March 11, 1941. H. F. OBERGFELL 2,234,650

SWITCHING APPARATUS

Filed May 27, 1938

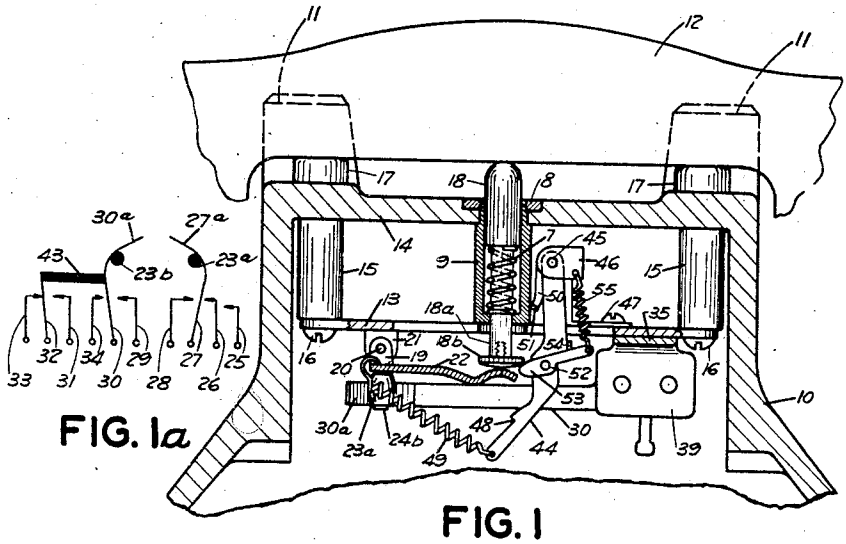


FIG. 1a

FIG. 1

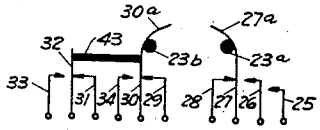


FIG. 2a

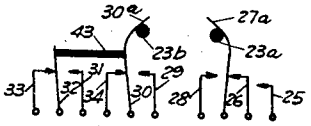


FIG. 4a

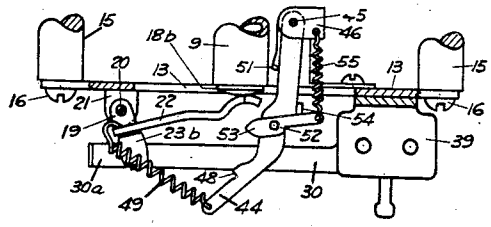


FIG. 2

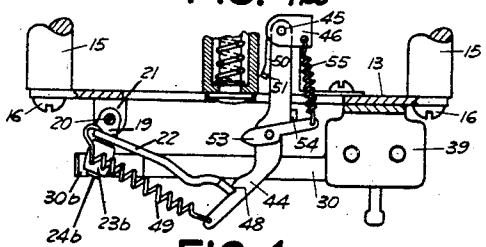


FIG. 4

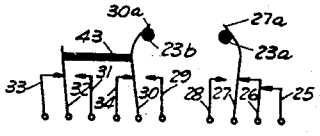


FIG. 3a

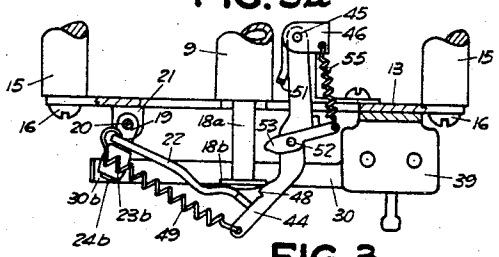


FIG. 3

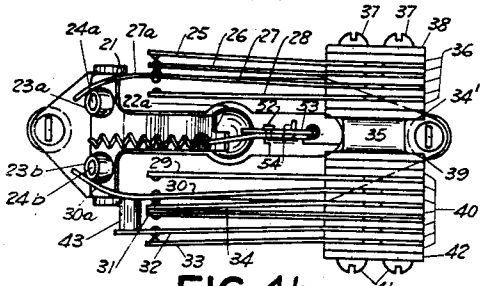


FIG. 4b

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ATTORNEYS.

