W. E. DATE.

ELECTRIC SWITCH.

APPLICATION FILED MAY 24, 1912.

1,145,569.

Patented July 6, 1915.

Fig. 1.

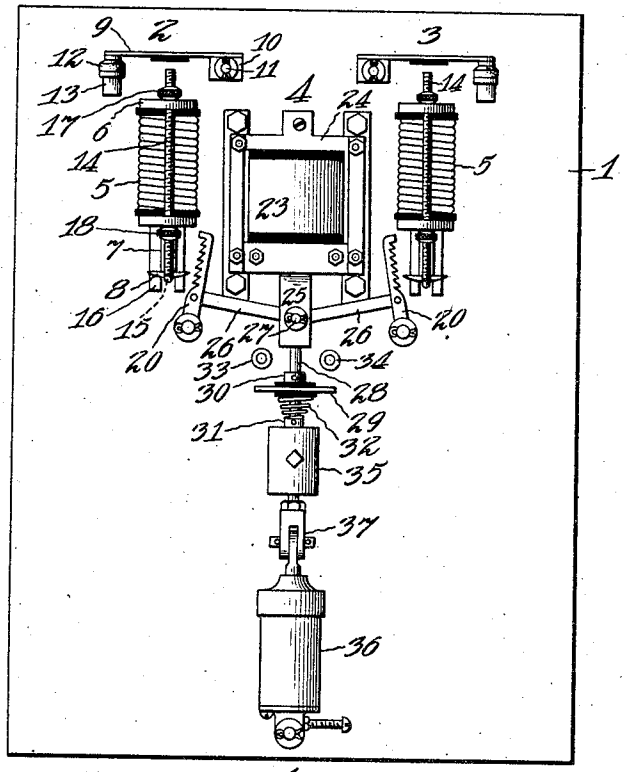
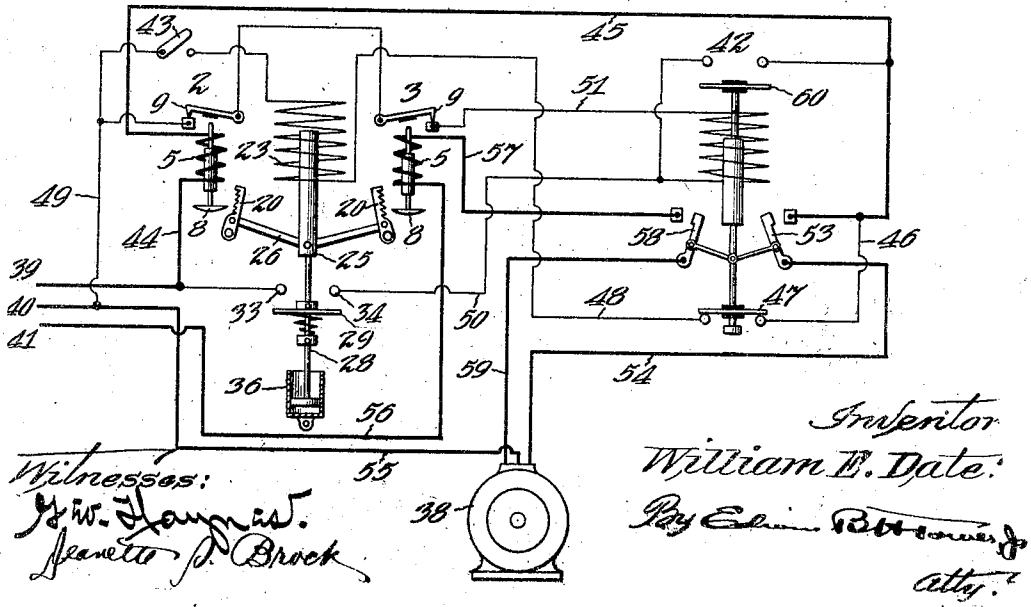


Fig. 2.



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UNITED STATES PATENT OFFICE.

WILLIAM E. DATE, OF WESTFIELD, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO AUTOMATIC REFRIGERATING COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

ELECTRIC SWITCH.

1,145,569. Specification of Letters Patent. Patented July 6, 1915.

Application filed May 24, 1912. Serial No. 699,431.

To all whom it may concern:

Be it known that I, WILLIAM E. DATE, a citizen of the United States, residing at Westfield, in the county of Union and State of New Jersey, have invented new and useful Improvements in Electric Switches, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

My invention relates to improvements in protective devices for electric circuits.

My invention is particularly applicable to overload protective devices for motor circuits where the starting current is greater than the motor can safely carry under normal running conditions. It should be understood however, that my invention is not limited to this particular application thereof, but may be used in various different relations for various different purposes.

It is one of the objects of my invention to provide a protective device with means for rendering the same ineffective to respond under certain conditions.

It is a further object of my invention to provide a protective device which will automatically become effective upon the lapse of a definite time after the closure of the circuit which it is designed to protect.

