H. R. CANFIELD.

ELECTROMAGNETICALLY OPERATED DEVICE.

APPLICATION FILED JULY 6, 1917.

1,354,880. **Patented Oct. 5, 1920.**

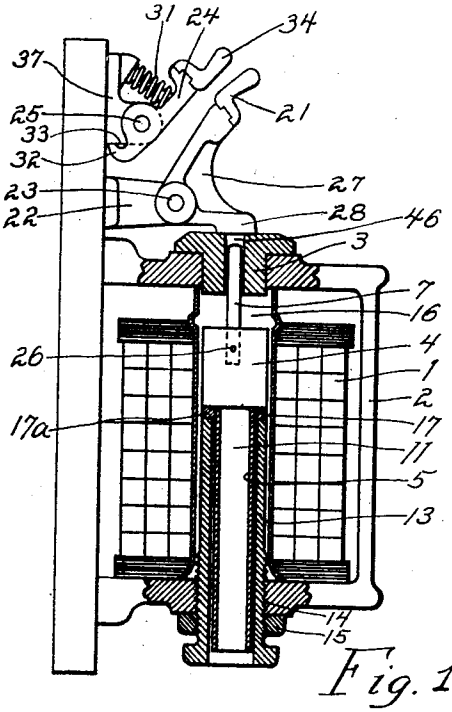


Fig. 1.

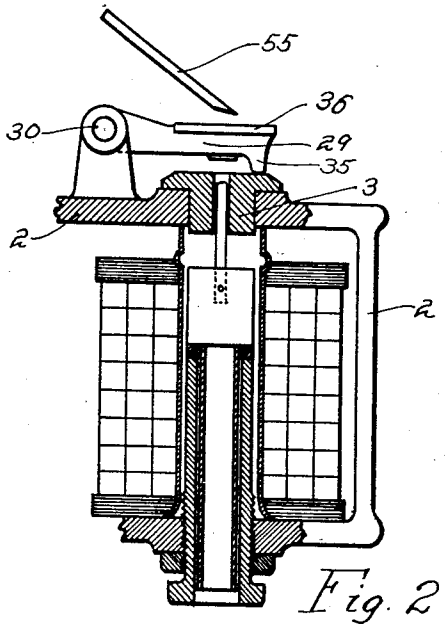


Fig. 2.

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ELECTROMAGNETICALLY-OPERATED DEVICE.

1,354,880. Specification of Letters Patent. Patented Oct. 5, 1920.

Application filed July 6, 1917. Serial No. 178,923.

To all whom it may concern:

Be it known that I, HARRY R. CANFIELD, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented new and useful Improvements in Electromagnetically-Operated Devices, of which the following is a specification.

This invention relates to electromagnetically operated devices, and particularly to magnetically operated switches.

It is one of the objects of this invention to provide an electromagnetic switch which, when its operating winding is energized above a predetermined value, remains in its normal, or open, position without restraint due to magnetism produced by the winding, and which closes when the energization thereof falls to a predetermined value. In my application, Serial Number 583,000, filed September 21, 1910, and in my Patent, No. 1,214,752, issued February 6, 1917, I show a switch in which the movable switch member is magnetically held in its open position when the current in its energizing winding is relatively high, and magnetically moved to closed position by the flux of the energizing winding when the current is reduced to a predetermined value, but in the present invention the energizing winding exerts no force on the switch member to prevent it from closing. The switch member has, when the winding is unenergized, a normal bias to the open position, and remains open by this bias alone without the assistance of bias from the winding when the current is above a predetermined value. Indeed, in carrying out my invention, the movable switch member, when in its open position, may be entirely disassociated from the magnetically actuated member or members which move it to the closed position, so that while the movable switch member may be moved to the closed position and held in the closed position by the force originating in the magnetic flux of the energizing winding, the movable switch member is not acted upon at all by the magnetic force of the winding when it is in its open position.

In the accompanying drawing, Figures 1 and 2 show similar side views, partly in section and partly broken away, of two of the many forms in which my invention may be embodied.

Referring to Fig. 1 of the drawing, the energizing winding is shown at 1. The magnetic circuit energized by the winding 1 has the main frame 2, the stationary pole piece 3, the movable armature 4, the armature tail piece 11 formed integral with the armature 4, and the stationary sleeve 13. The armature 4 has the upper non-magnetic stem 7, rigidly connected thereto by a pin 26 and passing loosely through the pole piece 3. The tail piece 11 is preferably restricted in cross-sectional area, and lies in the longitudinal bore of the sleeve 13, and is separated therefrom radially by a non-magnetic sleeve 5 to prevent its sticking thereto magnetically. The magnetic sleeve 13 is threaded into the main frame 2 at 14, and may thereby be adjusted axially in the frame and fixed at any adjusted position by the lock-nut 15. By this construction two working air gaps are provided, the gap 16 between the pole piece 3 and the armature 4, and the gap 17 filled by the non-magnetic spacer 17^a lying between the armature 4 and the upper end of the sleeve 13. It will be apparent that the gap 16 may be adjusted by adjusting the position of the sleeve 13, as above described while the length of the lockout gap 17 may be set to any desired length by providing a spacer 17^a of proper thickness.

The movable non-magnetic switch-arm 27, pivoted to the bracket 22 at 23, has a finger 28 resting on the top surface of the pole piece 3, and carries a contact 21. A relatively stationary switch-arm 24, carrying a contact 34, is pivoted at 25 to a bracket 37, and is given a clockwise torque about the pivot 25 by a compression spring 31 lying between the switch-arm 24 and the bracket 37. The clockwise movement of the arm 24 is limited by the engagement of a finger 32 on the switch-arm 24 with a stop 33 on the bracket 37. The stem 7 terminates at a point below the finger 28, leaving a space 46 between the upper end of the stem and the finger.

When the winding is energized with current above a predetermined value, the armature 4 is held downwardly magnetically and when the current is below the

predetermined value, the armature 4 is lifted and the stem 7 closes up the space 46 and strikes the finger 28, rotating the contact 21 into engagement with the contact 34. As the gap 16 fully closes, the two contacts rotate counterclockwise to their final position, being held in mutual engagement resiliently by the spring 31.

The form of my invention shown in Fig. 2 is identical with that shown in Fig. 1, except the form of the contacts. The movable non-magnetic switch-arm 29, pivoted to the main frame 2 at 30 rests upon the pole piece 3 by means of the depending finger 35. The arm 29 carries a contact 36, adapted to be rotated about the pivot 30 into engagement with a resilient brush 55. The electrical connections are omitted from this figure.

The operation of the form shown in Fig. 2 will be understood from the description in connection with Fig. 1.

While I have shown my invention in two forms, it will be apparent that it may be embodied in other forms. For example, I have shown six forms thereof in my application Serial Number 382,082, filed May 17, 1920. While I have shown the contacts of the pivoted type, it will be apparent that other forms of contacts may be used. In other aspects my invention may be modified without departing from the spirit thereof.

I claim:

1. In a controlling device for electric currents, a winding, a movable member, a flux path including the said member and having an operating and a lock-out gap for controlling said member, and means for moving the movable member to change the length of the operating gap without changing the length of the lock-out gap.

2. In a controlling device for electric currents, a winding, a movable member, a flux path including the said member and having an operating and a lock-out gap for controlling said member, means for moving the movable member to change the length of the operating gap without changing the length of the lock-out gap, and means for independently setting the lock-out gap to a predetermined length.

Signed at Cleveland, Ohio, this 30th day of June, 1917.

HARRY R. CANFIELD.