Patented Mar. 11, 1941

2,234,650

# UNITED STATES PATENT OFFICE

2,234,650

## SWITCHING APPARATUS

Herbert F. Obergfell, River Forest, Ill., assignor to Associated Electric Laboratories, Inc., Chicago, Ill., a corporation of Delaware

Application May 27, 1938, Serial No. 210,348

20 Claims. (Cl. 179—164)

The present invention relates to switching apparatus and more particularly to telephone hook or cradle switches of the type adapted for use in conjunction with a telephone instrument which is normally supported upon a supporting element and is adapted to be removed from the supporting element for use.

A switch of the character indicated, when used in conjunction with a telephone instrument of the hand set type is usually housed within the pedestal forming the supporting element for the hand set and is provided with an operating member comprising a plunger which projects through an opening in the top of the pedestal and is arranged to be operated between two positions in response to removal of the hand set from the supporting pedestal or replacement of the hand set upon the supporting pedestal. Also, in the usual arrangement, the switch is provided with only two operating positions respectively corresponding to the two operating positions of the plunger.

It is an object of the present invention to provide an improved switch of simple construction and arrangement which is operable into any one of several operating positions and is provided with an improved locking arrangement for restraining the switch in a predetermined operating position.

It is a further object of the invention to provide a switch of the character described wherein the release of the locking arrangement is under the control of the switch operating member.

It is a still further and more specific object of the invention to provide an improved switch adapted for use in conjunction with a telephone instrument which is normally supported upon but is removable from a supporting element and wherein the operating member of the switch is controlled by removal of the instrument from its supporting element and is operable into any one of several different operating positions individually corresponding to different arrangements of the switch contacts.

In general, the objects as set forth above are attained in accordance with the present invention by providing a switch comprising an operating member having a plurality of operating positions and a contact controlling member operative in response to operation of the operating member and having a plurality of operating positions individually corresponding to the operating positions of the operating member, together with locking means controlled by the operating member for restraining the contact controlling member in one of its positions and contacts arranged in different manners when the contact controlling member occupies different ones of its operating positions. More particularly, the switch operating member is in the form of a plunger biased toward one position and movable from the one position through at least one intermediate position to a final position. The circuit controlling element is operative in response to movement of the operating member from its one position to its final position and is biased to follow the operating member during a portion of the return movement thereof from its final position toward its one position. The locking means is arranged to arrest and restrain the contact controlling member in a position corresponding to an intermediate position of the operating member, means being provided, operative in response to operation of the operating member from its one position to one of its intermediate positions, for causing the locking means to release the circuit controlling member so that it may return to its normal position.

The novel features believed to be characteristic of the invention are set forth with particularity in the appended claims. The invention, both as to its organization and method of operation, together with further objects and advantages thereof, will best be understood by reference to the specification taken in connection with the accompanying drawing, in which Figure 1 is a fragmentary cross-sectional view of a telephone subset of the hand set type having embodied therein a switch constructed and arranged in accordance with the present invention; Figs. 2, 3 and 4 illustrate three different positions of the switch shown in Fig. 1; Figs. 1*a*, 2*a*, 3*a* and 4*a* illustrate the contact arrangements of the switch corresponding, respectively, to the operating positions shown in Figs. 1, 2, 3 and 4; and Fig. 4*b* is a bottom view of the mechanism of the switch illustrating this mechanism when operated to the position shown in Fig. 4.

Referring now to the drawing, the improved switch briefly described above is illustrated as being mounted within a pedestal or base 10 of a telephone subset of the hand set type. The pedestal 10 is provided with upstanding lugs or arms, two of which are indicated at 11, which are displaced in the usual manner to provide a cradle for supporting therein the handle portion of the hand set diagrammatically indicated at 12. The contacts and controlling mechanism therefor are carried by a bracket member 13 which is secured to the top portion 14 of the pedestal 10 by a mounting arrangement comprising spacing members 15 and screws 16. More particularly, each of the screws 16 extends through openings provided in

the bracket 13, the associated one of the annular spacing members 15 and the top portion of the pedestal 10, and is threaded into a tapped cap 17 which forms a rest for the handle of the hand set 12.

