July 18, 1961 J. R. CANADAY 2,993,098

CIRCUIT CONTROLLER

Filed Sept. 29, 1958 3 Sheets-Sheet 1

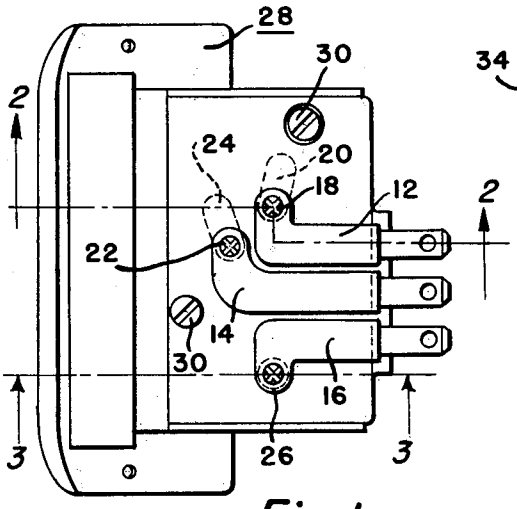


Fig. 1

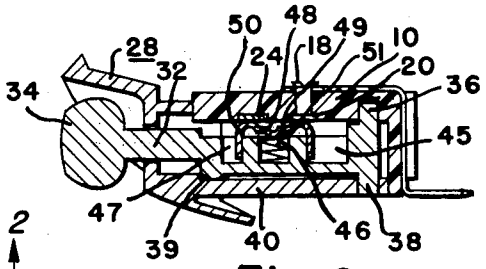


Fig. 2

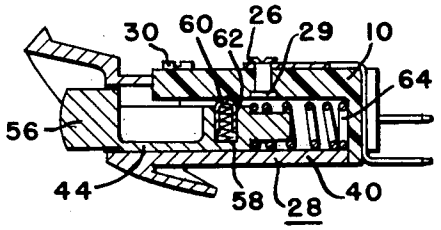


Fig. 3

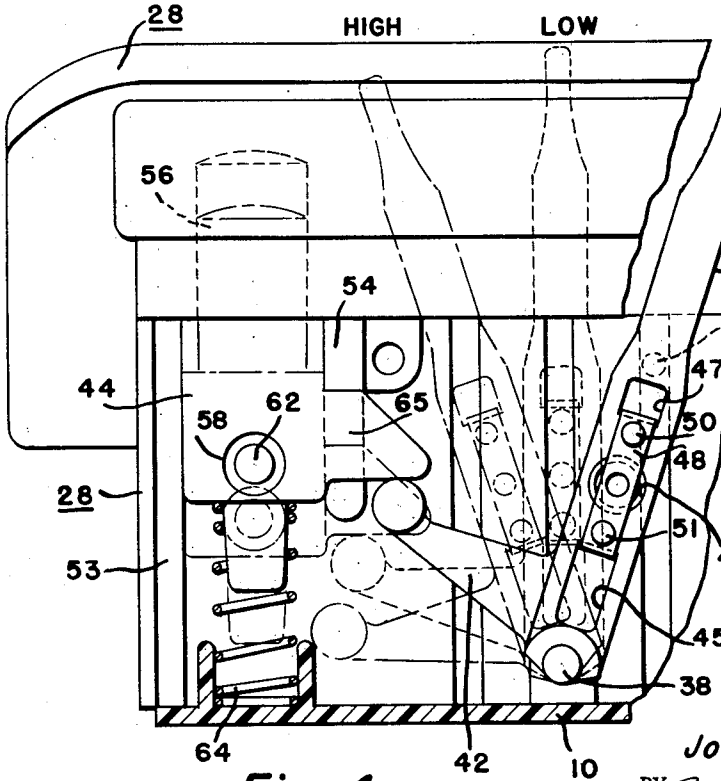


Fig. 4

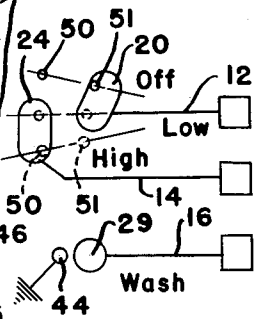


Fig. 5

INVENTOR.
Joe R. Canaday
BY John T. Marini
His Attorney

July 18, 1961 J. R. CANADAY 2,993,098

CIRCUIT CONTROLLER

Filed Sept. 29, 1958 3 Sheets-Sheet 2

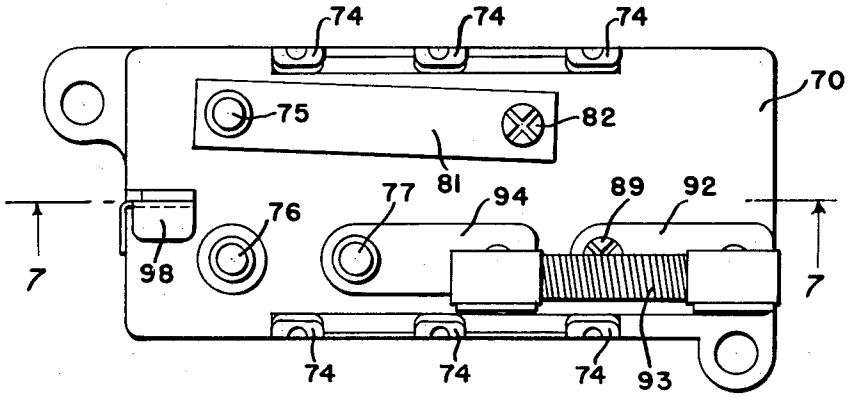


