

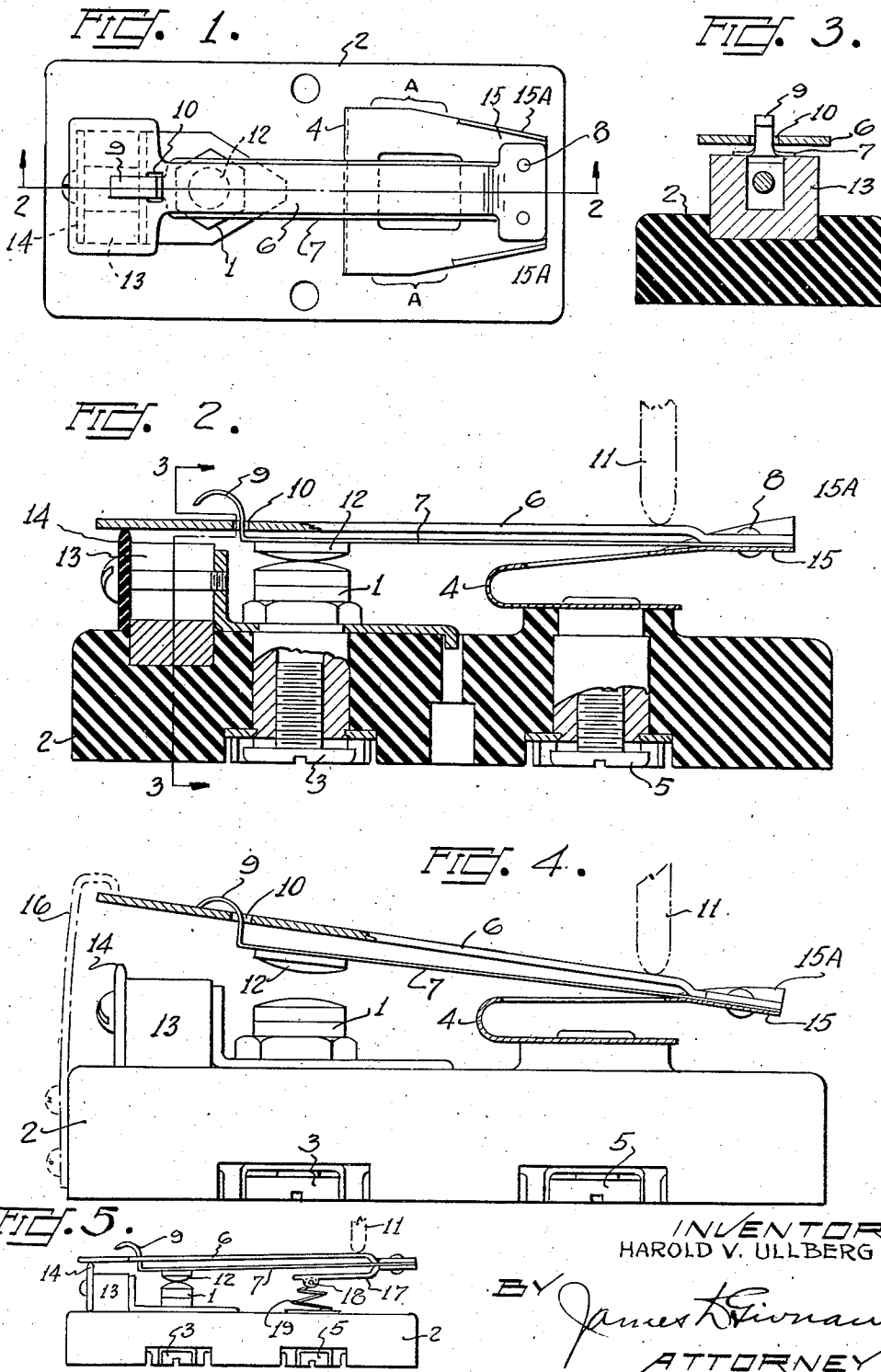
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MAGNET SWITCH

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MAGNET SWITCH

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This invention relates to snap switches of the type particularly adapted for use with condition-control apparatus.

