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2,432,782

ELECTRIC SWITCH

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Fig. 1.

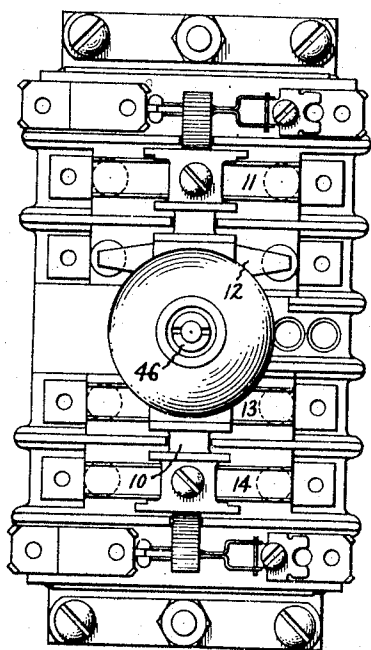


Fig. 2.

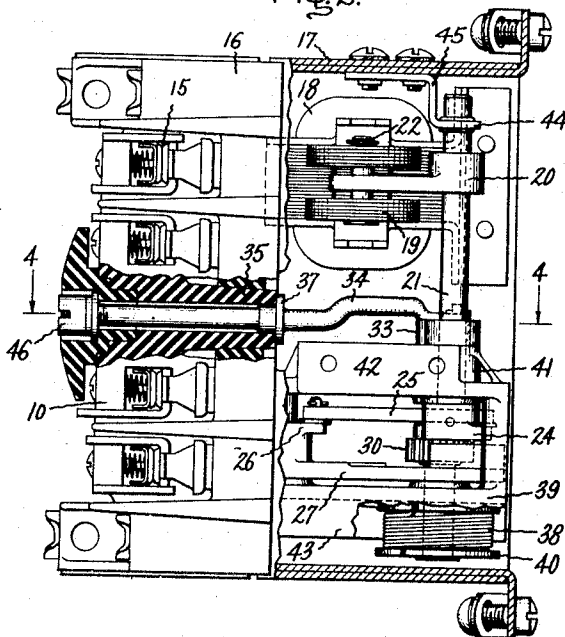


Fig. 4.

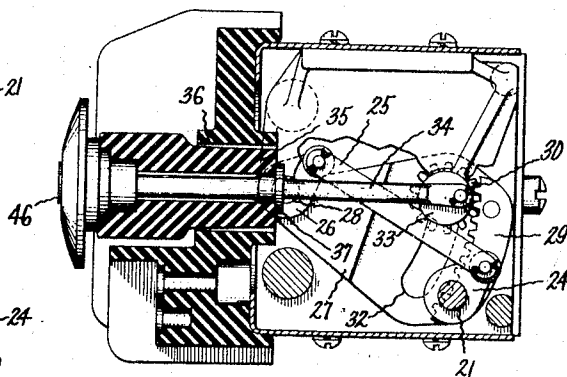
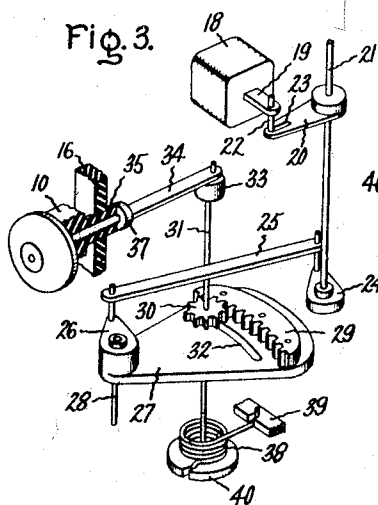


Fig. 3.



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ELECTRIC SWITCH

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2 Claims. (Cl. 200—87)

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My invention relates to electric switches, more particularly to electromagnetically operated switches sometimes known as contactors, and has for its object a simple and reliable shockproof operating mechanism for switches.

