

A. SUNDH.
ELECTROMAGNET SWITCH.
APPLICATION FILED MAY 25, 1906.

1,066,677.

Patented July 8, 1913.

Fig. 2.

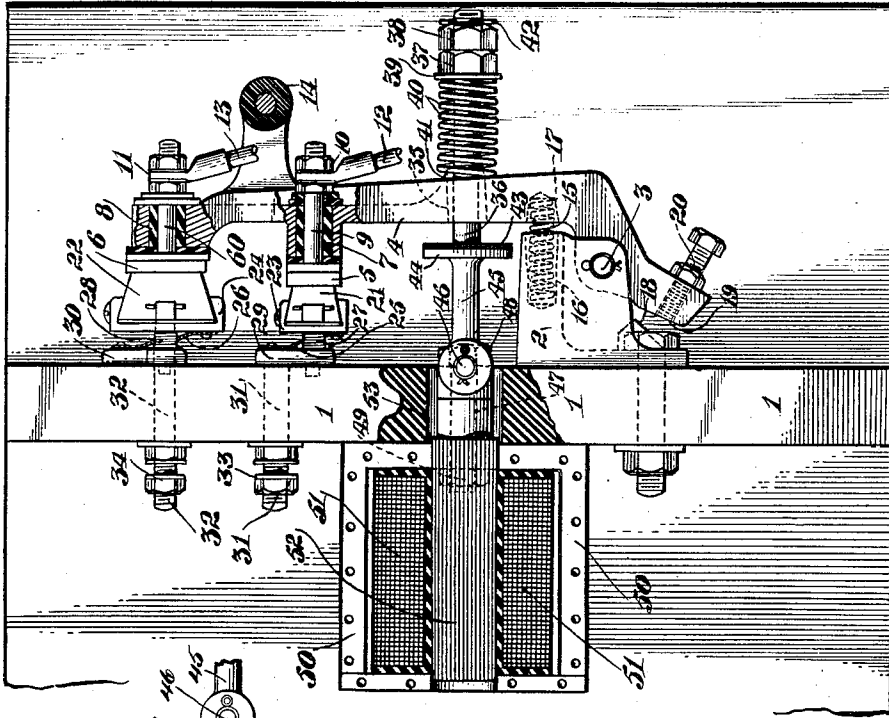
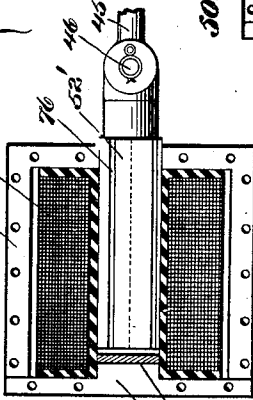
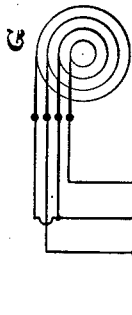


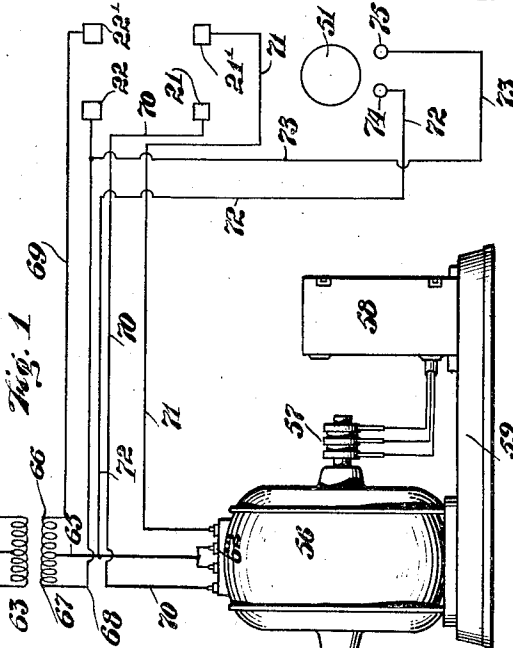
Fig. 3.



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UNITED STATES PATENT OFFICE.

AUGUST SUNDH, OF YONKERS, NEW YORK, ASSIGNOR TO OTIS ELEVATOR COMPANY,
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ELECTROMAGNET-SWITCH.

1,066,677.

Specification of Letters Patent.

Patented July 8, 1913.

Application filed May 25, 1906. Serial No. 318,624.

To all whom it may concern:

Be it known that I, AUGUST SUNDH, a citizen of the United States, residing at Yonkers, in the county of Westchester and State of New York, have invented a new and useful Improvement in Electromagnet-Switches, of which the following is a specification.

My invention relates to electro-magnetic switches and has for one of its objects the provision of means for minimizing chattering noises of an alternating current electro-magnetic multiple switch.

Other objects of the present invention will appear hereinafter, the novel combinations of elements being pointed out in the claims.

