F. L. STONE.

ELECTROMAGNETIC SWITCH.

APPLICATION FILED AUG. 9, 1919.

1,331,882.

Patented Feb. 24, 1920.

2 SHEETS—SHEET 1.

Fig. 1

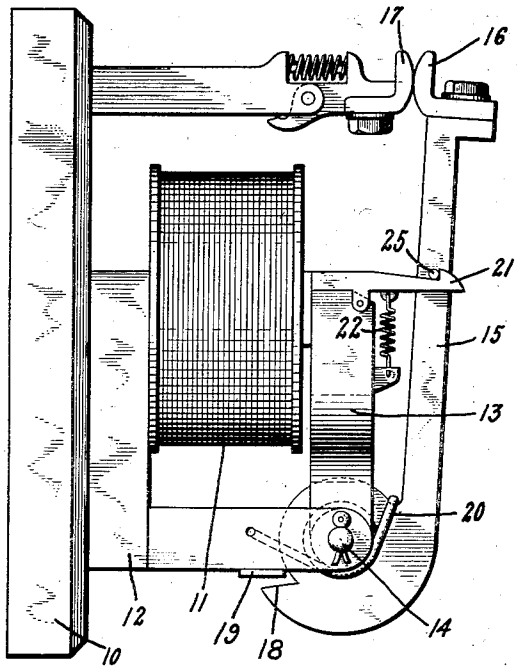


Fig. 2

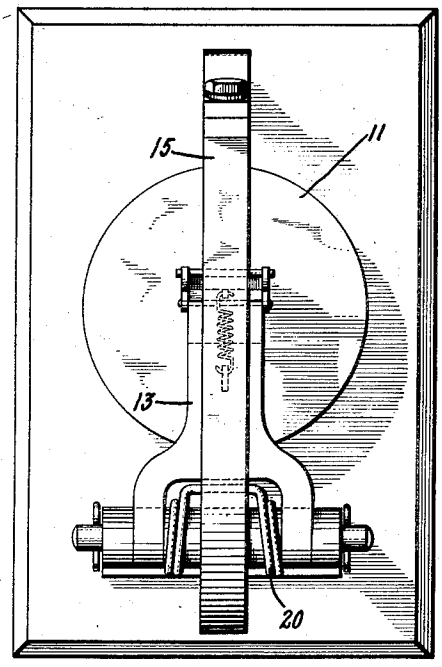
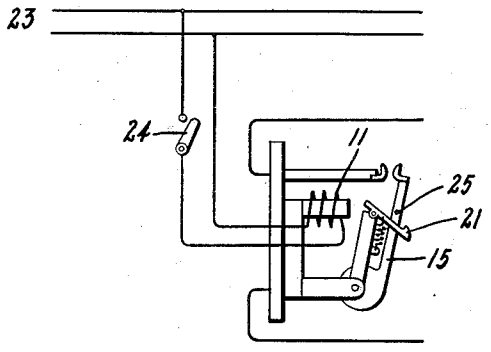


Fig. 3



Inventor:
Fred L. Stone,
by Albert G. Davis
His Attorney.

UNITED STATES PATENT OFFICE.

FRED L. STONE, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ELECTROMAGNETIC SWITCH.

1,331,882. Specification of Letters Patent. Patented Feb. 24, 1920.

Application filed August 9, 1919. Serial No. 316,465.

To all whom it may concern:

Be it known that I, FRED L. STONE, a subject of the King of Great Britain, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Electromagnetic Switches, of which the following is a specification.

My invention relates to devices for controlling electric circuits and has for its object the provision of an improved device of this character which will operate to open and close an electric circuit in a reliable, simple and efficient manner.

My invention relates more specifically to electromagnetically controlled switches and has particular reference to increasing their speed of operation. It is frequently important that an electromagnetic switch should operate with the utmost speed when its operating winding is deënergized. As ordinarily constructed, the switch member is biased to open position by gravity and, by reason of the fact that it also acts as the armature of the electromagnet and must therefore have considerable weight, it is slow to start its movement when released by the electromagnet.

In carrying out my invention I so arrange the parts that the contact member, which may be light and will therefore start to move quickly, moves independently of the armature when the electromagnet is deënergized, provision being made whereby the armature moves the contact member when the magnet is energized.

In the accompanying drawing illustrating my invention Figure 1 is a side elevation of an electromagnetic switch embodying my invention; Fig. 2 is a front view of the same; Fig. 3 is a diagrammatic view of the switch and its connections; Fig. 4 is a side elevation of another embodiment of my invention; Fig. 5 is a front view of the same and Fig. 6 is a diagrammatic view showing this form of invention connected to the electric circuit; Fig. 7 is a side elevation of a still further embodiment of my invention, and Fig. 8 is a front view of the same.

