

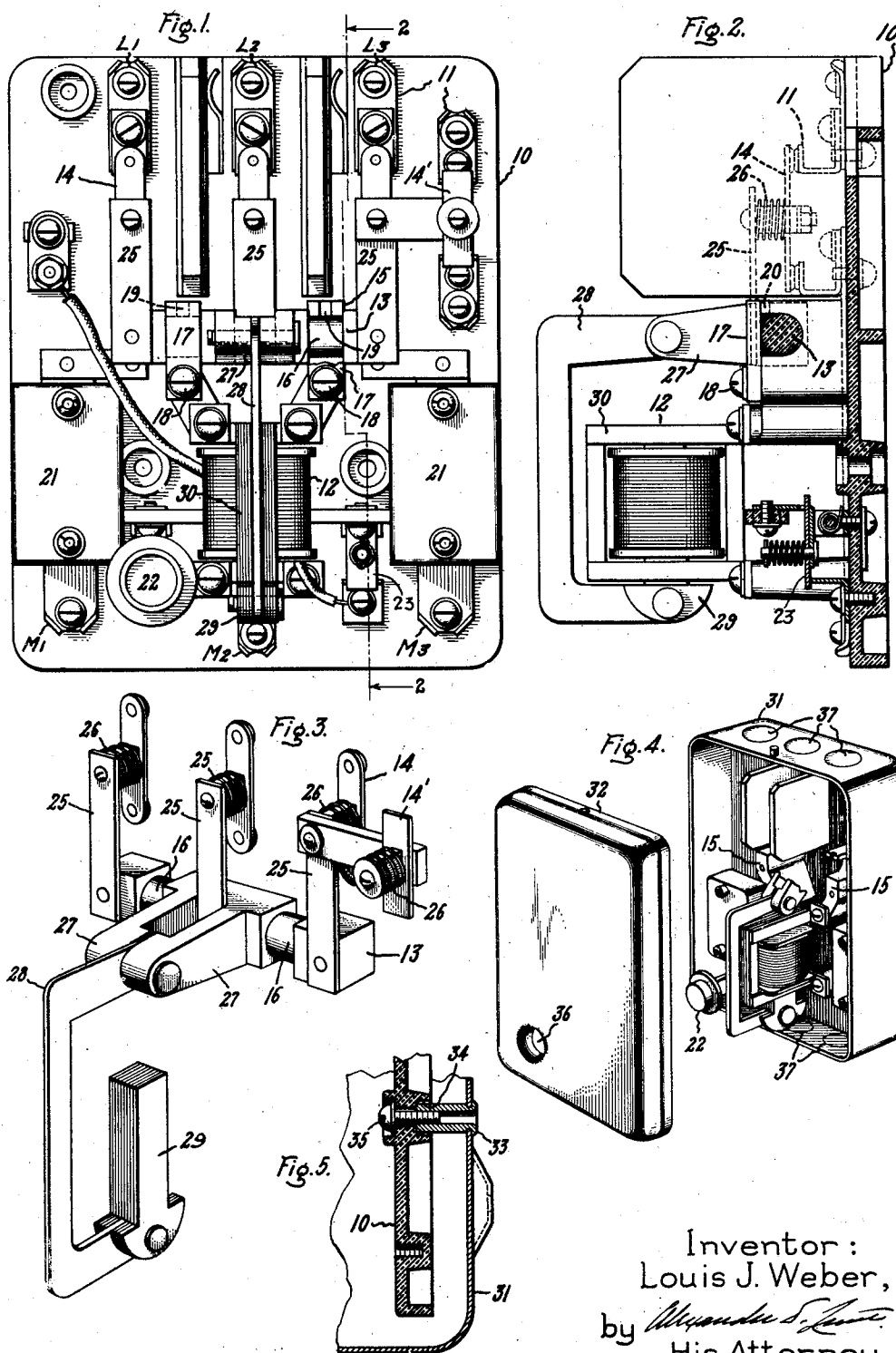
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ELECTRIC SWITCH MECHANISM

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ELECTRIC SWITCH MECHANISM

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The present invention relates to electric switches and more particularly to electromagnetically operated multiple pole switches adapted for controlling electric motors.

5 The principal object of the invention is to provide an improved form of electromagnetically operated switch mechanism of the above character.

Among the advantageous features of the improved switch mechanism are the arrangement for obtaining quick operation of the switch mechanism to the circuit opening position when the operating electromagnet is de-energized and the arrangement readily permitting removal of the movable switch contacts for inspection and repair, as well as the improved mounting of the switch mechanism and operating electromagnet on the supporting base and the mounting of the supporting base in an enclosing casing. Other features will be apparent from the following description of the accompanying drawing which illustrates a preferred form of switch mechanism embodying the invention.