Fig. 6

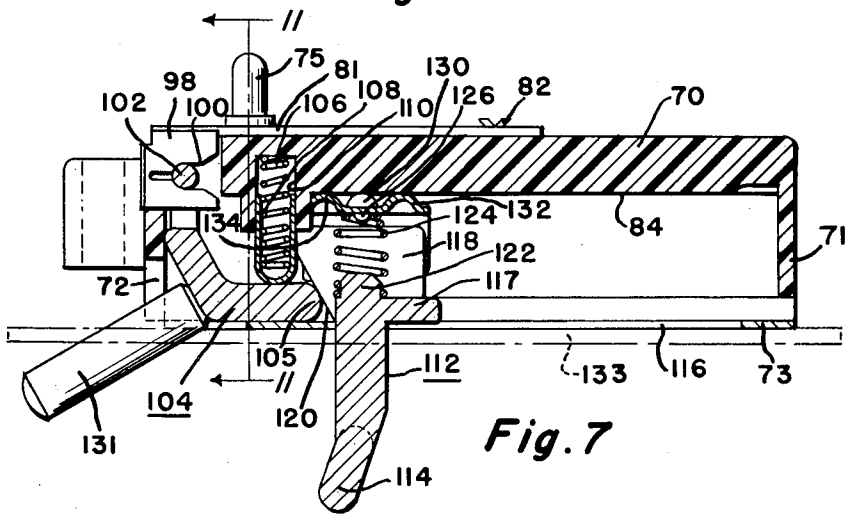


Fig. 7

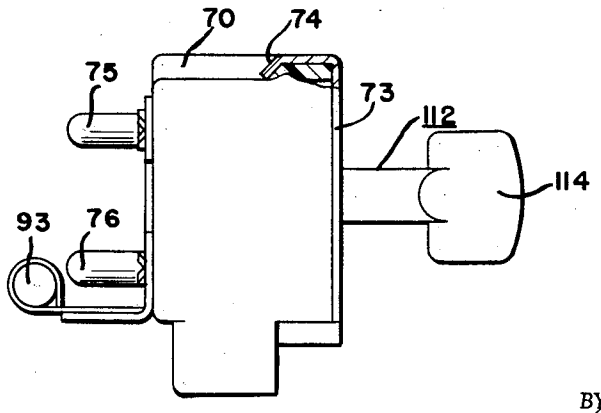


Fig. 8

INVENTOR.
Joe R. Canaday
BY
His Attorney

July 18, 1961 J. R. CANADAY 2,993,098

CIRCUIT CONTROLLER

Filed Sept. 29, 1958 3 Sheets-Sheet 3

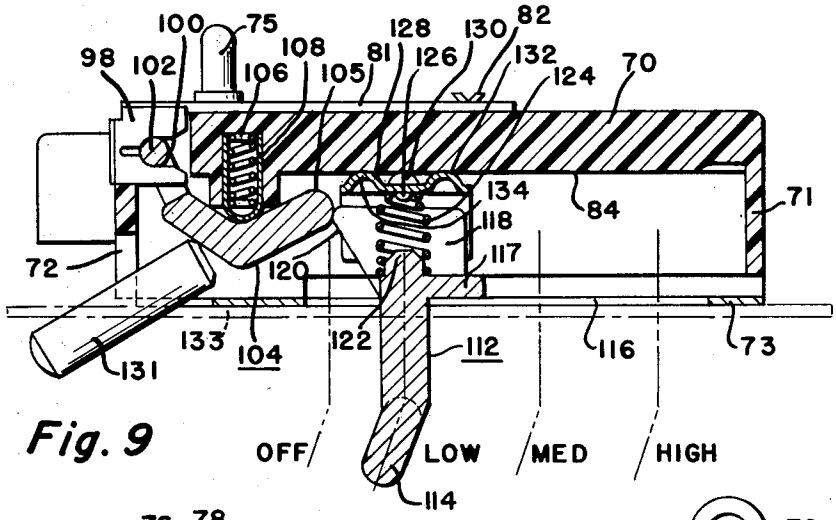


Fig. 9

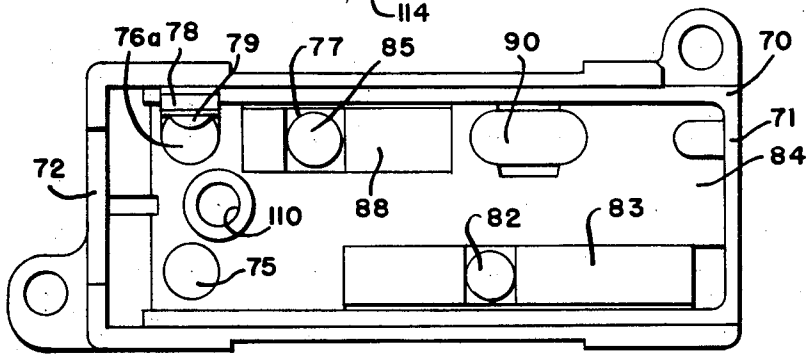


Fig. 10

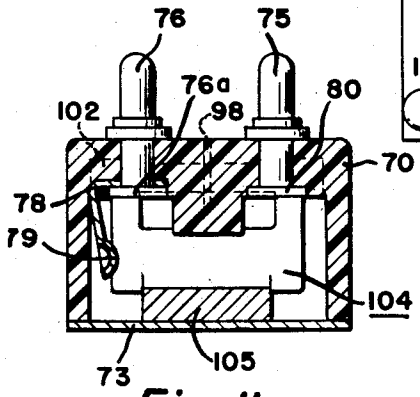


Fig. 11

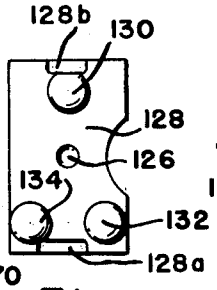


Fig. 12

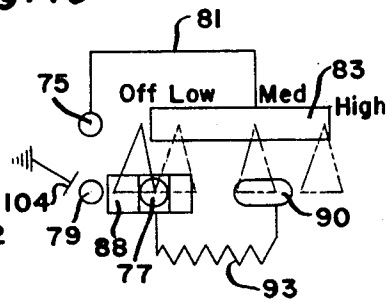


Fig. 13

INVENTOR.
Joe R. Canaday

BY
John T. Mannix
His Attorney

United States Patent Office 2,993,098 Patented July 18, 1961

2,993,098

CIRCUIT CONTROLLER

Joe R. Canaday, Anderson, Ind., assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Filed Sept. 29, 1958, Ser. No. 764,122
4 Claims. (Cl. 200—5)

This invention relates to electrical switches, and more particularly to electrical switches that are adapted to complete a pair of electrical circuits, one of which is completed only momentarily and the other of which is completed simultaneously with the completion of the momentary circuit.

