

Nov. 20, 1928.

1,692,604

G. H. WHITTINGHAM

SWITCH MECHANISM

Filed April 26, 1924

3 Sheets-Sheet 1

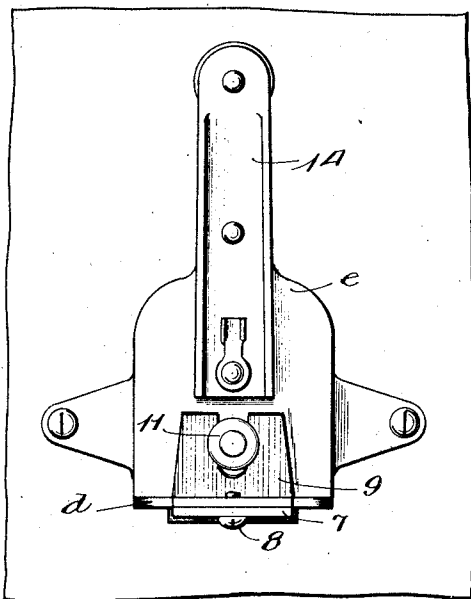


Fig. 1.

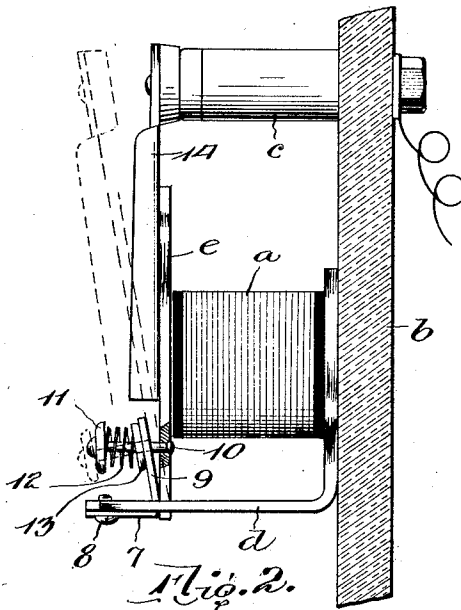


Fig. 2.

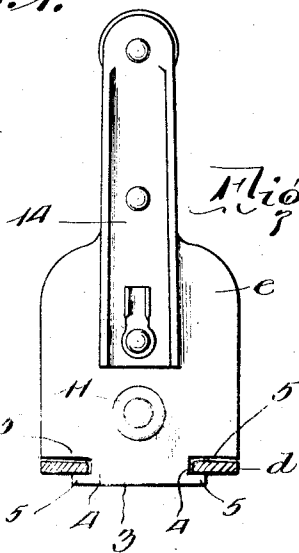


Fig. 3.

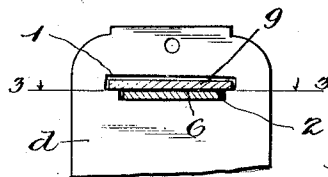


Fig. 4.

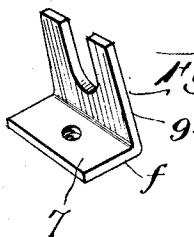


Fig. 5.

