H. M. STEVENS.

ELECTROMAGNETIC ACTUATING MECHANISM.

APPLICATION FILED AUG. 4, 1913.

1,119,660. Patented Dec. 1, 1914.

Fig. 1.

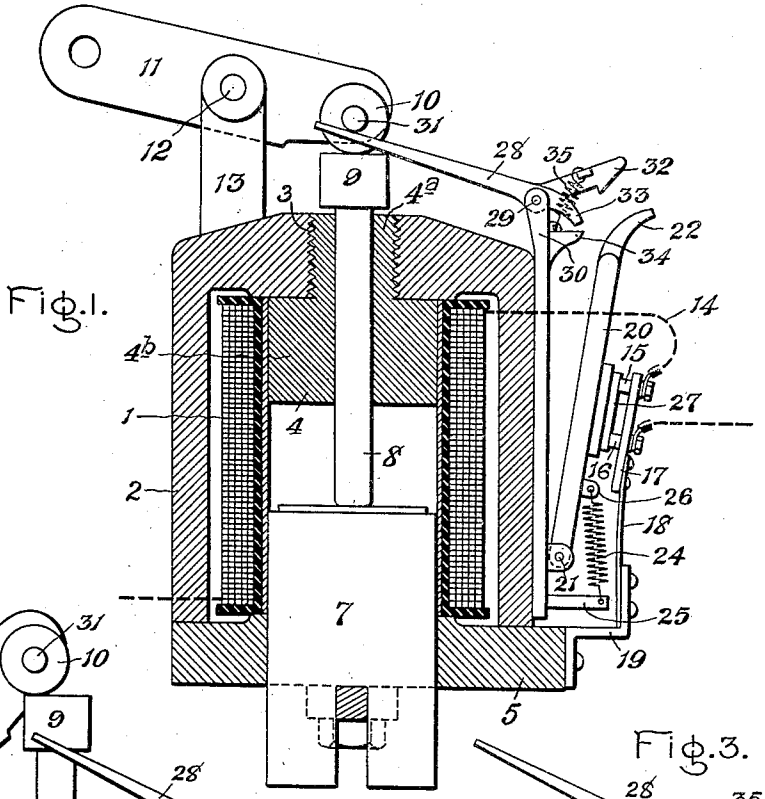


Fig. 2.

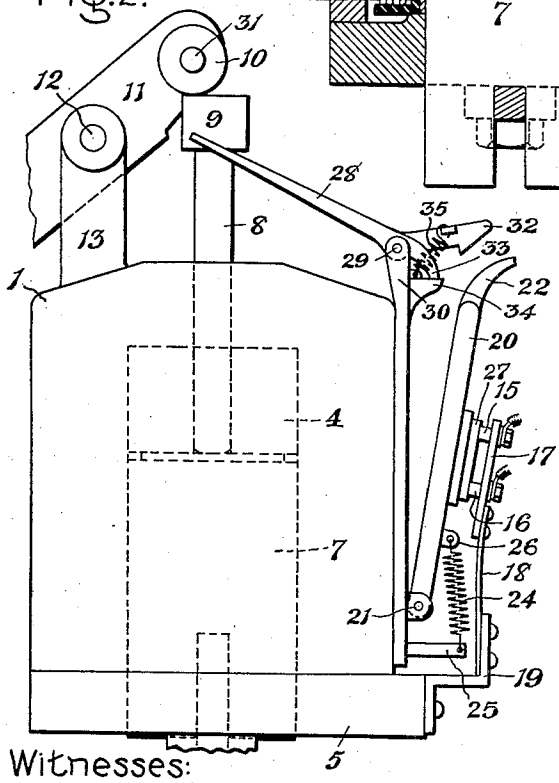
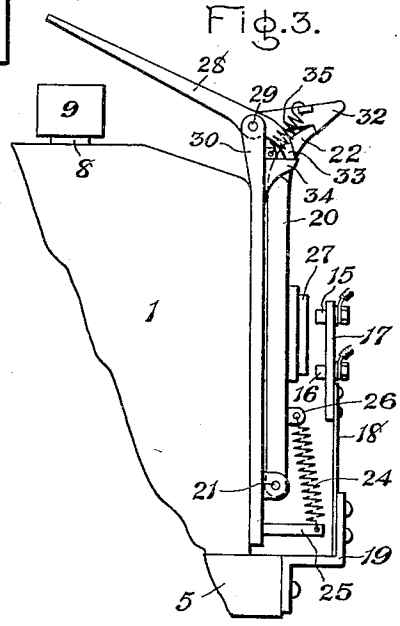


Fig. 3.



