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DIMMER SWITCH

Filed May 21, 1940

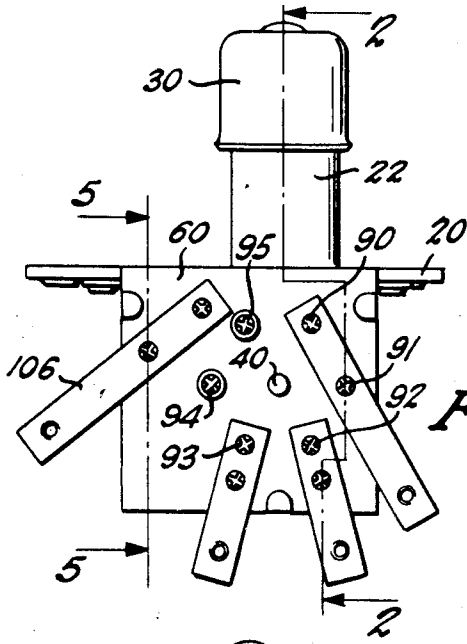


Fig. 1.

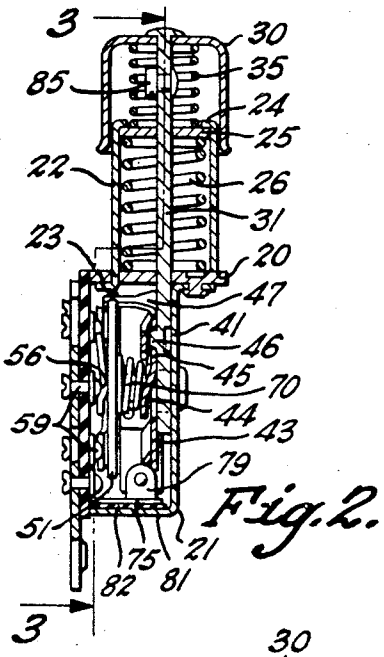


Fig. 2.

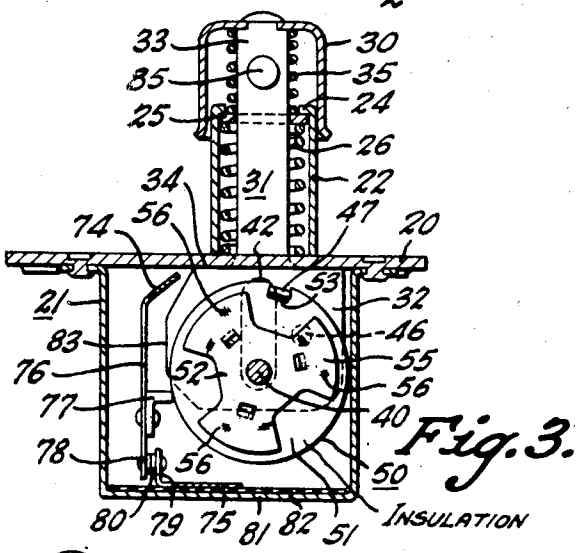


Fig. 3.

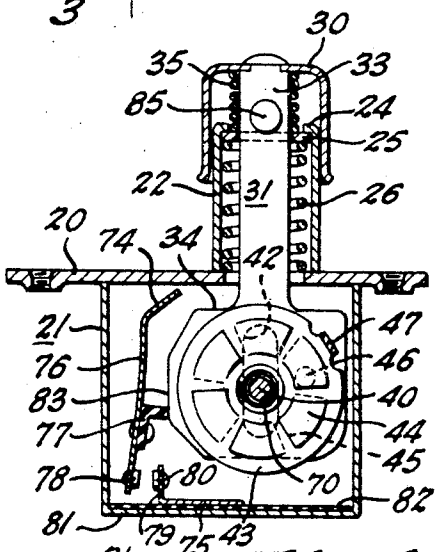


Fig. 4.

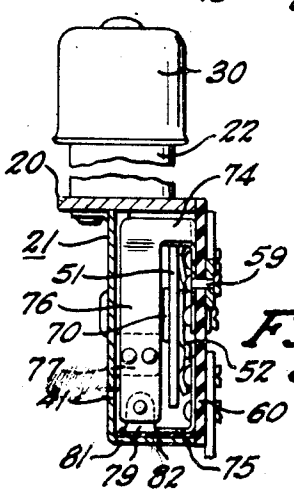


Fig. 5.

