

March 2, 1926.

1,575,010

G. B. SCHEER

LIMIT SWITCH

Filed April 29, 1922

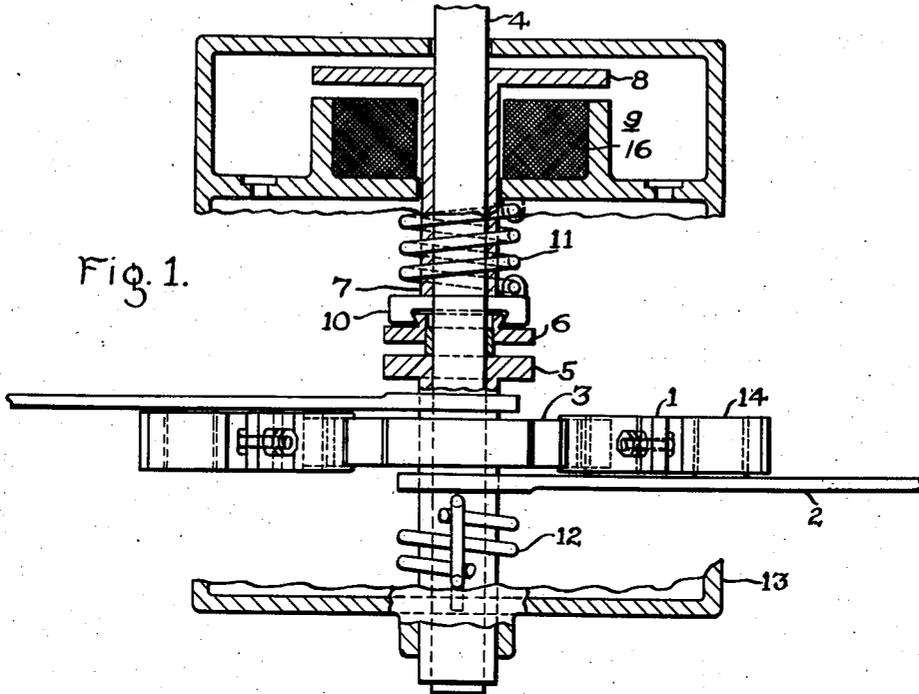


Fig. 1.

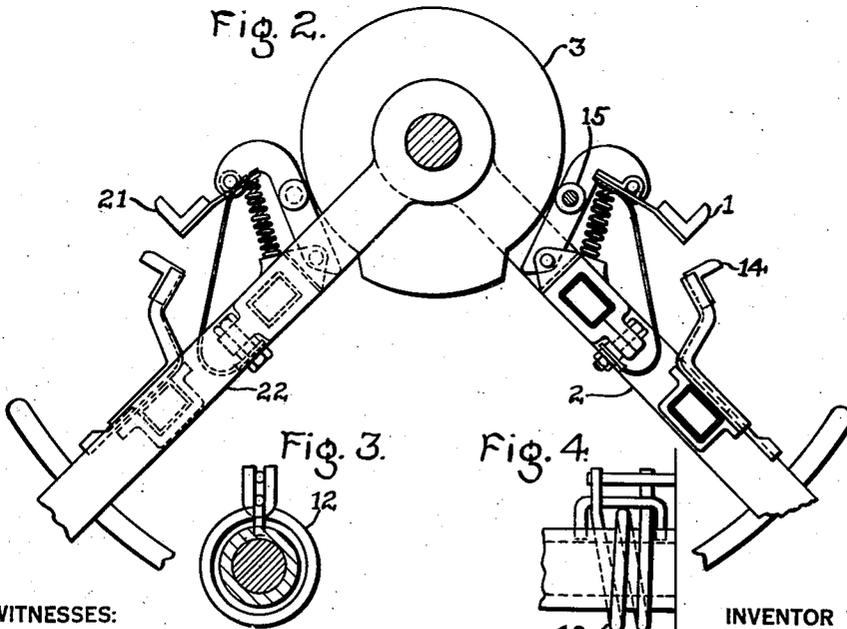


Fig. 2.