The switch comprises an operating member in the form of a plunger 18 having a plurality of operating positions illustrated, respectively, in Figs. 1 to 4, inclusive, of the drawing, and a contact controlling member comprising an element 19 pivotally mounted at 20 upon two lugs 21 projecting downward from the bracket member 13. The plunger 18 is mounted upon the upper portion 14 of the pedestal 10. More particularly, the plunger 18 is supported within a cup-shaped member 9 having an upper end of reduced cross section extending through and snugly engaging an opening provided in the top portion 14 of the pedestal 10. A nut 8, threaded onto the reduced portion of the member 9, serves rigidly to secure this member to the portion 14 of the pedestal 10. The plunger 18 is provided with a lower portion $18^a$ of reduced cross section which extends through an opening provided in the lower wall of the member 9. An enlarged cap $18^b$ having a shank threaded into the lower end of the plunger 18 is provided for restricting the movement of the plunger in an upward direction and for controlling a locking arrangement associated with the contact controlling member 19, in a manner more fully described subsequently. The plunger is normally biased in an upward direction toward one of its operating positions by a helical spring 7 surrounding the portion $18^a$ of the plunger and having one end abutting the enlarged portion of the plunger and the other end abutting the lower wall of the member 9.

The contact controlling element 19 includes an arm 22 biased to engage the rounded lower surface of the cap $18^b$ and carries two contact actuating rollers $23^a$ and $23^b$ rotatably mounted, respectively, upon pins $24^a$ and $24^b$ rigidly supported upon the element 19. These rollers, which are constructed of insulating material, respectively cooperate with two different operating springs of a spring pile comprising the springs 25 to 34, inclusive. The springs 25 to 28, inclusive, are mounted upon one leg 34' of a U-shaped supporting bracket 35 rigidly secured to the bracket member 13. The springs of this group are insulated from each other by spacing members 36 formed of insulating material, and are secured to the leg 34' of the bracket piece 35 by screws 37 extending through a face plate 38 and the alternately spaced insulating members 36 and springs, and threaded into the leg 34'. A similar arrangement is used for mounting the springs 29 to 33, inclusive, upon the other leg 39 of the U-shaped bracket piece 35. The springs of the last-mentioned group are insulated from each other by members 40 formed of insulating material and are secured to the bracket leg 39 by screws 41 extending through a face plate 42 and the alternately spaced springs and insulating members, and threaded into appropriately spaced tapped openings provided in the leg 39. The springs 27, 30 and 32 of the spring pile comprise the main operating springs and are movable in response to movement of the rollers $23^a$ and $23^b$ carried by the contact controlling member 19. To this end, the springs 27 and 30 are formed of relatively heavy resilient stock and are respectively provided with curved end portions $27^a$ and $30^a$ which respectively cooperate with the rollers $23^a$ and $23^b$. The resilient spring 32 is arranged to respond to movement of the spring 30 through the provision of an element 43 formed of insulating material and rigidly secured to the spring 32. The element 43 is biased by the spring 32 to engage the spring 30 so that movement of the spring 30 is directly transmitted to the spring 32.

For the purpose of locking the contact controlling element 19 in one of its operating positions, there is provided locking means comprising an element 44 pivotally mounted at 45 upon a bracket piece 46 secured by means of a screw 47 to the bracket member 13. The element 44 is provided with a recess 48 which is adapted to engage the end of the arm 22 to restrain the contact controlling member 19 in the position shown in Fig. 4. The element 44 is normally biased to move in a counterclockwise direction toward the end of the arm 22 by a spring 49 connected between the lower end of the element 44 and the left end of the arm 22. This spring also serves to bias the right end of the arm 22 into engagement with the lower rounded surface of the cap $18^b$ secured to the plunger 18. Movement of the element 44 in a counterclockwise direction is limited by a stop comprising an arm 50 forming a part of the bracket piece 46 and provided at its lower end with a bent-over projection lying in the path of movement of the element 44.