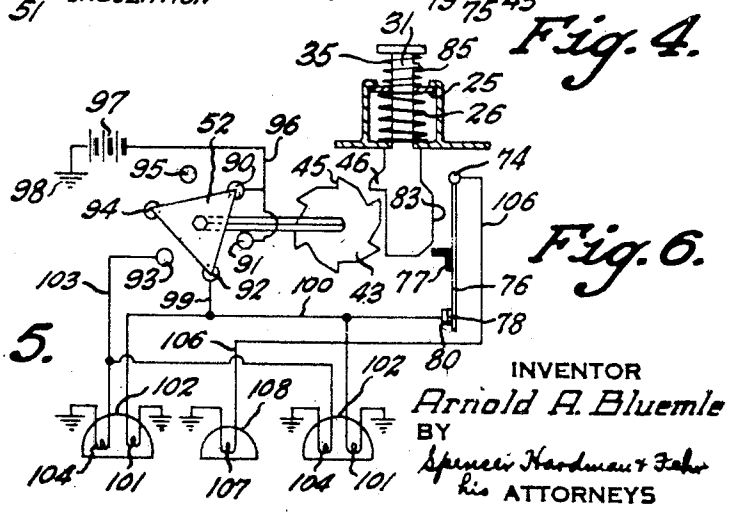


Fig. 6.

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DIMMER SWITCH

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17 Claims. (Cl. 171—97)

This invention relates generally to improvements in switch mechanism and more particularly to improvements in construction and operation of so called dimmer switches for controlling the front lights of vehicles, such as automobiles.

An object of the present invention is to provide an improved switch mechanism which is simple in construction and highly effective in use.

Another object of the present invention is to provide a three-way switch mechanism of the type including a pair of switches that are so interconnected whereby successive full stroke manipulations of a single operating member will control both switches to connect different electrical circuits, and if so desired the operating member may be maniplated a partial stroke to actuate one switch without effecting the position of the other switch to modify temporarily one of the circuits when connected, while the alternate full stroke manipulations complete the same circuit.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing wherein a preferred embodiment of the present invention is clearly shown.

In the drawing:

Fig. 1 gives a rear plan view of the assembled switch mechanism embodied in the present invention.

Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1.

Fig. 3 is a view taken on the line 3—3 of Fig. 2 showing the normal position of the switch mechanism.

Fig. 4 is a view similar to Fig. 3 showing the corresponding parts in operative relation when the operating member is partially depressed.

Fig. 5 is a view taken on the line 5—5 of Fig. 1.

Fig. 6 illustrates diagrammatically the wiring diagram and the switch mechanism employed for accomplishing the aforesaid mentioned control of the vehicle front lights.

Referring to the drawing the improved switch mechanism comprises in general a supporting bracket or plate 20 having a cup-shaped housing 21 attached to under side thereof and having a tubular sleeve 22 projecting from its upper side. The sleeve is firmly attached to the plate 20 by several integral lugs 23 passing through suitable apertures in the plate and bent over against the under side of the plate 20, as clearly shown in Fig. 2. The sleeve 22 is provided with an integral internal flange 24 at its upper end to provide a seat for an apertured disc 25. The disc 25 is held against the flange 24 by a heavy compression spring 26 interposed between the plate 20 and the washer 25.

The upper end of the sleeve 22 is telescopically engaged by a cup-shaped button 30 to provide a cover for the sleeve 22. The button 30 is attached to the upper end of a plunger element 31. This plunger is stamped from sheet metal and has an enlarged portion 32 and a reduced portion 33 to provide shoulders 34 which normally engage the under side of the bracket 20. The reduced portion 33 passes loosely through the apertures provided in the plate 20 and the disc 25. A light compression spring 35 around the reduced portion 33 is disposed between the washer 25 and the button 30. The spring operates to hold the button in its uppermost position as shown in Figs. 2 and 3. The spring 35 also operates to hold the shoulders 34 of the plunger 31 against the under side of the bracket of plate 20 which acts as a stop for the plunger to limit the upward travel thereof.

