot plates are in said respective switching positions to hold said pivot plates and said insulating plate against swinging movement between said switching positions by force applied to said insulating plate by said lever pressure means, said one end of said lever upon being swung past a dead center position between said pivotal axes being engageable with the shoulder engaging detent plate to disengage the latter from the coacting locking shoulder to free said pivot plates for switching movement by the force of said lever pressure means on said insulating plate, said one pivot plate defining on one edge thereof cam surfaces facing toward said lever axis and extending toward each other from the outer tips of said shoulders to hold each detent plate in an outwardly displaced ineffective position after disengagement thereof until said pivot plates have swung back to the switching position in which the detent plate re-engages its coacting shoulder, a plurality of switching rockers pivotally mounted in underlying relation to said insulating plate, electrical contacts carried by said rockers, terminal contacts opposing said rocker contacts, and spring means connecting said rockers to said insulative plate to transmit switching movement of the latter to the rockers.

4. A switch comprising a base, a yoke on said base, pivot means on said yoke, rocker means rockably mounted on said yoke pivot means, movable contact means carried by said rocker means, fixed contact means carried from said base and engageable by said movable contact means, there being selectively variable conditions of switch contact engagement, actuator means pivotally mounted on the yoke pivot means to rock said rocker means to vary the condition of switch contact means engagement, lock means associated with said actuator means, lock means associated with said base and cooperative with the actuator lock means to prevent movement of said actuator means, manually operable means acting on said actuator means and when manually operated tending to move said actuator means to rock said rocker means, said manually operable means being pivotally mounted from said base and resiliently engaging said actuator means, movement of said actuator means initially being prevented by the cooperation of said lock means, said manually operable means upon predetermined movement thereof moving said lock means out of cooperative engagement whereby to effect movement of said actuator means to rock said



rocker means for varying the condition of switch contact engagement, a terminal post, said yoke comprising a web and a pair of side flanges, the web being secured to the top of said terminal post, said pivot means comprising a pin extending between the flanges of said yoke, said actuator means comprising a plate having slots therein fitting over the flanges of said yoke, and a pair of members secured to said plate and pivoted on said pin, said rocker means likewise being pivoted on said pin.

5. A switch as set forth in claim 4 wherein the flanges of said yoke are provided at their upper corners with outward extensions having slots therein, and wherein the lock means associated with the base comprises a pair of bars mounted in said slots and having coil springs stretched between said bars, the members connected to said actuator plate having projections thereon forming the lock means associated with the actuator means and alternatively engageable with said lock bars.

6. A switch comprising a base and a casing thereon, a plurality of terminal posts insulatedly mounted on said base, a lesser plurality of yokes mounted within said casing on the ends of corresponding ones of said terminal posts, each of said yokes including a web and a pair of flanges, the webs being mounted on the corresponding posts and the flanges having pivot pins extending therebetween, a rocker pivotally mounted on each of said pins and having its opposite ends adjacent pairs of said terminal posts with which yokes are not associated, fixed contacts on the posts with which yokes are not associated, movable contacts on said rockers and alternatively cooperable with the fixed contacts, one of said yokes being larger than the others, an insulating actuator plate having slots receiving the flanges of the larger yoke, said insulating actuator plate overlying the remainder of said yokes and all of said rockers, pivot members secured to said insulating actuator plate and pivotally mounted on the pivot pin of the larger yoke, means interconnecting said insulating plate and said rockers whereby pivoting of said insulating plate produces rocking of said rockers to reverse the condition of switch contact engagement of the fixed and movable contacts, lock means associated with the insulating plate, lock means associated with the larger yoke and cooperative with the previously mentioned lock means to hold said insulating plate against pivoting movement, a manually operable handle pivotally carried from said casing and having a resiliently biased end riding on said insulating plate, pivotal movement of said manually operable handle tending to pivot said insulating plate to rock said rockers, such movement of said insulating plate initially being prevented by the cooperation of said lock means, said manually operable handle passing through a dead center position relative to the insulating plate and thereafter moving said lock means out of cooperative engagement whereby to effect pivoting of said insulating plate to rock said rockers for reversing the condition of switch contact engagement.

7. A switch as set forth in claim 6 wherein the means interconnecting the insulating plate with the rockers comprises springs.

8. A switch as set forth in claim 7 wherein the lock means associated with the larger yoke comprises a pair of lock bars transversely movable in slots in said larger yoke, and a pair of coil springs stretched between said lock bars, the other lock means comprising projections on the pivot members secured to the insulating plate.


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