H. A. STEEN.

SWITCHING MECHANISM.

APPLICATION FILED MAR. 23, 1912.

1,194,564.

Patented Aug. 15, 1916.

2 SHEETS—SHEET 1.

Fig. 1

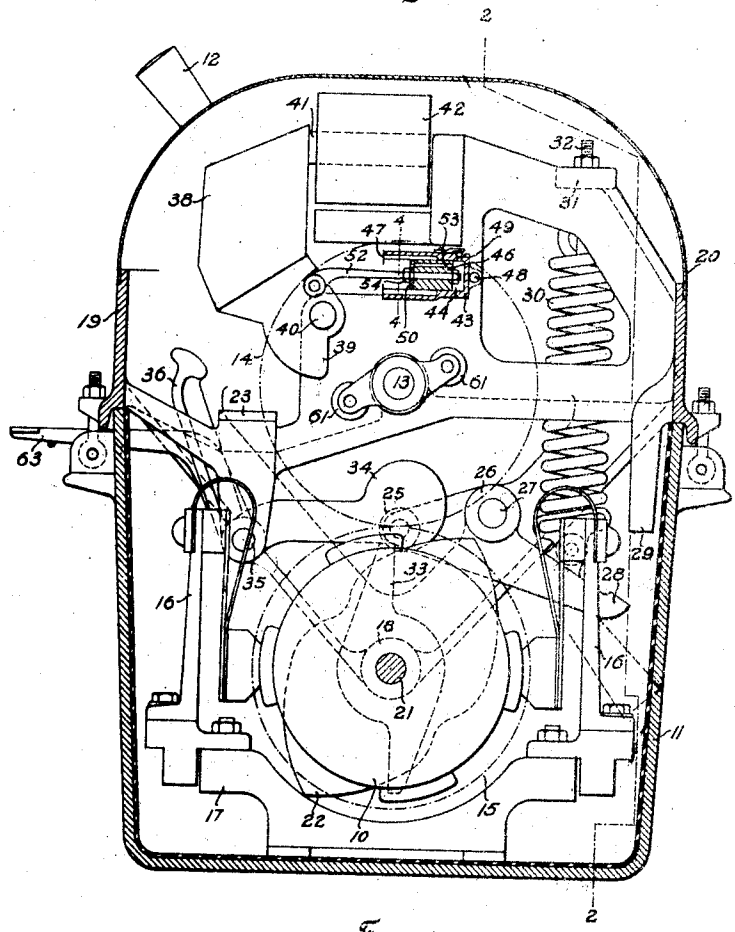
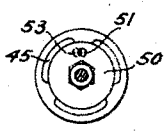


Fig. 4



Witnesses

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2 SHEETS—SHEET 2.

Fig. 3

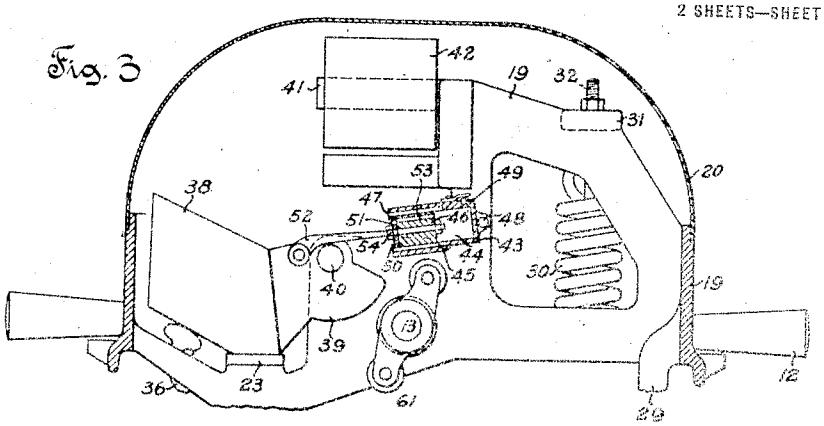
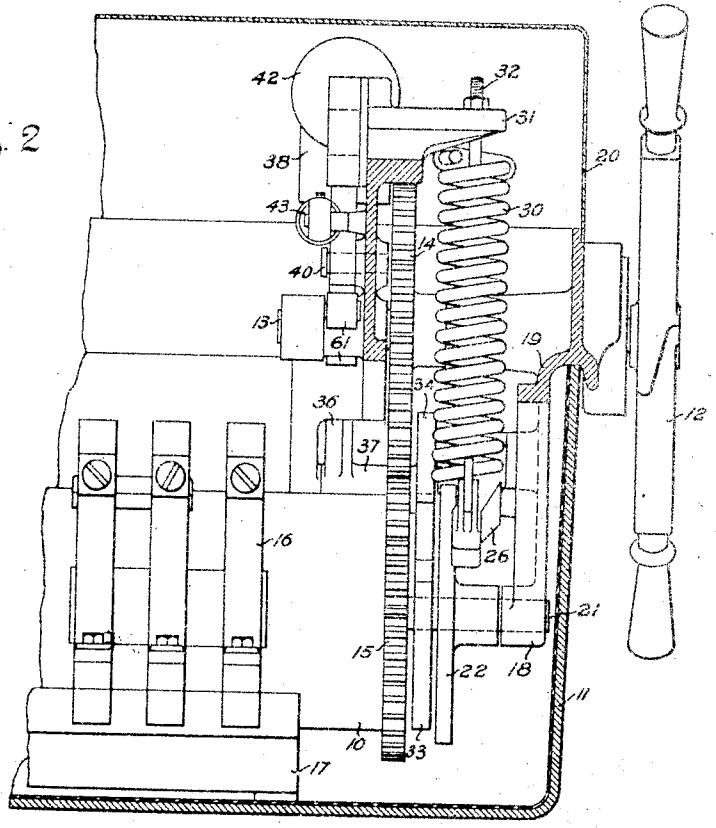