A pivot stud or post 40 is attached at one end to a back wall 41 of the housing 21. This stud 40 has a sliding fit with the side marginal walls of an elongated slot 42 provided in the enlarged portion 32 of the plunger element 31. The free end of the stud 40 projects thru the slot 42 and beyond the outer face of plunger. The slot 42 together with rectangular openings in the plate 20 and disc 25 guide the plunger element 31 in a straight line movement. The shaft portion of the stud 40 which projects beyond the plunger element 31 provides a pivot for an apertured drive disc or plate 43. This drive plate 43 has a plurality of cam portions 44 that are equally spaced in a circular row about the axis of the plate 43. The cam portions 44 are preferably punched out of the plane of the disc 43 so that straight edge portions 45 are provided to receive progressively a projection 46 carried by the enlarged portion 32 of the plunger element 31. In the normal position of the plunger element 31 the projection 46 is spaced a predetermined distance above one of the straight edges 45 that is next adapted to receive the projection 46, see Fig. 2. When the plunger element is given a partial stroke the projection 46 can move the predetermined distance without effecting the position of the drive plate 43. When the plunger has moved the predetermined distance the projection 46 will be in a position to engage one of the straight edges so that any further downward movement of the plunger the projection 46 will actuate the drive disc in a clockwise direction. In case the plunger is given

a full stroke the projection will rotate the plate substantially 60 degrees about the pivot stud 40. The periphery of the drive disc 43 is provided with an angular ear 47 for driving a contact assembly 50.

The movable contact assembly 50 is removably mounted on the shaft portion of the stud 40. This contact assembly comprises a disc 51 of insulating material and a bridging contact plate 52. The ear 47 of the drive disc 43 fits into a notch 53 provided in the periphery of the disc 51. The disc 51 is also provided with suitably spaced notches about the axis of the disc 51 to receive prongs formed integral on the bridging contact plate 52 to hold the bridging plate in assembled relation with the disc 51.

The movable contact plate 52 is mounted upon the disc 51 on the side opposite to the side which faces the drive plate 43. The bridging contact plate has three radially disposed arms 55 which are deformed to provide grooves 56 to receive rounded heads of contact terminal rivets 59 suitably supported and insulated from each other on a closure 60.

The housing 21 is closed by the closures 60 which carries a plurality of conducting terminal rivets 59 having a rounded head which are adapted to fit into the deformations or grooves 56 in the arms 55. The grooves 56 are provided with suitable shoulders at one end which cooperate with the rounded heads of the rivets to prevent reverse rotation of the contact assembly on the stud 40. A compression spring 70 interposed between the drive plate 43 and the disc 51 operates in two directions. The spring 70 operates to urge constantly in one direction the various elements associated with the contact assembly 50 towards the closure 60 and in the opposite direction to urge the drive plate against the plunger element 31 and the plunger element against the back wall 41 of the housing so that the plunger element will have a sliding engagement with the back wall. The spring 70 also furnishes the necessary pressure to effect a good contact engagement between the arms 55 and the rounded head of the rivet terminals 59, as is obvious from the showing in Fig. 2. The spring 70 permits the contact assembly to yield axially on the stud 40 as the contact assembly is moved from one position to another by the actuation of the plunger 31. Since the contact wheel 52 is provided with three radial arms 55 having grooves 56 with shoulder resting against the headed rivets the contact assembly 50 is prevented from moving in a reverse direction when the plunger element is returned to its normal position by the springs 26 and 35.

The closure 60 supports a pair of conducting brackets 74 and 75 within the housing 21. The bracket 74 is provided with an extending arm 76 which carries a rubbing block 77 and a contact 78 while the bracket 75 is provided with an angular ear 79 which carries a relative stationary contact 80. The arm 75 is so supported on the closure 60 that it will be adjacent the bottom wall 81 of the housing 21. The bracket 75 is suitably insulated from the bottom wall 81 by an insulating strip 82. In the normal position of the switch assemblage the movable contact 78 is normally biased into engagement with the contact 80 due to the resiliency of the arm 76. One arm of the rubbing block 77 is located in a path of a cam portion 83 formed on the marginal edge of the enlarged portion 32 of the plunger element 31. Thus when the plunger 31 is partially actuated, as shown in Fig. 4, the cam portion 83 will force the arm 76, thru the block 77, in a counterclockwise direction as viewed in Fig. 4 to separate the contact 78 from the contact 80.

The reduced portion 33 of the plunger 31 carries a pin or stud 85. When the plunger is fully elevated the pin 85 will be located a predetermined distance above the washer 25 which is equal to the distance the projection 46 is spaced from one of the straight edges 45 said distance being the amount the plunger can move before the drive disc 43 will be rotated on the stud by the projection 46. When the plunger is actuated a full downward stroke the drive disc 43 and contact assembly 50 will be revolved by steps equal to one-sixth of a revolution.

