

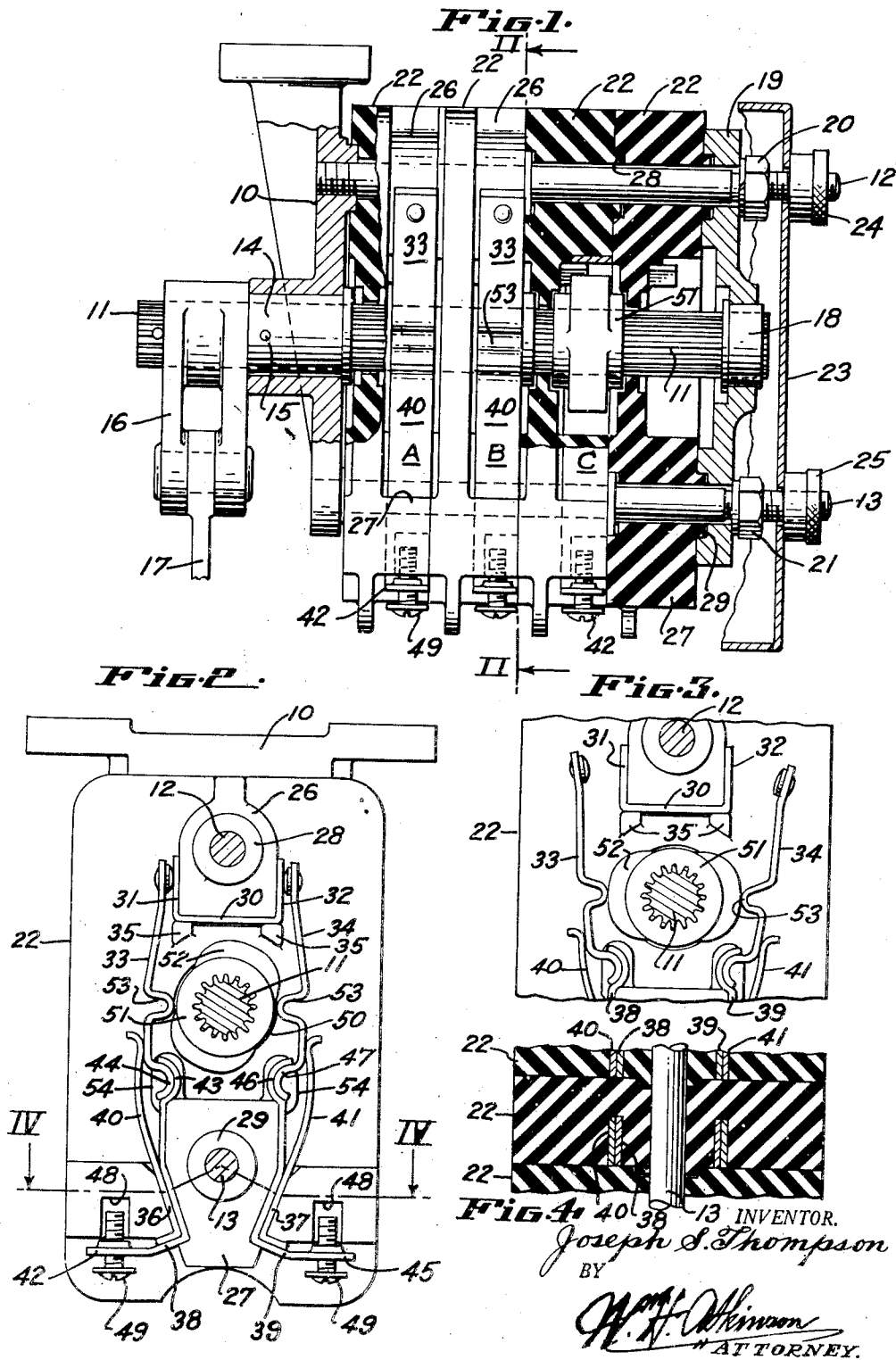
Nov. 11, 1941.

