Dec. 14, 1943. W. A. RAY 2,337,001

SNAP SWITCH

Filed Oct. 13, 1941

Fig. 1

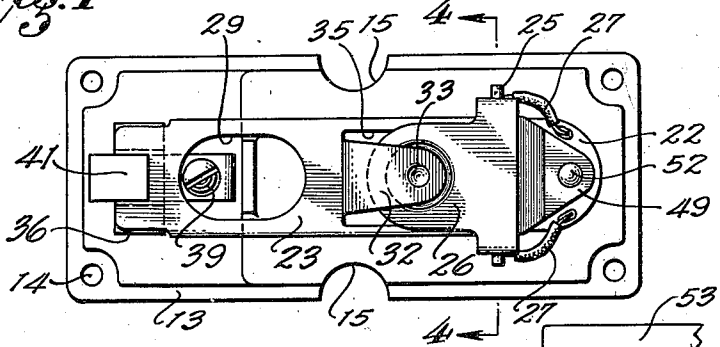


Fig. 2

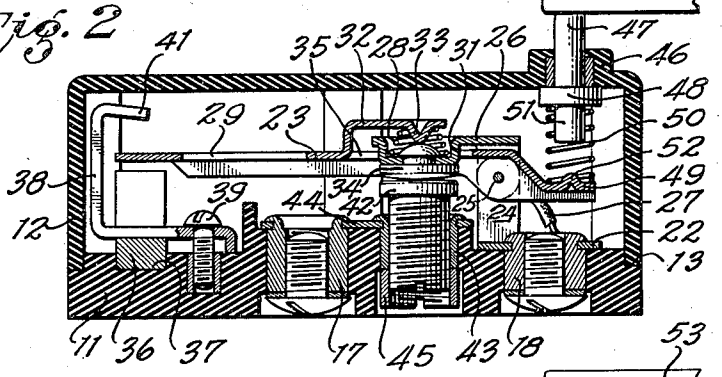


Fig. 3

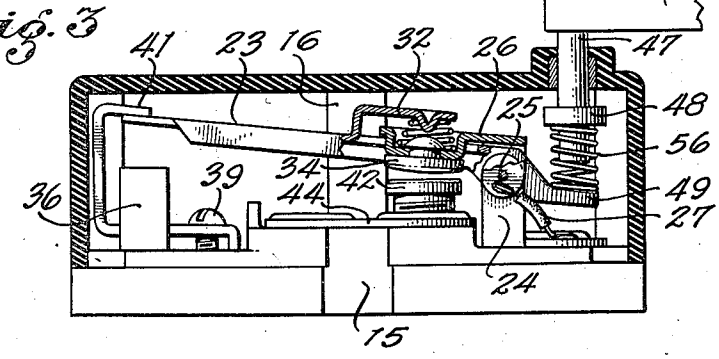
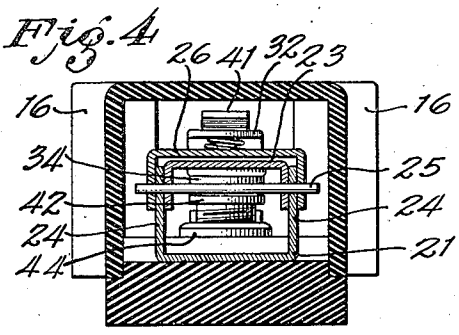


Fig. 4



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SNAP SWITCH

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2 Claims. (Cl. 200—67

My present invention relates to improvements in snap switches of the type which utilize magnetic force, and resilient means through which an actuating force opposing that of the magnet is applied to effect snap-action of the contacts; and particularly to those of the sensitive type adapted to be actuated by means moved gradually in response to change in a condition, such as temperature or pressure.

An object of this invention is to provide a switch of the character described which is capable of handling relatively heavy loads.

A more specific object is to provide, in a switch of the character described, a novel arrangement of the parts whereby the contacts, upon initial engagement, are firmly held in that condition and vibration between them is substantially eliminated.

Another object is to provide, in a switch of the type indicated, an improved means whereby, in the opening movement of the contacts, they are held in engagement under a high contact pressure until the means for opening them has gained considerable momentum.

Other objects and advantages of my invention will be found in the description, the drawing, and the appended claims.

For complete understanding of the invention, reference may be had to the following detailed description and accompanying drawing, wherein:

Figure 1 is a plan view of a snap switch embodying my invention, with the cover 12 omitted;

Figure 2 is a vertical section of the switch shown in Fig. 1 with the switch cover in place;

Figure 3 is a view, partly in section, similar to that of Fig. 2 and showing the parts in their moved positions; and

Figure 4 is a transverse section taken along the line 4—4 of Fig. 1.

In the drawing, the numeral 11 indicates a base, and 12 a cover for the base, both of which are made of insulating material. The peripheral edge of the cover 12 rests on a shoulder 13 of the base and is held thereon by screws (not shown) which extend through openings 14 in the base and into threaded bores in the filleted corners of the cover. The base 11 is notched at 15 for the cover bosses 16 which are bored to receive bolts by means of which the switch unit may be mounted on a panel or the like.