For the purpose of releasing the locking means just described to permit the arm 22 to be moved under the influence of the spring 49 back into engagement with the cap $18^b$ carried by the plunger 18, there is pivotally mounted at 52 on the element 44 a finger 53 which is normally biased into engagement with a bent-over portion 54 of the element 44 by means of a light helical spring 55 having one end secured to the bracket piece 46 and the other end secured to the right end of the finger 53. As best shown in Fig. 4*b*, the free end of the arm 22 is cut away at $22^a$ to permit the arm to be moved between its two extreme positions without engaging the finger 53.

With the operating member or plunger 18 occupying its normal position as shown in Fig. 1 of the drawing or, more particularly, with the hand set 12 resting upon its supporting pedestal 10 so that the plunger 18 is depressed to its first intermediate or normal position, the contact controlling element 19 occupies a position such that the contact springs of the spring pile have the arrangement illustrated in Fig. 1*a*. It will be observed that, with the contact controlling member in this position, only the springs 32 and 33 are in engagement. When the hand set is removed from its supporting pedestal 10, the spring 7 forces the plunger 18 upward to its first position so that the elements of the contact controlling mechanism assume the positions illustrated in Fig. 2. More particularly, when the plunger 18 is moved upward, the arm 22 is rotated in a counterclockwise direction under the influence of the spring 49 and the rollers $23^a$ and $23^b$ are moved to the right over the curved portions $27^a$ and $30^a$ respectively, of the springs 27 and 30, so that a new arrangement of the contact springs is achieved. It will be observed that the cut away portion $22^a$ of the arm 22 passes by the finger 53 during movement of the arm 22 to the position shown in Fig. 2. During the indicated movement of the contact controlling member 19 the springs 32 and 33 are moved out of engagement, the spring 32 is moved into

engagement with the spring 31, the spring 30 is moved into engagement with the spring 29, and the spring 27 is moved into engagement with the spring 28.

If, with the elements of the switch occupying the positions shown in Fig. 2, the plunger 18 is depressed by pressing downward thereon, it is moved through its normal or first intermediate position as shown in Fig. 1 and the second intermediate position as shown in Fig. 4 to its final position as shown in Fig. 3. During such movement, the contact controlling element 19 is rotated in a clockwise direction against the bias of the spring 49 and the rollers 23a and 23b, by riding over the inwardly curved ends 27a and 30a, respectively, of the springs 27 and 30, force the springs 27 and 30 outward so that, at the end of the movement, the contact arrangement illustrated in Fig. 3a is achieved. More specifically, the springs 27, 30 and 32 are moved out of engagement with the springs 28, 29 and 31, respectively, and are moved into engagement with the springs 33, 34 and 33 respectively. Also, with the plunger 18 occupying its final operating position, the spring 25 is forced outwardly into engagement with the spring 26. As the plunger 18 is moved downward from its first operating position to its final position the cap 18b engages the rounded cam surface provided on the left end of the finger 53, which finger is biased into engagement with the stop 54. Due to the engagement of the cap 18b and the finger 53, the locking element 44 is pivoted in a counterclockwise direction to move the finger out of the path of movement of the cap 18b. When the cap 18b is moved beyond the finger, the element 44 is snapped into engagement with the right end of the arm 22 under the influence of the spring 49 and continues to engage the arm 22 until the final position of the plunger 18 is reached.

If, after the plunger 18 has been depressed to its lowermost or final operating position, it is released, it starts to move upward under the influence of the spring 7, and the contact controlling member 19, due to the force exerted thereon by the biasing spring 49, follows the movement of the plunger during a portion of its movement toward its first operating position. At this time, the lower portion of the locking element 44 is biased into engagement with the right end of the arm 22 so that, when the plunger is returned to its next to last operating position, the right end of the arm 22 engages or drops into the recess 48 provided in the locking element 44 to hold the contact controlling member in a position, shown in Fig. 4, corresponding to the next to final position of the plunger 18 while the plunger returns to its first operating position. During the return movement of the plunger 18 the upper side of the cap 18b engages the finger 53 to cause this finger to be pivoted in a clockwise direction against the bias of the spring 55 out of the path of movement of the cap. After the cap passes over the finger 53, the finger is rotated back into engagement with the projection 54 by the spring 55. With the contact controlling element 19 occupying the position shown in Fig. 4, the contact springs 25 and 26 are disengaged, but otherwise the contact arrangement is the same as shown in Fig. 3a.

