July 22, 1947. R. G. FERRIS 2,424,390

SWITCH

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FIG. 1.

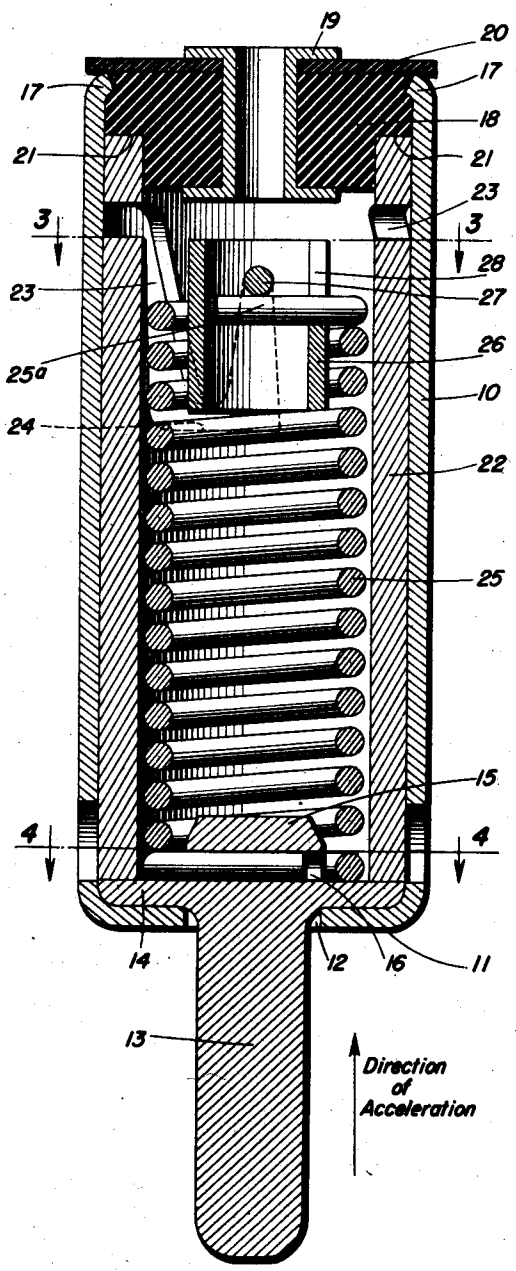
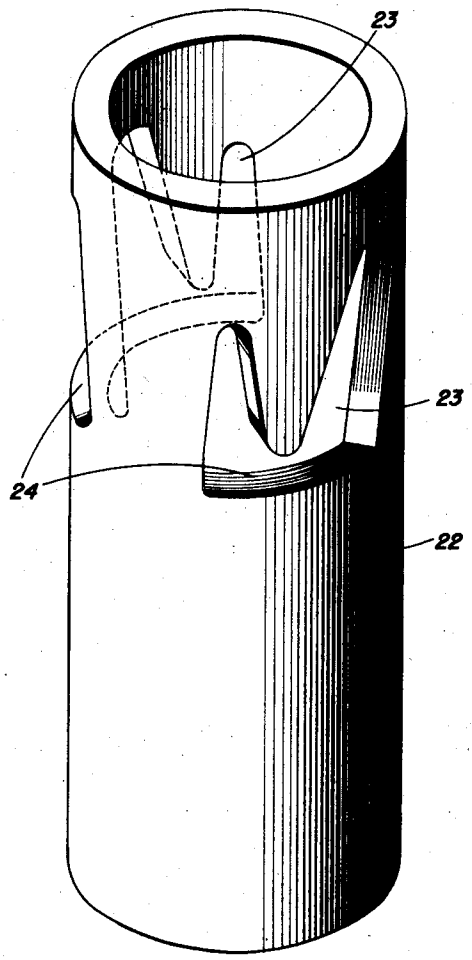


FIG. 2.



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FIG. 3.

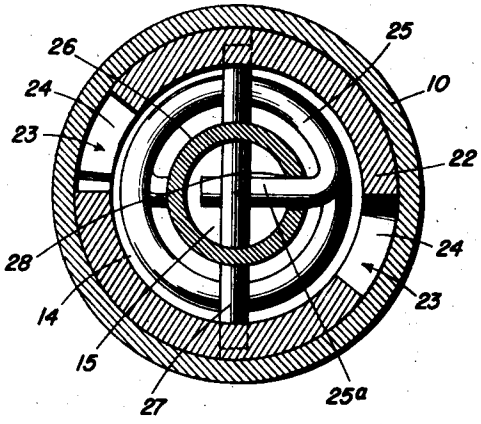


FIG. 4.

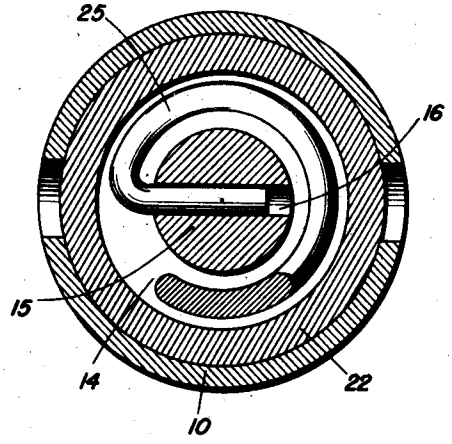


FIG. 5.

