Oct. 31, 1944. E. T. PLATZ 2,361,564

SWITCH

Filed Nov. 6, 1942 3 Sheets-Sheet 1

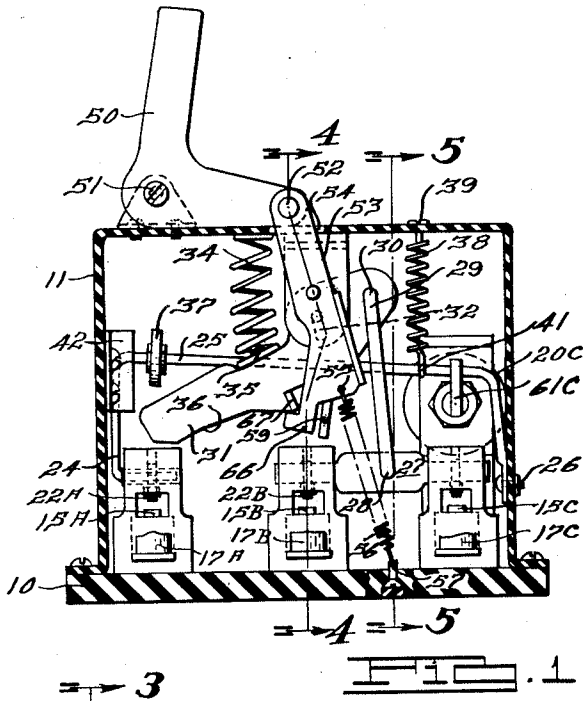


FIG. 1

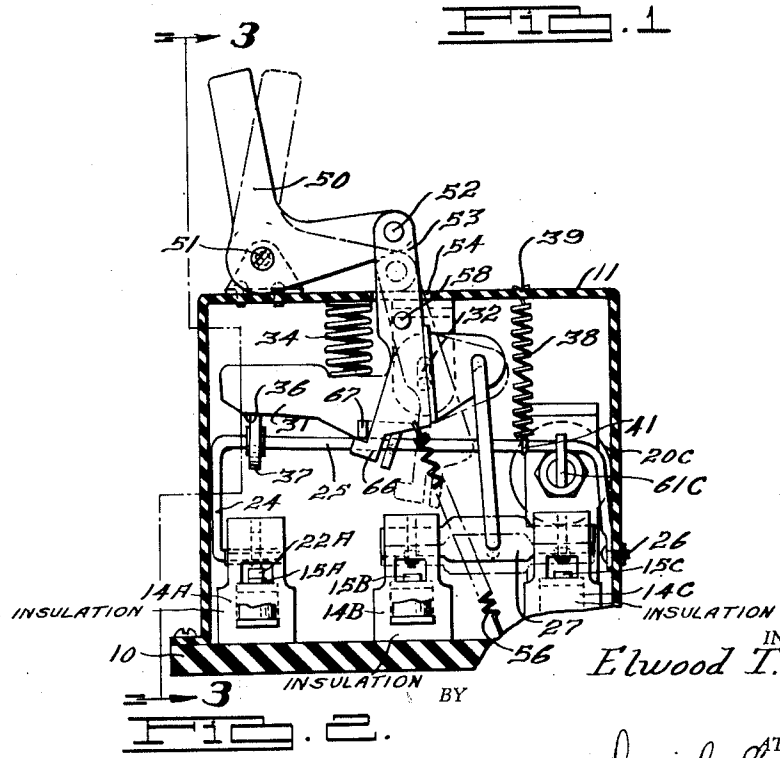


FIG. 2.

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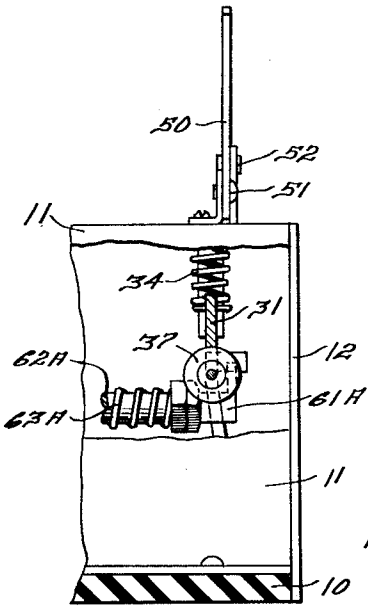


FIG. 3.