Release of the locking means to permit the contact controlling member to return to its normal position is effected when the hand set 12 is again placed upon its supporting pedestal 10. Thus, when the hand set 12 is replaced upon the supporting pedestal 10, the plunger 18 is forced downward to its normal or first intermediate position by the weight of the hand set. During the final movement of the plunger, the cap 18b carried thereby engages the rounded end of the finger 53. Since this finger is now biased by the spring 55 into engagement with the projection or stop 54, the downward movement of the plunger 18 causes the locking element 44 to be pivoted in a counterclockwise direction a sufficient amount to disengage the right end of the arm 22 from the recess 48. Hence the arm 22 is permitted to return to its normal position or into engagement with the cap 18b under the influence of the spring 49 whereby the contact springs are caused to again assume the positions shown in Fig. 1a.

While there has been described what is at present considered to be the preferred embodiment of the invention, it will be understood that various modifications may be made therein, and it is intended to cover in the appended claims all such modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. A switch comprising, in combination, an operating member having a plurality of operating positions, a contact controlling member operative in response to operation of said operating member and having a plurality of operating positions individually corresponding to the operating positions of said operating member, locking means operative to restrain said contact controlling member in one of its operating positions, means responsive to movement of said operating member from one of its operating positions into a second of its operating positions and back toward its one operating position for operating said locking means, means responsive to subsequent movement of said operating member into a third of its operating positions for causing said locking means to release said contact controlling member, means operative to move said contact controlling member into another of its operating positions when said locking means releases said contact controlling member, and contacts controlled by said contact controlling member, said contacts being arranged in different manners when said contact controlling member occupies different ones of its operating positions.

2. A switch comprising, in combination, an operating member comprising a plunger biased toward a normal position and depressible to a plurality of operating positions, a contact controlling member operative in response to operation of said plunger and having a normal position and a plurality of operating positions individually corresponding to the normal position and the operating positions of said plunger, locking means operative to restrain said contact controlling member in one of its operating positions, means responsive to movement of said operating member from its normal position into one of its operating positions and back toward its normal position for operating said locking means, means responsive to subsequent movement of said plunger from its normal position into a second of its operating positions for causing said locking means to release said contact controlling member, means operative to move said contact controlling member into another of its operating positions when said locking means releases said contact controlling member, and contacts controlled by said contact controlling member, said contacts being arranged in different manners

when said contact controlling member occupies its normal position and different ones of its operating positions.

3. A switch comprising, in combination, an operating member having three operating positions, a contact controlling member having four operating positions, means responsive to movement of said operating member into one of its positions for moving said contact controlling element into one of its positions, means responsive to movement of said operating member into a second of its positions for moving said contact controlling member into a second of its positions, means responsive to movement of said operating member away from its second position for moving said contact controlling member toward its third position, locking means for restraining said contact controlling member in its third position, means responsive to movement of said operating member into its third position for causing said locking means to release said contact controlling member, means operative to move said contact controlling member to its fourth position when said locking means is operated to release said contact controlling member, and contacts associated with said contact controlling member, said contacts being arranged in different manners when said contact controlling member occupies different ones of its operating positions.

4. A switch comprising, in combination, an operating member having a normal position and operable to a first off-normal position, said member being arranged successively to be operated from said first off-normal position to a second off-normal position and back to said first off-normal position, a contact controlling member having a normal position and two off-normal positions individually corresponding to the normal and two off-normal positions of said operating member, means for causing said contact controlling element to follow the movement of said operating member during operation of said operating member from its second off-normal position toward its first off-normal position, locking means for restraining said contact controlling member in a third off-normal position during said last-mentioned movement, means responsive to movement of said operating member from its first off-normal position for releasing said locking means, means operative to return said contact controlling member to its normal position when said locking means is released, and contacts controlled by said contact controlling member, said contacts being arranged in different manners when said contact controlling member occupies different ones of its positions.

