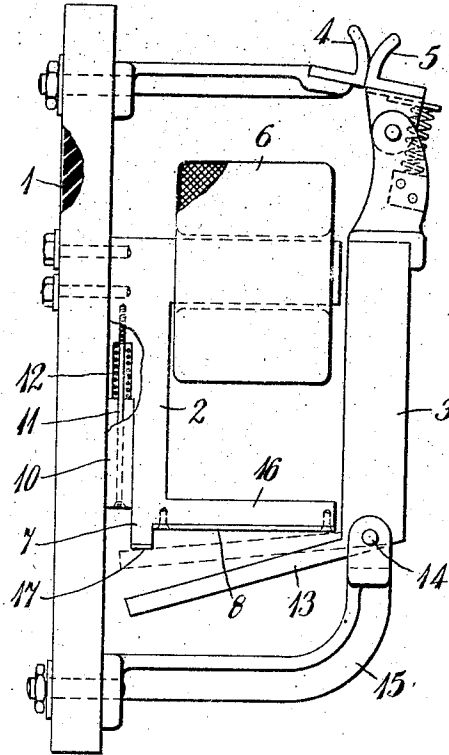


W. O. LUM.
ELECTRICALLY OPERATED SWITCH.
APPLICATION FILED MAR. 21, 1914.

1,298,746.

Patented Apr. 1, 1919.



WITNESSES:

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UNITED STATES PATENT OFFICE.

WALTER O. LUM, OF WILKINSBURG, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

ELECTRICALLY-OPERATED SWITCH.

1,298,746.

Specification of Letters Patent.

Patented Apr. 1, 1919.

Application filed March 21, 1914. Serial No. 826,246.

To all whom it may concern:

Be it known that I, WALTER O. LUM, a citizen of the United States, and a resident of Wilkesburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Electrically-Operated Switches, of which the following is a specification.

My invention relates to electrically operated switches, and it has special reference to switches of this character which are adapted for use with systems of electric motor control.

My invention has for one of its objects to provide a switch of the character indicated above that shall be simple and durable in construction and have the characteristic of operating only when the energy supplied to its actuating winding falls between predetermined limits.

Another object of my invention is to provide means for adjusting the reluctance of one of a pair of substantially parallel magnetic paths in order to vary the current value at which the switch operates.

A switch constructed in accordance with my invention is particularly adapted for use in connection with systems of electric motor control. It has been previously proposed to employ switches having two paths for the magnet flux, one of which predominates to hold the switch open when the energy supplied to the actuating coil exceeds a predetermined value, and the other of which predominates to close the switch when the current supplied to the coil falls within predetermined limits. In my Patent No. 1,138,677, granted May 11, 1915, I have provided a switch having the characteristics above described. The reluctance of that magnetic path that is traversed by the flux which operates to hold the switch in an open position, is varied by means of an adjustable screw which operates to vary the distance between a magnetizable member and an armature member. This arrangement possesses the disadvantage of varying the reluctance of the main magnetic circuit as well as that of the auxiliary magnetic circuit which tends to retain the switch in its open position.

According to my present invention, I provide a stationary magnetizable member with an adjustable portion, the position of which controls the reluctance of the auxiliary magnetic circuit. By means of this arrangement,

I am thus enabled to change the conditions in one magnetic circuit without affecting the conditions in the other circuit.

My invention will be described in connection with the accompanying drawings in which the single figure is a side view, in elevation, of a switch constructed in accordance with my invention.

The switch here shown comprises a slab or base 1 of insulating material, a stationary magnetizable member 2 secured thereto, a movable armature 3, a stationary switch contact member 4, a cooperating movable contact member 5, and an actuating coil 6.

The stationary laminated core member 2, which is of substantially U-shape, is provided with a projecting portion or lug 7 and a damper 8 of any suitable material and construction. The stationary member 2 is also provided with an adjustable laminated portion 10, the position of which is controlled by means of an adjusting screw 11 and a helical compression spring 12.