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3 Sheets-Sheet 2

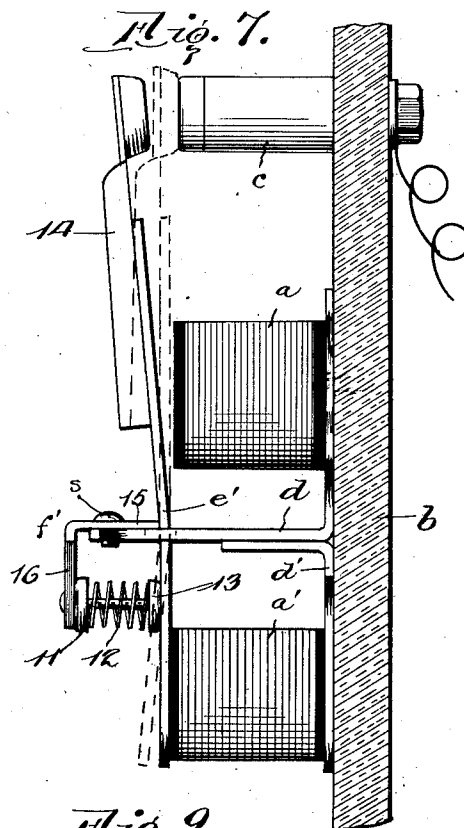
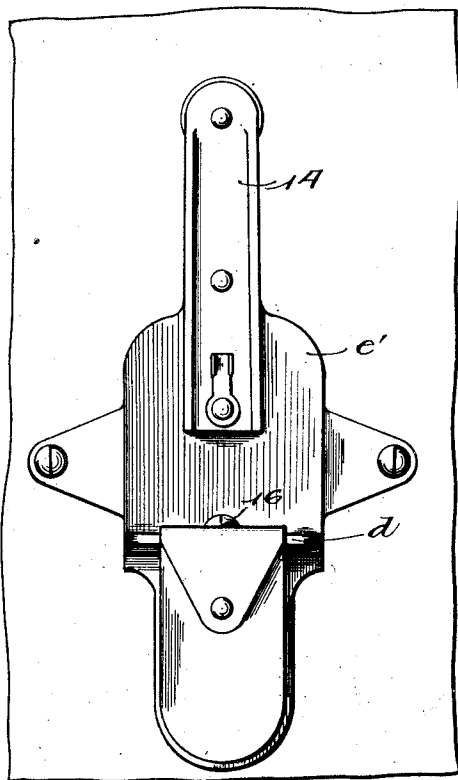


Fig. 6.

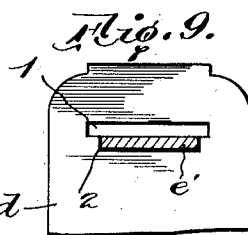


Fig. 9.

Fig. 8.

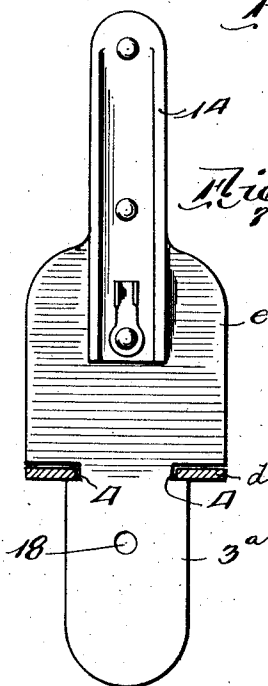


Fig. 10.

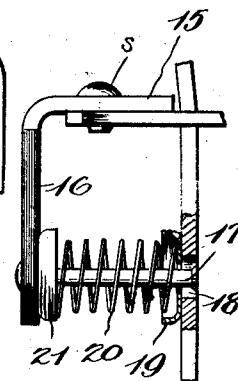
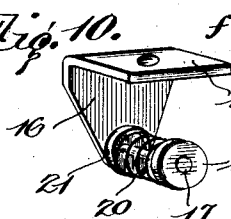


Fig. 11.

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SWITCH MECHANISM

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3 Sheets-Sheet 3

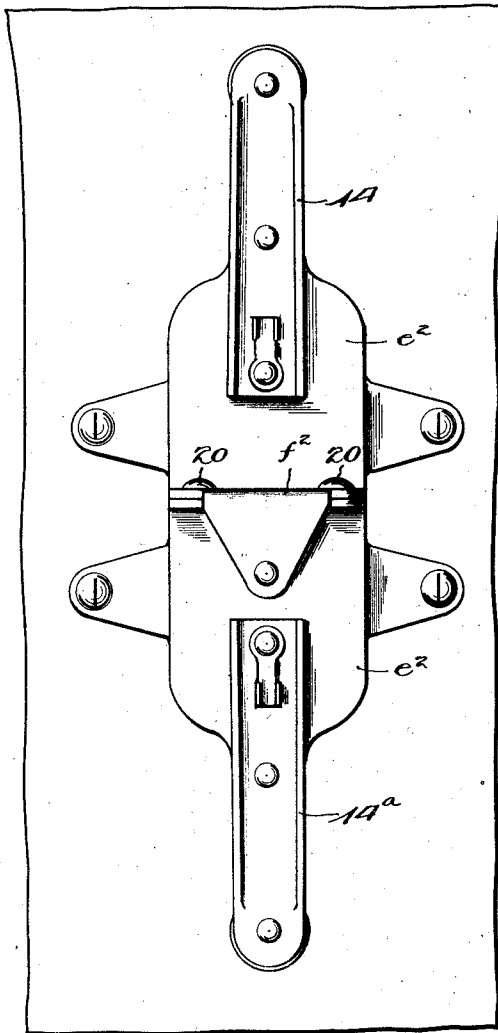


Fig. 12.

