

1,360,281.

Patented Nov. 30, 1920.

Fig. 1.

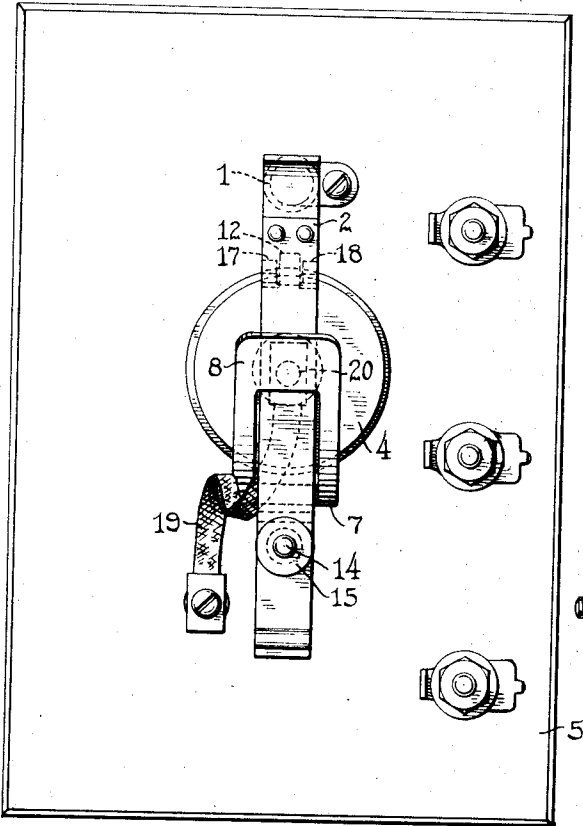


Fig. 2.

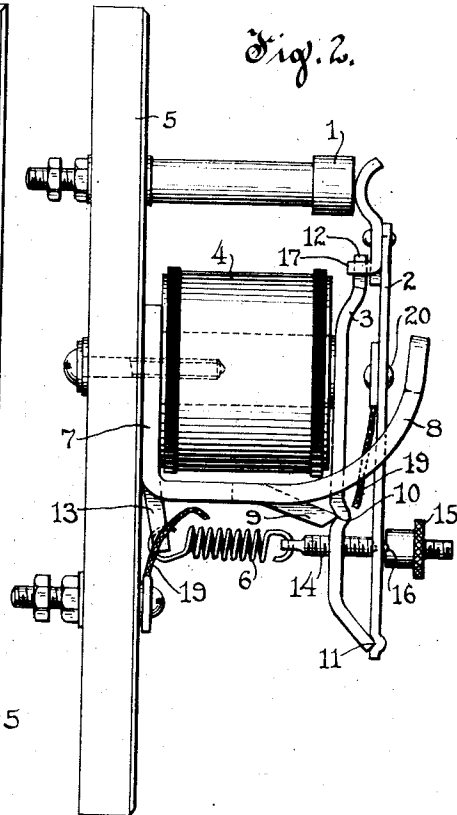
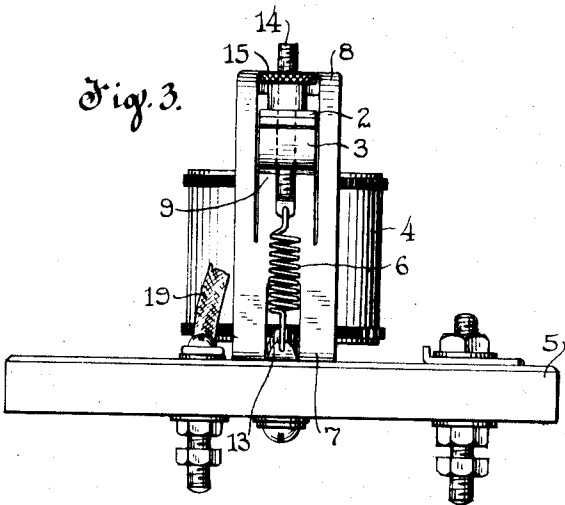


Fig. 3.



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ELECTRIC SWITCH.

1,360,281.

Specification of Letters Patent. Patented Nov. 30, 1920.

Application filed October 19, 1918. Serial No. 258,869.

To all whom it may concern:

Be it known that I, CLARENCE T. EVANS, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented new and useful Improvements in Electric Switches, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

This invention relates to electric switches and is particularly applicable to electromagnetically operated switches.

One of the objects of the invention is to provide a simple and inexpensive but yet rugged and efficient switch of the type wherein the movable contact element is fulcrumed upon a rocking supporting member, for example, the armature of an electromagnet and yieldingly held in a given relation therewith in order to permit continued movement of the supporting member after engagement of said element with its cooperating contact.

A further object is to provide a switch of the aforesaid type wherein a single tension device serves to yieldingly hold the contact element and its supporting member in the desired relation and to also bias the same away from attracted position, and wherein the parts may be arranged to graduate the force exerted by said tension device in opposition to the pull of the operating electromagnet to facilitate initial operation of the switch and hence to enable the switch to be designed with a wide arcing gap.