Fig. 2



Witnesses

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UNITED STATES PATENT OFFICE.

HALFDAN A. STEEN, OF NORWOOD, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO ALLIS-CHALMERS MANUFACTURING COMPANY, A CORPORATION OF DELAWARE.

SWITCHING MECHANISM.

1,194,564. Specification of Letters Patent. Patented Aug. 15, 1916.

Application filed March 23, 1912. Serial No. 685,717.

To all whom it may concern:

Be it known that I, HALFDAN A. STEEN, a subject of the King of Norway, residing at Norwood, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Switching Mechanisms, of which the following is a full, clear, and exact specification.

This invention relates to potential starters for alternating current motors and particularly to potential starters having means responsive to abnormal circuit conditions with time element attachments.

In the operation of potential starters, it is desirable that such starters be moved into off positions when in running position in response to abnormal circuit conditions. Such potential starters can be moved backward from starting position to off position without danger to the switch parts, but to avoid injury to the switch parts it is necessary that the starter or switch when in running position be moved forward to off position. In potential starters thus far manufactured the movable switch member has been thrown into off position upon the occurrence of abnormal circuit conditions without respect to the time that such abnormal conditions have existed. This means that in potential starters thus far used, it has been necessary to again actuate the potential starter through its starting and into its running position after the occurrence of every abnormal circuit condition.

It is therefore the object of my invention to improve potential starters and switches by providing them with an arrangement to prevent the opening of such starters or switches upon the occurrence of low or no-voltage circuit conditions until or unless said abnormal circuit conditions have existed for a predetermined time.

The various novel features of my invention will be apparent from the specification and drawings, and will be particularly set forth in the appended claims.

The invention is illustrated on the accompanying sheets of drawings, in which—

Figure 1 is an end elevation, of a potential starter embodying my invention, one end of the tank being broken away for the sake of clearness, and the switch being in running position; Fig. 2 is a sectional view, most of the parts being shown in elevation, of the same potential starter, taken along the irregular line 2—2 of Fig. 1; Fig. 3 is a fragmentary elevation, similar to that shown in Fig. 1, with the parts shown in off position; and, Fig. 4 is a sectional view of a detail taken along the line 4—4 of Fig. 1.

The details of the starting controller proper will not be fully described herein because they form no part of my present invention and are unnecessary to an understanding thereof.

The normal operation of the potential starter is substantially in the same direction, a movement through 180° constituting a complete operation. The controller drum 10, which is immersed in oil in the tank 11, is moved by an operating handle 12 through a shaft 13 and gear wheels 14 and 15. The two opposite halves of the controller drum are identical in structure and each half cooperates in turn with each of two sets of contact fingers 16 during successive operations of the controller, the sets of contact fingers being on opposite sides of the drum and arranged to simultaneously co-act with the two halves of the drum respectively. The stationary contacts 15 are mounted on an insulating support 17 which is located in the bottom of the stationary oil tank 11. The switch drum 10 with which these contact fingers coöperate is rotatably mounted in bearings 18 formed in the lower part of a large irregular shaped casting 19, which forms a portion of the cover for the oil tank, the remaining part 20 of the cover being of sheet metal and secured over the part 19. The shaft 13 upon which the handle 12 and gear 14 are mounted is supported in another bearing portion of the irregular shaped casting 19.