It is an object of this invention to provide an electric switch that includes a push button actuator that closes a momentary circuit through the switch and wherein slidable movement of the actuator operates to move a second actuator that completes a second circuit through the switch.

Another object of this invention is to provide an electric switch having a pair of manually operable actuators, one of which is of the push button type that operates the second actuator to a predetermined position and wherein each actuator operates to complete separate circuits through the switch.

A further object of this invention is to provide an electric switch of the type wherein a manually operable actuator slides between an insulator block and a housing, and wherein the actuator carries an electrical contact that engages contacts supported by the insulator block, there being a second manually operable actuator that moves the first actuator a predetermined distance when it is depressed, the second actuator operating to momentarily complete a circuit when it is depressed.

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

In the drawings:

FIGURE 1 is a plan view of an electric switch made in accordance with this invention.

FIGURE 2 is a sectional view taken along line 2—2 of FIGURE 1.

FIGURE 3 is a sectional view taken along line 3—3 of FIGURE 1.

FIGURE 4 is an enlarged plan view of the electric switch of FIGURE 1 illustrating the relative positions of the two actuators of this switch.

FIGURE 5 is a circuit diagram of the electric switch illustrated in FIGURES 1 through 4.

FIGURE 6 is a plan view of a modified electric switch made in accordance with this invention.

FIGURE 7 is a sectional view taken along line 7—7 of FIGURE 6.

FIGURE 8 is an end view of the switch illustrated in FIGURE 6.

FIGURE 9 is a sectional view similar to FIGURE 7, but showing certain of the parts of the switch moved to a shifted position.

FIGURE 10 is a plan view of the interior of the insulator block of the electric switch of this invention.

FIGURE 11 is a sectional view taken along line 11—11 of FIGURE 7.

FIGURE 12 is a plan view of an electrical contactor shown in FIGURES 7 and 9.

FIGURE 13 is a circuit diagram of the electric switch illustrated in FIGURES 6 through 12.

The electric switch of this invention has more or less general application, but is particularly adapted for use as a grounding switch in a coordinated washer and wiper

control system as illustrated in application Serial No. 709,056, filed January 15, 1958, and assigned to the assignee of this invention.

Referring now more particularly to FIGURES 1 through 4, the electric switch illustrated in these figures includes an insulator block 10 formed of suitable insulating material which carries three strap connectors 12, 14 and 16. The ends of these connectors are adapted to fit within a female electric connector as is well known to those skilled in the art. The connector 12 is fixed to the insulator block 10 by means of a rivet 18 which also serves to hold a conducting segment 20 in place. The conducting strap 14 is held to insulator block 10 by means of a rivet 22 which also serves to hold a second conducting segment 24 in place with respect to the insulator block. The third conducting strap 16 is held to the insulator block by means of a rivet 26, and this rivet has a head 29 that forms an electrical contact for the switch, as will become more readily apparent hereinafter. The conducting segments 20 and 24 are located in the same plane as the rivet head 29 and also serve to form electrical contacts for the switch.

The insulator block 10 is supported from a housing 28 formed of die cast metal by means of one or more screws 30 which pass through the insulator block, and which are threaded into the housing 28. The housing 28 carries a first actuator designated by reference numeral 32 and including a knob portion 34. The actuator 32 has portions 36 and 38 journalled within opposed openings formed respectively in the insulator block and in the housing 28. The actuator or lever 32 is thus pivotally supported by the housing and insulator block, and the lever swings around an axis that passes through portions 36 and 38 of the lever. The lever is preferably formed of metal material and has a projection 39 that is adapted to engage within detent recesses formed in the lower wall 40 of the housing. The projection 38 and the recesses cooperate to form detents for the lever 32.

The lever 32, as is better illustrated in FIGURE 4, has an extension 42 which is adapted to be engaged by the push button actuator 44 illustrated in section in FIGURE 3. The lever 32 has three recesses 45, 46 and 47. The recesses 45 and 47 receive the ends of an electrical contact 48, whereas the recess 46 receives a spring 49 that urges the electrical contact into engagement with fixed contacts 20 and 24. It will be apparent from the foregoing, that the contact 48 swings across the inner face of insulator block 10 to engage the fixed contacts in a predetermined sequence. As illustrated in FIGURE 5, the contact points 50 and 51 of the contactor 48 engage both conducting segments 20 and 24 in one position of the switch, and contact point 51 only engages contact segment 20 in another position of the lever 32. In a third position of the lever, the contact point 50 only engages the conducting segment 24.