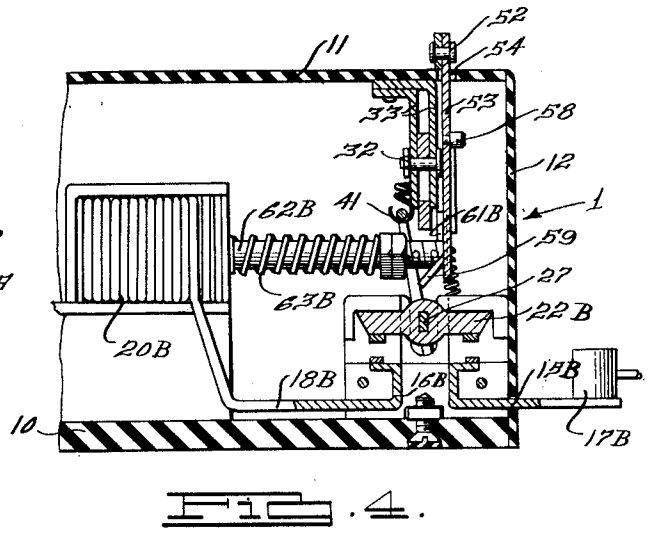


FIG. 4.

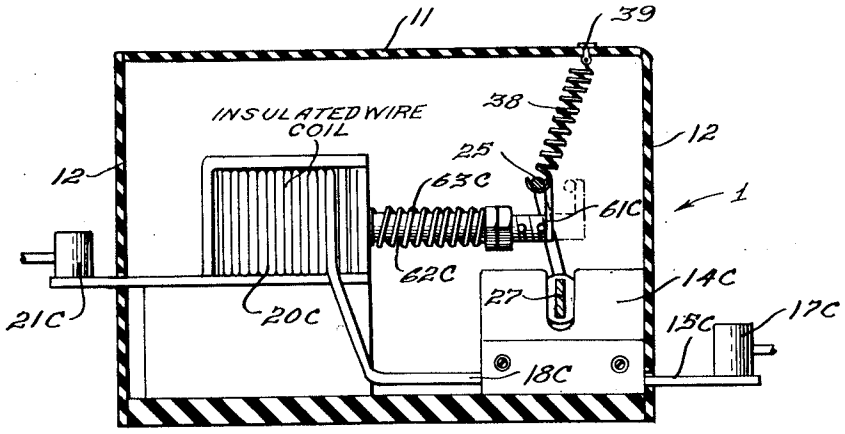


FIG. 5.