Various other objects and advantages of my invention will be hereinafter clearly and fully set forth.

In order to fully and clearly disclose the nature and characteristic features of my invention, I shall describe the device illustrated in the accompanying drawing which embodies my invention in one form. It should be understood however, that my invention is not limited to the specific structure shown in the accompanying drawing, but is susceptible of embodiment in various other forms. Neither is my invention limited to the particular application thereof disclosed herein.

In the accompanying drawings:—Figure 1 is a front elevation of the device and Fig. 2 is a diagrammatic view of a motor control system including the device shown in Fig. 1.

The device shown in the drawing which has merely been selected for the purpose of illustration, is particularly applicable to use as a circuit breaker for polyphase alternating current circuits. It includes overload devices 2 and 3 and a controlling mechanism 4 therefor all mounted upon a panel 1.

In practice the overload devices may be of various different types. As illustrated both devices are of the same construction, and I shall therefore only describe one of the same.

The device 2 includes an overload winding 5 mounted in a suitable magnet frame 6 secured to the panel 1. The winding 5 has a movable plunger 7 provided at its lower end with a thin disk member 8. The upper end of the plunger 7 is provided with an extension not visible and which it has been deemed unnecessary to specially illustrate. This extension is adapted upon response of the winding 5 and a consequent upward movement of the plunger 7 to engage and actuate a switch member 9. The switch member 9 is mounted upon a block 10 fulcrumed upon a pin 11 projecting from the panel 1. At its free end the switch member 9 carries a contact 12 adapted to engage with a stationary contact 13. The switch member 9 normally engages contact 13, but is disengaged therefrom upon response of the overload winding 5. Passing through the upper and lower members of the magnet frame 6 is a rod 14 having at its lower end an angular extension 15 extending under the disk member 8 and projecting into a groove in a guide member 16. The extension 15 of the rod 14 extending under the disk member 8 forms a down-stop for the plunger of the overload winding 5. Threaded on to the rod 14 are knurled collars 17 and 18 which provide for longitudinal adjustment of the rod 14 and in consequence adjustment of the down-stop for the plunger 7. This adjustment affords means whereby the overload device may be calibrated to respond at any predetermined current value. The overload device 3 as above stated is of the same construction as the device 2.

The controlling mechanism 4 includes pivoted pawls 20 mounted upon the panel 1 adjacent to the overload devices. These pawls are notched to engage the disk members 8 of the overload plungers to lock the same against upward movement. Each pawl is preferably provided with a series of teeth to insure locking engagement between the same and its corresponding member 8 in the dif-

ferent positions to which the disk member may be adjusted by adjustment of the rod 14 in a manner previously set forth.

The pawls 20 are adapted to be thrown into and out of engagement with the disks of the overload devices by means of a solenoid 23 mounted in a suitable frame 24 secured to the panel 1. The solenoid 23 is provided with a movable plunger 25 connected to the pawls 20 by links 26. The links 26 are connected to the plunger 25 by a pin 27 and are pivoted at their free ends to the pawls 20. The link arrangement is such that when the solenoid 23 is energized and its core raised the pawls are thrown into engagement with the disk members of the overload devices and when the solenoid is deënergized said pawls are withdrawn from engagement with the overload devices. Thus upon energization of the solenoid 23, the overload devices are locked against operation and are not released until the solenoid is deënergized and its plunger descends to a predetermined degree depending upon the extent of overlapping of the teeth on the pawls with the disks.

The plunger 25 is provided with a tail rod 28 upon which is loosely mounted a contact disk 29. This contact disk 29 is confined between collars 30 and 31 fixed to the tail rod 28, a coil spring 32 being interposed between said disk and the lower collar. Mounted upon the panel 1 and adapted to be engaged and bridged by the contact disk 29 are stationary contacts 33 and 34.

Secured to the tail rod 28 below the contact disk is a weight 35 tending to move the plunger 25 downwardly against the action of a dash pot 36 suitably secured to the panel 1 and having its piston rod connected to the tail rod 28 by any suitable means such as the connection 37. The dash pot 36 is preferably so designed as to have no retarding effect upon the upward movement of the solenoid plunger.

The operation and functions of the device described will be best understood upon reference to the controller diagrammatically illustrated in Fig. 2. In this figure I have shown an alternating current motor 38 supplied with current from a three wire two phase alternating current circuit having supply lines 39, 40 and 41. The circuit of the motor is controlled by an electro responsive main switch 42, while the overload device above described is employed for controlling the main switch to disconnect the motor from circuit upon the occurrence of overloads. A switch 43 is provided for controlling the operating windings of the controller.

