

W. S. MORSE.
CURRENT CONTROLLING APPARATUS.
APPLICATION FILED OCT. 26, 1912.

1,103,528.

Patented July 14, 1914.

Fig. 1.

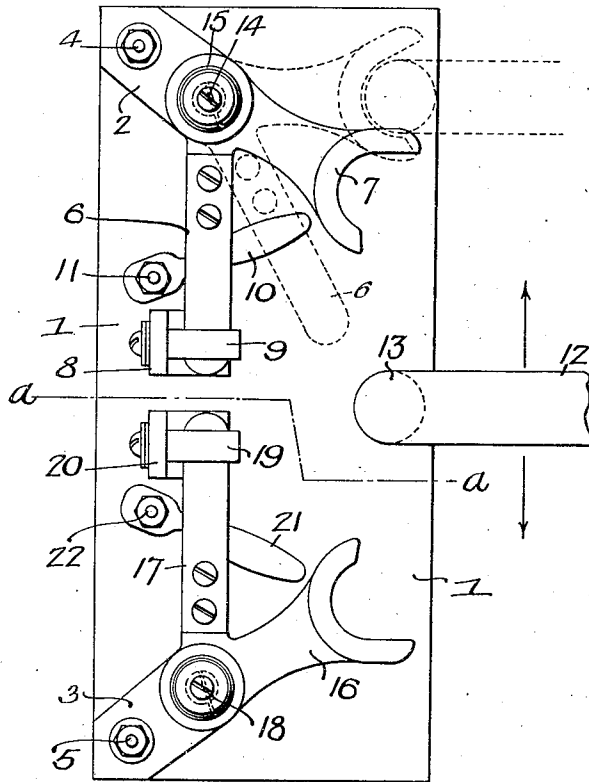


Fig. 2.

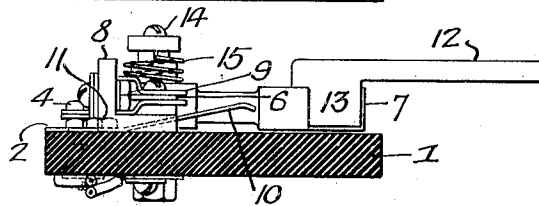
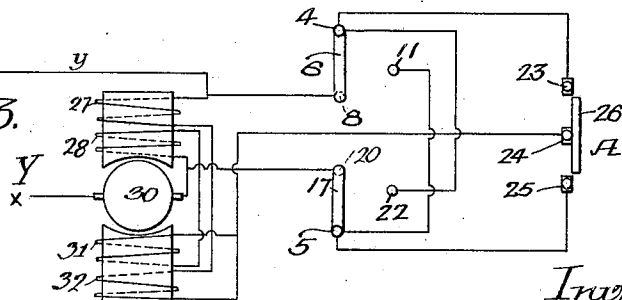


Fig. 3.



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WILLIS S. MORSE, OF PHILADELPHIA, PENNSYLVANIA.

CURRENT-CONTROLLING APPARATUS.

1,103,528.

Specification of Letters Patent.

Patented July 14, 1914.

Application filed October 26, 1912. Serial No. 727,955.

To all whom it may concern:

Be it known that I, WILLIS S. MORSE, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Current-Controlling Apparatus, of which the following is a specification.

One object of my invention is to provide a novel form of electric switch having its parts so arranged as to open a circuit under predetermined conditions and thereafter close a second circuit in order to first stop operation of an electric motor and then start said motor in a reverse direction.

Another object of my invention is to provide a novel combination of apparatus including an electric switch having a member designed to move between predetermined limits, in combination with switch blades actuated by said member at either end of its path of movement, to first open a motor circuit and immediately thereafter close said circuit in such a manner that the motor is reversed.

I further desire to provide a novel form of double acting limit reversing switch particularly designed for use in connection with the tension regulating mechanism of a web printing press, for the purpose of stopping and immediately thereafter reversing an electric motor which governs the retarding force exerted upon the paper web of the press.