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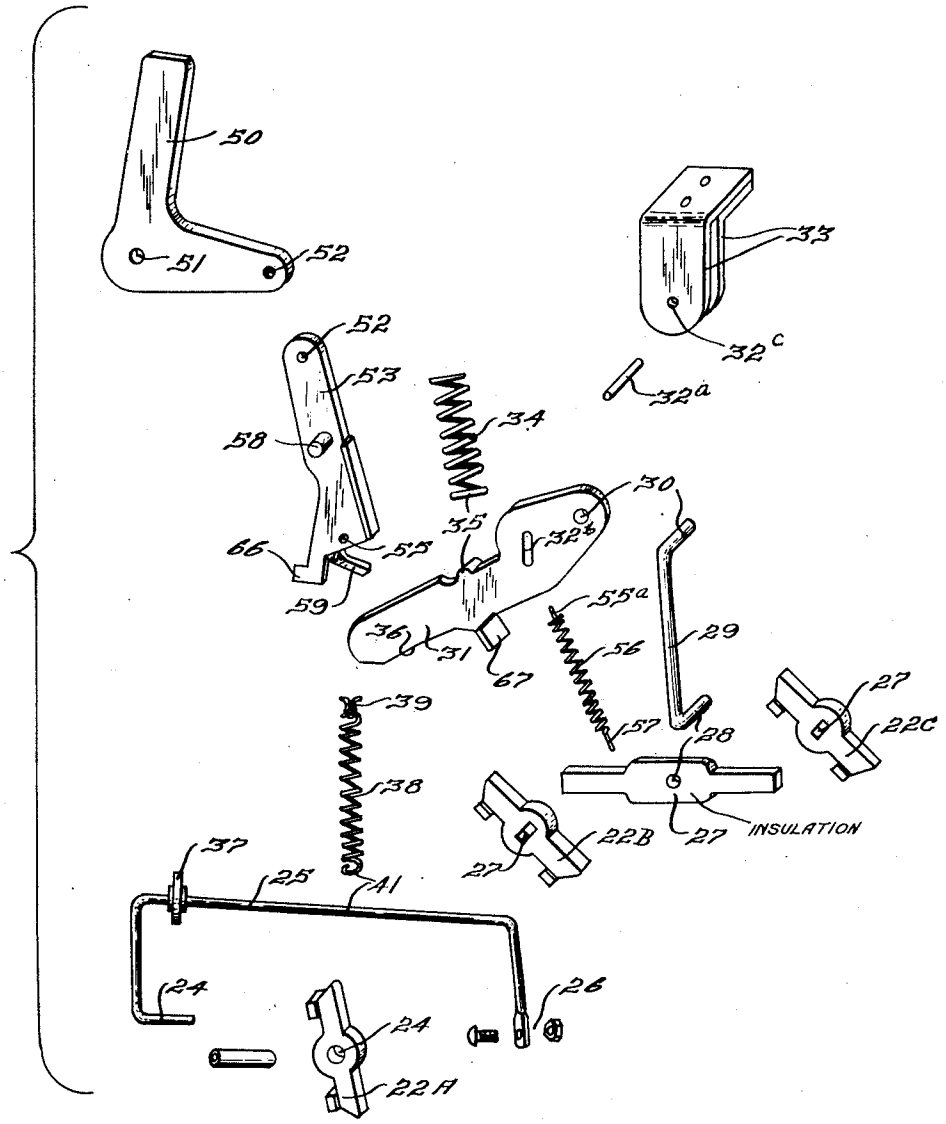


FIG. 8.

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UNITED STATES PATENT OFFICE

2,361,564

SWITCH

Elwood T. Platz, Detroit, Mich., assignor to Bulldog Electric Products Company, Detroit, Mich., a corporation of West Virginia

Application November 6, 1942, Serial No. 464,773

14 Claims. (Cl. 200—89)

This application relates to switches and more particularly to switches of the manually operable and automatically openable type.

An object of this invention is to provide a releasably latched switch for controlling several contacts simultaneously and this is accomplished, in the main, by providing a latching member and a latched member, with the former directly controlling one of the contacts and the latter directly controlling another contact.

A further object is to provide a manual circuit opening operation accomplished by unlatching a latching member which normally holds a latched member, rather than, as is common, by operating on the latched member directly, then being held by the latching member, for circuit opening. Where a spring biased latched member is operated upon directly for circuit opening, while latched, there arises the objection of additionally stressing the latching member with the latching member functioning as a pivot for the latched member, and also the objection of overcoming the main operating spring then operating on the latching member. By having the circuit opening movement effected by unlatching the latching member, rather than by moving the latched member while latched, the foregoing objections are eliminated.

Still another object is to provide in a switch a manual actuation of such a character that though successively different operations are to be performed by manual operation, the manually movable parts go through identical movements, sometimes known as step by step movement. In known switches, the manually movable means is moved first one way for circuit opening and then the opposite way for circuit closing. In the switch hereof the movement imparted to the manually movable means is the same whether the effect desired be circuit opening or circuit closing.

The foregoing objects and others are attained by the switch herein disclosed, for an understanding of which reference should be had to the accompanying drawings.

In these drawings,

Fig. 1 shows the switch in open circuit position, at rest, and is a view as if in the direction of the arrows 1 of Figs. 4 and 5.

Fig. 2 shows the switch in two different positions, the dotted lines indicating the final rest closed circuit position and the full lines indicating the position of the parts after being moved from circuit open position but before they are finally released to move to rest.