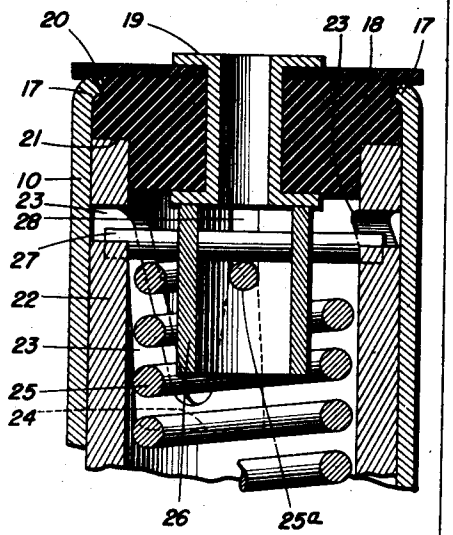
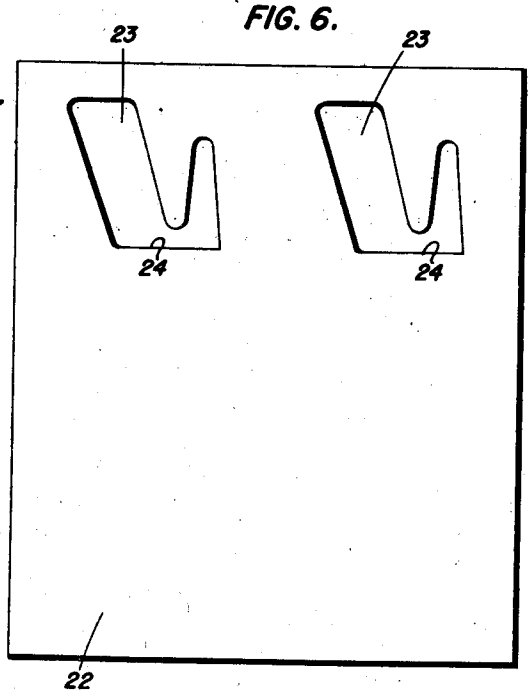


FIG. 6.



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UNITED STATES PATENT OFFICE

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SWITCH

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Application June 24, 1944, Serial No. 541,991

5 Claims. (Cl. 200—52)

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This invention relates to a circuit making and breaking device and more particularly to a setback operated switch for use in projectiles.

One object of the invention is to provide in a projectile a switch which is actuated by a sustained force of setback coacting with a spring.

A further object of the invention is to provide a switch of the character described which is positively maintained in open condition until acted on by a sustained force of setback.

Another object of the invention is to provide a device of the character described which is simple, rugged, and positive in operation, and which is not armed by tumbling or by unsustained accelerations.

These and other objects of the invention will be evident from the following specification and the accompanying drawings, in which

Fig. 1 is a longitudinal sectional view of the new switch with the parts in their open circuit positions;

Fig. 2 is a perspective view of a guide sleeve of the new switch;

Fig. 3 is a cross-sectional view taken on line 3—3 of Fig. 1;

Fig. 4 is a cross-sectional view taken on line 4—4 of Fig. 1;

Fig. 5 is a longitudinal sectional view of part of the switch showing the elements in their closed circuit positions; and

Fig. 6 is a front view of the blank from which the guide sleeve is formed.

In the drawings, the numeral 10 indicates a thin-walled, tubular outer casing which has its lower end portion bent inwardly at 11 to form an opening 12. A contact plug 13 having a flange portion 14 extends through the said opening 12. A hub 15 having a diametrically extending opening 16 is provided on the upper end of plug 13 above the flanged portion 14.

The upper end of casing 10 is bent slightly inwardly at 17 to retain an insulating closure plug 18 which is mounted in the upper end of the casing. The closure plug 18 carries a fixed, cylindrical contact member 19 having radial end flanges, one of which secures an insulating washer 20 to the outer end of the plug 18. A portion of the closure plug 18 is cut away at 21 to provide a shoulder for a purpose which will be explained presently.

Mounted in the casing 10 between the flange 14 of plug 13 and the shoulder 21 of plug 18, is a cylindrical guide sleeve 22, which is formed from a blank of the shape shown in Fig. 6. The guide sleeve 22, shown in perspective in Fig. 2, has two

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diametrically opposed V-shaped slots 23. These slots are formed with one leg of the V substantially longer than the other leg and with a straight portion 24 at the lower or apex end of the V. The longer legs of the two slots are diametrically opposite each other, as are the two short legs.

