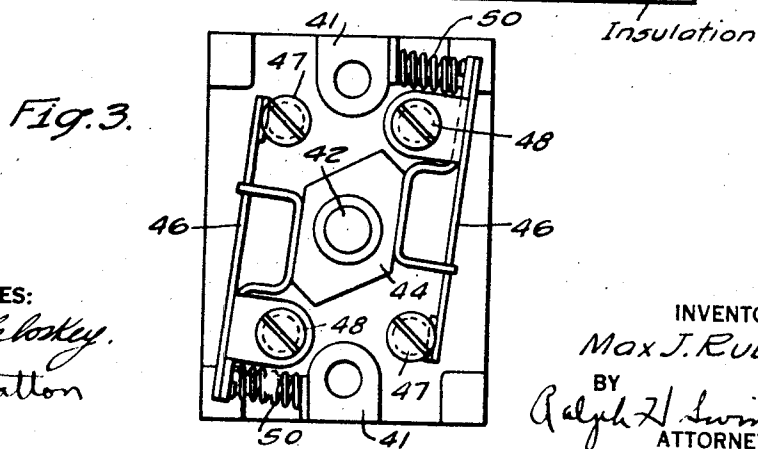
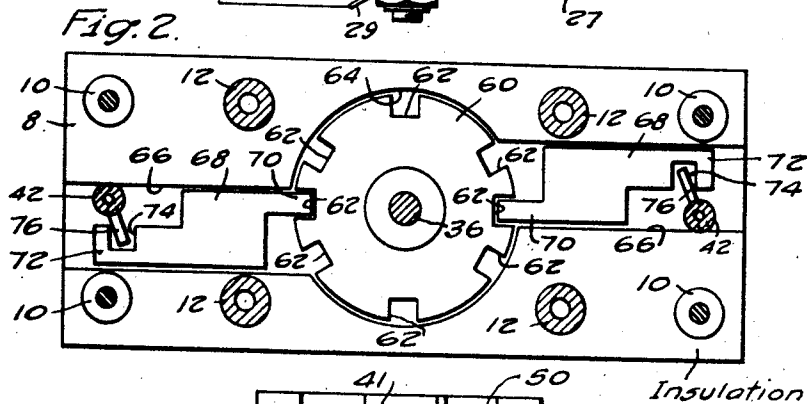
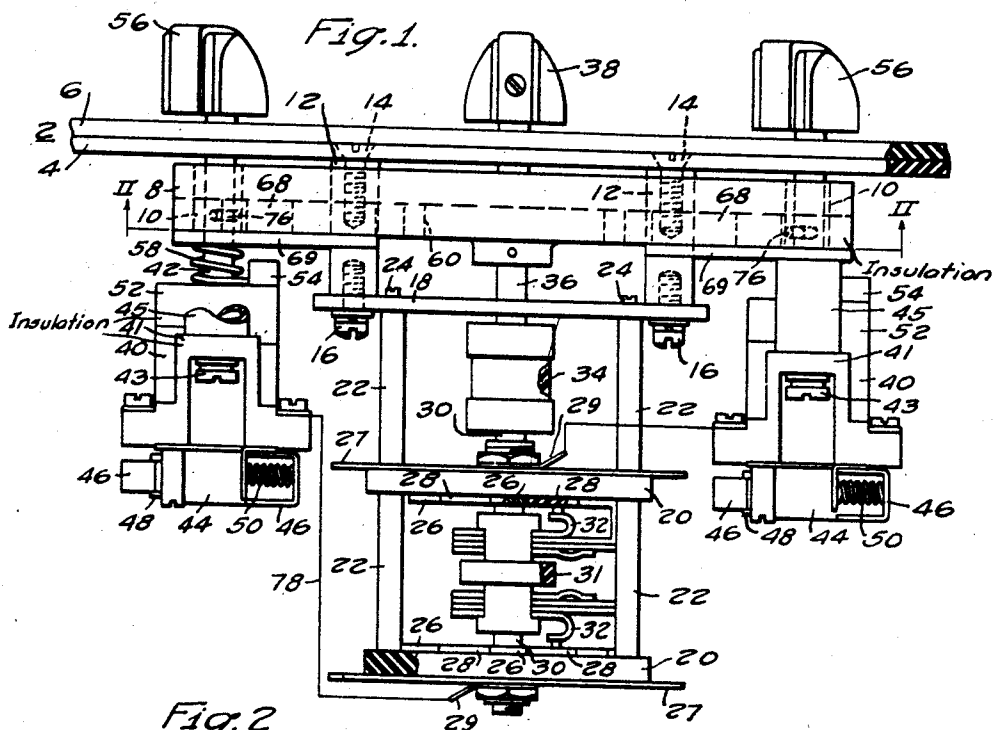