Figs. 3—4—5 are section views on lines 3—3, 4—4, 5—5 of Figs. 2, 1, and 1 respectively.

Fig. 6 is an exploded view of the parts.

The switch hereof includes an insulating base 10 and a U shaped insulation casing 11 closed at its bottom by the base 10 and closed at its ends by end plates 12—12. The switch is shown as controlling three poles, with the controlling parts of the three poles labelled A, B, and C, respectively. The controlling parts include insulation blocks 14 mounted on the base and within which are separated stationary line and load contacts 15, 16, the former being connected by straps and connectors 17 to terminals of line conductors and the latter being connected through connectors 18, magnetic coils 20, and connectors 21 to terminals of load conductors. Since the switch is shown as three pole, there are three complete sets of parts 14—21, one set for each pole and these are disposed along the base 10 in spaced relation.

There are also three sets of movable bridging contacts 22 in the form of elongated members and these are pivotally connected at their centers to operators therefor. For operating the movable contact 22 of pole A there is connected to it the downwardly projecting end 24 of a latch rod 25 whose other end is pivotally mounted at 26 in the casing 11. The other two contacts 22, of phases B and C, are connected at their centers to ends of a bridge piece 27 in turn connected at 28 to a link 29 whose other end is connected at 30 to one end of a contact support or latched member 31 which is pivotally mounted, by a pin and slot connection at 32 to lugs 33 fastened to the casing 11, and the contact support 31 may therefore be regarded as pivotally mounted on the casing between its ends. The connection 32 includes a pin 32a riding in slot 32b of support 31 and fitted in holes 32c of lugs 33. A coil spring 34 has its free end disposed against the upper surface of the casing 11 and its lower end fitted on a spring seat 35 of the contact support. The spring seat 35 and the connection 30 are on opposite sides of the pivotal mounting 32 of the support 31.

The end of the support remote from the connection point 30 is adapted to be releasably latched by the engagement of its lower edge portion 36 with a circular roller or latching member 37 mounted on the latch rod 25. A coiled spring 38 connected at point 39 to the casing 11 and at point 41 to the latch rod 25 at all times tends to pull the latch rod clockwise (Fig. 1) on its pivot 26 so as to bias the latch 37 upwardly. The spring 38 also biases the latch rod towards a stop

42 on the casing 11, opposing latch release parts later described, as shown in Figs. 4 and 5.

Manual actuation movement of the latch rod for circuit opening is provided by a lever or handle 50 pivoted on the casing at 51 and connected at 52 to a link 53 passing through a slot 54 of the casing and having an end connected at 55 to a spring 56 connected to the base 10 at 57, a stop 58 on link 53 terminating upward movement of the link 53 as lever 50 is moved counterclockwise, Fig. 1. The spring 56 at all times biases the lever and link to the final rest position shown in Fig. 1. The lower end of the link 53 is the circuit opening actuator and is formed as a latch releasing cam 59, being inclined in such a manner that when the lever 50 is moved counterclockwise, Fig. 1, the cam 59 of the link 53 cams the latch rod 25 to rock on pivot 26 away from the stop 42, in this manner moving the latch member or roller 37 away from under the lower edge 36 or latched portion of the support or latched member 31. The pick up of latch rod 25 by cam 59 occurs only when the latch rod is in the circuit closed or latching position.

Automatic actuation movement may be imparted to the latch rod 25 for circuit opening by latch release hook 61 formed on the end of a plunger 62 moved by the magnetic coil 20. A spring 63 is provided for constantly biasing the hook 61 to the ineffective or dotted line position of Fig. 5. On the arising of an overload in any pole, the coil 20 of that pole will be energized sufficiently to overcome the spring 63 and pull hook 61 to the left, Fig. 5, and move latch rod 25 away from stop 42, opposing spring 38, to move the latch 37 and release the support 31.