The movable armature 3 is provided with a projecting portion 13 which forms an obtuse angle with the body of the armature. The armature has a pivotal support on a pin 14 which is secured to a stationary bracket 15. When the switch is open, the projecting portion 13 of the armature is substantially parallel to an arm 16 of the stationary member 2 and is in engagement with a thin plate 17 of non-magnetizable material that is fixed to the outer face of the lug 7.

The damper 8 is secured to the arm 16 adjacent to the projecting arm 13 of the armature and operates to force the leakage flux which traverses the arm 13 to pass through the lug 7. This arrangement insures that the leakage flux exerts a maximum force tending to hold the switch open.

It may be assumed that the switch is open and that the arm 13 occupies the position indicated by dotted lines. If excessive current be supplied to the coil 6, a magnetic circuit is energized, which comprises the stationary member 2 and the body portion of the armature 3. Since the arm 16 is smaller in cross section than the remainder of the stationary member 2, it will be saturated and a portion of the flux will traverse the leakage path which comprises the lug 7 and the arm 13 of the armature 3. The switch will then be held in its open position until the current has decreased to such an

amount that the flux traversing the leakage path is insufficient to hold the arm 13 in its dotted line position against the force of the main magnetic circuit which tends to close the switch. The armature 3 will then be rocked into the position shown in the drawing and the switch will be closed.

When the switch is closed, the energy supplied to the coil 6 may be varied over comparatively wide limits without tending to open the switch, since the arm 13 is then separated from the lug 7 by a considerable distance.

The current value at which the switch is closed may be readily adjusted by means of the screw 11 and the spring 12. It will be noted that, as the movable portion 10 approaches the end of the lug 7, the length of the air gap between the lower end of the movable portion 10 and the arm 13 is decreased, thereby decreasing the reluctance of the leakage path and increasing the force with which the arm 13 is held in its dotted line position.

It will be noted that I have provided a simple and convenient means for adjusting the current value at which the switch is operated by adjusting the force with which the switch is held in its open position. This result is accomplished without in any way affecting the reluctance of the main magnetic circuit, as, for example, by changing the initial position of the armature 3.

I claim as my invention:

1. A magnet comprising a base, a stationary magnetizable member mounted thereon and having a magnetizable arm, an armature pivotally mounted on said base near the outer end of said arm and having a main body portion for coacting with said stationary member to constitute a main magnetic circuit and a projecting portion for coacting with the inner end of said arm to constitute an auxiliary magnetic circuit, said projecting portion extending substantially parallel to said arm when said armature occupies one extreme position and at an angle to said

arm when said armature occupies its other extreme position, means for magnetically insulating said projecting portion from said arm except at said inner end of said arm, and a magnetizable member adjustably mounted on said base near said inner end and separated from said projecting portion to vary the reluctance of said auxiliary magnetic circuit.

2. A magnet switch comprising a stationary magnetizable member having a body portion and two arms, one of said arms being provided at its inner end with a projection, an armature pivotally mounted independently of said stationary member near the outer end of said one arm and having a main body portion for coacting with said stationary member to constitute a main magnetic circuit and having a projecting portion for coacting with said projection, said body portions and said other arm to constitute an auxiliary magnetic circuit, said projecting portion extending substantially parallel to said one arm when said armature occupies one extreme position and at an angle to said one arm when said armature occupies its other extreme position, means for magnetically insulating said projecting portion from said one arm except at said projection, a magnetizable member adjustably mounted near said projection and separated from said projecting portion, whereby adjustment of said adjustably mounted member will vary the reluctance of said auxiliary circuit without varying the reluctance of said main circuit, a single coil mounted upon said other arm for energizing said circuits, a stationary contact member, and a movable contact member coöperating therewith carried by said armature.

In testimony whereof I have hereunto subscribed my name this 13th day of March, 1914.

WALTER O. LUM.

Witnesses:

W. M. CODDINGTON,
B. B. HINES.