In the accompanying drawings, Figure 1 represents more or less diagrammatically an application of my invention; Fig. 2 is a side elevation of an electro-magnetic switch having certain parts broken away and embodying the features of my invention; Fig. 3 illustrates a modified electro-magnet; and Fig. 4 is an end view of the plunger of the magnet shown in Fig. 3.

Referring to Fig. 2, it will be seen that the various parts are mounted on a base board or support 1 of insulating material, preferably slate; 2 designates a bracket secured to the board 1. To this bracket is pivoted at 3 the switch contact-carrying arm 4, at the upper end of which I have in this instance shown the contacts 5 and 6. These contacts may be secured to the arm 4 in any desired manner, as, for example, by means of bolts 9 and 60 passing respectively through the insulating bushings 7 and 8. The outer ends of the bolts 9 and 60, form binding posts or connectors 10 and 11, respectively, for the wires or leads 12 and 13. A spring 15 fitting in the recesses 16 and 17 in the bracket 2 and lower end of arm 4, respectively, operates to throw the switch quickly to open position when the switch is released after being actuated. A stop 18, which is preferably integral with the bracket 2, is arranged in the path of movement of the downwardly extending portion of the arm 4 and a screw 19 provided with a lock nut 20 serves as an adjusting means to regulate the outward throw of the switch arm and contacts.

21 and 22 designate the contact blocks with which the contacts 5 and 6 cooperate to

close certain circuits. These contact blocks are mounted in suitable holders 23 and 24, respectively, which are electrically connected by the flexible conductors 25 and 26 to the fixed blocks 29 and 30. The latter are secured to the board 1 by means of the bolts 31 and 32 which extend back of the board to form binding posts 33 and 34. It will be noticed that springs 27 and 28 hold the contact blocks 21 and 22 outwardly and permit a predetermined inward movement of the same. No springs are employed in connection with the contacts 5 and 6 as herein illustrated as I preferably connect them rigidly with the arm 4.

At some convenient point, preferably on the back of the board 1, is horizontally mounted an electro-magnet 50 having a laminated frame, a solenoid 51, and a laminated core 52. This electro-magnet is therefore particularly adapted to alternating, intermittent or pulsating currents, but my invention is not limited to construction arranged for alternating currents as a direct-current magnet could be employed when direct-current is available. The frame of the electro-magnet may be secured to the board by means of bolts 47 and nuts 49. This electro-magnet as shown in Fig. 2, involves the equilibrating feature clearly explained in the patents aforementioned in that the magnet frame is provided with openings at its ends and the core 52 is movable to a position of magnetic equilibrium. That is, the core 52 is so connected to the switch that when the latter is closed the core occupies such a position relatively to the magnet frame that there is little tendency for the magnet to draw the core 52 inwardly any farther. In this position, therefore, there is little tendency for the magnet to produce longitudinal vibrations in its core due to alternations of current in the solenoid, and to transmit such vibrations to the switch, but nevertheless holds said switch firmly in circuit-closing position.

Through an opening 53 in the board 1 extends the head 48 which is rigid with the core 52 and pivotally connected at 46 to the link 45, the latter having a stud 36 at its outer end. Between the link 45 and stud 36 is a buffer block 44 provided with a washer 43 of resilient material such as leather, rubber, and the like, to form a re-

silient abutment. When the magnet is de-energized and the spring 40 snaps the buffer device against the arm 4, the washer 43 lessens the noise.

5 The stud 36 passes through an opening 35 in the switch arm 4 and is provided with an adjusting nut 37 at its outer end and also with a locking nut 38 and a cotter pin 42. Between a washer 39 and a lug 41 is placed
10 the spring 40, of any desired shape, to act as a resilient abutment for the switch arm. If the switch is double-armed the connection of the stud 36 through the spring 40 may be varied accordingly.

15 Various changes in the details and arrangement of parts of the devices herein disclosed may be made by those skilled in the art without departing from the spirit and scope of my invention as defined by the
20 claims hereto appended. I desire therefore, not to be limited to the precise construction detailed as it is set forth merely to illustrate the principles of my invention.

A handle 14 is connected to the switch so
25 that it may be closed manually if desired. It is evident that the switch apparatus may be so constructed, however, that when the magnet is energized it will close the switch and hold the same closed, or it may be so
30 designed that it must be closed manually after which, upon the energization of the electro-magnet or the same having been energized, it will be effective in holding the switch closed.