Referring first to the form of my invention shown in Figs. 1 to 3, 10 represents an insulating base upon which the parts are mounted. Mounted upon the base 10 is an electromagnet comprising an operating winding 11 and a U-shaped magnet frame 12 having one of its legs energized by the winding 11. An armature member 13 is pivoted at 14 so as to coöperate with the magnet frame in a well understood manner. Pivoted concentrically with the armature member 13 is the contact member 15 having at its upper end a contact member 16 for operating with a stationary resiliently mounted contact 17. The contact arm 15 is normally biased to open position in which the projection 18 engages the stop 19 by a spring 20, so that normally it occupies the position shown in Fig. 3. As shown the armature member 13 is biased to normal position by gravity.

A catch 21 of magnetic material is provided for moving the contact arm 15 from its normal open position to the closed position as shown in Figs. 1 and 2. This catch is pivotally mounted on an armature 13 and is biased to the position shown in Fig. 3 by means of the spring 22. This catch 21 not only moves the switch member to the closed position but also holds it there as long as the winding 11 is energized. As thus constructed, and arranged, the operation of my invention is as follows: The winding 11 is energized from the source of supply 23 by the closing of the pilot switch 24, and thereupon the armature 13 is attracted and moves to the attracted position from its normal open position. The pivoted catch 21 is also moved against the bias of the spring 22 so as to engage the pin 25 on the contact arm 15 by reason of the magnetic attraction of the armature 13 for the left-hand end of the catch, thereby causing the armature 13 and the contact arm to move as a unit to the closed position at which the contacts 16 and 17 make wiping engagement. When the pilot switch 24 is opened and the winding 11 is deënergized, the catch 21 is released from engagement with the pin 25 by reason of the bias due to the spring 22 and the demagnetization of the armature 13 and the left-hand end of the catch 21. The contact arm 15 will thereby be caused to move quickly to the open position due to the bias of the spring 20 and the force of gravity. The switch arm will move quickly because it has a small inertia effect by reason of being constructed of light weight material. The armature 13 will also move to the open position, but this will occur an appreciable interval of time after the contact 16 and

17 have separated. A quick separation of the switch contacts is thereby effected and the delay which would be caused by the heavy armature 13 if it were secured to the contact arm is avoided.

Referring to Figs. 4, 5 and 6 wherein I have shown another embodiment of my invention, the switch is provided with a winding 26 and a U-shaped magnet frame 27, a heavy armature 28 pivoted at 29 and a contact member 30 also pivoted at 29. The armature 28 is biased to the open position by gravity and the contact arm 30 is biased to the open position by the spring 31 in addition to the force of gravity. In the open position, (shown in Fig. 6) the projection 32 of the contact arm 30 engages a stop 33. Mounted on the armature 28 is an electromagnet having a winding 34 and an armature 35 which is biased to the upper position by means of the spring 36. The windings 26 and 34 are connected in series, and when the winding 34 is energized, the armature 35 is pulled downwardly against the bias of the spring 36 to engage a stop 37 on the contact arm 30. This armature 35 coöperating with the stop 37 provides a means whereby the contact bar is moved to and held in the operated position against its bias to the open position. As thus constructed and arranged, the operation of my invention as shown and embodied in Figs. 4, 5 and 6 is as follows:—When the pilot switch 38 is closed, the windings 26 and 34 are both energized from the source of supply. The end of the armature 35 engages the stop 37 and the switch arm 30 is thereby moved to the closed position as a unit with the armature 28. When the pilot switch 38 is opened, the windings 26 and 34 are deënergized and the end of the armature 35 is quickly released from its engagement with the stop 37 due to the bias of the armature 35 to the upper position. The contact arm 30 is of light weight material having a small moment of inertia and it is therefore caused to move quickly to the open position by reason of the bias of the spring 31 and the force of gravity. The armature 28 also moves to the open position but an appreciable interval of time after the contact arm 30 has separated the switch contacts. The switch contacts are thereby quickly opened and the delay which would otherwise be caused by the weight of the relatively heavy armature 28 is thus avoided.