Referring to the wiring diagram shown in Fig. 6 the rivet heads 59 form the stationary contacts on the closure 60. The stationary contact should be referred to as follows: battery terminal 90 and 91, dim light terminal 92, bright light terminal 93, and dummy terminals 94 and 95. The terminals 90, 91 and 93 are electrically connected outside the closure 60 with lead wires. The battery terminals 90 and 91 are connected by a lead 96 to one terminal of a storage battery 97. The other terminal of the storage battery 97 is connected to ground indicated by reference character 98. Terminal 92 is connected by lead 99 to a lead 100 which is in turn connected to the dim filaments 101 of headlight 102. The lead 100 is also electrically connected to the stationary contact 80. The bright terminal 93 is connected by leads 103 to bright filaments 104 of head lamps 102. Bracket 74 is electrically connected by a lead 106 to a filament 107 of the passing light 108. All filaments of the various lamps are connected to ground in any suitable manner.

The switch assemblage in the present invention is adapted to control a plurality of circuits. In the present instance, the switch is used to control the bright, dim and passing lighting circuits of an automotive vehicle. Referring to the wiring diagram, the plunger element is shown diagrammatically in its normal elevated position with the dim and passing light filaments connected in circuit. In this position of the switch mechanism the battery terminal 90 and the terminal 92 are bridged by the movable contact 52 to complete a circuit from the current source 97. When in this position current will flow from one side of the battery 97 thru lead 96, terminal 90, movable contact 52, terminal 92, lead 99 connected to a lead 100 from whence it will be divided. A portion of the current will pass from the lead 100 to the dim filaments 101 and back to battery thru the ground connection. Another portion of the current will flow from the lead 100 to the stationary contact 80, and thence through the movable contact 78, arm 76, bracket 74, lead 106, thru filament 107 of passing light 108, back to battery thru its ground connection. This current flow will be maintained so long as the plunger element 31 is not actuated. Should the operator desire to eliminate temporarily the passing light from the lighting circuit the operator will then press lightly upon the button 30 until the stud 85 contacts with the washer 25. When that happens the cam portion 83 will have engaged the block 77 and forced the arm 76 outwardly to separate the contacts 78 and 80 to interrupt the current flow to the passing light filament 107. Upon subsequent release of the

pressure on the button 30, the spring 35 quickly becomes effective to return the plunger to its normal position and thereby causing the arm 76 to act and again closes the contacts 78, 80 to connect again the passing lamp in the circuit.

When the operator desires to place the bright head lights in circuit he manually depresses the plunger 31 a full stroke against the tension of both springs 35 and 36. When this happens the projection 46 will have engaged the proper straight edge 45 and revolve the contact assembly substantially 60 degrees causing the movable contact 52 to change its position to bridge stationary contacts 91 and 93 to connect the bright filaments 104 in the circuit. In this position of the switch the current flow will be as follows: from the battery 97 to lead 96, terminal 91, movable contact 52, terminal 93, lead 103, and thence through the bright filament 104 of the lamp 102 and back to battery thru the ground connections. When the switch is in this position the movable contact 52 will be so positioned that neither of the arms 55 will engage the stationary contact 92, thus no current can flow to the dim filaments 101, consequently no current can flow thru the contacts 80 and 78 to the passing light filament 107. Thus, in this particular arrangement the passing light will not be connected in the circuit when the bright lamps are connected.

While the switch assemblage is especially adapted for use as a dimmer swtch in connection with automobile lighting systems it may obviously be used for other purposes.

While the embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. In an electrical distributing system, the combination of bright, dim and passing lights; electrical connections for all the lights; a common source of current for supplying all the lights; a master switch for controlling all the connections and arranged to connect alternately the bright and dim lights with the source; an auxiliary switch for controlling the distribution of current to the passing light when the dim lights are connected with the source; and a common actuator for the master and the auxiliary switches, said actuator being capable of movement to operate the axiliary switch to disconnect the passing light from the source without effecting the position of the master switch, whereby the dim lights are maintained in connection with the source.

2. In an electrical distributing system, the combination of bright, dim and passing lights; electrical connections for all the lights; a current source for all the lights; a master switch for controlling the distribution of current to the bright and dim lights alternately; an auxiliary switch for controlling the distribution of current to the passing light, a common actuator for both switches, said actuator being capable of predetermined movement to operate the auxiliary switch to disconnect the passing light from the source without effecting the position of the master switch whereby the lights then connected with the source by said master switch will keep on burning.