The push button 44 is slidably disposed between the housing 28 and the insulator block 10. The push button 44 engages one side wall 53 of the housing 28, and a second wall 54 is provided which insures that the push button will slide along a fixed axis. The push button actuator has a portion 56 that is operated by the user of the switch, and the push button has a recess 58 which receives a spring 60 and a bullet-nosed contactor 62. The spring 60 urges the contactor 62 against the inner face of insulator block 10. The push button actuator 44 is normally maintained in the position of FIGURE 3 by a spring 64 positioned between the push button and an end wall of insulator block 10. It will be appreciated that when the push button 44 is depressed inwardly, the contact 62 engages fixed contact 29 to complete a circuit between the push button 44 and the contact 29.

The push button 44 has an extension 65 which engages the extension 42 of lever 32 during certain predetermined positions of the push button. Thus, when the lever 32 is in its fully clockwise position in FIGURE 4, a depression of push button 56 will cause the lever to move from its full line position in FIGURE 4 to the first dotted line position just to the left of the full line position. Once the lever has been moved to the "low" position, the further inward movement or depressing of lever 44 will not operate to move the lever 32, as the push button cannot be depressed sufficiently to cause this movement. The lever may then be moved manually from the upright "low" position to the fully counterclockwise "high" position by manual actuation of lever 32.

The lever 32, of course, can always be operated manually without impediment by the push button 44. It will also be apparent that the lever 32 must be returned to its "off" position after the lever 44 has actuated it to its "low" position, as the returning of lever 44 to its normal position by spring 64 has no effect on the movement of lever 32.

As has been noted hereinbefore, the switch just described is particularly adapted for use as a grounding switch and has particular utility in the coordinated wiper and washer circuit of the above identified copending application. Thus, it will be appreciated that the housing 28 will be secured to the metal dashboard of a motor vehicle so that it will be at ground potential in a motor vehicle electrical system. With the housing 28 at ground potential, it is apparent that both levers 32 and 44 are also at ground potential, so that contacts 48 and 62 are at all times grounded and thus complete circuits to ground for fixed contacts 20, 24, and 29. The contacts 20 and 24 and contactor 48 are used to control the electric motor that drives the wiper blades of a windshield wiping apparatus, whereas the fixed contact 29 and contactor 62 complete a circuit for the washer apparatus of a windshield washing system of a motor vehicle of the type referred to in the above identified copending application. Thus, it will be apparent that when the push button 44 is depressed, the wash circuit for the coordinated washing and wiper control will be completed simultaneously with the completion of a circuit for the electric motor. The motor circuit will be made by the shorting of contacts 20 and 24, and the motor will run in its low speed condition. The motor, of course, can always be controlled by movement of lever 32 which moves contactor 48 in relation to contact segments 20 and 24. Although the switch just described has particular utility in the washer-wiper system in the above identified copending application, it will be readily apparent that the switch will have utility in any circuit arrangement wherein it is desired to complete two electrical circuits simultaneously, and where one of the circuits need only be closed momentarily.