These objects and other advantageous ends, I secure as hereinafter set forth, reference being had to the accompanying drawings in which,

Figure 1 is a front elevation of a switch forming part of and constructed according to my invention; Fig. 2 is a vertical section on the line *a—*a**, Fig. 1 and Fig. 3 is a diagrammatic representation of the electrical connections of the circuit controlling apparatus comprising my invention, and showing it as connected under conditions of use.

In Figs. 1 and 2 of the above drawings, 1 represents a supporting plate or other structure of insulating material on which are mounted a pair of terminals 2 and 3 having binding posts 4 and 5 for the attachment of electrical conductors. To the first of these terminals is pivoted an L-shaped structure formed of a switch blade 6 and a forked arm 7; the latter extending in the present instance, at an angle of about 60 degrees to

the line of the blade. Mounted on the supporting plate 1 is another terminal structure 8, having a pair of jaws 9 designed to receive the blade 6, when this and the forked arm 7 are at one extreme of their possible path of movement. A spring contact 10 is also mounted on the supporting plate 1 in such position as to be engaged by the blade 6 immediately after this has been so moved as to disengage the clips or jaws 9, and it has connected to it a binding post 11.

An operating member in the form of a reciprocable arm 12 is mounted to be actuated in any suitable manner from the motor to be controlled and one device for accomplishing this end is shown and described in my application for Patent Number 681,781, filed March 5, 1912. Said arm 12 has at its end a projecting portion 13 so placed as to engage the fork 7 under certain conditions of operation, when the blade 6 is in engagement with the jaws 9. Such engagement with the fork thereafter causes it and the blade 6 to turn on their pivot 14; it being noted that there is a spring 15 mounted on said pivot which while at all times tending to press the arm and blade toward the plate 1, is capable of yielding to permit of a slight motion of the parts longitudinally of the pivot. A second forked arm 16 with a blade 17 rigidly fixed thereto is similarly mounted on a pivot 18 carried by the terminal 2 and said arm 16 is so formed that in one position the projection 13 of the arm 12 may engage it to turn it with the blade on said pivot. The blade is designed to cooperate with a pair of jaws 19, mounted on a terminal structure 20 and in addition there is mounted on the supporting plate 1, a spring contact 21, so arranged as to be engaged by the blade 17 immediately after this has been so moved as to disengage said jaws 19. A binding post 22 is provided for the contact 21.

Under conditions of use the switch illustrated in Figs. 1 and 2 may be connected with the other pieces of apparatus comprising my invention as illustrated diagrammatically in Fig. 3; the binding post 4 being connected to a terminal 23 of a reversing switch A which also has two other terminals 24 and 25. In the present instance said switch A is so designed that a slidable contact 26, at all times in electrical connection with the contact 24, will engage the contact

23 when displaced a slight distance from its neutral position in one direction, and will engage the contact 25 when displaced in the opposite direction from said neutral position. This latter contact 25 is connected to the binding post 5 while the binding post 22 is connected to the binding post 4, and the binding post 11 is connected to the post 5. The terminal 8 in the present instance is connected to one terminal of the armature 30 of the electric motor Y to be governed at the point of connection thereto of one of the four field coils. These coils 27, 28, 31 and 32 are connected in series and at the point of junction of the two field coils 28 and 31 a connection is made with the contact 24 of the reversing switch A. The contact or terminal 8 is connected to the second end of the field winding 32 as well as to one of the two current supply mains, while the second current supply main is connected to the second armature terminal of the motor. In this particular instance the motor Y is so designed that when all of its field windings are energized by a current flowing through them in series, their effect on the armature is such that it is held from rotation, whereas either pair of said field windings 27—32 or 28—31 when excited by itself causes revolution of the armature in one direction or in the other. With this arrangement of parts if it be assumed that the blade 6 is in engagement with the contact 8, and the blade 17 with the contact 20, the armature of the motor will not turn as long as the movable member 26 of the reversing switch A is in its neutral position, for, under these conditions, the current will flow from the supply main *x* through the armature 30 and all of the field windings to the supply main *y*. If, however, the member 26 be so moved as to connect the contacts 23 and 24, it will be seen that the field coils 27—32 are short circuited and current will flow from the supply main *x* through the armature 30, field coils 28 and 31, contact 24, switch member 26, contact 23, terminal 4, blade 6, terminal 8, and so to the second supply main *y*. If, on the other hand, the contact of the reversing switch A be moved to electrically connect the contacts 24 and 25, then current flows from the supply main *x* to the armature 30, through the contact 20, switch blade 17, terminal 5, contact 25, switch member 26, contact 24, field coils 32 and 27, and so to the second supply main *y*, thus short circuiting the coils 28—31. Said field coils are so arranged that when the coils 28—31 are energized as above noted, the armature turns in one direction, while when the coils 27—32 are supplied with current, the armature turns in the opposite direction.

