Dec. 24, 1935. J. F. FRESE 2,025,682

ELECTRIC SWITCH OPERATING MEANS

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FIG. 1.

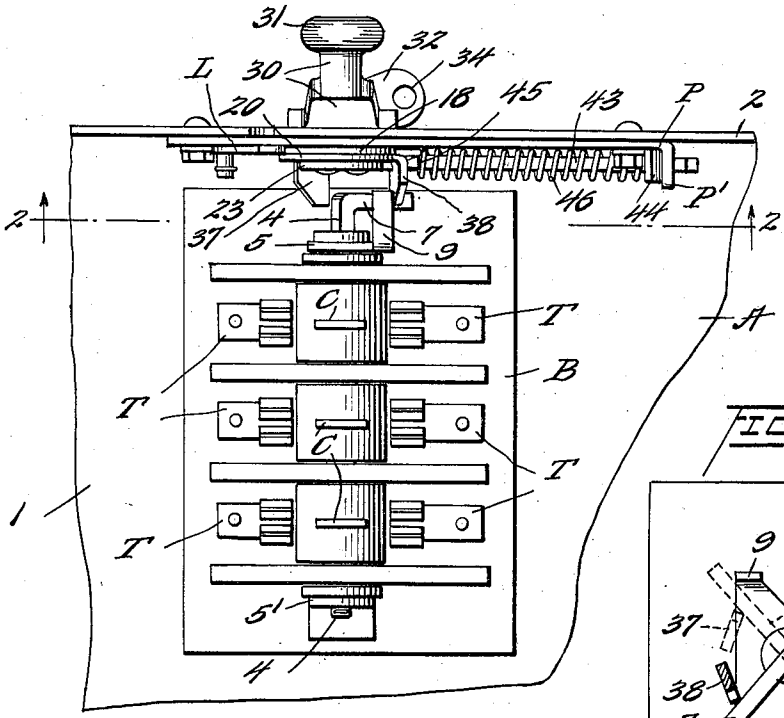


FIG. 7.

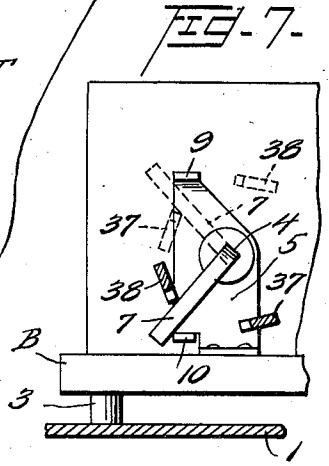
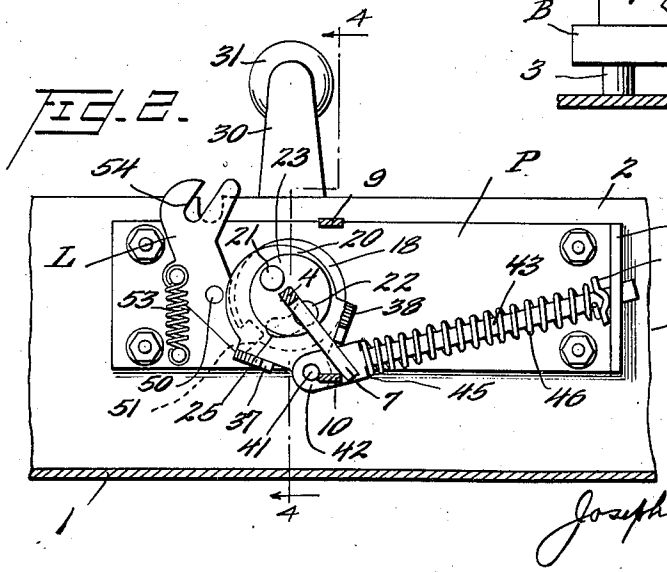


FIG. 2.



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FIG. 3.