A further object is to provide a switch of the aforesaid type wherein the contact element and its supporting member may be provided with open bearings and retained in place by the tension device, previously mentioned, whereby the switch may be readily assembled and disassembled.

Various other objects and advantages of the invention will hereinafter appear.

The accompanying drawing illustrates an electromagnetic switch embodying the invention in one form and the same will now be described, it being understood that the invention is susceptible of embodiment in other forms falling within the scope of the appended claims.

In the drawing,

Figure 1 is a front elevational view of the switch;

Fig. 2 is a side elevational view of the switch; and,

Fig. 3 is a bottom plan view thereof.

The switch as illustrated comprises a stationary contact 1 and a cooperating contact element or finger 2 mounted upon the armature 3 of an electromagnet 4, said stationary contact and said electromagnet being fixed to a supporting panel 5. The contact element 2 is normally disengaged from contact 1 by a tension spring 6 and is operable by the electromagnet to engage said contact, the arrangement being such that said element is engaged with said contact prior to full attraction of the armature.

The electromagnet 4 is provided with an L-shaped magnetic frame 7 having at its forward end an upwardly curved extension 8 and a downwardly inclined knife edge lug 9. The extension 8 of the frame is recessed to receive and aline both the armature and the contact element and the former is provided with a transverse bearing groove 10 to receive the knife edge of lug 9. Also, the lower extremity of the armature is offset to provide a similar knife edge bearing 11 for the contact element while said armature is provided at its upper end with an offset lug 12 affording an abutment or stop for said element. Thus both the armature and the contact element are provided with open bearings in which they are retained by the tension spring 6.

Spring 6 is connected at one end to a downwardly struck lug 13 provided on the frame 7 and at its other end to a pin 14 passing loosely through both the armature member and the contact element and having threaded thereon a thumb nut 15 to engage the contact element. Thus, as will be apparent, the spring serves to press the armature and contact element against their respective knife edge bearings; to yieldingly hold said element against stop 12 on said armature; and to rock said armature and contact element jointly about the fulcrum point of the former for disengagement of the latter from contact 1. In other words, the spring biases the armature away from attracted position and such biased movement thereof is limited by the upper end of the extension 8 of the magnetic frame which serves as a stop for the contact element.

In practice the fulcrum points of the armature and contact element are preferably

spaced to a considerable degree, as illustrated, while the tension spring is preferably arranged relatively close to the fulcrum point of the armature. Thus the leverages are such that the opposition offered by the spring to attraction of the armature is relatively slight until the contact element engages the stationary contact, after which the effective force of the spring is greatly augmented. Accordingly this arrangement facilitates initiation of the operation of the switch by the electromagnet when its pull is relatively small so that the electromagnet may be designed with a relatively large air gap to provide a wide arcing gap between the switch contacts. Further, this arrangement provides for utilization of the increased final pull of the electromagnet to insure very firm engagement of the contacts. Also, in practice, it is preferred to maintain axial alinement of the spring and the pin 14 throughout the full range of operation of the armature and to this end the contact finger is provided with a transverse rib 16 upon which the nut 15 is adapted to fulcrum. The nut is preferably recessed to receive the crest of the rib, whereby said rib also serves to releasably lock said nut against turning.

The contact element 2 is shown as comprising a contact tip and a finger riveted together and the contact tip is shown as interposed between the finger and the stop 12 on the armature. This arrangement is very advantageous where the finger is formed of iron, as is frequently desirable, for the interposed contact then prevents magnetic attraction between the finger and the armature. Also, the contact tip is shown as provided with lugs 17 and 18 straddling the lug 12 on the armature to aline the armature and contact finger adjacent to their upper extremities.

A flexible lead 19 is provided for the contact finger, the former being secured to the latter by a rivet 20 disposed in alinement with the stop afforded the finger by the extension 8 of the magnetic frame. Hence should the contact finger be formed of iron, the use of a rivet of non-magnetic material would prevent sticking of the finger against said stop.

With this construction it will be seen that the parts may be largely formed of very simple stampings which may be readily assembled and that the contact finger and armature may be easily and quickly removed upon mere release thereof from the tension device, while after removal they may be instantly separated for repair or replacement of either. On the other hand, it will be seen that the structure thus provided is extremely rugged, durable and reliable.

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

1. In an electric switch, in combination, a relatively stationary contact, a movable supporting member, a cooperating contact finger fulcrumed upon said member for movement therewith and relative thereto, said member also being fulcrumed intermediate said fixed contact and the fulcrum of said finger, and a resilient connection between said finger and a fixed part, said connection acting on said finger at a point between the fulcrum thereof and the fulcrum of said member and nearer the latter fulcrum to bias said finger toward said member and relatively to said stationary contact.