It will be understood that under the conditions above described, the operating arm

12 is actuated by, and moved in proportion to the number of rotations of the motor armature, it being the intention that after said motor has made a predetermined number of revolutions in one direction, it shall be prevented from further operation and then caused to rotate in an opposite direction. Consequently after the motor has operated to the predetermined extent in one direction, the projection 13 of the operating arm 12 comes into engagement with the forked arm 7, for example, and turns this with the blade 6 on the pivot 14. Said blade is thereby moved out of engagement with the jaws 9, so that its connection with the terminal or binding post 8 is broken, and, as a consequence, the motor at once stops with all of its field coils energized. If the motor drifts however, it moves the arm 12 sufficiently forward to cause the blade 6 to be brought into engagement with the contact 10 with the result that current flows from the supply main *x* to the armature 30, contact 20, blade 17, contacts 5 and 11, blade 6, contact 4, contact 23, switch member 26, contact 24, field coils 32 and 27, and so to the supply main *y*. As a consequence of the short circuiting of the coils 28—31, the field coils 27—32 so act on the armature 30 as to cause this to rotate in a direction the reverse of that heretofore noted, thereby starting back the movable arm 12, which shortly thereafter so moves the fork 7 and blade 6 that this disengages the contact 10 causing the motor to stop.

With the various parts in the above noted positions a movement of the contact member 26 so that it disengages the contact 23 and electrically connects the contact 25 with the contact 24 again short circuits the field coils 28—31 and causes the motor to start under the action of the field coils 27—32. In this case its direction of rotation is such that the arm 12 is moved toward the forked arm with its projection 13 in engagement with the forked arm 7; this with the blade 6 being so moved that the latter is brought into engagement with the jaws 9.

It should be noted that the forks of the two arms 7 and 16 are so constructed that after having been once engaged by the projection 13 and moved out of the normal position shown in full lines in Fig. 1, they cannot be disengaged by said projection when the direction of movement of this latter is reversed, until their respective blades are again in their normal positions, engaging the jaws 9 or 19, as the case may be.

The operation of the motor and the movement of the arm 12 under the action thereof will continue either until the member 26 is shifted out of engagement with the contact 25 so as to stop the motor and into engagement with the contact 23 to thereafter start said motor in the opposite direction, or on

the other hand, until the projection 13 engages the forked arm 16 and so moves it as to stop the motor by moving the blade 17 out of engagement with the jaws 19 as above described in connection with the forked arm 7. In such case the stoppage of the motor is due to the simultaneous energization of all its field windings as above noted. Should the said arm 12 move the forked arm 16 through a sufficient distance, the blade 17 would be brought into engagement with contact 21 and thereby reverse the direction of rotation of the motor for a sufficient time to cause the arm 12 to move said blade 17 out of engagement with the contact 21 and again stop the motor.

By the above described arrangement of parts the operation of the motor is so controlled that after having made a predetermined number of revolutions in either direction, it is either reversed or is caused to come to rest while by means of the reversing switch A it may be caused to start and operate in either direction from any position within its limits of movement. Moreover the construction of the limit switch is such that one of the two blades 6 or 17 is necessarily in engagement with its corresponding jaws 9 or 19, regardless of the position of the other blade, in view of the peculiar construction of the forked arms 7 or 16 above referred to. As a result, when the motor has been caused to stop owing to one of the blades being disengaged from its jaws or from its corresponding contact 10 or 21, as the case may be, it is still possible for the motor to be again started by proper operation of the member 26 of the reversing switch A.

