July 2, 1929. S. SEABERG 1,719,563

CIRCUIT CONTROL MECHANISM

Filed Dec. 15, 1924 3 Sheets-Sheet 1

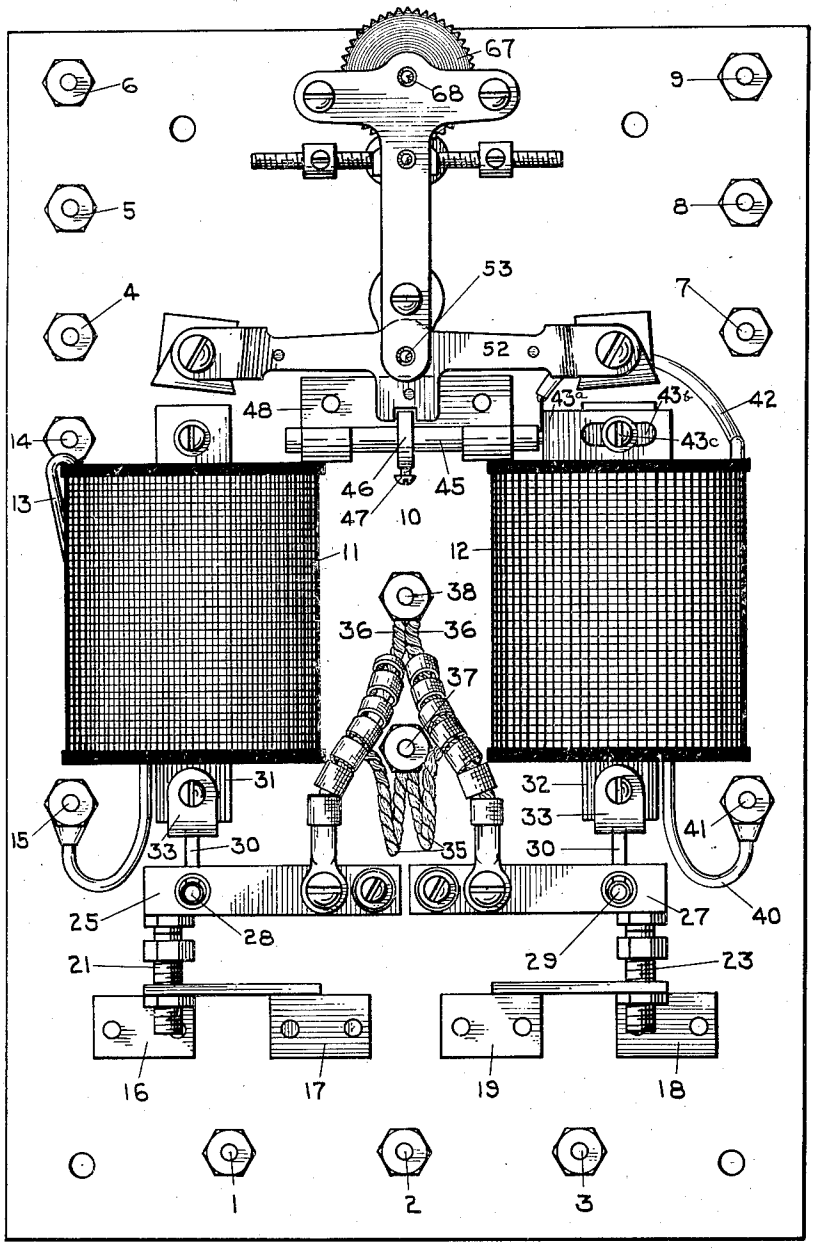


Fig I

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CIRCUIT CONTROL MECHANISM

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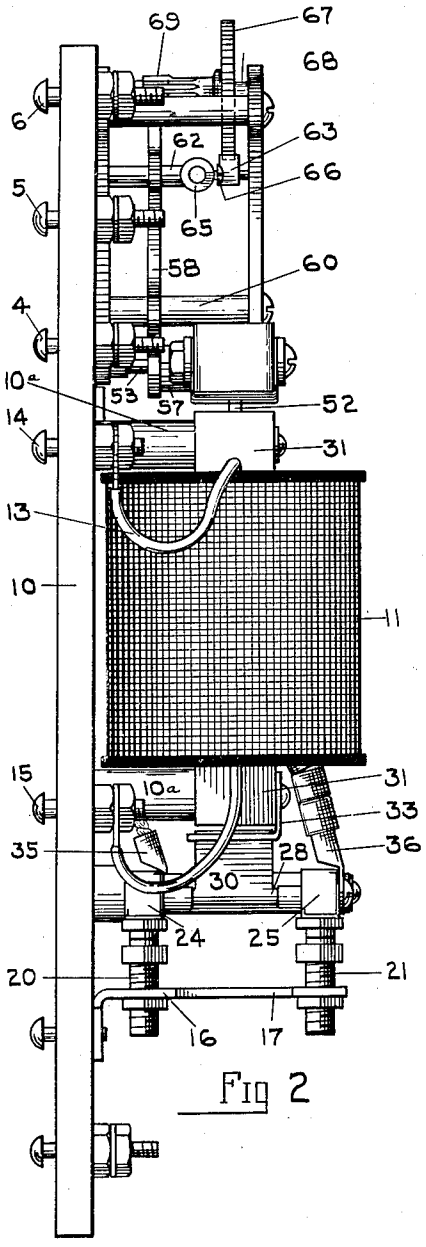