3. In a switching device for controlling the lighting apparatus of an automotive vehicle which are operable to produce bright, dim and passing lighting conditions and which include electrical circuits for establishing different lighting conditions, the combination of, switching means for controlling alternately the bright and dim light apparatus in the circuit; switching means for connecting the passing light apparatus in the circuit only when the dim light apparatus is connected in the circuit; and a common actuator for both of the switching means, said actuator being capable of movement a predetermined distance for actuating the second mentioned switching means to disconnect the passing light from the circuit without effecting the position of the first mentioned switch.

4. In a switching device for controlling the lighting apparatus of an automotive vehicle which are operable to produce bright, dim and passing lighting conditions and which include electrical circuits for establishing different lighting conditions, the combination of, switching means for connecting alternately the bright and dim light apparatus in the circuit; electrical connections for connecting the passing light apparatus in circuit with the dim light apparatus; switching means for controlling the circuit from the dim circuit to the passing light apparatus; a common actuator for both switching means; and a lost motion connection for the actuator permitting the actuator to move a certain distance to operate the second mentioned switching means to open the circuit to passing light apparatus without effecting the circuit to the dim light apparatus.

5. In a switching device for controlling the front lighting apparatus of an automotive vehicle which are operable to produce bright, dim and passing lighting conditions and which include electrical circuits for establishing different lighting conditions, the combination of, switching means for connecting alternately the bright and dim light apparatus in the circuit, electrical connections for connecting the passing light circuit in parallel with the dim light circuit, switching means for controlling the passing light circuit; a single reciprocable member for actuating both switching means; and yieldable means for permitting the member to move a predetermined distance to actuate only the second mentioned switching means to open the circuit to the passing light apparatus without effecting the position of the first mentioned swiching means.

6. In a switching device for controlling a plurality of current consuming signal devices which are operable to produce predetermined conditions and which include electrical circuits for establishing different circuit conditions, the combination of, switching means for controlling alternately a circuit to devices having definite characteristics; electrical connections for connecting an auxiliary device in parallel with one of the devices having different characteristics; switching means for controlling the circuit to the auxiliary device; a common actuator for both switching means; and resilient means permitting the actuator to move a predetermined distance to operate the second mentioned switching means to open the circuit to the auxiliary device without effecting the circuit connections to the device connected in parallel therewith.

7. In an electrical distributing system, the combination of bright, dim and auxiliary lights, electrical connections for all the lights; a common current source for supplying all the lights; a rotary master switch for controlling the distribution of current to all the lights whereby the bright light and the dim and passing lights are

connected alternately with the source; a normally closed oscillatable switch for controlling the distribution of current from the dim light circuit to the auxiliary light circuit; and a plunger element cooperable with the switches, said element adapted to move the rotary switch step-by-step in one direction only and to operate intermittently the oscillatable switch.

8. An electric switch comprising in combination; a housing; rotary means in the housing; a closure for the housing; stationary terminal contacts carried by the closure; a bridging member carried by the rotary means for engagement with said terminal contacts; an auxiliary switch supported within the housing comprising a stationary contact and a movable contact normally biased into engagement with its stationary contact; and a single actuator extending into the housing for operating the rotary means and the auxiliary switch, said actuator including means formed marginally on the actuator adapted to separate the auxiliary contacts and hold said contacts separated while means formed on the face of the actuator revolve the rotary means in steps when the actuator is moved in one direction.

9. An electric switch comprising in combination; a housing; rotary means in the housing; a closure for the housing; stationary terminal contacts carried by the closure; a bridging member carried by the rotary means for engagement with said terminal contacts; an auxiliary switch supported within the housing comprising a stationary contact and a movable contact normally biased into engagement with its stationary contact; a single actuator having a normal home position extending into the housing; means for limiting the movements of the actuator in both directions; cam means carried by the actuator adapted to separate intermittently the auxiliary switch contact upon partial movement of the actuator from the normal home without effecting the position of the rotary means position; means carried on the face of the actuator adapted to revolve the rotor in steps upon full movement of the actuator from the home position; and yieldable means for returning and holding the actuator in its home position.

10. An electric switch comprising in combination; a housing; a rotary switch supported within the housing comprising stationary contacts and a rotor carrying a bridging member for engagement with the stationary contacts; an auxiliary switch supported within the housing comprising a stationary contact and a movable contact normally biased into engagement with its stationary contact; a common manually actuated member extending into the housing adapted to operate said switch; means formed on the marginal edge of the member within the housing for separating the auxiliary switch contacts upon a partial movement of the member in one direction without effecting the position of the rotary switch; means formed on the face of the member within the housing adapted to revolve the rotor in steps upon completed movements of the member in said one direction; and resilient means supported within a casing supported by the housing for returning the member to its normal position upon release of the manual means to urge the member in said one direction.