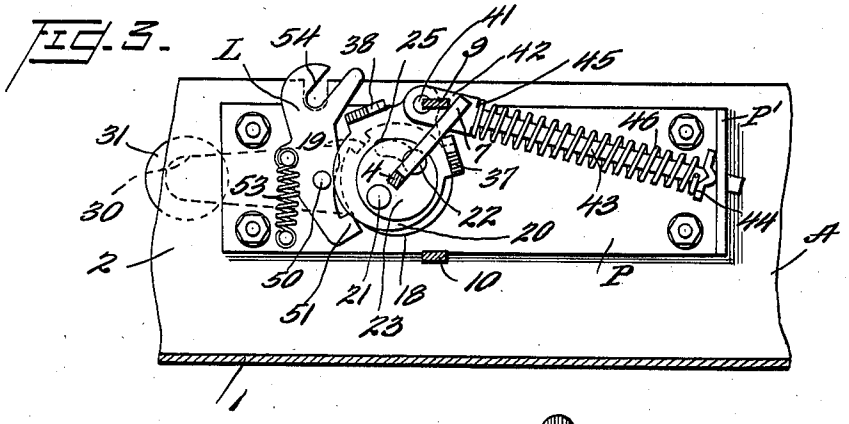


FIG. 4.

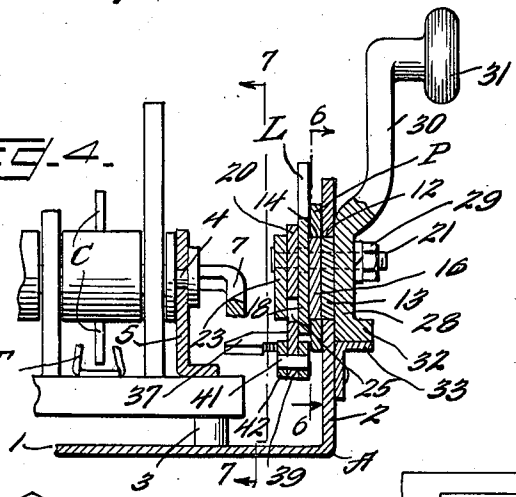


FIG. 6.

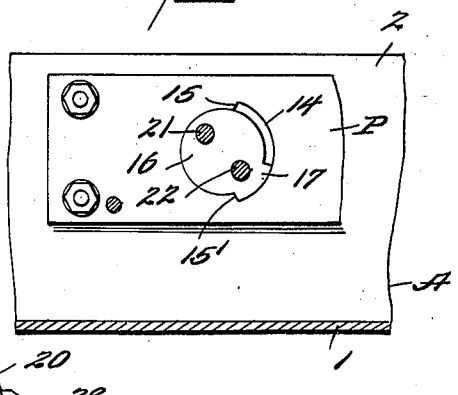
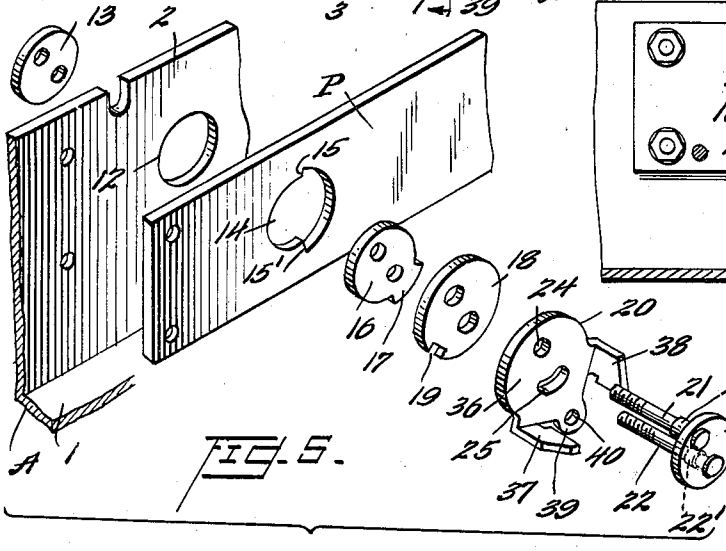


FIG. 5.