Fig. 3.

Fig. 4.

WITNESSES:

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LIMIT SWITCH.

Application filed April 29, 1922. Serial No. 557,484.

To all whom it may concern:

Be it known that I, GEORGE B. SCHEER, a citizen of the United States, and a resident of Berkeley, in the county of Alameda and State of California, have invented a new and useful Improvement in Limit Switches, of which the following is a specification.

My invention relates to electrical switching apparatus and it has particular relation to electric-motor control.

One object of my invention is to provide means for limiting the period of operation of a motor.

Another object of my invention is to provide an adjustable limit-switch that shall be capable of effecting small movements of the apparatus to be controlled, such as the edging rolls in a reversing steel mill.

Other objects of my invention will become apparent from the following specification and the appended claims.

My invention comprises a switch having an operating shaft arranged to be controlled or rotated in accordance with certain movements of the operating motor or mechanism that is actuated thereby.

One or more movable switch members are actuated preferably by means of a cam which is operatively connected through an electromagnetic clutch to the operating shaft of the switch. The electromagnet is energized simultaneously with the main motor-controlling devices. The contact members are so arranged as to be capable of angular movement corresponding to the movement of the cam, thereby affording adjustable means for retarding or for advancing the operation of the movable switch member relative to the rotary movement of the operating cam. A centering spring is provided for returning the cam to its inoperative or "off" position when the electromagnet becomes de-energized.

Figure 1 of the drawing is a sectional view of apparatus embodying my invention;

Fig. 2 is a plan view of a portion of the apparatus illustrated in Fig. 1; and

Figs. 3 and 4 illustrate the essential details of the centering spring for the operating cam.

Referring particularly to Fig. 1, a movable switch member 1 is carried by a lever 2 and is arranged to be actuated by a cam 3.

Both the cam 3 and the lever 2 are sup-

ported by, and may be rotated about, a main shaft 4, being loosely mounted with respect to the shaft 4. The cam 3 is mounted upon a shaft that is concentric with the shaft 4 and carries with it a clutch member 5. A second clutch member 6 is mounted upon the shaft 4 in such manner as to be capable of axial movement with respect to the shaft and also to rotate therewith.

A sleeve member 7 carries an armature 8 of an electromagnet 9 and is arranged to control the axial movement of the clutch member 6 by means of a hub portion 10 that is semi-cylindrical in form for convenience in assembling the clutch member 6 therewith. Any other convenient assembly may be employed. A compression spring 11 is designed to establish the necessary frictional engagement between clutch members 5 and 6 upon the energization of the electromagnet 9. A centering spring 12, also illustrated in Figs. 3 and 4, normally maintains the cam 3 in an operative position. A torsional spring of this character is sufficiently familiar in design and function as not to require detailed description. The various elements of the limit switch are contained within a casing 13, which provides suitable support for these elements.

Referring to Fig. 2, it will be noted that movable contact member 1 is mounted upon and suitably insulated from the lever 2. Stationary contact member 14 is also carried by the lever 2. The switch contact members may be of any desired character but I prefer to employ members capable of establishing a rolling contact under heavy spring pressure, such as the familiar type that is illustrated in the drawing. Operation of the movable contact member 1 is effected by engagement of the roller switch member 15 with the inclined surface of the cam 3. The switch members are capable of any desired angular movement by means of the operating lever 2.

It may be assumed, for example, that the shaft 4 of the limit switch is to be geared to a motor for operating rolls, such as in a steel mill. The motor may be started by means of a master switch (not shown) which simultaneously effects the energization of the electromagnet 9, by means of an operating coil 16, and any suitable motor controller of electromagnetic type (not shown). It may also be assumed that the lever 2

has been set in any desired position, such as that illustrated in Fig. 2.