Fig. 14.

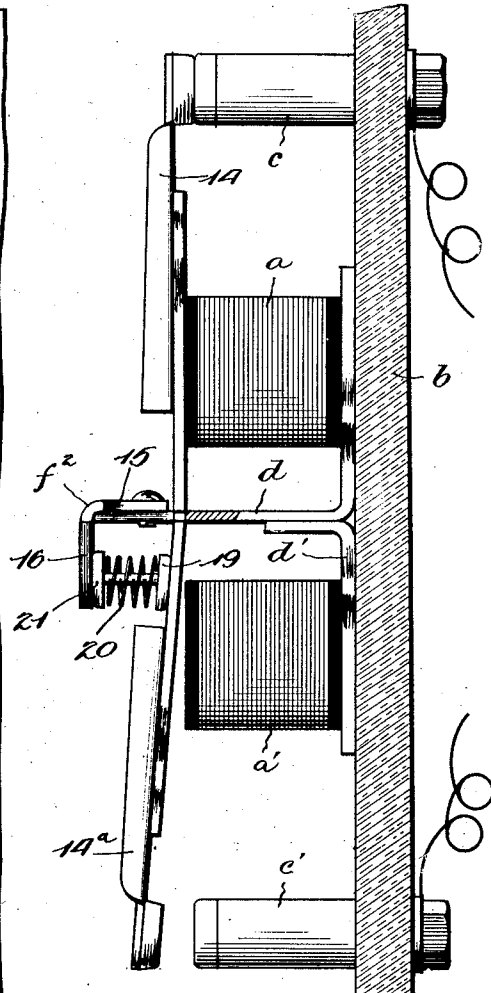
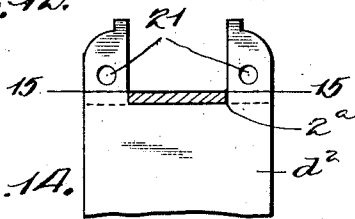


Fig. 13.

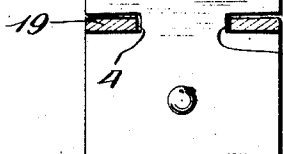


Fig. 15.

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UNITED STATES PATENT OFFICE.

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SWITCH MECHANISM.

Application filed April 26, 1924. Serial No. 709,163.

This invention relates to electro-magnetic switches and particularly to certain structural features which reduce the cost of manufacture, facilitate assembly of the parts, and provide a bearing for the armature which is more durable than the hinged joint usually employed.

In carrying out the invention, I provide a sheet metal support extending from one end of the magnet core outwardly along the side of the magnet to a point beyond the other end of the core, the support constituting a part of the magnetic circuit. This support is provided with a transverse notch adapted to receive a sheet metal armature having slots in its edges which fit closely about the ends of the notch. The armature fulcrums upon the bottom of the notch for the full length of the latter, and is held against lateral movement by the walls of the slot which form shoulders at opposite sides of the support. For holding the armature in the notch, I provide a locking-piece, which may be readily attached to or removed from the support, and this locking-piece closes the notch adjacent the armature and prevents displacement of the latter. The locking-piece is also extended longitudinally of the armature from the support and forms an abutment for a spring which bears upon the armature to rock the switch to open position. In one form of the invention, the locking-piece also forms a stop for limiting the opening movement of the switch.