A circuit closing actuator is provided; this is in the form of a lug 66 formed on the link 53 and adapted to pick up a closing lug 67 on the support 31, but only when the support 31 is in the released or open circuit position. At that time movement of the lever 50 from its rest position will cause lug 66 of link 53 to pick up lug 67 of the support 31 and rock it clockwise (Fig. 1 to Fig. 2), on its pivot 32 to ride up and over latch roller 37 of latch rod 25. If the circuit be closed, however, closing lug 67 is out of the path of movement of lug 66 of link 53, and lever movement, from rest position, does not act upon support 31 through any cooperation of lugs 66 and 67.

Operation

The operation is as follows:

When the parts are in circuit open position, Fig. 1, spring 38 biases latch rod 25 towards but not against stop 42 but latch rod 25 is held stopped by the engagement of latch rod 25 with the back of support 31, viewed in Fig. 1. Spring 34 pushes down on support 31 to bias it counterclockwise and support 31 is held stopped by the engagement of portions 22 with the blocks 14, as shown in Fig. 4. Spring 56 holds the lever 50 and link 53 in the rest position shown, Fig. 1.

To close the circuit, the lever 50 is moved counterclockwise to the full line position of Fig. 2, and then the lever is released to move to the dotted line position of Fig. 2. When the lever is first moved, that is before it is released, closing lug or actuator 66 of link 53 picks up lug 67 of support 31 to move the latter up and over latch roller 37, whereupon spring 38 pulls latch rod 25 forwardly to stop 42, thus positioning latch 37 under latched portion 36 of support 31, there being some degree of overtravel. Spring 34, biasing support 31 down, while support 31 has its portion 36 engaging roller 37 on latch rod 25, causes that rod to move down, to close the circuit on pole A at 22—15, even while the lever 50 is held in the full line position, Fig. 2, to hold the link assembly and the support in their full line position, Fig. 2. On release of the lever 50, spring 56 pulls link 53 and lever 50 to the dotted line position, freeing support 31 from the lever and link assembly. However, spring 34 still pushes down on support 31 to bias latch roller 37 and latch rod 25, and particularly its portion 24 and the pole A contact 22 carried thereby, down to the pole A stationary contacts 15, 16 to continue to close the circuit on pole A. The stress of spring 34 on support 31, latched at 36, also is imparted to link 29 to move it down, thus, moving the bridging piece 27 and the poles B and C contacts 22 carried thereby down to circuit closing position.

When a latch release force arises, either from a movement of lever 50 from its rest position counterclockwise, Fig. 2, or from a movement of any latch releasing hook 61 due to an overload in any coil 20, the latch rod 25 is moved in opposition to the holding spring 38 to move latch roller 37 back from under support 31 which then is rocked clockwise by spring 34 to pull up on link 29 and contacts 22 to open the circuit on poles B and C. Spring 38 will rock the latch rod 25 clockwise on pivot 26 to lift up on the contact 22A connected to the trip rod at 24 to open the circuit on pole A.

Since spring 34 is well to the left of lug 67, it can swing support 31 counterclockwise for circuit opening on unlatching at 36, even though support 31 be held up at lug 67 by the holding of handle 50 in the full line position of Fig. 2.

Features

It will be observed that the latch roller 37, which functions as a latch for the contact support 31, is itself connected, through part 24, to a movable contact 22, independent of the support or latched member 31, so as to function as a contact controlling element as well as a latching element. This enables the switch to control several contacts simultaneously, one being controlled by latch rod 25, and the other two by support 31.

Unlike single pole switches having a support generally similar to the support 31 hereof and connected to a contact at a point generally similar in location to point 30 hereof, the switch hereof has as a feature a (pole A) movable contact 22 connected to the latch 37 and controlled by that latch in such a manner that when that latch is in support released position its (pole A) movable contact 22 is in circuit open position and when that latch is in support holding position, its (pole A) movable contact 22 engages its stationary contacts 15, 16. Though, in prior known switches, a latch located similarly to latch 37 hereof is used for holding a support, such latch is not known to have been provided with a contact controlled by it, in the manner just described, independent of the support 31.

In addition, the switch hereof has as a feature not only an automatic release for latch 37 (coil 20—hook 61), but also a manual release (cam 59—lever 50). Whereas, in prior known switches employing support members similar to the support member 31 hereof, manual switch opening is accomplished by a handle operating on the support member directly, to overcome its spring (like spring 34 hereof) rather than on the latch,

in the construction hereof, the handle operates directly on the latch to release it and it is the spring 34 that moves the support for circuit opening, rather than the manual actuator.

