

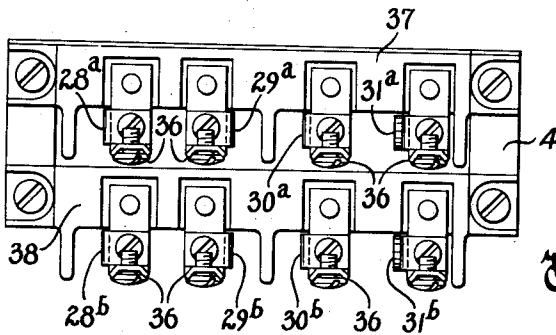
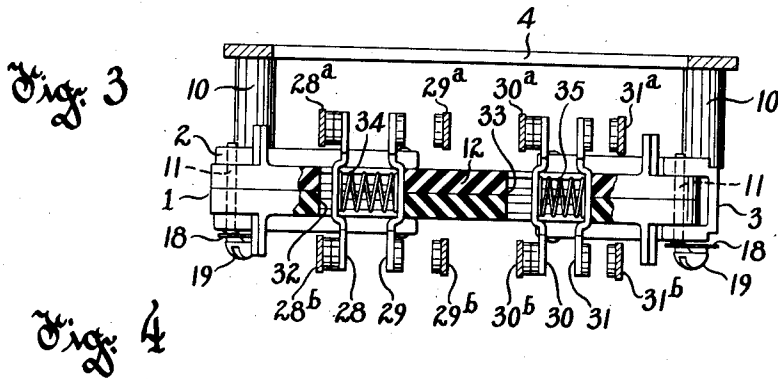
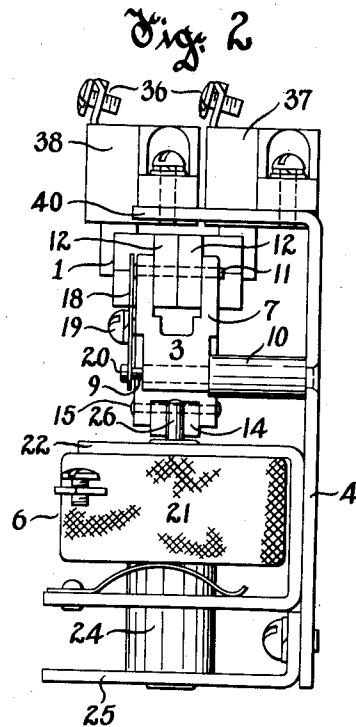
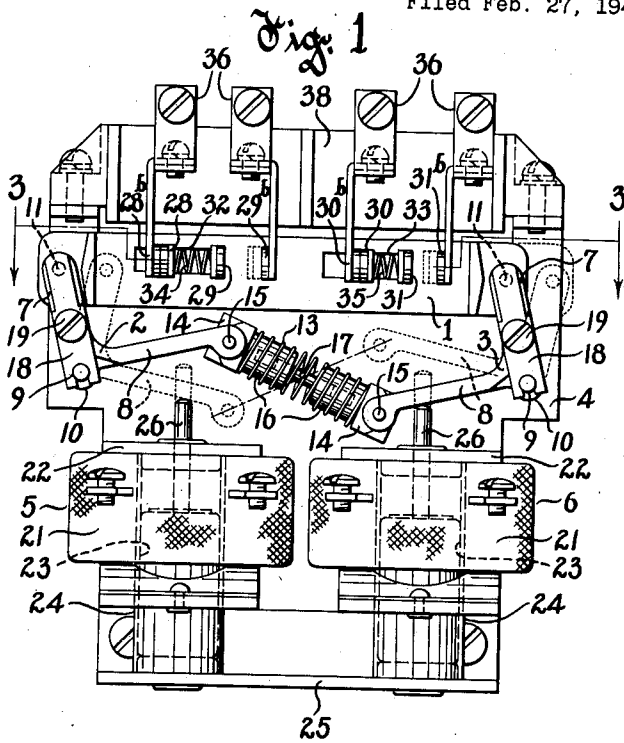
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ELECTRIC SWITCH

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ELECTRIC SWITCH

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7 Claims. (Cl. 200—98)

This invention relates to electric switches.

The invention relates more particularly to electromagnetic control switches and has among its objects to provide a new and novel control switch which is operable in opposite directions between given extreme circuit controlling positions by alternate energization of a pair of operating windings.

Another object is to provide a control switch of the aforesaid type which is exceptionally simple in design, rugged in construction and reliable in operation.

A further object is to provide a control switch of the aforesaid character having an improved operating mechanism associated therewith which provides for snap operation of the switch into either of its extreme circuit controlling positions and which also insures against accidental movement thereof out of either of such positions.

