

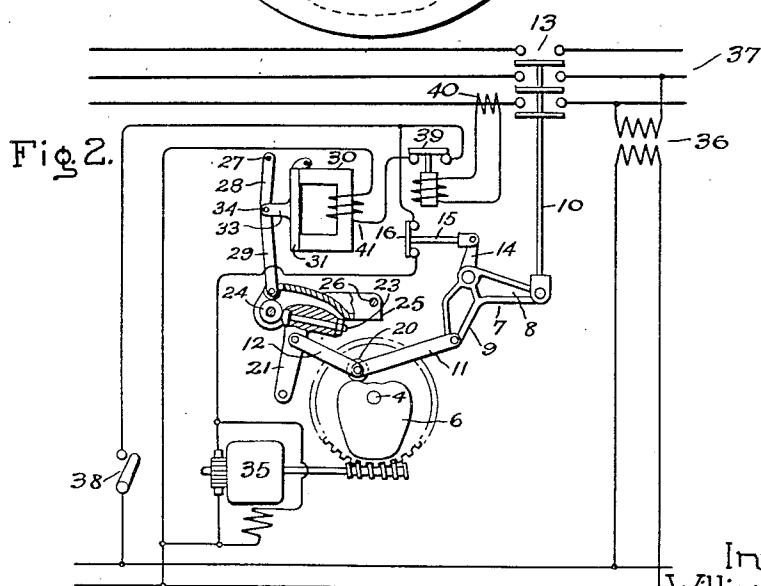
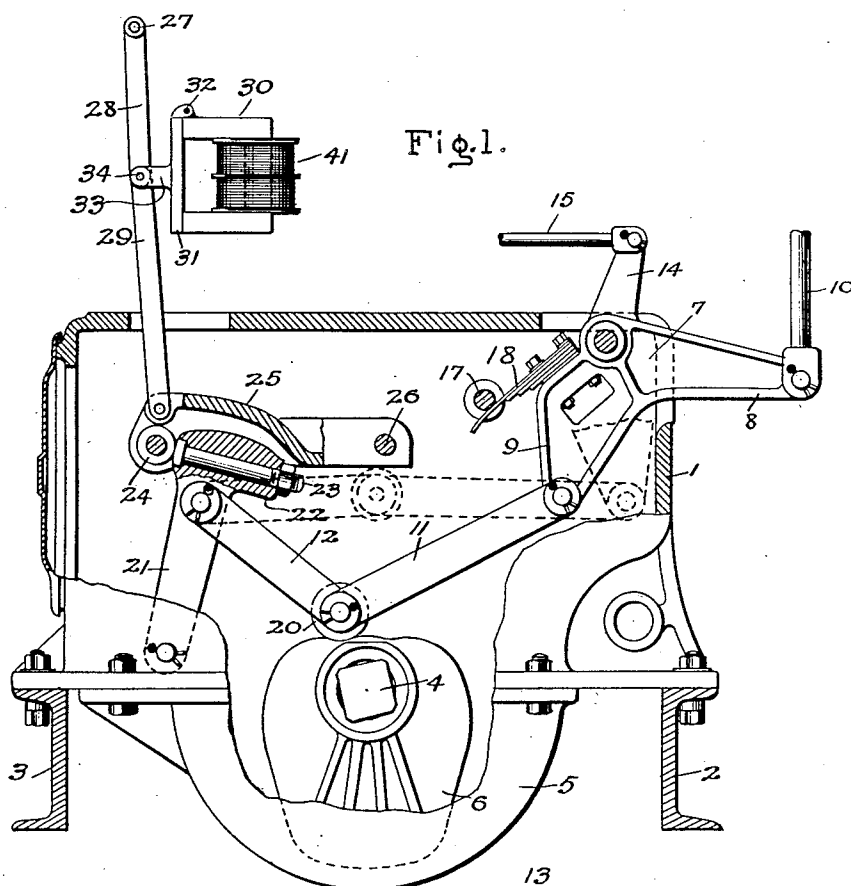
Dec. 25, 1928.

1,696,582

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ELECTRIC SWITCH OPERATING MECHANISM

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UNITED STATES PATENT OFFICE.

WILLIAM K. RANKIN, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ELECTRIC-SWITCH-OPERATING MECHANISM.

Application filed August 1, 1923. Serial No. 655,134.

My invention relates to electric switches and particularly to the operating mechanism therefor.

An object of my invention is to provide improved means for automatically tripping open an electric switch upon the occurrence of a predetermined current condition on the line controlled thereby. Another object is to provide for immediately tripping open the switch the instant the contacts close should a short circuit or an abnormally heavy load exist on the line at the time the switch is closed.

My invention will be better understood by reference to the accompanying specification and drawing and its scope will be pointed out in the appended claims.

Referring to the drawing, Figure 1 is a view partly in section of a switch operating mechanism illustrating my invention and Fig. 2 is a diagrammatic view of the same showing the circuit connections thereto.