5. A switch comprising, in combination, an operating member having a normal position and operable to an off-normal position, a contact controlling member having a normal position and operable to two different off-normal positions, means responsive to movement of said operating member to its off-normal position for moving said contact controlling member to one of its off-normal positions, means responsive to subsequent movement of said operating member away from its off-normal position for moving said contact controlling member to its second off-normal position, locking means for retaining said contact controlling member in its second off-normal position, means responsive to movement of said operating member to its normal position for releasing said locking means, means operative to return said contact controlling member to its normal position when said locking means is released, and contacts controlled by said contact controlling member, said contacts being arranged in different manners when said contact controlling member occupies different ones of its positions.

6. A switch comprising, in combination, an operating member having a normal position and operable to an off-normal position, a contact controlling member including an arm, spring means normally biasing said arm into engagement with said operating member, whereby said contact controlling member is provided with a normal position and is moved to an off-normal position in response to movement of said operating member to its off-normal position, locking means comprising an element provided with a piece adapted to engage said arm when said contact controlling member is moved from its normal position to its off-normal position, thereby to restrain said contact controlling member in its off-normal position, means responsive to a predetermined subsequent movement of said operating member into its normal position for moving said element to disengage said arm and piece, thereby to release said contact controlling member for return to its normal position, and contacts controlled by said contact controlling member.

7. A switch comprising, in combination, an operating member having a normal position and operable to an off-normal position, a contact controlling member including an arm, spring means normally biasing said arm into engagement with said operating member, whereby said contact controlling member is provided with a normal position and is moved to an off-normal position in response to movement of said operating member to its off-normal position, locking means comprising an element provided with a piece adapted to engage said arm when said circuit controlling member is moved to its off-normal position, thereby to restrain said contact controlling member in its off-normal position, means comprising a finger carried by said element and adapted to be engaged by said operating member for moving said element to disengage said arm and piece in response to a predetermined subsequent movement of said operating member into its normal position, thereby to release said contact controlling member for return to its normal position, and contacts controlled by said contact controlling member.

8. A switch comprising, in combination, an operating member having a normal position and operable to an off-normal position, a pivotally mounted contact controlling member including an arm, spring means normally biasing said arm into engagement with said operating member, whereby said contact controlling member is provided with a normal position and is operable to an off-normal position in response to movement of said operating member to its off-normal position, a pivotally mounted element provided with a piece for engaging said arm when said contact controlling member is moved to its off-normal position, thereby to restrain said contact controlling member in its off-normal position, spring means biasing said element in a direction to bring said arm and said piece into engagement, a finger rotatably mounted on said element and adapted to be engaged by said operating member during movement of said operating member between its normal and off-normal positions, a lug carried by said element and projecting into the path of rotation of said finger, said finger normally being biased into engagement with said

lug and being so arranged that during movement of said operating member from its off-normal position to its normal position said finger is rotated against its bias out of the path of said operating member and during movement of said operating member toward its off-normal position said finger engages said lug to cause said element to move and disengage said arm and said piece, thereby to permit said contact controlling member to return to its normal position, and contacts controlled by said contact controlling element.

9. A switch comprising, in combination, an operating member comprising a plunger having a normal position and depressible to an off-normal position, spring biasing means for moving said plunger toward its normal position after it has been depressed to its off-normal position and released, a contact controlling member including an arm, spring means normally biasing said arm into engagement with one end of said plunger, whereby said contact controlling member is provided with a normal position and is operated to an off-normal position in response to movement of said plunger to its off-normal position, locking means comprising an element provided with a piece adapted to engage said arm when said circuit controlling member is moved from its normal position to its off-normal position, thereby to restrain said contact controlling member in its off-normal position, means responsive to a predetermined subsequent movement of said plunger into its normal position for moving said element to disengage said arm and piece, thereby to release said contact controlling member for return to its normal position, and contacts controlled by said contact controlling member.

10. A switch comprising, in combination, an operating member comprising a plunger having a normal position and depressible to an off-normal position, spring biasing means for moving said plunger toward its normal position after it has been depressed to its off-normal position and released, a contact controlling member including an arm, spring means normally biasing said arm into engagement with one end of said plunger, whereby said contact controlling member is provided with a normal position and is operated to an off-normal position in response to movement of said plunger to its off-normal position, locking means comprising an element provided with a piece adapted to engage said arm when said circuit controlling member is moved to its off-normal position, thereby to restrain said contact controlling member, means comprising a finger carried by said element and adapted to be engaged by said one end of said plunger for moving said element to disengage said arm and piece in response to a predetermined subsequent movement of said operating member into its normal position, thereby to release said contact controlling member for return to its normal position, and contacts controlled by said contact controlling member.