I claim:

1. The combination with an electric motor of a governing device therefor consisting of a member movable by said motor; with two reversing switches electrically connected in circuit with the motor and mounted to be respectively actuated at irregular intervals by said movable member adjacent the two ends of its path of movement.

2. The combination with an electric motor of a governing device therefor consisting of a member movable by said motor; two reversing switches connected to the motor and mounted to be respectively actuated by said movable member adjacent the two ends of its path of movement; with a third reversing switch for the motor operatively independent of said first two switches.

3. The combination with an electric motor of a governing device therefor consisting of a member movable by said motor in a substantially predetermined path; with two switches in circuit with said motor and respectively placed to be acted on by said movable member adjacent the ends of its path of movement, to first break the motor actu-

ating circuit and thereafter cause the reversal of the direction of rotation of said motor.

4. The combination with an electric motor of a governing device therefor consisting of a member movable by said motor in a substantially predetermined path; with two switches in circuit with said motor respectively placed to be acted on by said movable member adjacent the ends of its path of movement to break the motor actuating circuit, each of said switches including means for completing the motor circuit by continued movement of its movable element after said circuit has been opened.

5. The combination of a supporting structure; a switch blade pivotally mounted thereon; a forked arm connected to said blade; two contacts mounted to be engaged by said blade; an electric motor connected to the switch formed by said blade and contacts; with a member actuated by the motor and mounted to engage the forked arm to move the blade from engagement with one contact into engagement with the other contact and finally out of engagement with the latter.

6. The combination with an electric motor of a governing device therefor consisting of a member reciprocable by said motor, and two reversing switches for the motor mounted to be actuated by said member at the two ends of its path of movement; each of said switches consisting of a pivoted blade having an arm placed to be engaged by the reciprocable member, and two contacts placed to be respectively engaged by the blade, when it is in two different positions.

7. The combination of an electric motor having a plurality of field windings connected to be incapable of causing rotation of the armature when they are energized in a predetermined manner; a member actuated from the motor; two switches mounted to be operated by said member for stopping rotation of the motor and thereafter reversing its direction of rotation under predetermined conditions; and a third switch for controlling the direction of rotation of the motor independently of said first two switches.

8. The combination of an electric motor having a plurality of sets of field windings connected to be incapable of causing rotation of the armature when they are supplied with current in a predetermined manner; a switch connected to short circuit either of the sets of field windings; a member movable by the motor between predetermined limits; and two other switches respectively mounted to be actuated by said member adjacent the ends of its path of movement; both of said latter switches being connected to short-circuit one of the sets of field wind-

ings when in one position and to short circuit the other set of field windings when in a second position.

9. The combination with an electric motor, of a member movable by said motor in a substantially predetermined path, a reversing switch connected in circuit with said motor and placed and constructed to be acted on by said movable member adjacent the end of its path of movement to first break the motor actuating circuit, thereafter to cause the reversal of the direction of rotation of said motor, and finally to cause the motor to stop.
10. The combination with an electric motor, of controlling means therefor including two switches spaced apart and connected in circuit with said motor, and a member movable by said motor and normally "floating" intermediate said switches but arranged to operate either one of the switches to break said motor actuating circuit to limit the

extent of operation of said motor under increasing abnormal conditions.

11. The combination of a pivotally mounted switch blade, a forked arm connected to said blade, two contacts mounted to be engaged by said blade, an electric motor connected to the reversing switch formed by said blades and contacts, and a member actuated by the motor and adapted to be retained in engagement with the forked arm while moving the blade from engagement with one contact into engagement with the other contact to reverse the rotation of said motor and out of engagement with the said other contact.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

WILLIS S. MORSE

Witnesses:

WILLIAM E. BRADLEY,

WM. A. BARR.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."