It will also be observed that the closing lug 67 of the contact support 31 is at one time in the path of lug 66 of the manual actuation means (50—53) but at another time is not in that path. The position of lug 67 therefore determines whether or not manual actuation will move the contact support through lug 66, and the position of lug 67 in turn is determined by the condition of the circuit. The manual actuation means (50—53) is constructed to have identical movements on successive strokes, but successively different operations despite the identity of successive movements. Every movement of lever 50 is a rocking of the lever counter-clockwise from its rest position and a subsequent release thereof. The first movement will cause circuit opening, the second will cause circuit closing, the third circuit opening, and so forth. The successive movements are identical but the effects are successively different. The switch hereof includes two separate and independent manual actuators, the first, release cam 59, being a latch release actuator, and the second, lug 66, being a relatching actuator. The two actuators 59 and 66 however, are arranged to have a common handle 50 and a common movement, but are so positioned that they operate on different parts of the switch at different times. Thus, in response to the common movement, cam 59 and lug 66 move in unison: however, if the switch is closed, Fig. 2, the lug 66 performs no function, at that time not engaging the held support and rather the cam 59 only functions, engaging the held latch to release it. On the other hand, when the switch is open, cam 59 and lug 66 will move in unison but cam 59 will not function since it will not engage the then released latch, but rather lug 66 will function to engage the then released support to return it to latched position. By having a common handle and a common movement for the two separate actuators, it is possible to employ successive identical movements for manual operation even though it is desired that successive manual operations produce successively different operations.

Now having described the switch herein disclosed, reference should be had to the claims which follow for a determination of the inventions hereof.

I claim:

1. A switch having two stationary contacts, two movable contacts adapted to engage them, a support connected at one point to one of said movable contacts, a releasable latch for holding the support in circuit closing position by engaging it at another point, the latch being connected to the other movable contact in such a manner that that movable contact engages its stationary contact when the latch holds the support and is free of its stationary contact when the latch releases the support, the support being pivotally mounted at a point intermediate the aforesaid points, a spring engaging the support between its pivotal mounting point and its latch held point for biasing the support to move for contact separation when the latch releases, the connection between the support and the movable contact connected to it being such that when the support is held by the latch, that movable contact engages its stationary contact, and when the latch releases the support, the latter is moved by the spring to move that movable contact away from its stationary contact, means for moving the latch to release the support, and means for returning the released latch to support holding position, and for returning the released support to latch held position.

2. A switch having two stationary contacts, two movable contacts adapted to engage them, a support connected at one point to one of said movable contacts, a releasable latch for holding the support in circuit closing position by engaging it at another point, the latch being connected to the other movable contact in such a manner that that movable contact engages its stationary contact when the latch holds the support and is free of its stationary contact when the latch releases the support, the support being pivotally mounted at a point intermediate the aforesaid points, a spring engaging the support between its pivotal mounting point and its latch held point for biasing the support to move for contact separation when the latch releases, the connection between the support and the movable contact connected to it being such that when the support is held by the latch, that movable contact engages its stationary contact, and when the latch releases the support, the latter is moved by the spring to move that movable contact away from its stationary contact, means for moving the latch to release the support, and manual means for returning the released latch to support holding position, and for returning the released support to latch held position.

3. A switch having two stationary contacts, two movable contacts adapted to engage them, a support connected at one point to one of said movable contacts, a releasable latch for holding the support in circuit closing position by engaging it at another point, the latch being connected to the other movable contact in such a manner that that movable contact engages its stationary contact when the latch holds the support and is free of its stationary contact when the latch releases the support, the support being pivotally mounted at a point intermediate the aforesaid points, a spring engaging the support between its pivotal mounting point and its latch held point for biasing the support to move for contact separation when the latch releases, the connection between the support and the movable contact connected to it being such that when the support is held by the latch, that movable contact engages its stationary contact, and when the latch releases the support, the latter is moved by the spring to move that movable contact away from its stationary contact, manual and automatic means for moving the latch to release the support, and means for returning the released latch to support holding position, and for returning the released support to latch held position.