In the accompanying drawing,

Fig. 1 is a front elevation of a simple form of switch embodying my improvements;

Fig. 2 is a side elevation of the same;

Fig. 3 is a front elevation of the armature and switch arm, the support for the armature being shown in section on the line 3—3 of Fig. 4;

Fig. 4 is an end elevation of the outer part of the support, the armature and locking-piece being shown in section;

Fig. 5 is a perspective view of the locking-piece shown in Figs. 1 and 2;

Fig. 6 is a front elevation of a switch in which the armature is extended in both directions from the support, and in which the locking piece for the armature differs from that shown in the previous figures;

Fig. 7 is a side elevation of the switch illustrated in Fig. 6;

Fig. 8 is a front elevation of the armature shown in Figs. 6 and 7, the support being shown in section on the line 8—8 of Fig. 9;

Fig. 9 is an end elevation of the outer part of the support shown in Figs. 6 and 7, the armature being shown in section;

Fig. 10 is a perspective view of the locking-piece and spring illustrated in Figs. 6 and 7;

Fig. 11 is a detail view on an enlarged scale, of the locking-piece and spring and part of the armature shown in Figs. 6 and 7;

Fig. 12 is a front elevation of a switch having the armature extended on both sides of the support and provided with two switch arms;

Fig. 13 is a side elevation of the same, partly in section;

Fig. 14 is an end view of the outer part of the support shown in Figs. 12 and 13, the armature being shown in section; and,

Fig. 15 is a front elevation of a part of the armature illustrated in Figs. 6 and 7, the support being shown in section on the line 15—15 of Fig. 14.

Referring to Figs. 1 to 5, inclusive, of the drawing, *a* represents an electro-magnet secured to a switchboard *b*, and *c* represents a stationary switch terminal also secured to said board. A sheet metal support *d* is secured to one end of the magnet core and extends outwardly parallel with the magnet to a point beyond the opposite end of this core. This support has a part punched out to form an opening extending transversely of the support, this opening having a relatively wide part 1 and a narrower part 2, which latter constitutes a notch for receiving the armature *e* of the switch. The main part of the armature is approximately the same width as the support, but one end 3 of the armature is of slightly less width than the slot 1 and of greater width than the notch 2, and it is provided with opposing slots 4, between the end 3 and the body of the armature. The armature is assembled upon the support by inserting the narrower end 3 through the slot 1 and then dropping it down into the notch 2. The edges of the notch will then fit into the slots 4 and the side walls 5 of the slots 4

constitute shoulders which will interlock with the ends of the notch and prevent lateral movement of the armature. The slots 4 are of such width that the armature resting upon the bottom wall 6 of the slot may rock thereon as far as is necessary to permit the switch to open and close.

The armature is held in place within the notch 2 by a metal locking piece *f*, having a part 7 adapted to be secured to the outer part of the support by a screw 8 and having a part 9 bent at an acute angle to the part 7, this part 9 being adapted to extend through the slot 1, over the armature and to prevent the armature from leaving the notch 2. The part 9 is forked, as shown. A stud 10, riveted to the armature, projects outwardly parallel with the support *d* and has at its outer end a cup-shaped stop 11, adapted to receive one end of a helical spring 12. A cup-shaped member 13 fits over the opposite end of the spring and is adapted to bear against the forked end 9 of the locking piece *f*, as shown in the drawing. With this arrangement, the spring normally tends to hold the switch arm 14 away from the stationary contact *c*, as shown in dotted lines in Fig. 2 of the drawing.

In assembling the parts, the armature is mounted upon the support as described with its slotted portion in the notch 2. The locking piece is then placed in position and in doing so, the forked arm 9 is passed under the cup 13. The locking piece is then secured by the screw 8, and as the forked arm 9 extends at an acute angle to the support, the spring will be compressed between the cup 11 and the locking-piece when the switch is closed. When the magnet is de-energized, the spring will move the switch arm to open position and the part 9 of the locking-piece will then serve as a stop to limit the outward movement of the switch arm.