Various other objects and advantages of the invention will hereinafter appear.

The accompanying drawing illustrates an embodiment of the invention which will now be described, it being understood that various modifications may be made in the embodiment illustrated without departing from the spirit and scope of the appended claims.

In the drawing,

Figure 1 is a front elevational view of the control switch embodying the invention;

Fig. 2 is a side elevational view of the control switch shown in Fig. 1;

Fig. 3 is a sectional view taken substantially on line 3—3 of Fig. 1, and

Fig. 4 is a top elevational view of the stationary contact assemblies shown in Figs. 1 and 2.

Referring to Fig. 1, the same illustrates a control switch having an elongated horizontally arranged movable contact carrier 1 which is supported at opposite ends by a pair of bell crank levers 2 and 3 to move longitudinally in opposite directions between given extreme circuit controlling positions. The bell crank levers 2 and 3 are of rectangular form and are pivotally mounted upon a vertically disposed base plate 4 which also carries a pair of vertically disposed operating solenoids 5 and 6 each of which is associated with one of said bell crank levers.

More specifically, bell crank levers 2 and 3 are of like form, each being provided with arms 7 and 8 and being oscillatably mounted upon a fixed pivot pin 9 located between said arms. Pivot pins 9 are carried by forwardly extending posts 10 secured to the front face of plate 4. The arms 7 of bell crank levers 2 and 3 extend

upwardly in parallel relation and the free ends thereof are pivotally connected to opposite ends of contact carrier 1 by pins 11. As shown in Figs. 2 and 3, arms 7 are bifurcated to receive contact carrier 1, and said contact carrier comprises two molded insulating sections 12—12 of like form which are mounted side by side in opposed relation upon said arms. The arms 8 of bell crank levers 2 and 3 extend toward each other and a coil spring 13 is held under compression between the free ends thereof. As shown in Fig. 1 spring 13 is supported at opposite ends by a pair of guide members 14—14 which are pivotally secured to the free ends of arms 8 by pivot pins 15—15. The guide members 14 are shouldered to engage spring 13 on opposite ends, and each of the same is provided with a cylindrical projection 16 which fits within said spring. Projections 16 are drilled to receive a pin 17 which serves to hold guide members 14 in axial alignment while permitting relative axial movement thereof.

Each of the bell crank levers 2 and 3 is held in assembled position upon its associated pivot pin 9 by a vertically disposed locking strip 18. Each of the strips 18 is secured at a point intermediate its ends to arm 7 of its associated lever by a screw 19, and each has its lower end slotted to receive a headed projection 20 on the front end of its associated pivot pin 9. Each of the locking strips 18 also serves to hold the pivot pin 11 of its associated lever against removal, the upper ends of said strips engaging with heads formed on the front ends of said pins.

The operating solenoids 5 and 6 are arranged below their associated bell crank levers 2 and 3 and each includes a stationary operating winding 21 carried by a C-shaped magnet frame 22 and a vertically disposed cylindrical plunger 23 which is slidably mounted within a non-magnetic tubular sleeve 24 located within said winding. Magnet frames 22 are secured to the front face of base plate 4 and said base plate also has a bracket 25 secured thereto for holding the sleeves 24 in assembled position within their associated windings 21. Each of the plungers 23 has a pin 26 fixed to the upper end thereof which extends through an opening in the upper leg of its associated magnet frame 22. Plungers 23 are normally held by gravity in the positions shown in dotted lines in Fig. 1 and when said plungers are in normal position their associated pins 26 occupy the positions shown in full lines in this figure. Upon energization of either of the solenoid windings 21 its associated plunger 23 is

moved upwardly into an attracted position to move the pin 26 thereof into the position shown in dotted lines in Fig. 1.

The operation of the aforescribed operating mechanism will now be more fully described. With the operating mechanism in the position shown in Fig. 1 spring 13 tends to rotate both of the bell crank levers 2 and 3 in a counterclockwise direction upon their associated pivot pins 9 to thereby bias contact carrier 1 toward the left. Movement of contact carrier 1 toward the left beyond the position shown in full lines in Fig. 1 is stopped by engagement of arm 8 of bell crank lever 3 with the pin 26 of operating solenoid 6. Upon energization of operating solenoid 6 the plunger 23 of said solenoid moves into its attracted position and its associated pin 26 rotates bell crank lever 3 in a clockwise direction for movement of contact carrier 1 toward the right out of the full line position shown in Fig. 1. During movement of contact carrier 1 toward the right bell crank lever 2 is also rotated in a clockwise direction upon its associated pivot pin 9 and just prior to full movement of plunger 23 of operating solenoid 6 into its attracted position arm 8 of bell crank lever 3 moves upwardly beyond a line joining the centers of pivot pins 9 and arm 8 of bell crank lever 2 moves downwardly beyond such line. Spring 13 then acts to bias both of the bell crank levers 2 and 3 for rotation in a clockwise direction, and upon movement of plunger 23 of operating solenoid 6 into its attracted position said spring effects continued clockwise movement of said bell crank levers to thereby effect snap movement of contact carrier 1 into the dotted line position shown in Fig. 1. Movement of contact carrier 1 beyond the dotted line position shown in Fig. 1 is stopped by engagement of arm 8 of bell crank lever 2 with the pin 26 associated with operating solenoid 5.