Dec. 21, 1943.

M. J. RUBEL
CIRCUIT CONTROLLER
Filed Feb. 6, 1942

2,337,130



WITNESSES:
E. A. M. C. C. C. C.
R. T. Stratton

INVENTOR
Max J. Rubel.
BY
Ralph Z. Swingle
ATTORNEY

UNITED STATES PATENT OFFICE

2,337,130

CIRCUIT CONTROLLER

Max J. Rubel, Pittsburgh, Pa., assignor to Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., a corporation of Pennsylvania

Application February 6, 1942, Serial No. 429,763

6 Claims. (Cl. 200—5)

This invention relates in general to electric circuit controlling devices, and more especially to switch arrangements for controlling a plurality of circuits.

The specific embodiment of the invention herein disclosed is especially designed for the control of runway illumination of airports; however, it will be apparent as the description proceeds that this invention is readily adaptable to many other uses where it is desired to select any one of a plurality of electric circuits.

In modern airport lighting, each runway is provided with series lights placed along the runway, and/or with floodlights at each end of the runway each in a separate circuit. In controlling the lights incident to the landing or take-off of an aircraft, it is necessary to select the proper runway as determined by weather conditions for illumination. For this purpose, a dial type selector switch may be used, and it is highly desirable that provision be made for the lighting only of the proper runway, and that once a runway has been selected that it be impossible to select another runway without first turning off the lights of the first runway. It is also undesirable to energize the runway lights in angular sequence when adjusting the selector switch from one runway position to another which may be several runway points removed from the original position.

Accordingly, one object of this invention is to provide selector switch means in circuit with master switch means and interlocked therewith.

Another object of this invention is to provide a novel interlocking switch arrangement.

Another object of this invention is to provide a novel arrangement of a single or multi-stage selector switch and one or more master switches in circuit therewith, together with means controlled by at least one master switch for locking the selector switch in adjusted position.

Another object of this invention is to provide selector switch means in series circuit with master switch means which is biased to closed circuit position in which it is operable to lock said selector switch means in an adjusted position.

Another object of this invention is to provide a selector switch in circuit with a pair of master switches each of which is effective to lock said selector switch in an adjusted position, with one of the master switches biased to locking position.

These and other objects of this invention will become more apparent upon consideration of the following detailed description of a preferred em-

bodiment thereof when taken in connection with the attached drawing, in which:

Figure 1 is an elevational view partly in section of the circuit controlling means comprising this invention;

Fig. 2 is a sectional view of the structure shown in Fig. 1, taken substantially on the line II—II thereof; and

Fig. 3 is a bottom view of one of the master switches shown in Fig. 1.