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ELECTRIC SWITCH OPERATING MEANS

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Application November 7, 1934, Serial No. 751,936

5 Claims. (Cl. 200—67)

In some factories where machine tools are operated by individual motors, it is customary to arrange the switch for opening and closing the motor circuits in a metal box and to provide means on the outside of the box for manually operating the switch. For the purpose of illustrating the present invention, a switch of the type illustrated in patent to G. H. Whittingham 1,945,459, dated January 30, 1934, is shown within such a box and an operating handle for the switch is mounted on one wall of the box. The switch shaft is movable through an angle of 90° from the "off" to the "on" position of the switch, and vice versa, and the operating mechanism of the present invention embodies means for giving the shaft a short positive movement by the handle, to avoid sticking of the contacts, and then a quick movement by an over-center device, to prevent arcing. The invention embodies means whereby the angular movements of the handle and of the switch shaft are approximately the same, and both the handle and the shaft are held against free movement in the "off" and "on" positions of the switch.

In the accompanying drawings,

Fig. 1 is a top plan view of the assembled switch and operating mechanism;

Fig. 2 is a section on line 2—2 of Fig. 1, showing the mechanism in one position;

Fig. 3 is a view similar to Fig. 2, showing the operating mechanism in the opposite position;

Fig. 4 is a section on line 4—4 of Fig. 2, looking in the direction of the arrows;

Fig. 5 is an exploded perspective view of parts of the operating mechanism;

Fig. 6 is a section on line 6—6 of Fig. 4, looking in the direction of the arrows and showing the arrangement of the stop lug, and,

Fig. 7 is a section on the line 7—7 of Fig. 4.

Referring to the drawings, there is shown at A a switch-enclosing box of metal having a bottom wall 1 and a side wall 2. Other walls, not shown, and the cover complete the box for housing the switch which is mounted on a base B of insulating material supported above the bottom of the box by suitable bolts and spacers 3, as seen in Fig. 4. The shaft 4 of the switch is journaled in standards 5, 5' secured to the base B and carries thereon a plurality of transversely disposed blades C, insulated from the shaft and constrained for movement therewith to open and close circuits between their respective stationary terminal contacts T mounted on the base B.

In Fig. 1, the blades are shown in the open circuit position and are intended for a 90° rotation to close the switch. The shaft 4 has an angularly disposed portion 7 which operates between stops 9 and 10 projecting out from the standard 5 and serving to limit movement of the switch shaft through the proper 90° of arc necessary for its operation.

The switch operating mechanism is carried by the side wall 2 of the box and by the metal plate P bolted to the inner face thereof, as clearly shown. The wall 2 has a large circular aperture 12 therein, concentric with the axis of the switch shaft, and forming a bearing for the disc 13 of metal of substantially the same thickness as the wall. In alinement with this aperture is the aperture 14 in the plate P, comprising portions of two different radii struck from the same center and connected by the radial stop shoulders 15—15'. In the smaller portion of this aperture which is of greater than 180° extent, fits the stop disc 16, having the stop lug 17 integral therewith for operation in the limits defined by the shoulders 15—15', which restrict its movement to 90°. A larger locking disc 18 fits against the inner face of the plate P and has the straight walled notch 19 therein. Against the disc 18 fits the inner face of the switch operating member 20.

Each of the discs 13, 16, and 18 has two diametrically opposite holes therein to receive a pair of parallel bolts 21, 22, having their inner ends secured in the disc 23. The switch-operating member has an opening 24 at one side of its center to receive the bolt 21 and an arcuate slot 25 through which the bolt 22 extends. When all of the parts are assembled on the bolts, the bolts are passed through openings in the portion 28 of the operating lever which is on the outside of the box wall 2 and nuts 29 complete the connection to hold discs 13 and 16 and handle lever in a rigid assembly. Suitable shoulders 21'—22' on the bolts which pass through the openings in the parts 20 and 18 engage against the inner face of the disc 16 so that tightening of the nuts does not prevent oscillation of the switch operating member 20 about the bolt 21 to the extent fixed by the length of the arcuate slot 25.