Fig 2

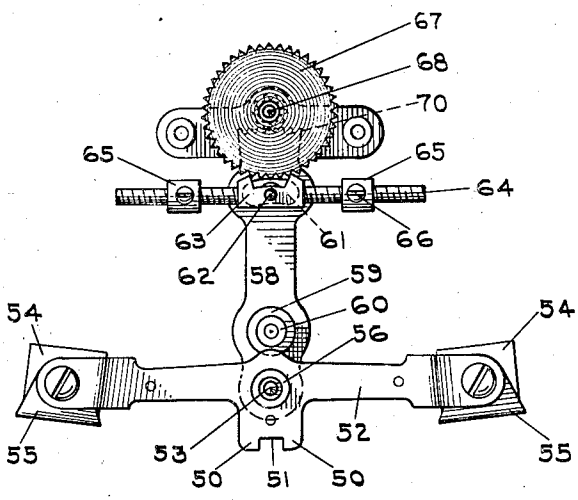


Fig 3

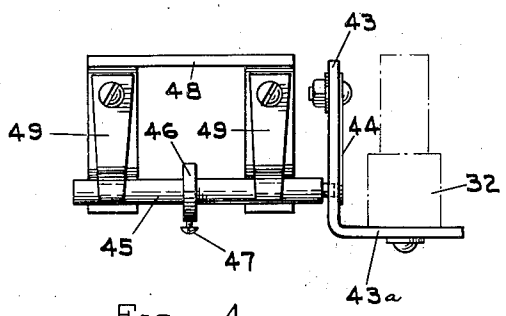


Fig 4

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CIRCUIT CONTROL MECHANISM

Filed Dec. 15, 1924 3 Sheets-Sheet 3

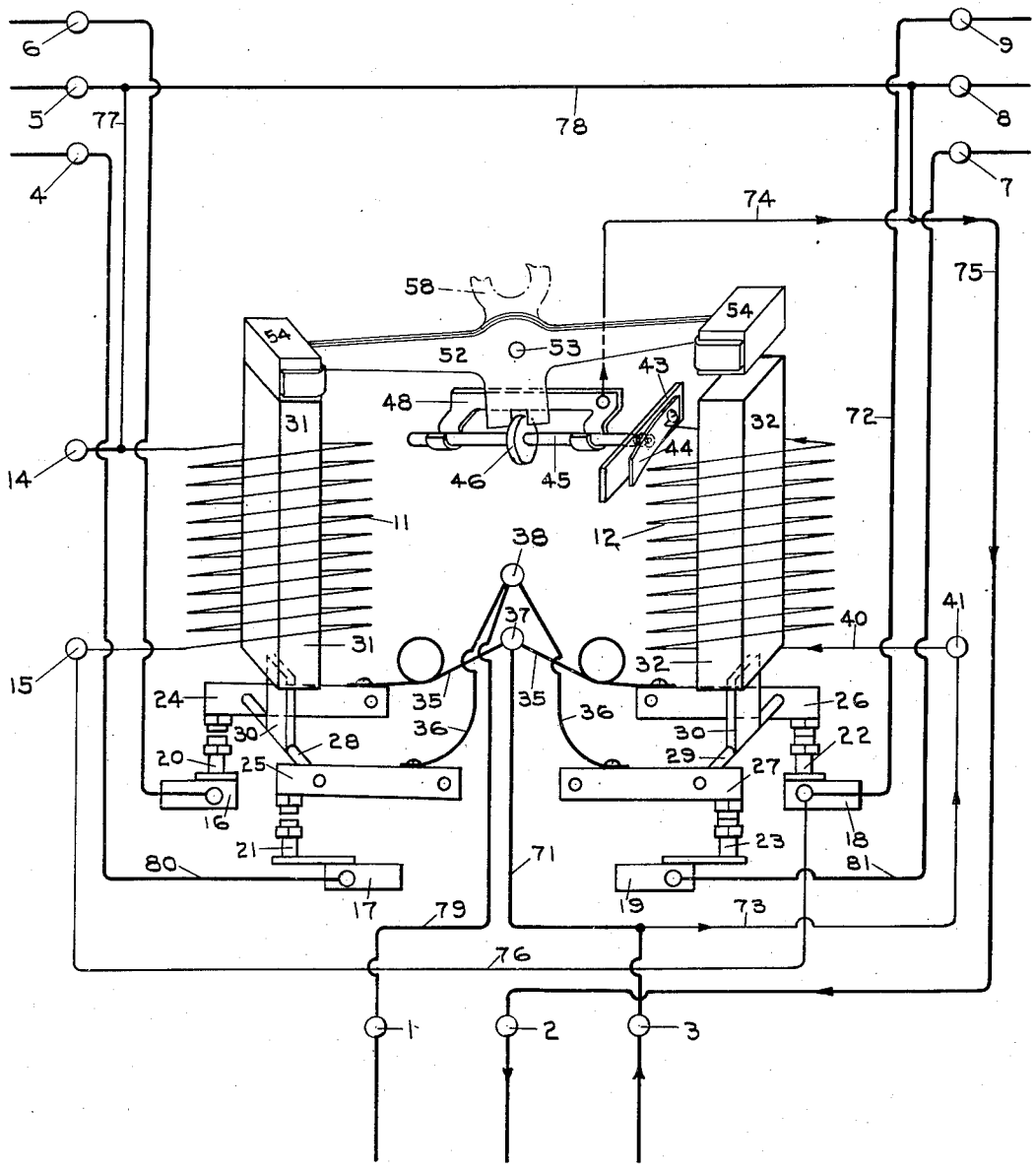


Fig 5

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UNITED STATES PATENT OFFICE.

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CIRCUIT-CONTROL MECHANISM.

Application filed December 15, 1924. Serial No. 755,997.

My invention relates to mechanism for alternately making and breaking one or more electrical circuits and concerns more especially apparatus for intermittently turning on and off the current in a plurality of electric light circuits. Among the objects of this invention are to improve upon previous construction of magnetic control mechanism for electrical circuits; to produce magnetic circuit control apparatus which will be less subject to the influence of dirt than are mechanisms including dash pot arrangements; to produce a mechanism of the character stated which will, during use, require a minimum amount of care; to produce mechanism of the character stated which will operate in heavy duty circuits and break large current flow with a minimum amount of arcing and danger of circuit break-down; and such further objects, advantages and capabilities as will later more fully appear and as are inherent in the construction herein disclosed.

My invention further resides in the combination, construction and arrangement of parts illustrated and, while I have shown herein what is now considered a preferred embodiment of my invention, I desire the same to be understood as illustrative only and not as limiting the scope of this invention.

Referring to the drawings attached hereto and forming a part hereof, Fig. 1 is an elevation of an embodiment of my invention, showing what appears upon the front of the panel; Fig. 2 is a view at a right angle to Fig. 1; Fig. 3 is a fragmentary elevation of a part of the control mechanism taken behind the front plate of the frame thereof; Fig. 4 is a plan view of a control switch; and Fig. 5 is a diagrammatic layout of the electrical circuits of this construction.