I shall now describe the operation of the controller illustrated, at the same time clearly setting forth the circuit connections and functions thereof. Assuming that switch 43 is closed, a circuit is completed from main line 39 by conductor 44 through the winding of overload device 2 by conductors 45 and 46 through an auxiliary down contact 47 of the main switch 42 by conductor 48 through the operating winding of solenoid 23 through switch 43 by conductor 49 to main line 40. The winding of solenoid 23 is thus connected across lines 39 and 40 and is therefore energized. The solenoid 23 accordingly draws up its plunger throwing the pawls 20 into engagement with the disks 8 of the overload devices and moving contact disk 29 into engagement with contacts 33 and 34. This completes a circuit from main line 39 through contact disk 29 by conductor 50 through the operating winding of main switch 42 by conductor 51 through the switches 9 of both overload devices 2 and 3 to conductor 49 and thence to line 40. This connects the operating winding of the main switch across lines 39 and 40 thereby causing its energization. The switch 42 is thereupon closed, closing the motor circuit as follows:—One phase of the motor circuit may be traced from main line 39 by conductor 44 through the winding of overload device 2 by conductor 45 through the contact member 53 of the main switch by conductor 54 to one terminal of the motor, thence through the motor winding to the middle terminal and by conductor 55 to main line 40, the connections between the middle terminal of the motor and conductor 40 being permanent. The other phase of the motor circuit may be traced from main line 41 by conductor 56 through the operating winding of overload device 3 by conductor 57 through the contact member 58 of main switch 42 by conductor 59 to the third terminal of the motor, thence through the motor windings to the middle terminal of the motor and common conductor 55 to line 40. Thus the motor circuit is completed and the motor set in operation.

The windings of the overload devices as has been seen are connected in different phases of the motor circuit and accordingly one or the other would tend to respond upon an abnormal flow of current in either phase. At this time however, both devices are locked against operation by the pawls 20 and thus any amount of current may be supplied to the motor for starting without danger of the overload devices responding. The overload devices are maintained locked until the winding 23 is deënergized and the plunger 25 falls.

The winding 23 is deënergized upon closure of the main switch, this being brought about by the opening of auxiliary contact 47 connected to the main switch. As illustrated a lost motion is provided for whereby the switch 47 will not be opened until the oper-

ating solenoid of the main switch substantially completes its stroke. The winding 23 now being deënergized its plunger 25 descends, but only at a slow rate of speed due to the opposing action of the dash pot 36. When the solenoid plunger descends to a certain degree it withdraws the pawls from engagement with the overload devices, leaving said devices free to respond upon an abnormal surge of current in either phase of the motor circuit. As both overload switches are connected in series with the operating winding of the main switch, it is obvious that the main switch would be deënergized, and disconnect the motor from circuit upon response of either of the overload devices. It will also be obvious that by regulation of the dash pot 36 the overload devices may be locked against response for any predetermined period after closure of the motor circuit. Thus the mechanism may be readily adjusted to enable the motor to attain normal speed and safe current conditions to be established under ordinary circumstances before the overload devices are unlocked. However the overload devices are always unlocked and rendered free to respond upon the expiration of a definite period of time so that the motor cannot be subjected to heavy surges of current longer than intended for starting the same.

Of course when the solenoid 23 is deënergized, the initial energizing circuit of the main switch is interrupted by contact disk 29, but a maintaining circuit for the operating winding of the main switch is established by its auxiliary contact 60 so that said main switch will remain energized. This auxiliary circuit may be traced from main line 39 by conductors 44 and 45 through the auxiliary contact 60, thence through the operating winding of main line 9 by conductor 51 through the switches of the overload devices by conductor 49 to main line 40.

What I claim as new and desire to secure by Letters Patent is:—

1. In combination, an electroresponsive protective device, a member for mechanically locking said device against operation, an electroresponsive winding for moving said member into locking position, said member tending to release said device upon deënergization of said winding, and means insuring the lapse of a predetermined period of time prior to the release of said device.

2. In combination, an automatic protective device for electric circuits adjustable to respond under different predetermined conditions, and a locking member therefor adapted to engage with a part of said device in any position to which it may be adjusted.

3. In combination, an electroresponsive protective device for electric circuits and a pivoted pawl adapted to engage with a part of said device to lock the same against operation, said pawl having a series of engaging portions to permit adjustment of the engaging part of said device without affecting the functions thereof.

4. The combination with an electroresponsive protective device for electric circuits including a solenoid having a movable plunger and a disk member secured to said plunger of a pivoted pawl having a notched portion for engaging the edge of said disk to hold said plunger against operation.

5. The combination with an overload protective device for electric circuits including a solenoid winding having a movable plunger and a disk member fixed to said plunger, means for adjusting said plunger within said winding for varying the calibration of said device, of a pivoted pawl to be moved into engagement with said disk member to lock said plunger against movement, said pawl having a series of teeth for engaging said disk member.

In witness whereof, I have hereunto subscribed my name in the presence of two witnesses.

WILLIAM E. DATE.

Witnesses:
FRANK J. BURD,
T. D. MONTGOMERY.