The principal object of this invention is to reduce to the lowest possible value the dissipation of energy attending operation of a switch, and, at the same time, to provide adequate contacting pressure between the points, and the requisite celerity of separation of the points, when actuated by an approximately uniform, relatively small, force transmitted from control apparatus.

A second object of the invention is to enhance the durability of the switch and the permanence of its efficiency.

A third object is the provision for a minimum number of parts capable of assembly with the fewest operations.

A fourth object is the provision for rigidly connected conductors throughout to insure the permanence of electrical efficiency.

Further objects will be apparent from the following description, wherein a practical embodiment of the invention is described.

In the drawing:

Figure 1 represents a view of the top of the switch.

Figure 2 represents a view of a vertical longitudinal section taken on the line 2—2 of Figure 1.

Figure 3 represents a transverse section taken on the line 3—3 of Figure 2.

Figure 4 represents a view of the side of the switch in elevation.

Figure 5 is a side elevation of a modified form of the invention.

Referring now more particularly to the drawing:

A stationary contact point 1 is rigidly attached to a dielectric base 2 in a conventional manner to provide a connection with a suitable binding screw 3. A spring 4 is rigidly secured to the base and to a suitable binding screw 5, to provide a spring mounting for the armature 6 secured, together with a spring-tongue 7, thereto by means of rivets 8.

The free end of the tongue 7 is formed with a hook 9 extending through an aperture 10 in the armature 6 adapted to engage the latter which rises in response to a force applied through an actuator as 11. The second contact point 12 is rigidly secured to the tongue 7 and is normally held in contact with the first point 1 by a bias of the tongue 7 tending to move the extremity of the hook 9 into contact with the armature 6.

A permanent magnet 13 attracts the free end of the armature 6 into contact with stop 14, whereat the extremity of the hook 9 will be free with respect to the armature 6; when the switch is closed, as particularly shown in Figure 2. Stop 14 is provided optionally, since slightly higher placement of contact 1 would permit the contacts to stop the armature in correct space relationship to magnet 13.

The operation of the switch contemplates a force transmitted through a stem as 11 to depress the attached end of the armature and result in the development, in the end 15 of the spring 4, of a rotary moment commensurate with the angular deflection of the upper part of the spring 4. This energy will be represented by potential strains in the spring 4 restrained by the action of the magnet 13, resisting movement of the free end of the armature 6.

At that instant, whereat the progressively increasing angular deflection of the spring 4 develops a potential sufficient to overcome the attraction of the magnet 13, the armature 6 is actuated into the open position with great celerity. It is calculated that during the time the armature 6 is rising to engage the hook 9 that the armature will have attained such a speed of movement as will safely separate the contact point 12 from the point 1.

Where desired, to secure optimum sensitivity of the switch, that is, operation with minimum change of force or movement, a backstop 16 or a housing, cover plate, or a portion of some related mechanism may be provided to restrict upward movement of the armature 6.

The novelty of this invention resides particularly in the spring 4 which supports the armature 6, provides a pivot for that member and also acts as a reservoir of potential energy to impart snap action to the separation of the contacts.

Better to explain the several functions of spring 4, an analogous alternate construction is shown in Figure 5. In this construction the armature 6 is supported by the bracket 17 pivotally attached at 18 to the upper end of spring 19, the lower end of which is secured to the base 2. When force is initially applied by the stem 11 to armature 6 the armature will be constrained in contact-closed position by magnet 13.

Increase of the operating force first compresses spring 19, rotating armature 6 about the stop 14 or contact 1. When sufficient energy has been stored in spring 19 the constraining force of magnet 13 is overcome. Spring 19 then rapidly

moves upward toward its free position, causing armature 6 to separate the contacts as it rotates about the point of stem 11. The hinge point 18 of this analogy has its counterpart at some point in the zone A—A, of reduced cross-section, of spring 4 of the preferred form. The equivalent of spring 19 of the alternate construction is embodied chiefly in the U-bend portion of spring 4. The spring 4 is made rigid between the end 15 and the zone A—A by bent-up ears 15A.

It must be noted that the spring 4 need not be of the precise shape and form illustrated to perform its several functions, other forms having been proved capable of substantially equivalent results.