Referring to the drawing, the circuit controlling switches are preferably mounted on a panel structure 2 which may comprise a main panelboard 4 to which the switches are secured, and a cover board 6. Both the main panelboard and cover 6 may be of any desired material. At the underside of the panel there is secured an insulating supporting block 8, preferably of a molded insulating material. A plurality of internally threaded anchoring sleeves 10 and 12 are secured in apertures through block 8, preferably by being molded therein for the purpose of securing the several switches to the block, and for securing the block to panel 2. It will be noted that a pair of anchor sleeves 10 are provided at each end of the block 8, and two spaced pairs of anchoring sleeves 12 are provided intermediate the ends of the block, and these latter sleeves are adapted to receive screws 14 for securing the block to panel 2, and the sleeves 12 are extended rearwardly for supporting the base 18 of a dial type selector switch. The base 18 of the dial switch may be secured to anchoring sleeves 12 by screws 16, and the switch, as shown, includes a pair of contact supporting bases 20 of insulating material for supporting the fixed contacts of the switch. The supporting bases 20 are maintained in spaced relation with each other and relative to base 18 by spacing sleeves 22, and bolts 24 extend through the bases and spacing sleeves 22 to secure the parts in assembled relation. Each insulating base 20 is provided on opposed confronting surfaces thereof with a plurality of annularly arranged spaced contact segments 26, and with insulating segments 28 between the contact segments. The opposite face of each base 20 is provided with a plate 27 of conducting material thereon and a terminal lug 29 secured thereto. Contact carrying shafts 30 of conducting material are rotatably mounted in insulating bases 20 and terminal plates 27, and each has secured thereon a pair of movable contact structures 32 for cooperation with the contact segments 26 mounted on supporting bases 20, respectively.

It will be observed that the switch structure defined above comprises in reality a pair of dial type selector switches, with the fixed contacts of each switch supported upon insulating bases 20, respectively, and adapted to cooperate with the respective movable contact units 32. The two contact carrying shafts 30 are secured together by an insulating coupling 31 so that the two switches are coupled for movement together. Upper contact carrying shaft 30 is adapted to be actuated by shaft 36 connected thereto by an insulating coupling 34, and shaft 36 is rotatably mounted through suitable apertures in base 18, block 8 and panel 2, and extends upwardly beyond the panel so that an operating handle 38 may be mounted thereon at the front of the panel. Upon rotation of handle 38, contact carrying shaft 30 and hence movable contacts 32 will be rotated so that the latter will successively engage contact segments 26 on insulating bases 20, respectively, upon continued rotation of handle 38 in one direction.

One or more master switches connected in series with the selector switch and adapted to control the operation of the selector switch are provided in accordance with this invention, and since the embodiment illustrated in effect is provided with a pair of dial type selector switches coupled for movement together, there is provided a pair of master switches, one for each dial type selector switch. Each master switch includes an insulating base structure 40 preferably of a molded insulating material, and provided with integral apertured ears 41 for receiving mounting bolts 43 adapted to engage in threaded anchor sleeves 10. Each master switch is maintained in spaced relation with respect to block 8 by spacer sleeves 45 surrounding bolts 43. The master switch contacts are supported at the end of block 40 opposite panel 2 and the block 40 is provided with a central aperture for rotatably receiving a contact actuating shaft 42 which extends through the block and is mounted for limited oscillatory movement therein. The shaft is provided at the rear side of the block with a contact actuating cam 44 for actuating contacts 46, located at opposite sides of the cam, into and out of engagement with fixed contacts 47. Each movable contact 46 is pivotally mounted as at 48 at the rear side of supporting block 40, and is biased into engagement with cam 44 by a coil compression spring 50. At the front of supporting blocks 40, actuating shafts 42 have secured thereto collars 52, which are preferably of a molded insulating material having an integral eccentric projection 54 provided thereon, for a purpose to be hereinafter referred to. Contact actuating shafts 42 project through apertures suitably provided in block 8 and panel 2 to the front of the panel for mounting an operating handle 56 thereon. The master switch at the left of Fig. 1 of the drawing, is preferably provided with a return spring 53 positioned over actuating shaft 42, and having one end thereof engaged with projection 54 on collar 52, and the other end of the spring engaged with a stationary part such, for example, as one of the spacing sleeves 45. If desired the corners of cam 44 may be rounded off to enable the use of a light return spring 53, by using the force exerted by contact springs 50 to aid in closing the switch.

The master switches have but two positions, that is, a position in which the contacts thereof are open, and a position in which the contacts

of the switch are closed. Opening and closing of the contacts is readily accomplished by rotation of actuating handle 56 in opposite directions to cause cam 44 on the shaft to move switch contacts 46 toward and away from contacts 47, or a spring 50 may be provided to move the contacts into engagement with contacts 47, to open and close the circuit through the switch.