11. In combination, a rotary switch for connecting sequentially a plurality of main terminals; a normally closed oscillatable switch electrically associated with one of the main terminals; a common actuator for said switches and having a normal home position; resilient means for holding normally the actuator in its home position, means carried by the actuator for opening the oscillatable switch each time the actuator is depressed a short distance from its home position without effecting the position of the rotary switch; and additional means carried by the actuator for revolving the rotary switch in steps when the actuator is moved its full distance from its home position, said resilient means returning the actuator to its home position upon release of the means to urge the actuator from its home position.

12. An electric switch comprising in combination; a housing; a rotary switch comprising stationary terminals carried by the housing and a rotary contact mounted within the housing and adapted to bridge the terminals; an oscillatable switch comprising a stationary contact and a movable contact normally biased into engagement with the stationary contact mounted within the housing; a plunger supported relative to the switches and adapted to operate both of the switches when the plunger is moved a predetermined distance in one direction, said plunger having a cam for actuating the oscillatable switch and having a projection for actuating the rotary contact step-by-step in one direction; a pair of springs supported in superposed relation for holding the plunger in a normal position; and means to actuate the plunger from its normal position, said plunger being adapted to move a certain distance to compress one of the springs against the tension of the other spring to open the oscillatable switch without effecting the position of rotary switch.

13. An electric switch unit having a power terminal; distributing terminals; switching means including a rotary contact movable in one direction only for connecting alternately the distributing terminals with the power terminal; a normally closed switch including one of the distributing terminals; a pawl-and-ratchet mechanism for actuating rotary contact; and operating means for moving the pawl in a direction to rotate the rotary contact, said operating means having provisions for opening the second switch upon movement of the means in said direction, said provisions being so arranged with respect to the pawl that the operating means is capable of partial movement in said direction to cause said provisions to open the second switch without causing the pawl to change the position of the rotary switch and when the operating means is moved further in said one direction to cause the pawl to actuate the rotary switch the said provisions will hold the second switch open.

14. An electric switch unit having a power terminal; distributing terminals; switching means including a rotary contact movable in one direction only for connecting alternately the distributing terminals with the power terminal; a normally closed switch including one of the distributing terminals; an operating member for actuating the switches; and means mounted as parts of the operating member for actuating the switches, the operating member being operable to move the parts together, said parts being so arranged that one part will open the normally closed switch while another part is approaching a position to actuate the rotary switch and when the other part actuates the rotary switch to a new position the first part will hold the normally closed switch open.

15. A switch device comprising in combination, a rotary switch including stationary terminals and a rotor carrying a movable contact for alternate engagement with the stationary terminals; a biased contact normally engaging a stationary contact electrically connected with one of the terminals, a common actuator supported relative to the movable contacts and adapted to actuate both movable contacts, said actuator having provisions whereby the biased contact will be moved from its contact when the actuator is moved a certain distance in one direction without changing the position of the other and said actuator having additional provisions whereby the rotor will be revolved in steps in one direction only when the actuator is moved its full movement in said one direction; and resilient means for automatically returning the actuator to a home position upon release of the means which moves the actuator in said one direction.

16. A switching mechanism comprising in combination; a rotary switch comprising a power terminal and a plurality of distributing terminals; a rotor carrying a bridging member for connecting alternately the distributing terminals with the power terminal; an auxiliary switch comprising a stationary contact electrically connected with one of the terminals and a biased contact normally in engagement with its stationary contact; a common manually actuated member adapted to operate said switches, provision provided on the member for separating the biased contact from its stationary contact upon a partial movement of the member in one direction from a normal position of the member without effecting the position of the rotor; provisions provided by the member adapted to rotate the rotor in successive steps upon each full movement of the member in said one direction; and resilient means for returning the member to its normal position automatically upon release of the manual means to urge the member in said one direction.

17. A switching device comprising in combination, a rotary switch including stationary contacts and a rotor carrying a bridging member for engagement with the stationary contacts; an oscillatable switch comprising a stationary contact and a movable contact normally biased into engagement with the stationary contact; a common manually operated actuator supported relative to the switches, said actuator carrying means whereby the contacts of oscillatable switch would be separated each time the actuator is moved a predetermined distance in one direction without changing the position of the rotary switch, and said actuator having additional means for operating the rotary switch only after said actuator is moved beyond said predetermined distance in the said direction; and resilient means for returning the actuator to its normal position.

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