Mounted upon the drum shaft 21 is a cam 22 upon which a roller 25 is adapted to ride. The roller is mounted in the casting 26 which is pivotally mounted on a rod 27 and which is provided with a finger 28 adapted to engage a stop 29 forming a part of the casting 19. Secured to the finger 28 is one end of a spring 30, the other end of which is secured to a portion 31 of the casting 19 by a bolt 32. This spring 30 presses the roller 25 against the surface of the cam 22 under all conditions, biasing the movable switch member or drum to off position. Also secured to the drum shaft 21 is a catch 33 adapted, when the potential starter is in running position, to be held by a weighted latch 34 which is pivotally mounted on a rod 35 and which is pro-

vided with an arm 36. The latch 34 and arm 36 are integrally formed and connected by a sleeve 37. By means of the latch the movable switch member is normally locked in running position.

A hammer 38, having a projection 39, and being pivotally mounted on a rod 40, is adapted to engage the arm 36 to disengage catch 33 and latch 34 to permit the spring 30 to throw the starter into off position. After striking the arm 36, the hammer 38 engages and rests on a padded stop 23. This hammer 38 forms the armature of a low or no-voltage magnet having a core 41 forming a part of the casting 19 and a coil 42. The hammer 38 is moved into engagement with the core 41 by one of the rollers 61 being forced against the top of the hammer projection 39 while the handle is being turned from off to running position. When the magnet is energized it holds the hammer armature 38 against the core 41, but when said magnet becomes deënergized, the armature or hammer 38 being biased to fall, due to its own weight and the position of its pivotal point 40, has a tendency to swing about said pivotal point 40 to engage arm 36 for tripping the latch 34 to permit the switch drum to be thrown into off position. But instead of rapidly rotating under its own weight and about its pivotal point 40, the armature 38 is caused to move slowly by a time element attachment. This time element attachment preferably takes the form of a dash-pot the stationary member 43 of which is provided with a bored portion 44, part of said bored portion being grooved to form air passageways to permit a quick movement of the piston 46 after its rear end has passed toward the open end 47 of the dash-pot a certain amount. The piston 46 is provided with a restricted air passageway 53 connecting the opposite sides of said piston, and also with a rod 52 which is pivotally connected to the hammer armature 38 which, under no-voltage or certain low voltage conditions, slowly draws said piston out of the stationary part of the dash-pot. This stationary member 43 of the dash-pot is pivotally mounted at 48 to the irregular shaped casting 19, and is provided with a valve 49 which permits the escape of air from but prevents the admission of air to the normally closed end of said dash-pot through said valve.

Due to the position of the pivotal point 40 of the hammer armature 38, when in engagement with the magnet core 41, it is biased by its own weight to rotate about the pivotal point 40 and to fall into engagement with member 36 for the purpose above set forth. With the potential starter or switch in running position the armature 38 is held against the magnet core 41 due to the action of the current in the magnet coil 42. If abnormal circuit conditions should arise, such as low or no-voltage circuit conditions, the magnet will become sufficiently deënergized and the hammer armature, due to its weight, would move slowly against the action of the dash-pot. Due to the connection between the armature 38 and piston 46 the piston is gradually moved to the left from the normal position shown in Fig. 1. If, within a certain predetermined time, the circuit conditions should return to normal, the armature 38 would be drawn back by the action of current in the magnet coil to the core 41, forcing the piston back into its normal position. But if the no-voltage circuit condition should continue for a certain predetermined time the piston 46 would be moved slowly by the weight of the armature until the piston passes the critical point where the passageways formed by the grooves 45 register with the space back of the piston 46, whereupon the piston would be snapped under the influence of the weighted armature 38 and said armature would engage the arm 36 for tripping the movable member of the switch, permitting said switch member to pass into off position. The time element may be made any desirable value by adjusting a disk 50, first loosening a nut 54 on the rod 52, so that its opening 51 registers more or less, as the case may be, with the opening 53 in the piston 46. In addition to being automatically tripped, the movable switch member may be tripped manually by pressing hand lever 63, which is connected to the latch 34. While this time element arrangement is particularly adapted for use in connection with potential starters, it can be used in connection with switches of all types which are responsive to low-voltage or no-voltage circuit conditions.