J. S. THOMPSON

2,262,306

AUXILIARY CIRCUIT CONTROLLING SWITCH

Filed Sept. 3, 1940



UNITED STATES PATENT OFFICE

2,262,306

AUXILIARY CIRCUIT CONTROLLING SWITCH

Joseph S. Thompson, Los Altos, Calif., assignor to Pacific Electric Manufacturing Corporation, San Francisco, Calif., a corporation of California

Application September 3, 1940, Serial No. 355,132

5 Claims. (Cl. 200—6)

The present invention relates to auxiliary circuit controlling switches, and more particularly to a circuit controlling switch that can be used in connection with electrically controlled equipment, such as automatically operating circuit breakers and the like, to provide interlocking control circuits for the various electrically responsive devices commonly used therewith.

An object of the invention is to provide a switch unit of uniform design that can be placed in superimposed relation with any number of other similar units and operated simultaneously therewith to either open and/or close any number of auxiliary control circuits in any desired sequence.

Another object of the invention is to provide an auxiliary circuit controlling switch that will establish a double break in the circuit when opened and in which the circuit controlling parts may be operated by oscillating or rotary movement of an operating shaft.

Another object of the invention is to provide a simple, practical and reliable auxiliary switch that can be operated by a straight line movement or a rotary movement of an associated piece of apparatus.

Another object of the invention is to provide a multi-circuit controlling means in which a plurality of independent circuit controlling switches are supported between insulating baffles that interlock and cooperate with each other to support the switches in cooperating relation with a common operating means.

Another object of the invention is to provide an auxiliary switch of simple construction which is mounted upon a base of insulating material having complementary surfaces that cooperate with similar surfaces of a similar base and provide an arrangement wherein any number of circuit controlling switches may be secured in superimposed relation upon a single support and in operative relation with a common operating means.

In the control of electrical apparatus, such as reclosing circuit breakers and other automatic sub-station equipment, it is necessary to provide auxiliary switches for the various interlocking circuits which such an installation requires, and since these circuits are necessarily controlled in relation to the position of some moving part of the equipment, it is desirable that the auxiliary circuit controlling means be of such a character that it be adapted to control either a single or any number of associated circuits

in response to the movement of a particular part of the equipment. Therefore, it is a further object of the present invention to provide a circuit controlling means which comprises individual switch units that can be mounted in any desired numbers in superimposed relation upon a single support and in cooperating relation with a common operating means.

For a better understanding of the invention, reference should now be had to the accompanying drawing, wherein there is shown by way of illustration and not of limitation a preferred embodiment thereof.

In the drawing, wherein like numerals refer to like parts throughout the several views;

Figure 1 is a side elevation of an auxiliary circuit controlling switch constructed in accordance with the invention and having parts broken away and in section to reveal its details of construction,

Figure 2 is a vertical view taken along line II—II of Figure 1, showing the elements of one of the circuit controlling switches in their circuit closed position,

Figure 3 is a fragmentary view similar to Figure 2 of the drawing, showing the circuit controlling elements of the switch in their circuit opened position, and

Figure 4 is a fragmentary sectional view taken along line IV—IV of Figure 2 and through a number of the circuit controlling switches.

In Figure 1 of the drawing there is shown a multi-circuit controlling device in which three independently insulated switches, designated A, B and C, are mounted upon a suitable bracket or support 10 in cooperating relation with a common operating shaft 11 by means of tie-rods 12 and 13. The operating shaft 11 is here shown as journaled at one end upon the bracket or support 10 by means of a bearing forming sleeve 14 which is secured against axial displacement upon the shaft 11 by means of a pin 15. At this end the shaft 11 is also shown as carrying a clevis-like crank arm 16 which connects with a reciprocating link or rod 17. The other end of the shaft 11 is shown as having a second bearing forming sleeve 18 that is journaled in an end plate 19 which is held in clamping relation with the support 10 by threaded nuts 20 and 21 respectively upon the tie-rods 12 and 13. As will be more clearly pointed out hereinafter, the switches A, B and C are each mounted upon similar supports or base forming members 22 that are preferably formed of a moldable insulating material. These bases 22