Rotation of the handle causes rotation of the discs 13, 16 and 18 to the same extent, the movement being limited by the shoulders 15, 15' which are engaged by the lug 17 on the disc 16, but the member 20, eccentrically pivoted on the bolt 21 can swing further than said discs.

The portion 30 of the handle lever is offset from the box for clearance and there is a grasping knob 31 on the end thereof for operating the

same. A right angled portion 32 on the opposite end of the lever engages the flange 33 of an angle plate secured against the outer face of the wall 2, when the switch is open, and both parts are perforated as at 34 to receive the shackle of a padlock for locking the switch in open position.

The switch-operating member 20 has, in addition to its disc-like portion 36, a pair of spaced lugs 37, 38 bent at right angles thereto and straddling the portion 7 of the switch shaft, as clearly seen in Figs. 2 and 3, while a radial projection 39 midway between the lugs is perforated as at 40 to receive the pin 41 which connects it to forked end 42 of a rod 43, the opposite end of which passes loosely through an aperture in the right-angled end P' of the plate P. Compressed between the rocker 44 which bears on the inner face of this end P' and a shoulder 45 near the forked end of the rod, is a helical spring 46 which produces the snap action.

When the handle, as view in Figs. 1 and 2, wherein the switch shaft is in the "off" position, is moved in the counter-clockwise direction, the bolt 22 which bears against the right-hand end of the arcuate slot 25 in the member 20, moves the latter with the assembly about the axis of the switch shaft and causes compression of the spring 46 and as the spring approaches the dead center position, the lug 37 on the member 20 engages the arm 7 of the switch shaft and gives the latter an initial movement. When the spring passes over the dead center position the arcuate slot permits the member 20 to swing about the bolt 21 until the left-hand end of the slot engages the bolt 22 and continued movement of the whole assembly by the action of the spring causes the lug 37 to quickly move the shaft arm 7 against the stop 9, as shown in Fig. 3, and to move the lug 17 on the stop disc 16 against the shoulder 15 on the plate P which limits the movement of the handle to an angle of approximately 90°, as indicated in Fig. 3, and the shaft arm and the handle are held against their respective stops by the pressure of the spring so that there can be no free or loose movement of the shaft or handle.

In moving the handle from the "on" position, indicated in Fig. 3, to the "off" position, shown in Fig. 2, the action is similar, the lug 38 in that case engaging and moving the arm of the switch shaft and carrying it into engagement with the stop 10, and the lug 17 on the stop disc 16 engaging the shoulder 15' in the plate P and limiting the movement of the handle, and in this "off" position of the parts the handle and switch shaft are held against free movement by the pressure of the spring.

In the event of any sticking action of the switch contacts in closed position, a positive release is effected when, in moving the handle from the "on" position, Fig. 3, to the "off" position, Fig. 1, the lug 38 engages and moves the shaft part 7 just before the spring reaches the dead center position, and thereafter movement of the shaft is under the action of the spring.

In order to provide for locking the switch, a lever L is pivoted at 50 to the plate P and has a dog-like end 51 which is received in the notch 19 of the disc 18, as seen in Fig. 2, when the switch is in the open position and held there by the action of the coil spring 53. The opposite end of this lever is forked as at 54 to receive any suitable operating means for the lever, for instance, a pin on the box cover arranged in such a manner that the box can only be opened when the switch is in the "off" position and so that the switch cannot be closed until the box cover is closed.

While the invention has been illustrated in connection with a switch arranged in a box and having a 90° movement from the "off" to the "on" position, the operating mechanism is capable of use with switches having shafts requiring a greater or less angular movement, and with switches which are not enclosed in boxes. An essential feature of the invention is the provision of means whereby the switch shaft and the operating lever, are both held in the "off" or "on" positions by the pressure of the over-center device.