11. A switch comprising, in combination, an operating member comprising a plunger having a normal position and depressible to an off-normal position, spring means for moving said plunger toward its normal position after it has been depressed to its off-normal position and released, a contact controlling member including an arm, spring means normally biasing said arm into engagement with one end of said plunger, whereby said contact controlling member is provided with a normal position and is operated to an off-normal position in response to movement of said plunger to its off-normal position, a pivotally mounted element provided with a piece for engaging said arm when said contact controlling member is moved to its off-normal position, thereby to restrain said contact controlling member in its off-normal position, spring means biasing said element in a direction to bring said arm and said piece into engagement, a finger rotatably mounted on said element and adapted to be engaged by said plunger during movement of said plunger between its normal and off-normal positions, a lug carried by said element and projecting into the path of rotation of said finger, said finger normally being biased into engagement with said lug and being so arranged that during movement of said plunger from its off-normal position to its normal position said finger is rotated against its bias out of the path of said plunger and during movement of said plunger toward its off-normal position said finger engages said lug to cause said element to move and disengage said arm and said piece, thereby to permit said contact controlling member to return to its normal position, and contacts controlled by said contact controlling member.

12. A switch comprising, in combination, an operating member biased toward one position and operable against its bias from its one position through an intermediate position to a final position, a contact controlling member operative in response to movement of said operating member from its one position to its final position and biased to follow said operating member during a portion of the return movement of said operating member from its final position toward its one position, locking means for restraining said contact controlling member in a position corresponding to the intermediate position of said operating member during the return movement of said operating member, means responsive to a succeeding operation of said operating member from its one position into its intermediate position for causing said locking means to release said contact controlling member, and a plurality of contacts controlled by said contact controlling member, said contacts being arranged in different manners when said operating member occupies different ones of its positions.

13. A switch comprising, in combination, an operating member biased toward one position and operable against its bias from its one position through an intermediate position to a final position, a contact controlling member operative in response to movement of said operating member from its one position to its final position and biased to follow said operating member during a portion of the return movement of said operating member from its final position toward its one position, locking means for restraining said contact controlling member in a position corresponding to the intermediate position of said operating member during the return movement of said operating member, means responsive to a succeeding operation of said operating member from its one position into its intermediate position for causing said locking means to release said contact controlling member, and a plurality of contacts controlled by said contact controlling member, said contacts being arranged in different manners when said operating member occupies different ones of its positions, one pair of said contacts being operated into engagement only when said operating member occupies its final position.

14. A switch comprising, in combination, an

operating member biased toward one position and operable against its bias from its one position through intermediate position to a final position, a contact controlling member operative in response to movement of said operating member from its one position to its final position and biased to follow said operating member during a portion of the return movement of said operating member from its final position toward its one position, locking means for restraining said circuit controlling member in a position corresponding to the intermediate position of said operating member, means responsive to a succeeding operation of said operating member from its one position into its intermediate position for causing said locking means to release said circuit controlling member, and a plurality of contacts controlled by said contact controlling member, said contacts being arranged in different manners when said operating member occupies different ones of its positions.

15. A switch comprising, in combination, an operating member biased toward one position and operable against its bias from its one position through an intermediate position to a final position, a contact controlling member operative in response to movement of said operating member from its one position to its final position and biased to follow said operating member during a portion of the return movement of said operating member from its final position toward its one position, locking means for restraining said circuit controlling member in a position corresponding to the intermediate position of said operating member, means responsive to a succeeding operation of said operating member from its one position into its intermediate position for causing said locking means to release said circuit controlling member, and a plurality of contacts controlled by said contact controlling member, said contacts being arranged in different manners when said operating member occupies different ones of its positions, one pair of said contacts being operated into engagement only when said operating member occupies its final position.