For a more complete understanding of my invention, reference should be had to the accompanying drawing, Fig. 1 of which is a plan view of an electric switch embodying my invention; Fig. 2 is a side elevation view partly in section and with the enclosure broken away of Fig. 1 showing the switch in its closed circuit position; Fig. 3 is a simplified diagrammatic view of the operating mechanism also showing the parts in their closed circuit positions; while Fig. 4 is a sectional view taken along the line 4—4 of Fig. 2 looking in the direction of the arrows.

Referring to the drawing, I have shown my invention in one form as applied to operating mechanism for reciprocating between open and closed circuit positions a movable switch member or bar 10 made of electrically insulating material. This bar is provided with a plurality of transversely extending electrically conducting bridging members 11, 12, 13 and 14 which cooperate with suitable stationary contacts 15 mounted on the outer side of a rectangular stationary support 16 made of electrically insulating material. The bar 10 and support 16 are preferably made of a suitable molded material such as a phenolic condensation product. As shown, the base 16 is mounted on a rectangular metallic casing or enclosure 17 with its opposite inner side secured to said enclosure. In the enclosure is mounted the operating electromagnet 18 for the bar 10, together with shockproof mechanism connecting the magnet with the bar.

Referring particularly to Fig. 3, the plunger type armature 19 of the magnet is connected to a crank 20 on a shaft 21 by means of a pin 22 in the end of the armature which extends through a radial slot 23 in the crank 20. Thus movement of the armature 19 between its attracted and unattracted positions turns the shaft 21 through a small angle of approximately 30 degrees. On the other end of the shaft 21 is a crank 24 having its end connected through a link 25 to a similar crank 26 secured to the narrower end of a sector shaped plate 27. The crank 26 and the plate 27 are mounted for movement about the fixed pivot 28.

Secured to one side of the plate 27 adjacent its wider end is an internal gear segment 29 with which meshes a gear 30 on a shaft 31. An arcuate slot 32 is provided in the plate 27 through which

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extends the shaft 31, and the end walls of which slot form stops for limiting by engagement with the shaft 31 the range of angular movement of the plate 27, and hence of the driving mechanism connected to the plate. It will be understood that the pivot 28 is the center of curvature of the gear segment 29 and of the slot 32.

On the upper end of the shaft 31 is a disc shaped crank 33, to which is connected an arm 34 having its other end secured to the switch bar 10. The arm 34 may be a link having its left-hand end, as viewed in Fig. 3, pivotally connected to the switch bar 10 although, as shown, this end of the arm is rigidly connected to the switch bar so that the switch bar is caused to rock somewhat upon turning of the crank 33. As shown, the switch bar is provided with a tubular portion 35 surrounding the arm 34 and extending through an oblong shaped hole 36 in the base or support 16, this hole being large enough or elongated in the plane of movement of the crank 33, as shown in Fig. 4, to provide for tilting of the switch bar 10 as required for the 180-degree movement of the crank arm 33. The arm 34 extends through tubular portion 35 and the switch part 10. It is secured to the switch part by means of a nut 46 (Fig. 2) whereby a flange 37 on the arm 34 is clamped against the end of the tubular member 35.

The magnet when energized through a suitable switch (not shown) attracts its plunger armature and turns the crank 20 and shaft 21 in a clockwise direction to the position shown in the drawing, especially in Fig. 3. This movement of the shaft 21 is transmitted by the link 25 to the plate or gear sector 27 which likewise moves in a clockwise direction about its pivot 28. The gear sector 27, by means of the gear segment 29 and gear 30, turns the shaft 31 in a clockwise direction against the biasing force of an opening spring 38 through an angle of substantially 180 degrees whereby the crank arm 33 is moved to the dead center shockproof position (shown in Figs. 3 and 4) with respect to the arm 34. The cross bar 10, as shown in the drawing, is in its farthest position toward the right with the bridging members 11-14 inclusive in engagement with their respective stationary contacts.

The helical opening spring 38 encircles the lower end of the shaft 31 with one end connected to the stationary supporting framework 39 for the driving mechanism and its other end connected to the shaft 31 through a disc 40 secured to the shaft. The spring biases the shaft 31 in a counterclockwise direction so that when the mag-

net 18 is deenergized, the spring moves the parts, including the switch bar 10, to their open circuit switching positions, the bridging contacts 11-14 then being in spaced open circuit relation with their respective stationary contacts, and the crank arm 33 is substantially in its 180-degree opposite dead center position from that shown in the drawing.