In Figs. 6 and 7, the armature *e'* is centrally mounted upon a support *d*, which is the same as the support in Fig. 1, but in Fig. 7 two magnets *a* and *a'* are shown, and the latter magnet has a sheet metal connection *d'* extending from one end of its core to the support *d* so that the magnetic circuits are completed through the support and the armature to the cores of both magnets. The armature has a narrow portion 3^a adapted to pass through the wider part 1 of the opening in the support *d*, and it has the opposing slots 4 which permit the armature to drop into the notch 2. The locking-piece in these views differs from the locking-piece in Figs. 1, 2, and 5. As shown in Figs. 7 and 10, the locking-piece *f'* comprises a sheet metal part having a right angled bend, the part 15 of the locking-piece being adapted to be secured by a screw *s* to the support and to extend across the slot 1 and close to the armature, so as to prevent the displacement of the

latter. The part 16 of the locking-piece extends longitudinally of the armature, from the support, and on this part of the locking piece is secured a pin 17, which projects toward the armature and into an opening 18 in the latter. The pin has a head on its outer end for retaining a cup-shaped disk 19, and a spring 20 is interposed between this disk and a similar disk 21 on the pin, adjacent the part 16 of the locking-piece. The opening 18 in the armature is large enough to permit the head of the pin to pass freely through it.

When the parts are assembled, as shown in Fig. 7, the spring will press the end 3^a of the armature toward the magnet *a'*, and this latter will hold the switch in open position. When the magnet *a* is energized the switch will be caused to rock, against the action of the spring, to closed position, provided the magnet *a'* is de-energized, or is weakened so that it is overpowered by the magnet *a*. When the magnet *a* is de-energized, the spring will return the armature to the position shown in Fig. 7.

When it is desired to have the armature carry two switch arms, one on each end, the armature cannot be passed through a slot of the form shown in Figs. 4 and 9. For a double switch of this kind, I provide a deep notch 2^a in the support *d'*, as shown in Fig. 14, this notch being conveniently cut inwardly from the outer end of the support. The armature *e'* has opposing slots 4 at its center and these fit down over the parts 19, which form the end walls of the notch. Thus, an armature having switch members 14 and 14^a at its opposite ends may be centrally fulcrumed upon the support *d'* by dropping it into a notch 2^a, and it may then be secured against displacement by a locking-piece *f'*, which is similar to the locking-piece shown in Fig. 10, although of greater width, in order that it may be secured to the parts 19 by screws 20, passing through the locking-piece and into openings 21 in the support. With the arrangement shown, the spring will constantly tend to hold one switch closed and the other switch open.

It is to be noted that in each of the switch mechanisms shown, the armature has a wide rocking bearing upon the bottom wall or edge of the notch. This makes a very desirable pivotal bearing, which is more durable than the ordinary hinge pin connection used for armatures. It will also be evident that the armature support and locking-piece may be made of stamped metal and that the several parts may be made up as units and assembled with a minimum amount of labor.

What I claim is:

1. An electro-magnetic switch comprising a magnet, a sheet metal support forming part of the magnetic circuit of the magnet and having a transverse notch, an armature mem-

ber fulcrumed on the bottom wall of the notch and interlocking with the end walls of the notch, a locking member detachably secured to said support and having a part extending close to the armature and retaining the latter in the notch and a part extending longitudinally of the armature from the support, and a spring interposed between said latter part and a part on the armature.

2. An electro-magnetic switch comprising a magnet, a sheet metal support forming part of the magnetic circuit and having an opening comprising a relatively wide transversely extending slot and a notch of shorter length than the slot, a sheet metal armature having a part wider than the length of the notch and adapted to pass through the slot, said armature having slots in its opposite sides adapted to permit it to pass into the notch, a locking piece secured to the support and extending through the slot in the support, to prevent displacement of the armature, and having a part ex-

tending longitudinally of the armature, and forming a stop to limit the movement of the latter.

3. An electro-magnetic switch comprising a magnet, a sheet metal support forming part of the magnetic circuit of the magnet and having a transverse notch, an armature fulcrumed on the bottom wall of the notch and interlocking with the end walls of the notch, a locking member secured to said support and extending close to the armature to retain the latter in the notch, said locking member having a forked part extending longitudinally of the armature and at an acute angle to the support, a pin secured to the armature and extending through the fork in the locking piece, and a spring interposed between the outer end of said pin and the locking piece.

In testimony whereof I hereunto affix my signature.

GEORGE H. WHITTINGHAM.