In FIGURES 6 through 12, a modified electric switch, made in accordance with this invention, is illustrated. This switch, like the switch of FIGURES 1 through 4, is adapted to be used with the washer-wiper system of the above identified application, and like the switch of FIGURES 1 through 4, is a grounding-type switch which completes circuits to ground. Referring now more particularly to FIGURES 6 through 12, it is seen that the switch includes an insulator block 70 formed of any suitable insulating material and having side walls 71 and 72. A metal face plate 73 is secured to the insulator block 70 in a manner illustrated in FIGURE 8 with portions 74 of the face plate being bent over the insulator block 70. The insulator block carries three pin-type terminals 75, 76, and 77. The terminal 76 has a head 76*a* which holds a contact 78 in position within the insulating block 70, as illustrated in FIGURE 11. The contactor 78 has a projecting portion 79, the purpose of which will be more fully described hereinafter. The pin-type connector 75 has a head portion 80 which serves to prevent withdrawal of the connector from the insulator body 70. The pin-type connector 75 is connected with a metal strap 81 which extends across the rear face of the insulator block 70. A rivet 82 passes through the metal strap 81 and serves to hold an elongated fixed contact 83 in position within a recess formed in the inner wall 84 of the insulator portion 70. The pin-type connector 77 has a head 85 which serves to hold a metal strap member 88 within a recess formed in the inner face of the insulator block 70. Rivet 89 holds a third conducting strap 90 in fixed relationship with the inner face of insulator block 70. The conducting straps 83, 88, and 90 are illustrated in the circuit diagram of FIGURE 13, and these conducting straps form fixed contacts for the electric switch. The rivet 89 positions a conducting strap 92 against the rear face of insulator block 70, the conducting strap 92 being connected to one side of a wire-wound resistor 93. The pin-type connector 77 positions a second conducting strap 94 against the insulator block 70 and this conducting strap is connected to the opposite side of wire-wound resistor 93.

The insulator block 70 carries a lever supporting member 98 shown in the sectional views of FIGURES 7 and 9. The member 98 is slotted as at 100 to receive cylindrical portion 102 of a lever designated by reference numeral 104. The lever is thus pivotally supported within member 98, and pivots around an axis that passes through the center of the cylindrical portion 102. The lever is normally held in its position illustrated in FIGURE 7 by means of a spring 106 and a bullet-shaped plunger 108. Both the plunger and spring are disposed within an opening 110 formed in insulator block 70.

A second lever generally designated by reference numeral 112 has a knob portion 114 that projects through an opening 116 formed in metal face plate 73. The lever 112 has a transversely extending portion 117 which engages the inner face of metal face plate 73. The lever 112, in addition, has portions 118 each formed with a cam face 120. The lever further has a cylindrical portion 122 which carries a spring 124. The spring 124 in turn surrounds a projecting portion 126 on an electrical contactor 128 that is formed of suitable electrical conducting material. The contactor 128, as is better illustrated in FIGURE 12, has three projecting portions 130, 132, and 134. The contactor 128 has side flanges formed with openings 128*a* and 128*b* which fit over projections (not shown) extending from the sides of portions 118. The contactor 128 thus moves with portions 118 with the walls of the openings 128*a* and 128*b* being held against the projections by spring 124. The projecting portion 130 engages the metal strap member 83 at certain positions of its movement, whereas the projections 132 and 134 cooperate with conducting segments 88 and 90. The lever 112 is thus positioned for slidable movement between the inner face 84 of insulator block 70, and the inner face of the metal face plate 73. As has been noted hereinbefore, the switch of this invention is a grounding-type switch, and thus the lever 112 will be grounded, as will the contactor 128 through spring 124. The lever 112 may either be grounded by connecting the metal face plate directly to a metal part of a motor vehicle, or by providing an escutcheon plate 133 that engages the metal face plate 73, and which is attached to the metal part of a motor vehicle such as the dashboard.

The rotatable lever 104 is adapted to be actuated by a metal push button 131, which is supported for sliding movement in the escutcheon plate 133. The metal push button may carry a plastic knob and is at ground potential by reason of its slidable connection with escutcheon plate 133. The push button plunger 131 is depressed whenever it is desired to complete a circuit for the washing apparatus of the system illustrated in the above identified copending application.