35 In certain devices of the prior art, the single movable contact carried by the switch arm was spring-pressed but it has been found in practice that by using a single spring, as that designated 40, for the switch which I
40 have herein shown as carrying a plurality of switch contacts, a much more efficient switch is produced. This is principally for the reason that if the springs or resilient abutments are mounted adjacent the contacts
45 5 and 6, they will soon become weakened by heat and lose their elasticity and consequently their ability to effectively take up the vibrations due to alternations of current in the electro-magnet. Furthermore,
50 instead of having a plurality of springs to adjust and take care of in case of a multiple switch, there is but a single spring in my device. By thus employing a single spring for the entire switch arm, the alternations
55 of current in the magnet cannot be transmitted but to a slight extent to the contacts for the reason that more inertia must first be overcome and a stronger, heavier and more elastic spring may be used, though this
60 latter is a matter of adjustment. I do not wish to be limited to any particular location of said spring 40, but I prefer to locate the same near the pivotal point of said switch arm so that standard switches may be pro-
65 vided with such springs 40. After the

switch has been moved to closed position as shown in Fig. 2, the core 52 nearly closes the magnetic circuit of the electro-magnet and therefore reduces the reluctance to lines
70 of force to a minimum. In other words, the core occupies a position of substantial magnetic equilibrium in which position there is minimum tendency to vibrate the core as an armature longitudinally. The vibration that
75 does take place, however, is taken up by the single spring 40 thus permitting the plurality of contacts carried by the arm to be held in firm engagement with the opposite contacts on the board. Chattering noises and heating due to vibrations at the contacts are
80 consequently very much reduced.

In Fig. 3 I have illustrated a modified form of electro-magnet in that instead of having an equilibrating magnet, one of greater strength is produced. This is due
85 to the inwardly extending pole piece P preferably provided with a leather disk or other resilient device W to receive the thrusts of the magnet core when drawn inwardly. The length of the stud 36 may be adjusted,
90 however, so that the core will not strike this disk at any time. So also in Fig. 2 a similar adjustment may be made to secure the desired travel of the core 52. Furthermore,
95 instead of having the core laminated when alternating current is used, it may be slotted longitudinally as shown at 76 in Figs. 3 and 4, where the core is designated 52'.

Referring now to Fig. 1, an application of my invention will be explained. An alternating current generator G is connected
100 through the main line switch L and transformer 63 to the alternating current motor 56, the latter being provided with slip rings 57 and a starting device 58. The pulley 61
105 may be connected to the apparatus to be driven, as, for example, an elevator. The motor and starting device are shown mounted on the bed plate 59. The central point of the transformer is in this instance connected
110 to the middle terminals 62 on the motor by the lead 65, and the ends 66 and 67 of the transformer are connected to the contacts 22' and 22 by the wires 69 and 68, respectively. Contacts 21 and 21' are connect-
115 ed by the leads 70 and 71 to the outside motor terminals. The terminals 74 and 75 of the solenoid 51 are connected across any two leads or to the wires 65 and 68 by the con-
120 ductors 72 and 73, respectively. Now assuming that the contacts 5 and 6 are electrically connected with each other through the terminals 12 and 13 (Fig. 2) and that similar contacts are electrically connected with each other, said contacts will form connectors for
125 the fixed contacts 21, 22 and 21', 22', respectively. When, therefore, the main line switch L is closed and the magnet energized by single phase current, the multiple switch
130 will be closed or the magnet will be placed

in readiness to hold said switch closed after the same has been closed manually. In any event, when the multiple switch is closed, the contacts 21 and 22 will be bridged and so also the contacts 21' and 22'. The various phases of the motor circuit will thus be closed as from point 67 through wire 68, contacts 22, 6, 5 and 21, wire 70 to the left-hand motor terminal and from the point 66 through wire 69, contact 22', contacts on an opposite switch arm not shown, contact 21' and wire 71 to the right-hand motor terminal. Thereupon the motor will start in the well-known manner. If the potential of the main line falls below a certain predetermined value, the multiple switch will be thrown to open position by the spring 15.

Having thus described my invention, what I claim and desire to have protected by Letters Patent of the United States is:—

1. The combination with an electro-magnet having a movable core, of a resilient abutment for said core, an electric switch connected to said core, and an additional resilient abutment to minimize the transmission of vibrations due to alternations of current in said electro-magnet to said switch.

2. The combination with an electro-magnet having a movable core, of an electric switch, a link connected to the core, a resilient abutment mounted between the core and said switch, and a spring between said switch and the outer end of the link.

3. The combination with an electro-magnet having a movable core, of a link connected to said core, an electric switch comprising a switch arm, a spring between said arm

and said link, and a buffer device for said arm and connected to said link.

4. The combination with a multiple switch comprising a pivoted contact-carrying arm, of an electro-magnet having a movable core, a link pivoted to said core, a spring between said arm and the outer end of said link, means for adjusting the tension of said spring, and a buffer device mounted on an intermediate portion of said link and serving to limit the movement of the link relatively to the arm in one direction.

5. The combination with an electromagnet, of an electric switch comprising a switch arm, a spring adapted to move the switch arm to open position, a second spring opposing such movement and under only partial compression while the switch is closed, and a connection between said second spring and the armature of the electromagnet.

6. The combination with an equilibrated electro-magnet, of an electric switch comprising a pivoted switch arm, a spring adapted to open the switch arm, an opposing coil spring, and connections between the armature of said electromagnet and said opposing spring operative through said opposing spring when the magnet is energized to maintain the switch arm closed and said opposing spring only partially compressed.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

AUGUST SUNDH.

Witnesses:

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