Embedded in the base 11 are a pair of terminals 17 and 18. A U-shaped bracket 21 is secured on the base by the riveted-over end of terminal 18 which extends through the mounting flange 22 of the bracket. An elongated channeled armature 23 is pivotally mounted between the arms 24 of the bracket 21 by means of a pin 25 which extends through openings in the bracket arms and the sides of the armature. To reduce the weight of the armature it is preferably apertured toward its free end, as at 29. Adjacent the top surface of armature 23 is a switch arm 26, also pivotally mounted on the bracket 21 by means of the pin 25, and connected with terminal 18 by flexible leads 27. A spring 28 is compressed between the bottom wall of a dished portion 31 of the arm 26 and a horizontal bent-up portion 32 of the armature 23. The spring is held in position at its lower end by the side walls of the dished portion 31 and at its upper end by a conical depressed portion 33 of the armature portion 32. Riveted in the bottom wall of the dished portion 31 is a downwardly-faced contact element 34. The portion 31 and contact 34 extend loosely through an opening 35 in the armature 23 beyond the lower side thereof, and the flat surfaces around the dished portion 31 and opening 35 overlap so that upward movement of armature 23 may be transmitted to arm 26. Downward movement of the armature is transmitted to arm 26 through spring 28. The arrangement is such that limited relative motion between the armature and switch arm is permitted in both the opening and closing movements.

A U-shaped permanent magnet 36, for attraction of armature 23, rests in a socket 37 in the base 11 and is held there by a metal strip 38, a horizontal portion of which extends between the arms of the magnet and is fixed to the base by a screw 39. The upper end portion 41 of strip 38 extends above, and is bent over the armature to limit the upward movement thereof.

Cooperable with contact element 34 is a relatively fixed contact element 42, the lower end portion of which is threaded into a tubular metal member 43 embedded in the base 11. The contact 42 is electrically interconnected with terminal 17 by a strap 44, held in place by the riveted-over ends of the terminal 17 and member 43. The contact 42 serves the additional purpose of limiting the downward movement of the armature, the lower end portion being threaded for regulating the air gap between the armature 23 and magnet 36. A lock nut 45 maintains the contact in its adjusted position.

Slidable in an opening through a boss 46 located on the upper wall of the cover 12, is an actuating rod 47 made of insulating material. Between an enlarged annular portion 48 of rod 47 and the end portion 49 of armature 23 is com-

pressed a spring **50**, held in place at its upper end by the lower end portion **51** of rod **47**, which extends centrally within the coils of the spring, and at its lower end by the conical raised portion **52** of the armature **23**.

The operation of the device is as follows: assuming that the switch is arranged to be actuated by an arm **53**, gradually movable in response to change in a condition, upon initial downward movement of rod **47** from its position shown in Fig. 2, the armature **23** will remain unmoved, due to the force thereon of magnet **36**, until the stress of the spring **50** is so increased that the magnetic force is finally overcome and the armature moves suddenly (due to the non-linear change in the magnetic force) to its position as shown in Fig. 3. Until the armature is moved away from magnet **36**, it exerts a direct force holding contacts **34** and **42** in engagement, but upon initial movement of the armature this force is removed and the contacts are then momentarily held in engagement by the force of spring **28**. This spring force is effective until the lost motion between the armature and arm is taken up, when the armature, having gained considerable momentum, strikes the arm, the impact separating the contacts.

Upon subsequent reversal of change in the controlling condition, the force exerted through spring **50** on armature **23** by the actuating arm **53** will decrease, and as it approaches zero, will be insufficient to retain the armature in its moved position against the force of magnet **36**. The armature will now move toward the magnet causing a rapid increase in the effective magnetic force which results in a snap-action circuit-closing movement of contact **34**, the movement of armature **23** being imparted to contact arm **26** through spring **28**.

Sudden stopping of contact **34** upon engaging contact **42** tends to cause vibration, or "bouncing" of contact **34** with consequent arcing. However, in the present construction, spring **28**, which is always under stress, tends to absorb the vibrations, and the lost motion between the depressed portion **33** of armature **23** and the upper end of contact **42** is instantly taken up when the contacts engage, and the magnetic force holds the contacts in engagement, as shown in Fig. 2. The relative positions of the magnet, contacts, and point of actuating force application **52** with respect to the bracket, in combination with spring **28**, result in a high contact pressure at all times that the contacts are in engagement.

In the event that the contacts **34** and **42** should stick or "weld," and spring **50** is not sufficiently strong to separate them, rod **42**, by its continued movement, will directly engage the raised portion **52** of armature **23**, and exert a direct contact-separating force thereon.

While I have herein shown and described a specific embodiment of my invention, I wish it to be understood that modifications may be made without departing from the spirit of the invention, and that I intened therefore to be limited only by the scope of the appended claims.

I claim as my invention:

1. In a snap switch: a base; a magnet mounted on one end portion of said base; a bracket mounted on the opposite end portion of the base; a fixed contact element mounted on the base between said magnet and said bracket; a relatively short and inflexible arm pivoted at one of its ends on the bracket, the other end of the arm extending toward said magnet and carrying a contact element cooperable with said fixed contact element; said contact elements being positioned nearer to the pivot point of said arm than to said magnet; an armature pivoted adjacent one of its ends on said bracket and on the same axis as the arm, the other end of the armature extending adjacent the magnet so that it is constantly attracted thereby; resilient means constantly exerting a force on the armature opposing that of the magnet; means effective in its movement in one direction to increase said opposing force so that the armature is suddenly moved away from the magnet, and subsequently in an opposite direction to decrease the opposing force so that the armature is suddenly attracted toward the magnet; said arm having a cupped depression in the side thereof away from said base; said armature having a portion overlying said depression and another portion between the arm and the base; and a coil spring in said depression normally yieldably maintaining said other portion of the armature in engagement with the arm.

2. A snap switch, as defined in claim 1, wherein the portion of said armature which overlies said depression is provided with means directly engageable with said arm when the armature is in its fully-attracted position.

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