Referring more in detail to the annexed drawings, numerals 1, 2 and 3 designate power circuit terminals, and numerals 4, 5, 6, 7, 8, and 9 designate load circuit terminals. These terminals are carried by a panel 10 which also carries a pair of electro-magnetic coils 11 and 12, appropriately spaced from the panel by suitable posts 10^a, shown in Fig. 2. An end 13 of the coil 11 is connected to the binding post 14 mounted upon the panel, while the opposite end of this coil is connected to the post 15.

Mounted upon the panel 10 are pairs of bracket members 16, 17, and 18, 19 which carry adjustable contact elements 20, 21 and 22, 23. Pivoted upon the panel member are switch arms 24, 25, 26 and 27 which co-operate with the aforesaid contact elements in the making and breaking of the electrical circuits. A cross-bar 28 connects the switch elements 24 and 25 and is appropriately insulated therefrom. A similar cross-bar 29 connects the switch elements 26 and 27 and each of the cross-bars carries a pole piece 30 adapted to be attracted by the cores 31 and 32 of the electro-magnets 11 and 12. Secured to the ends of the cores 31 and 32 are angular guide members 33, each of which has a slot in one of its arms for the reception of the pole pieces 30. It will be seen from this that when either of the coils 11 and 12 is energized the corresponding pole piece will be drawn toward the core of the coil and will thereby cause the switch elements to be separated from their respective contacts.

Leads 35 and 36 connect the switch arms 24, 25, 26 and 27 with binding posts 37 and 38, as will be seen from Figs. 1 and 5.

A terminal 40 of the coil 12 is connected to the binding post 41, while the other terminal 42 of this coil is connected to bracket arm 43 which carries a resilient contact element 44 for co-operation with a slidable switch element 45. The bracket 43 has an arm 43^a bent substantially at a right angle thereto and provided with a slot 43^b for the reception of a screw 43^c whereby the position of the bracket may be adjusted so that the end of the walking beam may come substantially into contact with the end of the core 31 before the current is switched to coil 12. Secured to the slidable element 45 is a collar 46 which is fastened in place by means of a set screw 47 or the like. This collar is adjustable longitudinally of the bar 45 for the varying of the relative lengths of light and dark periods of the two load circuits. A bracket 48 has a pair of hook shaped arms, shown most clearly in Fig. 5 for the reception and support of the slidable rod 45. Secured to arms of the bracket 48 are resilient members 49 which press downwardly upon the rod 45 and hold the same in place until it is moved to the right or left by the projections 50 at the sides of the notch 51 in the walking beam 52 which is pivoted at 53.

The structure of the speed control appa-

ratus will now be described with more particular reference to Fig. 3 of the drawing. The cross-bar or walking beam 52 carries at each end a pole piece, or so called armature 54, these armatures being prevented from coming in contact with the cores 31 and 32 by means of pieces of copper or brass 55 secured around the face of the armature which is directed toward the core. This prevents sticking of the armature to the core by reason of the low residual magnetism always present to a certain extent, where direct current is used. Preferably a sleeve 56 is secured in the walking beam to serve as a bearing member for the prevention of undue wear and also to make the construction more rigid. The shaft 53 which serves as a pivot member for the walking beam 52 extends backwardly to the back frame member of the escapement mechanism and has a spacing member 57 surrounding the same and separating walking beam 52 from the crank arm 58 which is perforated, as shown at 59 in Fig. 3, for the passage of a frame post 60 separating the front and back members of the frame and permitting them to be rigidly secured together. From this it will be seen that as the walking beam 52 rocks back and forth the crank arm 58 will swing from side to side but it will at no time come in contact with the post 60. This crank arm 58 is provided at its upper part with arcuate slot 61 through which extends the pivot member 62 of the pallet 63. This slot 61 permits the lateral swinging of the crank arm 58 without any interference from the pivot member 62. The pallet carries laterally extending arms, preferably in the form of a transverse screw threaded member 64. This may be secured in place in any desired manner as, for example, by being screw threaded through the pivot member 62 and having a pin extended transversely through the members 62 and 64. Weights 65 preferably have screw threaded connections with the cross-bar 64 and may be locked in place by means of set screws 66 which may be screwed in to engage the cross-bar. This latter may, if desired, have its front side flattened to make it more difficult for the weights to inadvertently become loosened and work out of adjusted position. The purpose of the foregoing adjustment is to make it possible to vary the speed at which the escapement mechanism operates, thereby varying the length of time during which the respective load circuits are in use. In order to prevent the mechanism from snapping over instantaneously from one side to the other, mechanism is provided which cooperates with the pallet 63 to retard the swinging action of the crank arm 58 and walking beam 52. This mechanism comprises a notched wheel 67 carried by a shaft 68 which is also provided with a pinion 69 adapted to engage the segmental rack 70 upon the upper end of the crank arm 58. From the foregoing it will be apparent that the pallet rocks back and forth upon its pivot permitting the toothed wheel 67 to rotate in one direction or the other, according to the direction of pull of the walking beam, which is, in turn, controlled by which one of the electro-magnetic coils is in circuit.