The engagement of clutch members 5 and 6 is effected by the closing movement of the magnet armature 8. Rotary motion is transmitted to the cam 3 through the operating shaft 4 and the clutch members 5 and 6. The cam 3 rotates, in a direction corresponding to the rotation of the shaft 4, until the inclined surface of the cam 3 engages the roller 15 and actuates the movable switch member 1 into engagement with stationary switch member 14. The engagement of these members may be arranged to shunt the familiar no-voltage release coil of the main operating controller (not shown), or by any other well-known method, to effect interruption of the motor control circuit.

The limit switch may, if preferred, be arranged with normally closed contact members, the opening of which is effected by means of the cam 3.

The interruption of the motor-control circuit results in de-energizing the electromagnet 9, which returns the clutch member 6 to its normal or inoperative position, and also permits the centering spring 12 to restore the cam 3 to its normal position. It is presumed that the operator will return his master switch or other controlling device to its inoperative position and reset the no-voltage relay, after which a second operation of the motor may be effected, as previously described.

It should be noted that the length of time during which the motor is permitted to operate depends upon the predetermined position or "setting" of the lever 2, which controls the angular movement of the cam 3 for advancing or delaying each operation of the movable switch member 1. The angular movement of the lever 2 is independent of the angular movement of rotation of the cam 3.

A reverse operation of the motor causes rotation of the cam 3 in the opposite direction and causes the operation of the similarly disposed movable contact member 21, mounted upon a lever 22, which is provided as illustrated in Fig. 2 for interrupting the motor-control circuit in that direction.

For the purposes of illustrating my invention, I have shown two sets of switch members, one set for each direction of rotation of the motor. Other combinations may be arranged and other modifications may be made to suit various operating requirements.

I have described a switch that may be used as a limit switch or that may be employed to accelerate or otherwise control a motor as will be readily appreciated by those familiar with the art. The advantages of my invention will be apparent to those

employing unskilled labor, since, for any predetermined setting of the limit switch, the control of the motor is entirely independent of the skill of the operator.

As there are many ways in which a switch of this character may be employed in systems of control, I have not deemed it necessary to illustrate any particular system. The application of my invention will be readily understood and various modifications therein may be made without departing from the spirit and scope thereof.

I claim as my invention:

1. A reversing limit switch comprising a plurality of movable members, an operating cam therefor, electromagnetic means for rendering said cam effective to actuate said members, means for advancing the operation of said movable members, and means for restoring said members to their original positions independently of said operating cam, when said electromagnetic means is inoperative.

2. A reversing switch comprising a plurality of movable contact members and operating means therefor, comprising a single cam, an electromagnetic clutch for rendering said means effective, a device for controlling the relative movements of said contact members and said operating means and means for restoring said contact members to their original positions independently of said operating means.

3. A limit switch comprising a movable switch member, a cam for actuating the member, electromagnetic means for rendering the cam effective and means for predetermining the effective angular movement of said cam and for actuating said switch member independently of said electromagnetic means.

4. A limit switch comprising a cam operated switch member, electromagnetic means for rendering said member effective, and means for predetermining the angular movement of the cam and for controlling the total angular movement required for actuating said switch member and for controlling said switch member independently of said electromagnetic means.

5. A limit switch comprising a movable switch member, a cam for actuating the member, electromagnetic means for rendering the cam effective and means for selectively controlling the effective angular movement of said cam to actuate the switch member and for actuating said switch member independently of said electromagnetic means.

In testimony whereof, I have hereunto subscribed my name this 15th day of April, 1922.

GEORGE B. SCHEER.

Certificate of Correction.

It is hereby certified that in Letters Patent No. 1,575,010, granted March 2, 1926, upon the application of George B. Scheer, of Berkeley, California, for an improvement in "Limit Switches," an error appears in the printed specification requiring correction as follows: Page 2, line 87, claim 2, after the word "reversing" insert the word *limit*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 13th day of April, A. D. 1926.

[SEAL.]

M. J. MOORE,
Acting Commissioner of Patents.