It is to be observed that all of the moving parts of the switch are so mounted as to involve no friction of the parts other than that incident to the flexure of the elastic elements. It is to be further especially observed that solid electrical conductors are provided to both contact points so that arcing may in no case occur between the various elements of the switch. No lubrication whatsoever is required, or desirable.

It will further be apparent that the force of contact between the points 1 and 12 will be a definite function of the energy invested through the stem 11, unmodified by usual frictional losses.

While I have shown a particular form of embodiment of my invention I am aware that many minor changes therein will readily suggest themselves to others skilled in the art without departing from the spirit and scope of the invention. Having thus described the invention, what I claim as new and desire to protect by Letters Patent is:

1. A switch comprising a pair of contact points mounted respectively upon a base and resiliently with respect to an arm terminating in an armature, a leaf spring fixed at one of its ends to the base and attaching said arm resiliently and rockably to said base, magnetic means acting upon said armature to constrain said points into contact, and actuating means bearing upon said arm at its opposite extremity from said armature to bias the spring in a direction and to a degree to overcome said magnetic means to effect separation of said contact points, said spring being disposed for effective support of said arm between the extremities thereof and being conformed with a portion substantially parallel to said arm.

2. In a switch, a base, a contact attached to said base, a magnet attached to said base, an armature disposed in apposition with said magnet, a second contact cooperating with said first contact and carried by a switch lever terminating in said armature, a U-shaped resilient member fixed at one of its ends to said base and at its other end to said lever in a manner to rockably support said armature and said second contact, the sides of said resilient member being substantially parallel to said lever, and switch actuating means engaging said lever near the opposite extremity from said armature in opposition to said resilient member and reacting there-through against the restraint of said magnet thereby compressing the sides of said member to store energy prior to movement of said armature away from said magnet to impart snap action to the contacts.

3. In a switch of the type employing a magnet and an armature to impart snap action to a pair

of contacts upon application of a force to the armature in opposition to the magnet, the combination of a resilient member fixed at one of its ends and carrying said armature and one of said contacts at its other end, said resilient member adapted to yield in the direction of force transmitted through said armature to said resilient member and combining the functions of rockably supporting the armature and receiving from said armature and storing potential energy imparted by said force prior to contact action, said resilient member having a major portion substantially normal to said transmitted force.

4. In a switch in which a magnetically restrained non-resilient contact bearing armature is actuated by an external operating force stored as potential energy to effect a snap action of contacts, the combination of a resilient member yieldingly supporting said armature and disposed substantially normal to and thereby adapted to be biased by said operating force to a degree and in a direction to overcome said magnetic restraint, and means for applying operating energy to the unrestrained end of said armature for storage in said resilient member prior to contact action.

5. In a switch, an armature magnetically urged, a contact adjacent said armature coacting with a stationary contact, a switch lever carrying said armature and said first contact at one extremity thereof, a spring member resiliently and rockably supporting said lever, actuating means adapted to operatively engage said lever near the other extremity thereof in opposition to said magnetic urge and to said spring member, said actuating means effecting abrupt contact action by rocking said lever about its magnetically restrained extremity with consequent deflection of said spring member, thereby stressing said spring to overcome said magnetic urge, said spring member being conformed with a major portion substantially parallel to said lever to yield in the plane of movement of said first contact and said armature when said lever is moved about either of its extremities.

6. In a switch, a base, a spring attached to said base, a rigid switch lever resiliently and rockably supported by said spring, an armature and a contact at one extremity of said lever cooperating respectively with a magnet and a contact on said base, an actuator bearing upon the other extremity of said lever in a direction to deflect said spring when said armature is restrained by said magnet and to rock said lever and thereby open said contacts when said magnetic restraint is overcome, said spring having a portion substantially parallel to said lever and normal to the direction of force application.

7. In a switch a leaf spring rockably and resiliently supporting an arm terminating in an armature, a contact carried by said arm adjacent said armature, a second contact in apposition to said first contact, a magnet cooperating with said armature normally to rock said arm into one position of said contacts, switch actuating means acting upon the other end of and disposed to rock said arm into the other position of said contacts, said leaf spring including a portion substantially normal to said actuating means and resilient to a degree to be displaced thereby prior to movement of said contacts to said other position whereby energy may be accumulated in said spring to impart snap action to said contacts.

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