The driving mechanism is brought to rest with the crank arm 33 in its two dead center positions by engagement with the shaft 31 of the end walls of the slot 32. Thus with the parts in their closed circuit positions shown in the drawing, the upper or left-hand end wall of the slot is in engagement with the shaft 31, while in the switch open position the opposite end wall engages the shaft.

It will be understood that the crank 33 can be connected by the arm 34 to operate any suitable electric switch. The cross bar 10 with its bridging contact members and the supporting member 16 carrying the stationary contacts are constructed substantially as described and claimed in a copending application Serial No. 452,262, filed by Chester I. Hall and Alexander W. Bedford on July 25, 1942, now Patent No. 2,401,153, dated May 28, 1946, assigned to the same assignee as this invention.

As shown in the drawing, the shafts 21 and 31 are parallel with each other. The gear sector 27 is mounted below the lower end of the shaft 21 and moves underneath the lower end of the shaft. Thus the lower end of the shaft 21 is mounted on a bearing 41 in the top plate 42 of a supporting framework having a lower plate 43, the two plates being secured rigidly together. The crank arm 24 is mounted between these two plates 42 and 43 on the lower end of the shaft 21, while the gear sector 27 is mounted between the plates adjacent the lower plate with the segment 29 below the low end of the shaft 21 so that the gear sector 27 is free to swing. An upper bearing 44 is provided on a bracket 45 for the upper end of the shaft 21. Suitable bearings are provided in the supporting plates 42 and 43 for the shaft 31.

While I have shown a particular embodiment of my invention, it will be understood, of course, that I do not wish to be limited thereto since many modifications may be made, and I therefore contemplate by the appended claims to cover any such modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A shockproof switch comprising a support made of electrically insulating material provided with an aperture, an enclosure secured to said support on one side thereof, a shaft mounted in said enclosure in substantially parallel relation with said support, a crank on said shaft, an operating arm having one end pivotally connected to said crank and extending through said aperture, switch contact means mounted on the opposite side of said support, cooperating movable switch contact means connected to said operating arm, a plate mounted in said enclosure for pivotal

movement on an axis substantially parallel with said shaft, said plate being provided with stops on opposite sides of said shaft, a gear segment on said plate, a gear on said shaft meshing with said gear segment, electric operating means connected to said plate so as to turn said plate and said shaft in one direction until one of said stops engages said shaft whereby said crank is turned substantially to one dead center position with respect to said operating arm and said operating arm is moved lengthwise to operate said movable switch contact means to one position, a spring, and an operating connection between said spring and said shaft for turning said shaft when said electric operating means is deenergized until said shaft is engaged by the other of said stops whereby said crank is turned substantially to its opposite dead center position and said movable switch contact means operated to another position.

2. A shockproof switch comprising a support made of electrically insulating material provided with an aperture, an enclosure secured to said support on one side thereof, a shaft mounted in said enclosure in substantially parallel relation with said support, a crank on said shaft, an operating arm having one end pivotally connected to said crank and extending through said aperture, switch contact means mounted on the opposite side of said support, cooperating movable switch contact means connected to said operating arm, a plate mounted in said enclosure for pivotal movement on an axis substantially parallel with said shaft, said plate being provided with a slot through which said shaft extends, a gear segment mounted on said plate adjacent said slot, a gear on said shaft meshing with said gear segment, electric operating means connected to said plate so as to turn said plate and said shaft in one direction until one end wall of said slot engages said shaft whereby said crank is turned substantially to one dead center position with respect to said operating arm and said operating arm is moved lengthwise to operate said movable switch contact means to one position, a spring, and an operating connection between said spring and said shaft for turning said shaft when said electric operating means is deenergized until said shaft is engaged by the other end wall of said slot whereby said crank is turned substantially to its opposite dead center position and said movable switch contact means operated to another position.

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REFERENCES CITED

The following references are of record in the file of this patent:

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