In operation, it will be apparent from the foregoing

description, that the lever **112** may be actuated to various positions which have been designated in the drawings as "Off," "Low," "Medium," and "High." These positions refer to the speed of the driving electric motor that drives the windshield wiper blades of the above identified copending application. When the lever **112** is in the off position, and when the push button **131** is depressed, the push button swings the lever **104** and the end of the lever **105** engages the cam surface **120** of lever **112** to move it to its low speed position. This sort of movement is depicted in the sectional view of FIGURE 9, wherein it is seen that the lever **104** has been swung to its fully inward position and has moved the lever **112** from its off position to its low speed position. When the lever **112** is in its low speed position, it must be manually returned to the off position and, of course, may be moved to the medium and high speed positions by manual actuation thereof. When the lever **104** is swung to the position illustrated in FIGURE 9, an edge of the lever engages the projecting portion **79** of contactor **78** to complete an electrical circuit to ground for contactor **78** through lever **104**. This circuit may be used to control the washing apparatus of the system illustrated in the above identified copending application, and it thus is apparent that the washing circuit will be closed simultaneously with the operation of lever **112** from its off position to its low speed position. In its low speed position, the grounded contactor **128** engages fixed contacts **83** and **88**. In the medium speed position, the grounded contactor **128** engages contacts **83** and **90**, and in its high speed position, the grounded contactor **128** only engages the fixed contact **83**. The spring **106** always returns the lever **104** to its FIGURE 7 position upon release of the push button **131** so that only a momentary switch closure is actuated by lever **104**.

Although the switches of this invention have been disclosed as grounding-type switches, that is of the type wherein a circuit is completed to ground through the switch, it is apparent that they may be used in any circuit arrangement wherein it is desired to control two electrical circuits and wherein it is desired to complete the two electrical circuits at the same time, but wherein only one circuit is only momentarily closed.

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.

What is claimed is as follows:

1. A circuit controller comprising, an insulator block carrying a plurality of fixed contacts, a housing secured to said insulator block and spaced therefrom to form a compartment, a first lever slidable between said housing and insulator block, a second lever mounted for swinging movement within said compartment, an opening in said insulator block, a spring biased plunger positioned within said opening and contacting said second lever for holding it against said housing, a cam face on said first lever engaging an end portion of said second lever, a spring biased contact carried by said first lever and adapted to engage said fixed contacts, and an electrical contact supported by said insulator block and adapted to engage said second lever when it is swung over a predetermined arc.

2. A circuit controller comprising, an insulator block carrying a plurality of fixed electrical contacts, a metal housing secured to said insulator block and spaced therefrom to form a compartment, a first lever engaging said housing, means for holding said lever against said housing including a spring attached to said lever and interposed between said lever and a metal contactor that engages said fixed contacts, a second lever mounted for swinging movement within said compartment, an electrical contact supported by said insulator block and adapted to engage said second lever when it is swung through a predetermined arc, a spring biased plunger positioned between said insulator block and said second lever for holding said lever against said housing, and a cam face on said first lever engageable with said second lever whereby said first lever is moved within said compartment when said second lever is swung through said predetermined arc.

3. A circuit controller comprising, an insulator block carrying a plurality of electrical contacts, a housing secured to said insulator block and spaced therefrom to form a compartment, an electrical contactor carried by a first manually operable lever and adapted to engage one or more of said fixed contacts when said lever is moved within said compartment, a second manually operable lever mounted for pivotal movement within said compartment, a fixed contact supported by said insulator block and adapted to directly engage said second lever when it is pivoted through a predetermined arc, said first lever being at times located in the path of movement of said second lever whereby said first lever is shifted to a switching position when said second lever is pivoted through said predetermined arc.

4. A circuit controller comprising, an insulator block carrying a plurality of fixed contacts, a housing secured to said insulator block and spaced therefrom to form a compartment, a first relatively rigid manually operable lever mounted for slidable movement within said compartment, a second relatively rigid manually operable lever mounted for pivotal movement within said compartment, means movable with one of said levers for engaging certain of said fixed contacts when it is moved, contact means carried by spring means that is positioned between said contact means and said one lever for engaging said fixed contacts when it is moved, biasing means for urging one of said levers to a retracted position, one of said levers being at times located in the path of movement of the other lever such that movement of one of said levers in one direction causes said levers to move together and movement of said one lever in another direction causes said one lever to move relative to the other.

References Cited in the file of this patent

UNITED STATES PATENTS

619,900	Miller	Feb. 21, 1899
1,854,056	Mott	Apr. 12, 1932
1,908,204	Winning	May 9, 1933
2,447,318	Dazley	Aug. 17, 1948
2,594,181	Kliegl	Apr. 22, 1952
2,725,451	Huck	Nov. 29, 1955