Operation of the master switches and selector switch are correlated by interlocking means supported by insulating supporting block 8. The selector switch actuating shaft 36 is provided with a locking disc 60 secured thereto at a position wherein it is located within a circular recess 64 provided in the rear side of supporting block 8, and this disc is provided with a plurality of notches 62 in the periphery thereof. The notches 62 are angularly spaced in accordance with the angular spacing of contact segments 26 so that a notch 62 will be presented at a given point each time movable contacts 32 are in engagement with a contact segment 26. Extending outwardly from circular recess 64 in supporting block 8 are slots 66 for the reception of lock bolts 63 slidably mounted therein. Each lock bolt is provided at one end with a longitudinally offset locking projection 70 of a size to enter notches 62 in the locking disc, and the other end of each lock bolt is provided with an oppositely offset projection 72 having a notch 74 in one side thereof for the reception of an actuating pin 76, secured in the adjacent master switch operating shaft 42. The lock bolts 63 are maintained within groove 66 in block 8, by cover plates 69 secured to the rear side of block 8.

In the position of the switches shown in the drawing, both master switches have the contacts thereof closed, and movable contacts 32 of the selector switch are in engagement with one of contact segments 26 thereof. It will be observed that it is now impossible to move operating handle 38 of the selector switch, and that this handle can only be moved when both master switches are adjusted to the open circuit position by clockwise rotation thereof, as viewed in Fig. 2 of the drawing, to remove lock projections 70 from notches 62 on locking disc 60. When both master switches are open, the selector switch may be adjusted to a new position, but in any event the master switches cannot be closed until the selector switch movable contacts 32 are in engagement with a contact segment 26.

At least one set of contacts of each master switch is adapted to be connected in series circuit with the contacts of the selector switch, and to this end it will be noted that one contact of one master switch is connected to the terminal lug 29 of the lower dial switch as by a conductor 78, whereas one terminal of the other master switch is connected to the terminal lug 29 of the upper dial switch. In an application such as airport lighting, previously mentioned, each contact segment of the dial type switches is adapted to be connected to control the lights for one runway, so that by properly adjusting the selector switch handle 38, the desired runway may be illuminated for the take-off or landing of aircraft. As previously stated, the selector switch comprises in reality a pair of dial type switches and the reason for this is that one of these switches is for the control of the series lights which are located along the entire runway and the other is for the control of the floodlights located at the end of the runway. Obviously but a single dial type switch could be used under the control

of actuating handle 33, or, if desired, more than two could be supported from base 13 and actuated by shaft 33.

In selecting a runway for illumination, the selector switch handle 33 is adjusted to the desired runway, when the master switch handles 53 have been adjusted to the off position, and thereafter the master switches may be closed to energize the lighting circuit for the particular runway selected. The particular construction and interlocking of the switches insures that once a runway has been selected and the corresponding series and floodlights turned on, it becomes impossible for the operator to change the selected runway without first operating both master switches. It also is impossible to turn on the runway lights in angular sequence when rotating the selector switch from one runway position to another which may be several points removed from the original position. It will be noted that only one switch is provided with a return spring 53, so that this switch and the selector switch may be manipulated by the operator at the same time. The other master switch will remain in either adjusted position, so that in changing from one runway to another, the operator would first adjust the master switch at the right in Fig. 1 to its off position, after which he would adjust the other master switch to its off position and hold it in this position while adjusting selector switch handle 33 to the desired point.

From the foregoing it is apparent that this invention provides a means for interlocking a series master switch with a multi-position selector switch such that the selector switch is locked in adjusted position when the master switch is closed, and can be adjusted only when the master switch is open. This also insures that the selector switch is deenergized when it is adjusted, and, therefore, this switch need have no provision for arcing-over between contacts. There is also disclosed herein a novel arrangement of selector and master switches and means for mounting the same in cooperative relation on a control panel.

Having defined a preferred embodiment of the invention in accordance with the patent statutes, it is desired that the invention be not limited to this particular embodiment because it will be obvious to those skilled in the art that many changes and modifications may be made in this particular construction without departing from the spirit and scope of this invention. Accordingly, it is desired that this invention be interpreted as broadly as possible and that it be limited only as required by the prior art.