4. A switch having two stationary contacts, two movable contacts adapted to engage them, a support connected at one point to one of said movable contacts, a releasable latch for holding the support in circuit closing position by engaging it at another point, the latch being connected to the other movable contact in such a manner that that movable contact engages its stationary contact when the latch holds the support and is free of its stationary contact when the latch releases the support, the support being pivotally mounted at a point intermediate the aforesaid points, a spring engaging the support between

its pivotal mounting point and its latch held point for biasing the support to move for contact separation when the latch releases, the connection between the support and the movable contact connected to it being such that when the support is held by the latch, that movable contact engages its stationary contact, and when the latch releases the support, the latter is moved by the spring to move that movable contact away from its stationary contact, manual and automatic means for moving the latch to release the support, and manual means for returning the released latch to support holding position, and for returning the released support to latch held position.

5. A switch having two stationary contacts, two movable contacts adapted to engage them, a support connected at one point to one of said movable contacts, a releasable latch for holding the support in circuit closing position by engaging it at another point, the latch being connected to the other movable contact in such a manner that that movable contact engages its stationary contact when the latch holds the support and is free of its stationary contact when the latch releases the support, the support being pivotally mounted at a point intermediate the aforesaid points, a spring engaging the support between its pivotal mounting point and its latch held point for biasing the support to move for contact separation when the latch releases, the connection between the support and the movable contact connected to it being such that when the support is held by the latch, that movable contact engages its stationary contact, and when the latch releases the support, the latter is moved by the spring to move that movable contact away from its stationary contact, manual and automatic means for moving the latch to release the support, and manual means for returning the released latch to support holding position, and for returning the released support to latch held position, the two manual means having a common handle and a common movement, and two separate actuators, one of which engages the latch when it holds but not when it is released, for releasing it, and the other of which engages the support when it is released but not when it is held, for returning it to latch held position.

6. A switch having a stationary contact, a movable contact adapted to engage it, a support connected at one point to said movable contact, a releasable latch for holding the support in circuit closing position by engaging it at another point, the support being pivotally mounted at a point intermediate the aforesaid points, a spring means engaging the support between its pivotal mounting point and its latch held point for biasing the support to move for contact separation when the latch releases, the connection between the support and the movable contact connected to it being such that when the support is held by the latch, that movable contact engages its stationary contact, and when the latch releases the support, the latter is moved by the spring to move that movable contact away from its stationary contact, manual means for moving the latch to release the support, and manual means for returning the released latch to support holding position, and for returning the released support to latch held position.

7. A switch having a stationary contact, a movable contact adapted to engage it, a support connected at one point to said movable contact, a releasable latch for holding the support in circuit closing position by engaging it at another point, the support being pivotally mounted at a point intermediate the aforesaid points, a spring means engaging the support between its pivotal mounting point and its latch held point for biasing, the support to move for contact separation when the latch releases, the connection between the support and the movable contact connected to it being such that when the support is held by the latch, that movable contact engages its stationary contact, and when the latch releases the support, the latter is moved by the spring to move that movable contact away from its stationary contact, automatic and manual means for moving the latch to release the support, and manual means for returning the released latch to support holding position, and for returning the released support to latch held position.

8. A switch having a stationary contact, a movable contact adapted to engage it, a support connected at one point to said movable contact, a releasable latch for holding the support in circuit closing position by engaging it at another point, the support being pivotally mounted at a point intermediate the aforesaid points, a spring means engaging the support between its pivotal mounting point and its latch held point for biasing the support to move for contact separation when the latch releases, the connection between the support and the movable contact connected to it being such that when the support is held by the latch, that movable contact engages its stationary contact, and when the latch releases the support, the latter is moved by the spring to move that movable contact away from its stationary contact, automatic and manual means for moving the latch to release the support, and manual means for returning the released latch to support holding position, and for returning the released support to latch held position, the two manual means having a common handle and a common movement, and two separate actuators, one of which engages the latch when it holds but not when it is released, for releasing it, and the other of which engages the support when it is released but not when it is held, for returning it to latch held position.