There may be various modifications and arrangements other than that here shown and described, and it is my intention to cover all such modifications and arrangements which do not depart from the spirit and scope of my invention as set forth in the appended claims.

What I claim as new is:

1. In a potential starter, the combination of a movable switch member, means for holding said switch member in a certain position, a member biased to one position but normally held in another position out of engagement with said holding means, said member being movable into engagement with said holding means to trip the same in response to no-voltage circuit conditions, and means associated with said member for retarding the first part of such movement while permitting free travel during the latter part of such movement.

2. In combination, a movable switch mem-

ber, means for holding said switch member in a certain position, an electromagnet having a pivoted armature normally held out of engagement with said holding means and responsive to abnormal circuit conditions, said armature being movable on the occurrence of abnormal circuit conditions to trip said holding means, and means for retarding the tripping action of said armature while permitting said armature to deliver a hammer blow to said holding means to effectively trip the same on the existence of said abnormal conditions for a predetermined time.

3. In combination, a movable switch member biased to one position, means for holding said switch member in another position, an electro-magnet having a pivoted armature normally held out of engagement with said holding means and movable in response to abnormal circuit conditions to trip said holding means, and means operative to retard the effective movement of said armature until said abnormal circuit conditions have existed for a predetermined time while permitting unrestricted final movement of said armature whereby the latter delivers a hammer blow in tripping said holding means, said retarding means comprising a dash-pot and a member directly connected to said armature and operatively associated with the piston of said dash-pot.

4. In combination, a movable switch member biased to one position, means for holding said switch member in another position, means for releasing said holding means comprising an electromagnet and an element held in inoperative position thereby during normal circuit conditions, said element being mechanically independent of said releasing means and biased to a position wherein it is engageable therewith to actuate said releasing means said element being movable toward said latter position on the occurrence of low voltage circuit conditions, and means operative to retard the initial part of such movement while permitting free and unrestricted travel during the latter part of such movement.

5. In combination, a movable switch member normally retained in one position, and means for causing the actuation of said switch member to another position, said latter means comprising a member movable in response to abnormal circuit conditions and effective to produce a hammer blow in the actuation of said movable switch member, and means associated with said member for insuring a retarded initial movement thereof and an unretarded final movement thereof.

6. In combination, a movable switch member biased to one position, means for holding said switch member in another position, an electromagnet having an armature movable in response to low voltage conditions to engage said holding means and render the same ineffective, means operative to cause the initial movement of said armature for actuating said holding means to be retarded and the latter part of such movement to be free and unrestricted, and means movable with said switch member and engageable with said armature for resetting the same.

7. In combination, a movable switch member normally retained in one position, means for controlling the actuation of said switch member to another position, said latter means comprising a member movable in response to abnormal circuit conditions, and means associated with said member for insuring the retardation of effective movement thereof for a definite time interval on the occurrence of said predetermined conditions while permitting an unretarded final movement thereof effective to produce a hammer blow in its action of controlling the actuation of said switch member.

8. In combination, a movable switch member normally retained in one position, means controlling the operation of said switch member to another position, said latter means comprising a member normally held in inoperative position during the existence of normal circuit conditions and operative on the occurrence of abnormal circuit conditions to exert its controlling effect on the operation of said switch member, and means associated with said member for insuring that effective operation of said member is retarded until said abnormal circuit conditions have existed for a definite time interval and that the final movement of said member is substantially unrestricted.

9. In combination, a movable switch member normally retained in one position, means for controlling the actuation of said switch member to another position, said latter means comprising an element movable in response to abnormal operating conditions, means associated with said element for insuring the retardation of effective movement of said element for a definite time interval on the occurrence of said abnormal operating conditions and the unrestricted final movement of said element to produce a hammer blow in the operation of said element, and means operable on movement of said switch member to said first position for resetting said element.

Milwaukee, Wis., March 12, 1912.

In testimony whereof I affix my signature, in the presence of two witnesses.

HALFDAN A. STEEN.

Witnesses:

LOUIS C. NICHOLS,

FRASER JEFFREY.