I claim as my invention:

1. In circuit controlling means, selector switch means including a plurality of spaced contacts, a movable contact successively engageable with said spaced contacts upon movement thereof in one direction, rotary operating means for said movable contact, master switch means including separable contacts for controlling the circuit through said selector switch means, oscillatory operating means for said separable contacts, locking means rotatably movable with said rotary operating means and having the periphery thereof provided with a plurality of indentations positioned to correspond to the positions wherein said movable contact is in engagement with said spaced contacts, respectively, a locking bolt, means supporting and guiding said bolt for rectilinear reciprocating movement toward and away from the periphery of said locking means, said

bolt having a projection at one end of a size to enter said indentations and having a side recess at its other end for receiving an actuating pin on said oscillatory actuating means so as to be reciprocated thereby, whereby to prevent engagement of said separable contacts unless one of said notches is aligned with said bolt, and to prevent movement of said movable contact unless said separable contacts are disengaged.

2. In circuit controlling means, selector switch means including a plurality of spaced contacts, a movable contact successively engageable with said spaced contacts upon movement thereof in one direction, rotary operating means for said movable contact, master switch means including separable contacts for controlling the circuit through said selector switch means, reciprocable operating means for said separable contacts, locking means rotatably movable with said rotary operating means and having the periphery thereof provided with a plurality of indentations positioned to correspond to the positions wherein said movable contact is in engagement with said spaced contacts, respectively, a locking bolt movable toward and away from the periphery of said locking means and actuated by said reciprocable actuating means so as to prevent engagement of said separable contacts unless one of said notches is aligned with said bolt, and to prevent movement of said movable contact unless said separable contacts are disengaged, and means biasing said separable contacts into engagement to thereby bias said bolt towards said locking means.

3. In circuit controlling means, plural stage selector switch means, each stage including a plurality of spaced contacts and a movable contact successively engageable with said spaced contacts upon movement thereof in one direction, a common actuating means for said movable contacts, a plurality of master switch means each including separable contacts for controlling the circuit through said selector switch means stages, respectively, and means controlled by each of said master switch means for preventing movement of said common actuating means when said separable contacts of either master switch are in engagement.

4. In circuit controlling means, plural stage selector switch means, each stage including a plurality of spaced contacts and a movable contact successively engageable with said spaced contacts upon movement thereof in one direction, a common actuating means for said movable contacts, a plurality of master switch means each including separable contacts for controlling the circuit through said selector switch means stages, respectively, means controlled by each of said master switch means for preventing movement of said movable contacts when said separable contacts are in engagement, and means biasing the contacts of one of said master switch means into engagement.

5. In circuit controlling means, a control panel, a plurality of switches spaced beneath said panel and supported therefrom, a movable actuating member for each of said switches projecting through an aperture in said panel for actuation above said panel, a block of insulating material mounted at the rear of said panel between said panel and switches and spanning said actuating members, and interlocking means for said actuating members movably supported in recesses provided in said block.

6. In circuit controlling means, a control panel, a plurality of switches beneath said panel and

supported therefrom, one of said switches comprising a dial type selector switch having a plurality of operative positions for energizing a plurality of circuits, respectively, said selector switch having a rotary actuating shaft projecting through an aperture in said panel, another of said switches comprising separable contacts for controlling the circuit to said selector switch and having a reciprocable actuating member extending through another aperture in said panel for actuation at the front of said panel, a block of insulating material mounted at the rear of said panel and spanning the distance between said shaft and actuating member, said block having a recess in the rear surface thereof for receiving

5 a locking disk secured to said shaft beneath said panel, said disk having notches in the periphery positioned to correspond, respectively, with the operative positions of said selector switch, and a locking bolt supported beneath said panel in said block recess for movement toward and away from the periphery of said disk and actuated by said reciprocable actuating means so as to prevent engagement of said separable contacts unless one of said notches is aligned with said bolt, and to prevent movement of said movable contact unless said separable contacts are disengaged.

10
MAX J. RUBEL.