Operation.

The operation of this device will now be explained in connection with Fig. 5 of the drawings. If a two wire circuit is used, the terminals thereof will be connected to the line circuit terminals 2 and 3 and the load will be connected to the load terminals 5, 6, 8 and 9. If a three wire circuit is used the neutral wire will be connected to the circuit terminal 2 and the other two wires to the terminals 1 and 3, while the load will be connected to the terminals 4 to 9, inclusive, as will be understood. In order to make more clear the path of the current, arrowheads have been used and the line connected to contacts 2 and 8 has been treated as the negative of a direct current circuit, while the line connected to terminal 3 has been considered the positive. Assuming the parts to be in the position shown in Fig. 5 when the current is connected to this apparatus, the following operations will result. Current will flow from terminal 3 through main feed wire 71 to terminal 37 and from this through connector 35, switch element 26, contact 22 and feed wire 72 to terminal 9. At the same time, current will flow from terminal 3 through control circuit lead 73 to connector 41 and from thence through connector 40, coil 12, contact 44, switch member 45 and circuit control lead 74 to the main circuit wire 75 and through this back to the line terminal 2. Upon the flow of current through the coil 12 the armatures 30 and 54 of the core 32 will be drawn toward the same, instantly raising the switches 26 and 27 from the contacts 22 and 23, thus breaking the circuit through the load terminals 7, 8 and 9. For the present the circuit through the other wire of the three wire circuit will be disregarded. The armature 54 can not be instantaneously drawn down to the core 32 because of the escapment mechanism shown in Fig. 3, but the breaking of the circuit through 26 and 22 does not cut the current from the coil 12, though it does cut the current from the coil 11 as will be explained later. As the escapement mechanism functions, it permits the walking beam 52 to turn slowly about its pivot until the armature 54 is substantially in contact with the core 32. When this happens, switch bar 45 is gradually moved toward the left by one of the projections 50 engaging the collar 46 and shoving it along. When the resilient contact element 44 springs into position so that it engages the bracket 43 in such a man-

ner that it can go no further, and the rod 45 is moved further to the left, the circuit is broken where the end of this rod touches the contact member 44 and coil 12 is thereby cut out of the circuit. When this happens, armature 30 is no longer pulled toward the core 32 and the contact arms 26 and 27 drop by gravity into contact with 22 and 23, thereby completing the circuit to the terminals 7, 8 and 9. At the same time, the circuit is completed through control lead 76 to the terminal 15 of coil 11. From here the current flows through control lead 77 into the jumper wire 78 and back through wire 75 to terminal 2. Current flowing through coil 11 attracts armatures 30 and 54 of core 31, thereby lifting the switch arms 24 and 25 from the contacts 20 and 21 and breaking the circuit through connectors 4, 5 and 6. The current will continue to flow through coil 11 until coil 12 is again energized to lift switch arm 26 which will break the flow of current through control wire 76 and coil 11. As the armature 54 is drawn down toward core 31, one of the projections 50 will engage the collar 46 and push the switch rod 45 over to the right until it comes into contact with the contact element 44. Since the notch 51 is considerably wider than the thickness of the collar 46, there is considerable lost motion at this point and as a consequence the make and break between 44 and 45 does not take place until substantially at the end of the rocking motion of the walking beam 52. It will be understood that the duration of the closed periods through the right and left load circuits can be adjusted, relatively, by adjusting the position of the collar 46 on the switch rod 45.