A helical spring 25 is mounted in the interior of sleeve 22 with the lower end of the spring bent inwardly and held in opening 16 in the hub 15. The upper or forward end 25a of the spring is bent inwardly to extend on the diameter of the sleeve and casing, and projects into, and is anchored in a movable contact sleeve 26. The sleeve 26 is disposed within the upper end portion of the spring 25 and carries a guide pin 27 extending diametrically through the sleeve 26. The guide pin, as best seen in Fig. 5, extends through the walls of the contact sleeve and has its ends mounted for movement in the V-shaped guide slots 23. Contact sleeve 26 has a slot 28 to permit the positioning of the upper end 25a of the spring in the sleeve. When in position, guide pin 27 retains the upper end 25a of the spring in place in the sleeve 26.

Prior to installation of the device in a projectile, a suitable tool is inserted through the contact 19 and is engaged with the guide pin 27. The guide pin and the contact sleeve 26 are then forced downwardly to the flat bottom of the V-slots and are then rotated through substantially 90 degrees until the pin 27 is at the bottom of the shorter of the two legs of the V-shaped slot 23. The pressure on the tool is then released to permit spring 25 to force the pin 27 and the sleeve 26 upwardly until the pin strikes the upper end of the short leg of the V slot. In this position the contact sleeve 26 is held away from fixed contact 19 so that the electrical circuit is open. The device is then mounted in a projectile with the upper end of the device toward the nose of the projectile and with the lower end containing the contact plug toward the base of the projectile.

When the projectile is fired from a gun, the switch is accelerated in the direction of the arrow in Fig. 1 and the force of setback shifts sleeve 26 and pin 27 rearwardly against the pressure of spring 25 until the pin reaches the flat portion of the slots. At this point, the torsion exerted by the spring rotates the sleeve and the pin approximately 90 degrees until the pin is at the lower end of the longer legs of the V-shaped slots. When the force of setback diminshes sufficiently to be overcome by the pressure of spring 25, pin 27 is moved upwardly in the longer legs

of the slots 23, and sleeve 26 is moved into contact with the fixed contact 19, thus closing the circuit. The closed circuit then comprises contact plug 13, spring 25, movable contact sleeve 26, and fixed contact 19.

The switch is not operated by a force of setback of short duration but is responsive only to a sustained force of setback of the order of that which is caused by firing a projectile from a gun. Minor accelerations caused by dropping or tumbling will have no effect on the device. After each shock, the spring 25 will return the pin 27 to its position at the upper end of the short arm of the V-shaped slot and the switch will remain in its original open circuit condition. In order that the switch may be actuated, it is necessary that the acceleration be in the direction of the arrow in Fig. 1 and be sustained over a substantial period. More particularly, the pin 27 must be moved to the bottom of the slots 23, and the spring must turn the pin 27, with its sleeve 26, to the position at the bottom of the longer leg of each V-shaped slot 23.

I claim:

1. A switch for use in a projectile, comprising a stationary contact element, a movable contact element, a spring tending to rotate said movable contact element from an inoperative into an operative position, and means for latching said movable contact element in inoperative position and so designed with relation to the strength of the spring that during short, accidental, releases of said latch the spring does not have time to turn the movable contact element sufficiently to effect its permanent release from the latching means, while intentional releases by setback, which are sustained for a period of a greater order of magnitude, suffice to allow the spring to release the latching means permanently.

2. In a switch for use in a projectile, a movable contact element normally in inoperative position, a torsional spring biasing said contact element to turn toward operative position, and means under control of said spring for locking said contact element in inoperative position and retaining it in such inoperative position in spite of relatively short accelerations and for unlocking said contact element when the device is acted upon by a relatively much more sustained force of setback.

3. In a switch for use in a projectile, a stationary contact element, a movable contact element normally out of contact with said stationary contact element, a guide member having a V-shaped slot, the arms of said slot being of unequal lengths, a pin carried by said movable contact element and being movably mounted in said slot and being positioned normally at the end of the shorter arm of the slot, a spring tending to move said movable contact element into contact with said stationary contact element and tending to rotate said pin toward the longer leg of said V-shaped slot, whereby a sustained force of setback moves said pin and said movable contact element rearwardly to the apex of the V-shaped slot and the spring rotates the pin into the longer arm of the slot and moves said pin to the end of said longer arm, thus moving said movable contact element into contact with said stationary contact element to close the switch.

4. A setback switch comprising a movable contact, cam means for guiding said contact in longitudinal and rotary movement and normally locking said contact in an inoperative position, and biasing means coacting with the cam means and operable in response to a sustained force of setback to cause the cam means to release said contact for movement by the biasing means to an operative position.

5. A setback switch comprising a movable contact, a fixed contact having an opening providing access to the movable contact, cam means for guiding the movable contact and normally locking the movable contact out of engagement with the fixed contact, the cam means having a portion for guiding the movable contact rearwardly away from the fixed contact, a second portion at the rear end of said first portion for guiding the movable contact generally transversely of said rearward direction, and a third portion for guiding the movable contact forwardly into engagement with the fixed contact, and biasing means for resisting said rearward movement of the movable contact and operable to move the movable contact along said second and third portions of the cam means into engagement with the fixed contact.

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The following references are of record in the file of this patent:

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