2. In an electric switch, in combination, a relatively stationary contact, an electromagnet having an armature member, a cooperating contact finger fulcrumed upon said armature member, said member being fulcrumed at a point intermediate said fixed contact and the fulcrum of said finger for moving the latter toward the former upon energization of said electromagnet and a resilient connection between said finger and a fixed part, said connection acting on said finger at a point between the fulcrum thereof and the fulcrum of said armature member and nearer the latter fulcrum to yieldingly hold said finger and said armature member in a given relation and to oppose attraction of said armature.

3. In an electric switch, in combination, a stationary contact, a cooperating contact finger, a rocking member for supporting said contact finger, a fixed part, said member having an open bearing on said fixed part and said contact finger having an open bearing on said member permitting it to rock thereon and a single resilient device for holding said contact finger and said member in assembled relation on said fixed part.

4. In an electric switch, in combination, a stationary contact, a cooperating contact finger, a rocking member for supporting said contact finger, a fixed part, said member having an open bearing on said fixed part and said contact finger having an open bearing on said member permitting it to rock thereon and a single resilient device for holding said contact finger and said member in assembled relation on said fixed part and yieldingly holding said finger in a given position on said member.

5. In an electric switch, in combination, a relatively stationary contact, a cooperating contact finger, a rocking supporting member therefor, said finger having an open bearing on said member permitting it to rock thereon, a support for said member, the latter having an open bearing on the former and a resilient connection between

said finger and a fixed part to retain said finger and its supporting member in assembled relation on said support and to bias both to maintain said finger in a given normal relation to said stationary contact.

6. In an electric switch, in combination, a relatively stationary contact, a cooperating contact finger, a rocking member, said finger having an open bearing on said member permitting it to rock thereon, a support, said member having an open bearing on said support, and common resilient means to hold said contact finger and said member in assembled relation on said support and to bias said finger away from said stationary contact.

7. In an electric switch, in combination, a relatively stationary contact, a cooperating contact element, a rocking supporting member therefor, said element having an open bearing adjacent to one end of said member to permit it to rock thereon and having another point of contact with said member, a support for said member, the latter having an open bearing on the former disposed between said first mentioned bearing and said point of contact and resilient means acting on said element at a point between the bearing thereof and the bearing of said member to hold said element and member in assembled relation on said support.

8. In an electric switch, in combination, a relatively stationary contact, a cooperating contact element, a rocking member, said element having an open bearing on said member permitting it to rock thereon and said element and member having abutting parts spaced from said bearing, a support for said member, the latter having an open bearing on the former disposed between the former bearing and said abutting parts, and resilient means acting on said element at a point between said bearings, to hold said element and said member in assembled relation on said support; to bias both to maintain said element in a given normal relation to said contact; and to yieldingly hold said element and said member in a given relation.

9. In an electric switch, in combination, a stationary contact, a cooperating contact element, a rocking member, said element having an open pivotal bearing on said rocking member, a support, said member having an open bearing on said support, a single resilient device for holding said element and said member in assembled relation on said base and biasing the same in a given direction and a stop for limiting such biased movement of said element and member.

10. In an electric switch, in combination, cooperating contacts including a contact finger, an electromagnet having a pivoted armature to support and actuate said finger, said armature having an open bearing on a part of said electromagnet and said finger

having an open pivotal bearing on said armature and a single resilient device to hold said finger and armature in their respective bearings.

11. In an electric switch, in combination, cooperating contacts including a contact finger, an electromagnet having a pivoted armature, said finger having an open pivotal bearing on said armature and also a stop thereon, and said armature having an open pivotal bearing on a part of said electromagnet, the latter bearing being disposed between the former bearing and said stop, a resilient device acting on said finger at a point between the bearing thereof and the bearing of said member, to hold said finger and member in their respective bearings and to bias both in a given direction and a stop to limit the biased movement of said finger and member.

12. In an electromagnetic switch, in combination, cooperating contacts including a contact finger, an electromagnet having an armature to support said finger and a magnetic frame affording a knife edge bearing for said armature, said finger and armature being arranged between parts of said frame for alinement thereof and said finger having an open pivotal bearing and a stop on said armature and a spring fixed at one end and connected at its other end to said finger at a point between the bearing thereof and the bearing of said armature.

13. In an electromagnetic switch, in combination, cooperating contacts including a contact finger, an electromagnet having an armature to support said finger and a magnetic frame providing a knife edge bearing for said armature and also parts to aline and limit the movement of said finger and armature, said finger having an open pivotal bearing and a stop on said armature on opposite sides of the bearing of the latter, and a spring fixed at one end and connected at its other end to said finger intermediate the bearing thereof and the bearing of said finger.

14. In an electromagnetic switch, in combination, cooperating contacts including a contact finger, an electromagnet having an armature to support said finger, said finger having an open pivotal bearing on said armature and also having a part spaced from said bearing to engage with said armature for alinement, said electromagnet further having a magnetic frame providing a knife edge bearing for said armature and also parts to aline and limit the movement of said finger and armature, and a spring fixed at one end and connected at its other end to said finger intermediate the bearing thereof and the bearing of said finger.

In witness whereof, I have hereunto subscribed my name.

CLARENCE T. EVANS.