What I claim is:

1. The combination with a switch comprising suitable bearings, a shaft journalled therein and carrying contact members and having a lateral projection, and stops adapted to be engaged by said projection for limiting the angular movement of said shaft to the off and on positions of the switch, of means mounted independently of the shaft for operating the switch comprising a lever pivotally mounted adjacent said lateral projection, stops for limiting the angular movement of the lever, a switch operating member rotatable with the lever about the axis of the latter and having spaced lugs for engaging said lateral projection to move the switch shaft, said member having a limited movement about an axis eccentric to that of the lever, and a spring-pressed over-center device connected to said member adapted, when the handle is operated, to move said member to actuate the switch and to hold the switch shaft and the lever against their respective stops.

2. The combination with a switch comprising suitable bearings, a shaft journalled therein and carrying contact members and having a lateral projection, and stops adapted to be engaged by said projection for limiting the angular movement of said shaft to the off and on positions of the switch, of means mounted independently of the shaft for operating said shaft comprising a lever journaled in a suitable support approximately in line with the axis of the shaft, stops for limiting the angular movement of the lever, a switch operating member rotatable with the lever about the axis of the latter and having spaced lugs for engaging said lateral projection to move the switch shaft, said member having a limited movement about an axis eccentric to that of the lever, and a spring-pressed over-center device connected to said member adapted, when the handle is operated, to move said member to actuate the switch and to hold the switch shaft and the lever against their respective stops.

3. The combination with a switch comprising suitable bearings, a shaft journalled therein and carrying contact members and having a lateral projection, and stops adapted to be engaged by said projection to limit the angular movement of the shaft to the off and on positions of the switch, of means mounted independently of the shaft for operating said shaft comprising a lever journaled in a suitable support approximately in line with the axis of the shaft, a pair of bolts connected to the lever at opposite sides of its axis, a stop-disc mounted on said bolts and having a part adapted to engage fixed stops to limit the angular movement of the lever, a switch operating member pivoted on one of said bolts and having a slot through which the other bolt extends, said slot

permitting limited oscillation of said member, said member having spaced lugs for engaging and moving the lateral projection on the switch shaft to its stops, and a spring-pressed over-center device connected to said member adapted, when the handle is operated, to move said member to actuate the switch shaft and to hold the shaft and lever against their respective stops.

4. The combination with a box and a switch, within the box, comprising a shaft carrying contact members and having a lateral projection, and stops for limiting the angular movement of said shaft to the off and on positions of the switch, of means mounted on a side wall of the box independently of the shaft for operating said shaft comprising a lever outside the box and journaled in a suitable support approximately in line with the axis of the shaft, stops for limiting the angular movement of the lever to approximately that of the switch shaft, a switch operating member rotatable with the lever about the axis of the latter and having spaced lugs for engaging said lateral projection to move the switch shaft, said member having a limited movement about an axis eccentric to that of the lever, and a spring-pressed over-center device connected to said member adapted, when the handle is operated, to move said member to actuate the switch and hold the switch shaft and the lever against their respective stops.

5. The combination with a box and a switch, within the box, comprising a shaft carrying contact members and having a lateral projection, and stops adapted to be engaged by said projection to limit the angular movement of the shaft to the off and on positions of the switch, of means mounted on a side wall of the box independently of the shaft for operating said shaft comprising a lever outside the box and journaled in a suitable support approximately in line with the axis of the shaft, a pair of bolts connected to the lever at opposite sides of its axis and projecting into the box, a stop-disc mounted on said bolts and having a part adapted to engage fixed stops to limit the angular movement of the lever, to approximately that of the shaft, a switch operating member pivoted on one of said bolts and having a slot through which the other bolt extends, said slot permitting limited oscillation of said member, said member having spaced lugs for engaging and moving the lateral projection on the switch shaft to its stops, and a spring-pressed over-center device connected to said member adapted, when the handle is operated, to move said member to actuate the switch shaft and to hold the shaft and lever against their respective stops.

JOSEPH F. FRESE.