Energization of operating solenoid 5 effects return movement of contact carrier 1 to the full line position shown in Fig. 1. Upon energization of operating solenoid 5 its associated plunger 23 moves into its attracted position and the pin 26 thereof moves bell crank lever 2 in a counterclockwise direction for movement of contact carrier 1 out of the dotted line position shown in Fig. 1. Prior to full movement of the plunger 23 of operating solenoid 5 into its attracted position arm 8 of bell crank lever 2 moves upwardly beyond a line joining the centers of pivot pins 9 and arm 8 of bell crank lever 3 moves downwardly beyond such line. Spring 13 then acts to bias bell crank levers 2 and 3 for rotation in a counterclockwise direction and upon arrest of plunger 23 of operating solenoid 5 in its attracted position said spring effects continued counterclockwise rotation of said levers to thereby effect snap movement of contact carrier 1 into its left hand extreme position.

In connection with the foregoing it should be noted that spring 13 acts to restrain contact carrier 1 against accidental movement out of either of its extreme positions. It should also be noted that in the event of simultaneous energization of both of the operating solenoids 5 and 6 contact carrier 1 will remain in the last position to which it is operated. Thus assuming that the operating solenoids are energized simultaneously with contact carrier 1 in its left hand extreme position as shown in full lines in Fig. 1, the plunger of operating solenoid 5 will move into its attracted position before plunger 23 of operating solenoid 6 can operate against 75

the action of spring 13. The pin 26 of operating solenoid 5 will therefore block bell crank lever 2 against clockwise rotation to thereby prevent a change in the position of contact carrier 1 by operating solenoid 6.

In the switch illustrated contact carrier 1 carries a plurality of bridging contacts 28, 29, 30 and 31 of like form which are disposed in a horizontal plane and at right angles to said carrier. The insulating sections 12 of contact carrier 1 are formed to provide slots 32 and 33, and bridging contacts 28 and 29 are mounted in opposed relation within slot 32, while bridging contacts 30 and 31 are mounted in opposed relation within slot 33. Bridging contacts 28 and 29 are yieldingly supported and held in assembled position within slot 32 by a spring 34 and bridging contacts 30 and 31 are yieldingly supported and held in assembled position within slot 33 by a spring 35. Each of said bridging contacts cooperates with a stationary contact member *a* located to the rear of contact carrier 1 and with the stationary contact member *b* located to the front of said carrier. Each of said stationary contact members extends upwardly from its associated bridging contact and has its upper end secured to a terminal member 36. The terminal members 36 associated with contact members 28^a to 31^a are mounted upon a molded insulating base 37 and the terminal members 36 associated with contact members 28^b to 31^b are mounted upon a molded insulating base 38. The insulating bases 37 and 38 are of like form and are mounted in parallel relation above contact carrier 1 upon forwardly extending arms 40 formed on the upper end of base plate 4.

When contact carrier 1 is in its extreme left hand position bridging contacts 28 and 30 are held in engagement with their cooperating stationary contact members by their associated springs 34 and 35 and bridging contacts 29 and 31 are held out of engagement with their cooperating stationary contact members by engagement with the right hand end of their associated slots 32 and 33. When contact carrier 1 is in its extreme right hand position bridging contacts 29 and 31 are held in engagement with their cooperating stationary contact members by their associated springs 34 and 35, and bridging contacts 28 and 30 are held out of engagement with their cooperating stationary contact members by engagement with the left hand end of their associated slots 32 and 33. In the embodiment illustrated the stationary contact members associated with bridging contacts 28 and 29 are so spaced that each of said bridging contacts is moved out of circuit closing position prior to movement of the other of said bridging contacts into circuit closing position. Also the stationary contact members associated with bridging contacts 30 and 31 are so spaced that each of said bridging contacts is moved out of circuit closing position after movement of the other of said bridging contacts into circuit closing position. It is of course apparent that the sequence of operation of the switch contacts may be varied to suit various control requirements.