have their adjacent faces formed complementary to each other, as will also hereinafter appear, so that when arranged side by side upon the tie-rods 12 and 13, as here shown, they will be clamped in registering alignment upon the support 10 when the nuts 20 and 21 are tightened against the end plate 19. At this point it will be noted that the switch forming elements and contacts have been omitted from the extreme right hand base forming member 22 and as a result this base forming member will merely cooperate with the next adjacent base forming member 22 to provide an enclosure for the switch C. With this arrangement it will be understood that should it be desired to add one or more additional circuit controlling switches to this assembly, this can be done by merely inserting switch forming elements and contacts similar to those of the switches A, B and C in the end base forming member 22 and providing longer tie rods 12 and 13, and if required, a longer operating shaft 11. In this way any number of circuit controlling switches similar to those here illustrated may be added to the assembly when desired. Instead of using a base forming member 22 at the end of the assembly, as here shown, it will be understood that a properly designed end member of insulating material, from which the switch and contact accommodating features are omitted, may be provided as a closure means at this point. In this figure of the drawing, the tie-rods 12 and 13 are shown as having their threaded ends extending out beyond the threaded nuts 20 and 21 so that, if desired, a suitable enclosing housing 23 may be telescoped over the base forming members 22 and secured thereupon by means of thumb nuts 24 and 25. In the event that such an enclosing housing 23 is used, it will be provided with a suitable opening or openings through which access can be had to the terminals of the several circuit controlling switches enclosed therein. Before passing on to the remaining figures of the drawing for a detailed description of the base forming members 22 and the nature and manner of assembly of the circuit controlling elements of the switch, it should be stated that while the switch operating shaft 11 is here shown as adapted to be oscillated by a crank arm 16, this shaft may also be operated to effectively control the individual controlling switches A, B and C by a complete rotation thereof, as through the medium of a gear or a direct connection with a rotating element at the end thereof.

Reference is now made to Figure 2 of the drawing for a detailed description of other novel features of the present invention. As here shown, the base forming members 22 each have a flat body portion of rectangular outline upon one side and at one end of which there is provided a raised spacing boss 26 that extends outwardly therefrom. At its lower end this rectangular portion of each of the base forming members 22 also has a transversely disposed raised surface or spacing boss 27. Each of the bosses 26 and 27 are here shown as having an opening through which the tie-rods 12 and 13 respectively extend. Surrounding the opening in the boss 26 there is a cylindrical extension 28 that is adapted to project into a complementary recess formed in a similar position at the other side of an adjacent base forming member 22. The spacing boss 27 also has a similar cylindrical extension 29 that is like-

wise adapted to project into a complementary recess which is formed in the other side of the adjacent base forming member 22. With the base forming members 22 formed in this manner, it will be readily seen that when two or more of these members are spaced side by side with their cylindrical extensions 28 and 29 on one side registering with complementary recesses formed in the other side of a similar base forming member 22, the adjacent base forming members will form a pair or series of spaced baffles between which circuit controlling elements and contacts may be disposed in insulated relation from each other, as is clearly shown in Figure 1 of the drawing.

In addition to providing for a spacing between the rectangular body portions of the base forming members 22, the bosses 26 and 27 are also relied upon to position and support circuit controlling switch elements and contacts of novel construction which will now be described in detail. The boss 26 is shown as having its inner end formed of rectangular outline and as carrying a contact forming conductor 30 which is bent therearound so as to provide oppositely disposed stationary contacts 31 and 32 with which pivotally mounted contact members 33 and 34 cooperate. The contact forming conductor 30 is so bent and dimensioned that it will fit tightly over the end of the boss 26 and at its corners it is held against vertical displacement by means of two upstanding smaller bosses 35 that are formed upon the base forming member 22. With this arrangement it will be seen that when the pivotally mounted contacts 33 and 34 are in their circuit closed position, as here shown, a circuit will be established through the conductor 30. Unlike the spacing boss 26, the spacing boss 27 extends laterally across the base forming member 22 and is provided with two irregular or L-shaped slots 36 and 37 into which terminal forming and contact supporting members 38 and 39, together with biasing leaf springs 40 and 41, are respectively disposed. As shown, the terminal forming and contact supporting members 38 supports the pivotally mounted contact 33 and has a terminal 42 at its outer end. The other end of the member 38 is bent to form a semi-cylindrical bearing surface 43 into which a semi-cylindrical end 44 formed upon the pivotally mounted contact 33 is disposed. The terminal forming and contact supporting member 39 likewise has a terminal 45 at its lower end and a semi-cylindrical bearing surface 46 at its other end with which a semi-cylindrical end 47 upon the pivotally mounted contact 34 engages. At this point it will be noted that the biasing leaf springs 40 and 41 are so dimensioned that their outer ends respectively engage the pivotally mounted contacts 33 and 34 at points beyond the pivotal axis of these contact members so that their contact making ends will be biased into contact making engagement with the contact forming ends of the conductor 30 previously described as supported by the spacing boss 26. It will also be noted that the outer portions of the spacing boss 27 are provided with recesses 48 into which conductor securing screws 49 carried by the terminals 42 and 45 may extend. As shown in Figure 1 of the drawing, the shaft 11 extends through an opening 50 formed in each of the base forming members 22 between the spacing bosses 26 and 27. By further reference to this figure, it will also be noted that