9. A switch having a stationary contact, a movable contact adapted to engage it, a support connected at one point to said movable contact, a releasable latch for holding the support in circuit closing position by engaging it at another point, the support being pivotally mounted at a point intermediate the aforesaid points, a spring means engaging the support between its pivotal mounting point and its latch held point for biasing the support to move for contact separation when the latch releases, the connection between the support and the movable contact connected to it being such that when the support is held by the latch, that movable contact engages its stationary contact, and when the latch releases the support, the latter is moved by he spring to move that movable contact away from its stationary contact, manual means for moving the latch to release the support, and manual means for returning the released latch to support holding position, and for returning the released support to latch held position, a second stationary contact, and a second movable contact, the latch being connected to the second movable contact in such a manner that the second movable contact engages the second stationary contact when the latch holds the support but is free of the sec-

ond stationary contact when the latch releases the support.

10. A switch having a stationary contact, a movable contact adapted to engage it, a support connected at one point to said movable contact, a releasable latch for holding the support in circuit closing position by engaging it at another point, the support being pivotally mounted at a point intermediate the aforesaid points, a spring means engaging the support between its pivotal mounting point and its latch held point for biasing, the support to move for contact separation when the latch releases, the connection between the support and the movable contact connected to it being such that when the support is held by the latch, that movable contact engages its stationary contact, and when the latch releases the support, the latter is moved by the spring to move that movable contact away from its stationary contact, automatic and manual means for moving the latch to release the support, and manual means for returning the released latch to support holding position, and for returning the released support to latch held position, a second stationary contact, and a second movable contact, the latch being connected to the second movable contact in such a manner that the second movable contact engages the second stationary contact when the latch holds the support but is free of the second stationary contact when the latch releases the support.

11. A switch having a stationary contact, a movable contact adapted to engage it, a support connected at one point to said movable contact, a releasable latch for holding the support in circuit closing position by engaging it at another point, the support being pivotally mounted at a point intermediate the aforesaid points, a spring means engaging the support between its pivotal mounting point and its latch held point for biasing, the support to move for contact separation when the latch releases, the connection between the support and the movable contact connected to it being such that when the support is held by the latch, that movable contact engages its stationary contact, and when the latch releases the support, the latter is moved by the spring to move that movable contact away from its stationary contact, automatic and manual means for moving the latch to release the support, and manual means for returning the released latch to support holding position, and for returning the released support to latch held position, the two manual means having a common handle and a common movement, and two separate actuators, one of which engages the latch when it holds but not when it is released, for releasing it, and the other of which engages the support when it is released but not when it is held, for returning it to latch held position, a second stationary contact, and a second movable contact, the latch being connected to the second movable contact in such a manner that the second movable contact engages the second stationary contact when the latch holds the support, but is free of the second stationary contact when the latch releases the support.

12. A switch having a stationary contact, a movable contact adapted to engage it, a latched member, a releasable latching member for holding the latched member in circuit closing position by engaging it, the latching member being connected to the movable contact in such a manner that that movable contact engages its stationary contact when the latching member holds the latched member, and is free of its stationary contact when the latching member releases the latched member, and releasing means for the latching member.

13. A switch having a stationary contact, a movable contact adapted to engage it, a latched member, a releasable latching member for holding the latched member in circuit closing position by engaging it, the latching member being connected to the movable contact in such a manner that that movable contact engages its stationary contact when the latching member holds the latched member, and is free of its stationary contact when the latching member releases the latched member, releasing means for the latching member including manual means and automatic circuit responsive means.

14. A switch having a stationary contact, a movable contact adapted to engage it, a latched member, a releasable latching member for holding the latched member in circuit closing position by engaging it, the latching member being connected to the movable contact in such a manner that that movable contact engages its stationary contact when the latching member holds the latched member, and is free of its stationary contact when the latching member releases the latched member, and releasing means for the latching member, and a second stationary contact, and a movable contact therefor, the latter being connected to the latched member, independently of the other movable contact or the latching member, and in such a manner that it leaves its stationary contact on release of the latching member and returns to its stationary contact on restoration of the latch engagement of the members.

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