Witnesses:

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UNITED STATES PATENT OFFICE.

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ELECTROMAGNETIC ACTUATING MECHANISM.

1,119,660. Specification of Letters Patent. Patented Dec. 1, 1914.

Application filed August 4, 1913. Serial No. 782,795.

To all whom it may concern:

Be it known that I, HARRY M. STEVENS, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Electromagnetic Actuating Mechanism, of which the following is a specification.

My invention has reference to mechanism comprising an electromagnet, such as a solenoid of the iron clad plunger type, the armature or core of which in its movement toward the magnet performs a useful operation, such as the closing of a switch. It is, of course, desirable to maintain the circuit of the magnet closed until this movement is completed, as otherwise the switch will not be completely closed.

The object of my invention is to provide means for maintaining the circuit of the magnet closed until the movement of its armature or core is completed and for then opening its circuit in order to avoid waste of energy and to prevent injury to the magnet.

For a fuller understanding of my invention, reference may be had to the accompanying drawings, in which, merely for purposes of illustration, I have shown one of the various forms in which my invention may be embodied, and in which—

Figure 1 is a vertical section through the magnet showing the coöperating parts in the position which they occupy just before the core of the magnet is attracted; Fig. 2 is a side elevation of the same showing the position which the parts occupy just after the core of the magnet has completed its movement, but before the circuit of the magnet has been opened, and Fig. 3 is a detail view showing the positions of the auxiliary armature and coöperating parts after the armature has been attracted and has opened the circuit of the magnet, and after the core of the magnet has dropped back to its initial unattracted position.

In the particular form of device shown in the drawings, 1 is the coil for the magnet, which is surrounded by an iron shell 2 closed at the upper end but provided with a screw-threaded opening 3 in which is received the screw-threaded contracted part 4^a of a block 4, the lower and larger end 4^b of which constitutes a stationary iron core for the magnet. The core 4^b coöperates with a movable core or armature 7, passing through the base plate 5, which core engages a plunger 8 passing axially through the block 4. The upper end of this plunger is provided with a head 9 which engages a roller 10 on one end of a lever 11 which is pivoted at 12 on a bracket 13. The opposite end of the lever 11 may be connected to a switch so as to close the same when the end of the lever which is engaged by the plunger 8 is lifted, or the movement of the lever may perform any other useful function.

In order to maintain the circuit of the magnet closed until its core has completed its movement, the circuit of the magnet comprising the conductor 14 is controlled by a pair of contacts 15 and 16, carried by a block 17 which is mounted on a spring strip 18. This spring strip may be secured to a bracket 19 which is in turn secured to the base plate 5. An auxiliary armature 20 is provided for the magnet, which is pivoted at its lower end at 21 and is curved outwardly at 22 at its upper end. This armature is normally held away from the magnet by a spring 24, one end of which is attached to a bracket 25, while its other end is connected to an arm 26 on the armature 20. The armature is provided with a contact plate 27 which bridges the contacts 15 and 16 when the armature is in its outer or released position. Now the iron shell of the magnet is so designed with reference to the ampere turns of the coil that when the core 7 is separated from the block 4 and an air gap is thus included in the magnetic circuit, the shell of the magnet is unsaturated, but when the core 7 has been attracted and brought into engagement with the block 4, a metallic path for the magnetic circuit is then completed and the shell, or some part of it, which forms a constricted portion of the magnetic circuit, becomes saturated. The saturation of this part of the shell of the magnet causes the creation of a stray field sufficient to result in the attraction of the auxiliary armature 20 to the shell of the magnet, whereupon the circuit of the magnet is opened at the contacts 15 and 16. In order that the circuit of the magnet may remain open when the auxiliary armature is attracted, a latch or lock is provided, comprising a lever 28 which is pivoted at 29 on a bracket 30 projecting upwardly from the shell of the magnet. The outer