What I claim as new and desire to secure by Letters Patent is:

1. In an electric switch, in combination, an elongated contact carrying element movable longitudinally in opposite directions between given extreme circuit controlling positions, two pivoted levers connected to opposite ends of said element to support the same, a spring connection

between said levers acting to oppose movement of said element out of either extreme position and also acting to effect snap movement of said element into either extreme position upon a given movement thereof away from its opposite extreme position, and a pair of electromagnetic operating devices each associated with one of said levers, said devices acting upon alternate energization to effect movement of said element in opposite directions between said extreme circuit controlling positions.

2. In an electric switch, in combination, an elongated contact carrying element movable longitudinally in opposite directions between given extreme circuit controlling positions, a pair of pivoted bell crank levers located to one side of said element and having corresponding arms pivotally connected to opposite ends thereof, said levers also having corresponding arms disposed in an end to end relation, a spring connection extending between the ends of said latter arms and acting to oppose movement of said element out of either extreme position and to also effect snap movement of said element into either extreme position upon a given movement thereof away from its opposite extreme position, and a pair of solenoids each associated with the last mentioned arm of one of said bell crank levers, said solenoids acting upon alternate energization to operate said levers for movement of said element in opposite directions between said extreme circuit controlling positions.

3. In an electric switch, in combination, a contact carrying element movable in opposite directions between given extreme circuit controlling positions, two pivoted operating levers connected to opposite ends of said element and supporting the same, a pair of operating solenoids each associated with one of said levers, each of said solenoids being responsive to move said contact element out of one extreme position to a position short of its other extreme position, and spring means associated with said levers for effecting snap movement of said element in opposite directions into said extreme positions upon alternate energization of said operating solenoids.

4. In an electric switch, in combination, an elongated contact carrying element movable longitudinally in opposite directions between given extreme circuit controlling positions, two bell crank levers of rectangular shape located to one side of said element and each having its apex oscillatably mounted upon a fixed pivot pin, said bell crank levers having corresponding arms the free ends of which are pivotally connected to opposite ends of said element and also having corresponding arms disposed in an end to end relation, an operating solenoid associated with each of said last mentioned arms, each of said solenoids being responsive to operate its associated bell crank lever for movement of said element out of one extreme position to a position short of its other extreme position and a spring held under compression between the free ends of said last mentioned arms, said spring providing for snap movement of said element in opposite directions into said extreme positions upon alternate energization of said solenoids.

5. In an electric switch, in combination, an

elongated horizontally arranged contact carrying element movable longitudinally in opposite directions between given extreme circuit controlling positions, a pair of pivoted bell crank levers located below said element and having corresponding vertically disposed arms connected to opposite ends of said element and also having corresponding horizontally disposed arms which are arranged in an end to end relation, a vertically disposed operating solenoid associated with the horizontally disposed arm of each of said bell crank levers, each of said solenoids being responsive to operate its associated bell crank lever for movement of said element out of one extreme position to a position short of its other extreme position and a spring held under compression between the free ends of said horizontally disposed arms, said spring acting to effect snap movement of said element in opposite directions into said extreme positions upon alternate energization of said operating solenoids.

6. In an electric switch, in combination, an elongated contact carrying element movable longitudinally in opposite directions between given extreme circuit controlling positions, a base plate, a pair of bell crank levers pivotally mounted upon said base plate and connected to opposite ends of said contact carrying element to support the same, a pair of operating solenoids mounted upon said base plate and each associated with one of said bell crank levers, each of said solenoids being responsive to operate its associated bell crank lever for movement of said element out of one extreme position to a position short of its other extreme position, and a spring associated with said bell crank levers for effecting snap movement of said element in opposite directions into said extreme positions upon alternate energization of said operating solenoids.

7. In an electric switch, in combination, an elongated horizontally disposed contact carrying element movable longitudinally in opposite directions between given extreme circuit controlling positions, two bell crank levers of rectangular form located below said element and each having its apex oscillatably mounted upon a fixed pivot pin, said bell crank levers having corresponding arms extending upwardly from their associated pivots in parallel relation and also having corresponding horizontally disposed arms arranged in an end to end relation, the free ends of said former arms being pivotally connected to opposite ends of said element, an operating solenoid associated with the horizontally disposed arm of each of said bell crank levers, each of said solenoids being responsive to operate its associated bell crank lever for movement of said contact element out of one extreme position to a position short of its other extreme position, a guide member pivotally connected to the free end of each of said horizontally disposed arms, and a spring supported by said guide members and held under compression therebetween, said spring providing for snap movement of said contact element in opposite directions into said extreme positions upon alternate energization of said operating solenoids.

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