In the drawing, a frame 1 is shown supported on and suitably secured by bolts to two channels 2 and 3. A portion of this frame constitutes the upper half of a bearing for shaft 4, the lower half of the bearing being formed in a depending portion 5 forming a casing for a cam 6, to be described later, on the shaft 4. A bell crank 7 pivotally mounted on the frame 1 has two main arms 8 and 9 respectively connected to the switch operating rod 10 and the toggle links 11 and 12. The bell crank 7 has an additional arm 14 to which is connected a rod 15 for actuating an auxiliary switch 16, the purpose of which will be described later. A stop 17 is provided on the frame 1 which is engaged by a spring 18 secured to the bell crank to cushion the return movement of the bell crank and connected parts. A roller 20 mounted upon the common connecting pin of the toggle links 11 and 12 is engaged by the cam 6 to effect the closing movement of the switch. The opposite end of link 12 is pivoted to an arm or lever 21 pivoted at its lower end to the frame and having its upper end provided with an extension 22 and passing through the upper end is shown a bolt 23, the head of which is preferably hard and provides a wearing surface for engaging a roller 24 mounted upon the abutment member 25. This member is pivoted at one end to the frame at 26 and has its

free end normally suspended from a supporting pin 27 by toggle links 28 and 29. The wearing face of the bolt 23 may be so formed that the roller 24 will tend either to rise or fall due to the pressure exerted by the arm 21. An important advantage results in having this wearing face formed in the manner illustrated so that as the lever 21 is pressed against the roller 24 by the end thrust of the toggle links there will be an upward component of that force tending to raise the corresponding end of the abutment member 25. Movement of this member is however prevented by the toggle links 28 and 29 and an electromagnet 30. Armature 31 of this magnet is pivoted to the core at 32 and connects by an arm 33 to the common connecting point 24 of the toggle links 28 and 29, the connection being such that the links are always maintained slightly buckled as shown.

Referring now to Fig. 2 the cam shaft 4 is shown adapted to be rotated by a worm wheel and worm which latter is driven by an electric motor 35. Current for operating this motor may be taken from any convenient source. As illustrated it is taken from a transformer 36 connected to one phase of the three phase line 37, in which is arranged the main switch 13, and is controlled by the auxiliary switch 16 and a hand switch 38. A solenoid operated overload switch 39 connected to take current from a current transformer 40 in one wire of the three phase line 37 serves to open a branch control circuit including the winding 41 of the electromagnet 30.

The operation of the switch will now be described. Assuming the main switch 13 to be open and the parts to be in the position illustrated, to close the main switch the hand switch 38 is first closed. The control circuit is thus completed to the motor 35 and to the electromagnet 30. As the motor operates the cam 6 is rotated raising the roller 20 of the toggle links 11 and 12. The resulting end thrust of the link 12 as the links approach their straightened position is opposed by the engagement of the lever 21 with the abutment member 25, the upward component of the pressure exerted by the lever 21 against the roller 24 being opposed by the toggle links 28 and 29 so long as the electromagnet 30 remains energized.

The solenoid operated switch 39 is so adjusted that under normal conditions of load on the main line the switch will remain in closed circuit position. Continued movement of the cam 6 results in rotating the bell crank 7 and in closing the main switch. The toggle links 11 and 12 are thereby slightly overset so that the roller 20 comes to rest against member 25 as shown in dotted lines. As the main switch reaches its closed position the switch 16 opens deenergizing the motor which soon comes to rest. The main switch may be tripped open manually by opening the hand switch 38 thereby deenergizing magnet 30. Should it happen that an excessively heavy load existed on that part of the three phase line 37 controlled by the main switch at the time of the closing of the switch or should there be a short circuit thereon at the moment the switch contacts close, the rush of current would cause the solenoid operated switch 39 to open the circuit of the electromagnet 30. The abutment member 25 would thereupon be free to rotate out of the way of the lever 21 permitting the main switch to drop immediately to open position irrespective of the continued rotation of the operating cam. By this construction it will be seen therefore that in the event of a short circuit or an excessively heavy load on the line, it is not necessary for the switch or the closing apparatus therefor fully to complete its closing movement before the switch may be automatically tripped open but on the contrary it will be immediately tripped open the moment the contacts touch.

While I have illustrated a single main switch and switch operating mechanism, it may be desirable under certain conditions to employ a number of switches having similar operating mechanisms each operated by a separate cam on a single motor driven cam shaft. In that case the several cams would preferably be mounted on the common shaft in various relative angular positions to better equalize the load on the motor should it be desired to close a plurality of the switches at one time.

While I have described only one embodiment of my invention, I do not wish to be limited to the particular form shown and described as it will be apparent that many modifications therein may be made without

departing from the scope of my invention as set forth in the appended claims.

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

1. An electric switch operating mechanism comprising a toggle mechanism, means for operating said mechanism, a switch actuating member connected to one end of said mechanism, a movable member connected to the opposite end of said mechanism for transmitting the end thrust thereof, a movable abutment for said movable member, said member and said abutment having cooperating faces disposed to cause the abutment to be displaced out of the path of movement of said movable member, a toggle for preventing displacement of said abutment, and an electromagnet for controlling said toggle.

2. In a system comprising a circuit and a switch therein, switch operating means comprising a toggle mechanism, a switch actuating member connected to one end of said mechanism, a movable member secured to the opposite end of said toggle mechanism and arranged to take the end thrust thereof when the same is moved to a straightened position, an abutment for said toggle mechanism mounted to move into or out of the path of movement of said movable member, and means adapted to be responsive to current conditions in said circuit for controlling the position of said abutment.

3. In a system comprising a circuit and a switch therein, switch operating means comprising a lever, a toggle mechanism having one end connected with said lever, a cam for engaging an intermediate portion of said toggle mechanism for operating the same, a movable member attached to the opposite end of said toggle mechanism, an abutment for said opposite end of the toggle mechanism constructed to normally lie in the path of movement of and to be displaced therefrom by contact with said movable member, and means for controlling the movement of said abutment comprising a toggle mechanism and an electromagnet connected therewith and adapted to respond to the current condition of said circuit.

In witness whereof, I have hereunto set my hand this 31st day of July, 1923.

WILLIAM K. RANKIN.