10 Fig. 1 is a front view of the preferred form of switch mechanism and the mounting panel therefor.

Fig. 2 is a side view of the switch mechanism of Fig. 1, partly in section.

30 Fig. 3 is a perspective view of the operating shaft carrying the movable switch members and the plunger of the operating electromagnet.

Fig. 4 is a perspective view of the switch mechanism mounted in its enclosing casing with the cover removed and with certain portions of the switch mechanism omitted, and

Fig. 5 is an enlarged sectional view of a portion of the enclosing casing and the mounting panel for the switch mechanism showing more clearly the manner in which the panel is mounted in the casing.

The improved switch mechanism as shown in Fig. 1 comprises the base 10 upon which the stationary contacts 11 and the operating electromagnet 12 are mounted. The switch shaft 13 carrying a plurality of movable switch contacts 14 which cooperate with the stationary contact 11 is rotatably mounted upon the base 10 between the stationary con-

tact 11 and the operating electromagnet 12. In the preferred construction shown the base 10 is formed of molded insulating material and has the spaced apart bearing lugs 15 molded thereon for rotatably supporting the switch shaft 13. Likewise, the switch shaft 13 preferably is formed of molded insulating material with the spaced apart bearing surfaces 16 molded therein in proper spaced relation to be received by the bearing caps 15. The removable bearing caps 17, also preferably formed of molded insulating material, serve to hold the switch shaft 13 securely in position in the bearings 15 when secured thereto by the screws 18. In order to maintain the bearing caps 17 in alignment with the open cylindrical bearings 15, the notches 19 are provided on one side of the bearing for receiving the projecting tongues 20 formed on the bearing caps 17.

The square portions of the shaft 13 on either side of the bearing surfaces 16 effectively serve to prevent axial displacement of the shaft in the bearings. Also the square portions of the shaft 13 provide a mounting surface for the several supporting arms 25 which carry the movable switch contacts 14. The latter are yieldingly mounted on the arms 25 by means of the springs 26.

The molded switch shaft 13 also is provided with the lever arms 27 which preferably are spaced apart to permit the mounting of the middle contact supporting arm 25 and the U-shaped yoke 28 therebetween. As more clearly shown in Fig. 2, the operating electromagnet 12 is mounted upon the base 10 at a greater distance therefrom than the switch shaft 13. Furthermore, the operating plunger 29 of the electromagnet is arranged in substantial alignment with the end of the lever arms 27 extending from the switch shaft 13. The U-shaped yoke 28 which is pivotally connected to both the lever arm 27 and the plunger 29, as indicated in the drawing, serves to straddle the magnetic frame 30 of the electromagnet and thereby operatively connect the plunger 29 with the switch shaft 13. One of the principal advantages of this construction is the fact that the maximum unbalanced weight provided by the plunger 29 and the

yoke 28 is available for effecting a quick operation of the switch shaft 13 to carry the movable switch members 14 to the circuit opening position. In addition, by simply unscrewing the screws 18 and removing the bearing caps 17, the switch shaft 13, together with the movable contacts 14, the plunger 29 of the electromagnet, and the interconnecting mechanism therebetween, may be entirely removed as a unit for inspection and repair.

This is particularly advantageous where the switch mechanism is mounted in a small enclosing casing as indicated in Fig. 4, as it permits the switch parts to be easily removed.

The switch mechanism as previously described is particularly adapted for mounting in an enclosing casing in accordance with the requirements for motor control service. The compact arrangement obtained by the operating electromagnet 12 below the switch shaft 13 and on the opposite side of the switch shaft from the stationary contacts 11 and between the thermal overload protective devices 21 permits the use of an enclosing casing of minimum size. This is particularly advantageous where the switch mechanism, together with the enclosing casing is to be mounted on the machine tool and employed to control the operating motor thereof. In such service space requirements are at a premium. The manner in which the base 10 with the switch mechanism mounted thereon is mounted in the enclosing casing 31 is illustrated in Fig. 5. A plurality of spacing bosses 33 are set into the back of the enclosing casing 31 so as to mount the base 10 a slight distance away from the back of the casing. This provides the space required for the wire connections behind the base 10, and between live parts on back of base and ground. In order to facilitate the mounting of the base 10 upon the spacing lugs 33, the base is provided with cooperating pockets 34 molded therein for receiving the projecting ends of the lugs 33. In this way the base is readily mounted upon the supporting lugs 33 with the holes in the base for receiving the holding down screws 35 in accurate alignment with the tapped hole in the lug 33 into which the screw 35 is threaded. It will be observed that the cover 32 of the enclosing casing is provided with an opening 36 for receiving a reset button 22 for the thermal overload protective relay arrangement. Likewise, the enclosing casing 31 is provided with a plurality of knockout holes 37 in the top and bottom for receiving the conduit containing the external wiring connections for the switch.