the openings 50 are counter-bored at each side so as to accommodate hubs 51 formed at each end of a double cam 52 which is splined upon the shaft 11 by a fluting of its central opening in a manner corresponding to that of the shaft 11. One of these double cams 52 is provided for each complete switch assembly. From this it will be seen that one of these cams 52 will be held in cooperating relation with each set of pivotally mounted contacts 33 and 34 by the adjacent base forming members 22. When thus assembled, the cam forming ends of the cams 52 will be adapted to engage inwardly extending portions 53 formed upon the pivotally mounted contacts 33 and 34 at a point radial to the axis of the shaft 11. Therefore, when the shaft 11 is turned, these double cams 52 will operatively engage inwardly extending portions 53 and move the pivotally mounted contacts 33 and 34 out of circuit making engagement with the stationary contact forming conductor 30, as shown in Figure 3, and thus open the circuit between the terminals 42 and 45 carried by the terminal forming and contact supporting members 38 and 39.

Upon referring to Figure 4 of the drawing, it will be noted that the slots 37 formed in the spacing boss 27 in the base forming member 22 support the terminal forming and contact supporting members 38 and 39 and the biasing leaf springs 40 and 41 edgewise with respect to the baffle forming portions of the base forming members 22. At this point it should also be noted that the base forming members 22 are provided with slightly raised surfaces 54 that are adapted to engage the opposite edges of the pivotally mounted contacts 33 and 34 at the points where they pivotally engage the semi-cylindrical bearing surfaces 43 and 46 formed respectively upon the terminal forming and contact supporting members 38 and 39. These slightly raised surfaces 54, together with similarly positioned raised surfaces upon the other side of each of the base forming members 22, serve to hold the pivotally mounted contact members 33 and 34, the biasing leaf springs 40 and 41, and the terminal forming and contact supporting members 38 and 39 in slightly spaced relation with respect to the flat body or baffle forming portions of the base forming members 22 and thus the pivotally mounted contact members 33 and 34 will be free to move between their open and closed circuit positions with respect to the contact forming conductor 30 when the shaft 11 is turned or rotated.

While I have, for the sake of clearness and in order to disclose the invention so that the same can be readily understood, described and illustrated specific devices and arrangements, I desire to have it understood that this invention is not limited to the specific means disclosed, but may be embodied in other ways that will suggest themselves to persons skilled in the art. It is believed that this invention is new and it is desired to claim it so that all such changes as come within the scope of the appended claims are to be considered as part of this invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. In an auxiliary switch of the character described, the combination of a plurality of baffle forming members of insulating material adapted to be secured in superimposed relation, a spacing boss upon each of said baffle forming members adapted to interlock with an adjacent one of said baffle forming members, a circuit forming conductor partially surrounding said boss and ar-

5 ranged edgewise between adjacent baffle forming members to provide a contact surface at the opposite sides of said spacing boss, a second boss carried by each of said baffle forming members spaced from said first boss and also interlocking with another of said baffle forming members, said latter boss having two slots formed therein, a movable contact supporting member and a contact operating spring disposed edgewise in each of said slots, a movable contact member pivotally associated with said contact supporting member and said operating spring, an operating shaft extending transversely through said baffle forming members, a plurality of cams upon said shaft adapted to operate said pivotally mounted contact members into and out of engagement with the contact surfaces of the associated circuit forming conductor, and means for securing said baffle forming members in superimposed relation with the spacing bosses upon said one of said baffle forming members in contact with another of said baffle forming members, whereby the circuit forming conductors, the contact supporting members, the contact operating springs and the movable contact members between the adjacent baffle forming members will be held in cooperating relation with each other and with their respective cams without other securing means.