In Figs. 7 and 8 I have shown a further embodiment of my invention. In this arrangement the relatively heavy armature 39 is pivotally mounted at 40 on one of the ends of the U-shaped magnet frame 41 on which the switch winding 42 is mounted and is biased to the open position by gravity. The contact arm 43 which is relatively quite light and of non-magnetic material is also pivoted at 40 and biased to the open position by gravity. Connected to this contact arm 43 is an armature 44 which is adapted to hold the contact arm 43 in the closed position after it has been moved there by the heavy armature 39. However, the armature 44 is not of such a size or of magnetic material of such quality that the contact arm would be moved to the closed position without the assistance of the heavy armature 39. The heavy armature 39 is adapted for free relative movement with the armature 44 and to that end has a sleeve portion which surrounds the armature 44 and a cutaway portion with which the pin 45 in the armature 44 engages so as to move the contact arm 43 with the armature 39 as a unit to the closed position when the winding 43 is energized. An arm 46 on the armature 39 coöperates with a pin 47 to limit the travel of the armature 39. On the end of the contact arm 43 is a pivotally mounted wiping contact 48 which is biased toward the stationary contact by means of the spring 49. As thus constructed and arranged, the operation of my invention as embodied in Figs. 7 and 8 is as follows: When the winding 42 is energized, the armature 39 is attracted and starts to move to the closed position. After it has made a limited movement, the pin 45 is engaged by the surface of the cutaway portion of the sleeve forming a part of the armature 39, and the contact arm 43 moves to the closed position as a unit with the armature 39 until arm 46 on the armature 39 engages the stop pin 47. At this time the pivotally mounted contact 48 has engaged with the stationary contact and the armature 44 completes its movement into engagement with the end of the U-shaped magnet structure on which winding 42 is mounted, thereby compressing the spring 49 and giving a wiping action to the contacts in closing. When the winding 42 is deënergized, the switch arm 43 will be quickly moved to the open position by reason of this switch arm having a small moment of inertia due to its light weight. The armature 44 will not interpose an objectionable delay in the operation of the switch in opening because this armature is relatively quite light. A small but appreciable interval of time after the contact arm 43 has been moved to separate the switch contacts the armature 39 will also be moved to the open position, the sleeve portion sliding along the armature 44. After the contact arm 43 has made a slight movement toward the open position, the compression of the spring 49 is relieved and the pressure between the switch contacts is thereby removed. In the open position the lower end of the pivotally mounted contact 48 will engage the stop 50.

In accordance with the provisions of the

patent statutes, I have described my improved method in connection with the steps which I now consider to represent the best manner of carrying it out, but I desire to have it understood that the specific steps enumerated are only illustrative and that the invention may be carried out by such other steps as come within the scope of the appended claims.

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

1. An electromagnetic switch comprising an electromagnet, an armature biased to a normal position and movable by said electromagnet to a second position, a contact member having similar positions and having less inertia than the armature member so that it will move more quickly toward its normal position, and means whereby the two members move together when the electromagnet is energized and move independently when the winding is deënergized.

2. An electromagnetic switch comprising an electromagnet, an armature biased to a normal position and movable by said electromagnet to an operative position, a contact member having similar positions and having less inertia than the armature member so that it will move more quickly toward its normal position, and means whereby the armature member moves the contact member when the electromagnet is energized and moves independently thereof when the winding is deënergized.

3. An electromagnetic switch comprising an electromagnet, an armature biased to a normal position and movable by said electromagnet to an operative position, a contact member having similar positions and having less inertia than the armature member so that it will move more quickly toward its normal position, and means whereby the armature and contact member are forced to move as a unit to the operative position but are free to move independently to their normal positions when the electromagnet is deënergized.

4. An electromagnetic switch comprising an electromagnet, an armature biased to a normal position and movable by said electromagnet to an operative position, a contact member having similar positions and having less inertia than the armature member so that it will move more quickly toward its normal position, and means for locking the armature and contact member together so that they will move together from their normal positions when the magnet is energized and releasing them in their operative positions when the magnet is deenergized.

5. An electromagnetic switch comprising an electromagnet, a pivoted armature biased to a normal position and moved by said electromagnet to a second position, a contact member pivoted concentrically with the armature member having similar positions and having less inertia than the armature member so that it will move more quickly toward its normal position and means for locking the two members together so that they will move together from their normal positions when the magnet is energized and releasing them when the magnet is deënergized.

6. An electromagnetic switch comprising an electromagnet, an armature biased to a normal position and movable by said electromagnet to an operative position, a contact member having similar positions and means whereby the contact member is moved by the armature when the electromagnet is energized and moves independently thereof when the magnet is deënergized.

7. An electromagnetic switch comprising an electromagnet, an armature biased to a normal position and movable by said electromagnet to an operative position, a contact member having similar positions and means whereby the contact member and the armature are held in operative position when the electromagnet is energized and moved independently of each other to normal position when the magnet is deënergized.

8. An electromagnetic switch comprising an electromagnet, an armature biased to a normal position and movable by said electromagnet to an operative position, a contact member having similar positions and latching means for locking the contact member and the armature together in the operative position and releasing them so that they may move independently of each other to their normal position when the magnet is deënergized.

In witness whereof, I have hereunto set my hand this 8th day of August 1919.

FRED L. STONE.