The operation of the switch mechanism will be evident from the foregoing description. When the operating electromagnet 12 is deenergized, the plunger 29 is in the unattracted position as shown in Fig. 4. Hence the switch shaft 13 is rotated to carry the movable switch contacts 14 to the circuit

opening position. Upon energization of the operating electromagnet 12 the plunger 29 is raised thereby exerting a force through the yoke connection 28 upon the lever arm 27 of the switch shaft. This effects rotation of the switch shaft 13 to carry the movable switch members 14 into engagement with the stationary contacts 11. Due to the yielding support of the movable switch members 14 provided by the springs 26, a firm engagement of the individual switches is insured. The electrical connections of the switch mechanism are not shown. It will be understood, however, that the incoming three phase lines are connected to the line terminals L^1 , L^2 , L^3 , while the three phase motor or other electrical translating device is connected to the terminals M^1 , M^2 , M^3 . The auxiliary switch 14' is arranged to be connected to establish a holding circuit around the starting push button for the operating electromagnet 12, the holding circuit extending through the contact 23 of the thermal overload protective device, and a stop push button in accordance with the usual practice.

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

1. In an electromagnetically operated switch, the combination of a switch operating shaft having a plurality of switch contacts mounted thereon and having an operating lever arm extending therefrom, a base having bearings for rotatably supporting said switch shaft in parallel spaced alignment therewith, stationary contacts mounted on said base at one side of said operating shaft in cooperating relation with the contacts on the switch shaft, an operating plunger electromagnet mounted on said base on the other side of said operating shaft with the operating plunger of the electromagnet in substantial alignment with the end of said operating lever arm and with the magnetic frame of the electromagnet located between the plunger and the arm, and a yoke straddling said frame and extending between said plunger and said lever arm.

2. In an electromagnetically operated switch, the combination of a base having a plurality of stationary contacts and an operating plunger electromagnet mounted thereon with the magnetic frame of the electromagnet located between the plunger and the contacts, a shaft rotatably mounted on the base between said stationary contacts and the magnetic frame of said electromagnet and having a plurality of movable switch contacts in cooperating relation with said stationary contacts and provided with an operating lever arm, and a U-shaped connection between the said lever arm and the operating plunger of the electromagnet straddling said frame for effecting operation of the movable switch members into and out

of engagement with the stationary contacts upon operation of the plunger.

3. A multiple pole electromagnetically operated switch having a rotatable switch shaft carrying a plurality of movable switch members and mechanically connected with the plunger of an operating electromagnet, and a supporting base provided with bearings for rotatably supporting said switch shaft and having removable bearing caps to permit removal of the shaft, the movable switch members, the plunger of the electromagnet, and the mechanical connection between the shaft and the plunger as a unit.

4. A multiple pole electromagnetically operated switch having a plurality of movable switch members mounted upon a common operating shaft with the shaft mechanically connected to the plunger of the operating electromagnet to be operated thereby, and means for removably mounting said shaft to permit removal of the shaft, the movable switch contacts, the plunger of the electromagnet and the mechanical connections therebetween as a unit.

5. A multiple pole electromagnetically operated switch comprising a base having a plurality of stationary switch contacts mounted thereupon, a switch shaft rotatably mounted on said base at one side of said stationary contacts and carrying a plurality of movable switch contacts in cooperating relation with the stationary contacts, an operating electromagnet mounted on the base on the other side of said shaft with the plunger of the electromagnet operable away from the shaft, and means operatively connecting the switch shaft and the plunger including a yoke spanning the electromagnet.

6. In an electromagnetically operated switch the combination of a base of molded insulating material having spaced apart open bearings molded thereon, a switch shaft of molded insulating material with spaced apart bearing surfaces adapted to be rotatably supported in said open bearings and having a lever arm extending from the base, removable bearing caps for closing said bearings, an operating plunger electromagnet mounted on the base with the magnetic frame of the electromagnet located between the plunger and said shaft and with the operating plunger pivotally supported upon and in substantial alignment with the end of said lever arm to provide an out of balance weight for operating the switch shaft upon deenergization of the electromagnet.

7. In an electromagnetically operated switch, the combination of a rotatably mounted switch member, an operating plunger electromagnet therefor mounted with the frame of the electromagnet between the plunger and the switch member, and means operatively connecting the plunger and the switch shaft including a yoke shaped connection be-

tween the plunger and the switch member spanning the frame of the operating electromagnet.

8. An enclosed electric switch comprising a base of molded insulating material having a switch mechanism mounted thereon, an enclosing casing therefor having a plurality of supporting bosses extending from one side thereof for receiving said base, said base being provided with pockets registering with said bosses on the casing for insuring alignment of the base in the casing.

In witness whereof, I have hereunto set my hand this 20th day of December, 1927.

LOUIS J. WEBER.