2. In an auxiliary switch of the character described, the combination of a supporting member of insulating material having an outwardly extending boss at one end, a contact forming conductor disposed edgewise upon said supporting member and providing a stationary contact at one side of said boss, a second outwardly extending boss at the other end of said supporting member having a slot formed therein, a terminal forming member having a semi-cylindrical bearing forming surface at its inner end supported edgewise to said supporting member in said slot, a leaf spring also disposed edgewise in said slot with said terminal forming member, a movable contact forming member having a semi-cylindrical end engaging the semi-cylindrical bearing forming surface upon said terminal forming member and a contact forming end which is biased into contact with the stationary contact upon said first boss by said leaf spring, an operating cam disposed between said bosses and operable upon an axis transverse to the plane of said supporting member for moving said contact forming member against the action of said leaf spring and out of contact making engagement with said stationary contact, and a second member of insulating material adapted to be secured against the extending bosses of said supporting member and hold said stationary contact, said terminal member, said spring and said movable contact member in cooperating relation and against edgewise displacement from said supporting member.

3. In an auxiliary switch of the character described, the combination of a supporting member of insulating material having an outwardly extending boss at one end, a contact forming conductor disposed edgewise upon said supporting member and providing a stationary contact at the side of said boss, a second outwardly extending boss at the other end of said supporting member having a substantially L-shaped slot formed therein, a terminal forming member of L-shaped configuration having a semi-cylindrical bearing forming surface at its inner end and arranged edgewise in said L-shaped slot, a leaf spring of L-shaped configuration disposed in said

L-shaped slot adjacent said terminal forming member, a movable contact forming member having a semi-cylindrical end engaging the semi-cylindrical bearing forming surface upon said terminal forming member and a contact forming end which is biased into contact with the stationary contact upon said first boss by said leaf spring, a rotatable cam disposed between said boss and operable upon an axis transverse to the plane of said supporting member for moving said contact forming member against the action of said leaf spring and out of contact making engagement with said stationary contact, and a second supporting member for a similar switch having flat surfaces adapted to be secured against the extending bosses of said first supporting member for securing said stationary contact, said terminal member, said spring and said movable contact member against edgewise displacement from said supporting member.

4. In a multiple circuit controlling switch, the combination of a plurality of contact supporting and baffle forming members of insulating material adapted to be secured in superimposed relation upon a suitable support, said baffle forming members having spacing bosses on one side which space them with respect to each other when secured in superimposed relation, a support for said baffle forming members, means for securing said baffle forming members in superimposed relation upon said support, a shaft extending through apertures formed in said baffle forming members between said spacing bosses, a switch operating cam positioned upon said shaft between adjacent baffle forming members, a current conducting member partially surrounding one of said spacing bosses and terminating with a contact surface at each side thereof, a pivotally movable switch forming member positioned by another of said spacing bosses in cooperating relation with each of the contact surfaces of said current conducting member, spring means for biasing said movable switch forming member into contact with said current conducting member, and an operating cam carried by said shaft and positioned axially between each of said baffle forming members for moving said pivotally movable switch forming members against the action of said spring means and out of engagement with the contact surfaces of the conductor upon said

first spacing boss as said shaft turns, each of said baffle forming members also having spacing pads at the pivotal point of said movable switch forming member to provide an operating clearance between said switch forming members and said baffle forming members, whereby said current conducting member said movable switch forming members said spring means and said cam will be held in cooperating and operative relation with each other solely by the adjacent baffle forming members.

5. In an auxiliary switch of the character described, the combination of a plurality of baffle forming members of insulating material adapted to be secured in superimposed relation, a spacing boss upon each of said baffle forming members adapted to interlock with another of said baffle forming members, a circuit forming conductor arranged edgewise between said baffle forming members partially surrounding said bosses and providing a contact surface at the opposite sides thereof, a second boss spaced from said first boss and also interlocking with another of said baffle forming members, said latter boss having slots formed therein, a contact supporting member and a contact operating leaf spring disposed edgewise in each of said slots, a movable contact member pivotally associated with said contact supporting member and said operating leaf spring, an operating shaft extending transversely through said baffle forming members, a cam upon said shaft adapted to move said pivotally mounted contact members against the action of said leaf springs and out of engagement with the contact surfaces upon said circuit forming conductor, metallic end plates adapted to interlock with the outer of said plurality of baffle forming members and provide bearings for said operating shaft, and tie-rods extending through said bosses for securing said end plates and said baffle forming members in superimposed relation with each other, whereby said baffle forming members, said circuit forming conductors, said contact supporting members, said contact operating leaf springs and said movable contact members will be held in cooperating relation with each other and with said cam without other securing means.

JOSEPH S. THOMPSON.