16. A switch comprising, in combination, an operating member comprising a plunger biased toward one position and depressible against its bias from its one position through an intermediate position to a final position, a contact controlling member including an arm biased to engage one end of said plunger so that said contact controlling member is operative in response to movement of said plunger from its one position to its final position and follows said plunger during a portion of the return movement of said plunger from its final position to its one position, locking means for restraining said contact controlling member in a position corresponding to the intermediate position of said plunger during the return movement of said plunger, means responsive to a succeeding operation of said plunger from its one position into its intermediate position for causing said locking means to release said circuit controlling member, and a plurality of contacts controlled by said contact controlling member, said contacts being arranged in different manners when said plunger occupies different ones of its positions.

17. A switch comprising, in combination, an operating member comprising a plunger biased toward one position and depressible against its bias from its one position through an intermediate position to a final position, a contact controlling member including an arm biased to engage one end of said plunger so that said contact controlling member is operative in response to movement of said plunger from its one position to its final position and follows said plunger during a portion of the return movement of said plunger from its final position to its one position, locking means for restraining said contact controlling member in a position corresponding to the intermediate position of said plunger during the return movement of said plunger, means responsive to a succeeding operation of said plunger from its one position into its intermediate position for causing said locking means to release said circuit controlling member, and a plurality of contacts controlled by said contact controlling member, said contacts being arranged in different manners when said plunger occupies different ones of its positions, one pair of said contacts being operated into engagement only when said operating member occupies its final position.

18. In a telephone hook or cradle switch adapted for use in conjunction with a telephone instrument which is normally supported upon a supporting element and is adapted to be removed from the supporting element for use; the combination comprising an operating member having a plurality of operating positions, said operating member being operative from one of its positions to another in response to the removal of the instrument from the supporting element and operative from said other position to said one position in response to replacement of the instrument on the supporting element, a contact controlling member operative in response to operation of said operating member and having a plurality of operating positions individually corresponding to the operating positions of said operating member, locking means for restraining said contact controlling member in one of its positions, means for setting said locking means, means responsive to movement of said operating member into a predetermined one of its positions for tripping said locking means to release said contact controlling member, means operative to move said contact controlling member into another of its positions when said locking means is tripped to release said contact controlling member, and contacts controlled by said contact controlling member, said contacts being arranged in different manners when said contact controlling member occupies different ones of its operating positions.

19. In a telephone hook or cradle switch adapted for use in conjunction with a telephone instrument which is normally supported upon a supporting element and is adapted to be removed from the supporting element for use; the combination comprising an operating member biased toward one position and operable against its bias through an intermediate position to a final position, said operating member being operative from its intermediate position to its one position in response to removal of the instrument from the supporting element and being operative from its one position to its intermediate position in response to replacement of the instrument on the supporting element, said operating member being manually operative to its final position, a contact controlling member operative in response to movement of said operating member from its one position to its final position and biased to follow said operating member during a portion of the return movement of said operating member from its final position toward its

one position, locking means for restraining said contact controlling member in a position corresponding to the intermediate position of said operating member during the return movement of said operating member, means responsive to a succeeding operation of said operating member from its one position into its intermediate position for causing said locking means to release said circuit controlling member, and a plurality of contacts controlled by said contact controlling member, said contacts being arranged in different manners when said operating member occupies different ones of its positions.

20. In a telephone hook or cradle switch adapted for use in conjunction with a telephone instrument which is normally supported upon a supporting element and is adapted to be removed from the supporting element for use; the combination comprising an operating member biased toward a first position and operable against its bias through an intermediate position to a final position, said operating member being operative from said intermediate position to said first position in response to removal of the instrument from the supporting element and being operative from said first position to said intermediate position in response to replacement of the instrument upon the supporting element, said operating member being manually operative to said final position, a contact controlling member operative in response to operation of said operating member and having a plurality of operating positions, locking means for restraining said contact controlling member in one of its positions, means responsive to operation of said operating member to said final position for setting said locking means, means responsive to replacement of the instrument on the supporting element for tripping said locking means to release said contact controlling member, means for moving said contact controlling member from said one position to another of its positions when said locking means is tripped to release said contact controlling member, and contacts controlled by said contact controlling member.

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