If a three wire circuit is being used, the current will flow from line terminal 1 through lead 79 to post 38 and from thence through connectors 36 to switch arms 25 and 27. From here the current will flow through whichever one of contacts 21 and 23 happens to be in engagement with switch arms 25 and 27. The current will flow then through either bracket 17 and lead 80 or bracket 19 and lead 81 to terminal 4 or 7. It will be seen that the circuit through terminal 1 and the associated leads does not enter into the control of the apparatus but is entirely under the control of the other half of the circuit, that is, through terminals 2 and 3.

From the foregoing it will be apparent that I have provided an apparatus in which a walking beam is used for the control of the circuits; that I have provided an apparatus in which expensive dash pot arrangements, which are likely to get out of order, have been dispensed with; that I have provided a mechanism which will efficiently control the intermittent energizing of circuits with a minimum of trouble, and that I have improved in general upon apparatus of the type indicated.

Having now described my invention, I claim:

1. In a magnetic switch, power circuit connectors, load circuit connectors, connections between the connectors, respectively, switches in part of the connections, laterally spaced magnetic coils for controlling said switches, a switch in the circuit of one of said coils, a walking beam for controlling the opening and closing of the last mentioned switch, the ends of the walking beam being adjacent corresponding ends of said coils, and speed governing means for the walking beam, comprising escapement mechanism.

2. In a magnetic switch having power circuit connectors, load circuit connectors, connections between the connectors, respectively, switches in part of said connections, unaligned magnetic coils for attracting said switches, a switch in the circuit of one of said coils, a walking beam for controlling the opening and closing of the last mentioned switch, the ends of the walking beam being adjacent corresponding ends of said coils, and escapement mechanism for governing the walking beam, including reversely operable pawl and ratchet mechanism.

3. In a magnetic switch, main circuit lines, control circuit lines, magnetic coils in the control circuit lines, said magnetic coils being arranged side by side but spaced from each other and connected to be operated alternately, a switch in one of the coil feed lines, a walking beam controlling said switch, said walking beam having an armature adjacent each end to be alternately attracted by said coils so that the walking beam may be actuated by the coils, and escapement mechanism governing the speed of operation of the walking beam.

4. In a magnetic switch, main circuit lines, control circuit lines, magnetic coils in the control circuit lines, said magnetic coils being arranged side by side but spaced from each other and connected to be operated alternately, a switch in one of the coil feed lines, a walking beam controlling said switch, said walking beam having an armature adjacent each end to be alternately attracted by said coils so that the walking beam may be actuated by the coils, and escapement mechanism governing the speed of operation of the walking beam, there being a lost motion connection between the walking beam and the switch.

5. In a magnetic switch, a plurality of circuit controlling switches, electro-magnetic switch opening coils to open said switches, a switch in the circuit through one of the coils, said last named switch being separate from the switches opened by the coils, and escapement mechanism actuated by the coils, the opening and closing of the separate switch being controlled by the escapement, mechanism.

6. In a magnetic switch, power circuit con-

nectors, load circuit connectors, connections between the connectors, respectively, alternately operated switches in part of said connections to open one circuit and simultaneously close another, magnetic coils for controlling said switches, a switch in the circuit of one of said coils, one of the switches associated with said last mentioned coil, and controlled thereby, controlling the circuit through the other coil, and means intermittently operating the switch in the coil circuit, including a walking beam and escapement mechanism associated therewith.

7. In a magnetic switch mechanism, switches alternately and intermittently actuated, electro-magnetic means for actuating said switches, one of the switches controlling the circuit for the electro-magnetic means of the other switch, a switch for the circuit of the other electro-magnetic means, and means for intermittently actuating said last mentioned switch, including an escapement mechanism for retarding the action of the last mentioned means.

In witness whereof, I hereunto subscribe my name to this specification.

SEVERIN SEABERG.