end of one arm of the lever 28 is engaged by a pin 31 carried by the lever 11. The other end of the lever 28 comprises an arm 32 formed with a shoulder to constitute a latch. The arm also comprises a finger 33 which engages a stop 34 on the bracket 30. The latch 32 is drawn downwardly by a spring 35, one end of which is connected to the latch 32, while the other end is connected to the stop 34, the movement of the latch being limited by the engagement of the finger 33 with the stop 34. When the lever 28 is held in the position indicated in Fig. 1 by the pin 31, the latch 32 is not in a position to engage the upper end of the auxiliary armature 20, so that in case the armature is lifted by accident it at once resumes its original position. As soon, however, as the lever 11 has been lifted by the movement of the core 7 and the lever 28 is thus free to occupy the position indicated in Fig. 2, the latch 32 is lowered by the spring 35 so that it is in a position to engage the end of the lever 20 when the same is attracted. As soon as the circuit of the magnet is broken, the core of the magnet drops down, leaving the latch or lock in engagement with the auxiliary armature in the position indicated in Fig. 3, with the circuit of the magnet open at the contacts 15 and 16.

The operation of the magnet and coöperating parts is as follows: When the magnet is energized in the usual manner, its core 7 is attracted and brought into engagement with the block 4, at which time the metallic path of the magnetic circuit is completed. Shortly after this operation takes place, the shell of the magnet becomes saturated and the stray field which is thus created is sufficient to attract the armature 20. The armature on being attracted breaks the circuit through the coil 1 at the contacts 15 and 16 thereby deënergizing the coil and allowing the core 7 to fall to normal position. This operation, however, takes place an appreciable time after the core of the magnet has completed its movement and after the oil switch or other device, which is operated in response to the movement of the core of the armature, has been actuated.

I have referred, for convenience, in certain of the claims to an iron clad magnet, but it is not necessary for the purposes of my invention that a magnetic shell should completely surround the coil, as shown in the drawing. When I refer to an iron clad magnet, I mean any form of magnet having a magnetic circuit through a metallic path outside the magnet winding.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof; but I desire to have it understood that the apparatus shown is only illustrative, and that the invention can be carried out by other means.

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

1. In combination, an iron clad magnet, the armature of which, when attracted, completes a metallic path for the magnetic circuit and the shell of which becomes saturated on the completion of said metallic path, and an auxiliary armature for said magnet which normally closes the circuit of said magnet and is attracted and opens the circuit of said magnet only in response to the stray field created by said magnet when the principal armature is attracted, and means for locking said auxiliary armature in circuit opening position.

2. In combination, an iron clad plunger magnet, the core of which, when attracted, completes the magnetic circuit, and the shell of which becomes saturated when the core has been attracted and the metallic path thus completed, an auxiliary armature for said magnet which is attracted only in response to the stray magnetic field which is created when the shell of the magnet is saturated, means controlled by said auxiliary armature for closing the circuit of said magnet when the armature is in its normal position and for opening the circuit of the same when the armature is attracted, a member which is moved in response to the movement of the coil, and a locking member for said armature which is disabled by said movable member when the latter is in its normal position.

3. An operating mechanism for an electric switch comprising an electromagnet having a magnetic circuit saturated at a predetermined point when substantially closed, a main armature movable in response to the energization of the magnet to substantially close said magnetic circuit, an auxiliary armature normally closing the circuit through said magnet and movable in response to the stray flux produced by said magnet when energized to break the circuit through the magnet, means for holding said auxiliary armature in circuit opening position when the switch is in one position, and means for releasing said auxiliary armature as the switch moves into the opposite position.

In witness whereof, I have hereunto set my hand this 2nd day of August, 1913.

HARRY M. STEVENS.

Witnesses:
BENJAMIN B. HULL,
HELEN ORFORD.

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