Jan. 4, 1949. R. L. MANEVAL 2,458,478

SETBACK SWITCH

Filed April 10, 1943

FIG. 1

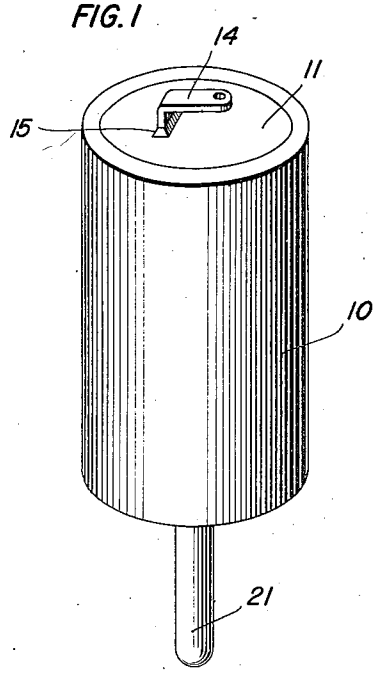


FIG. 2

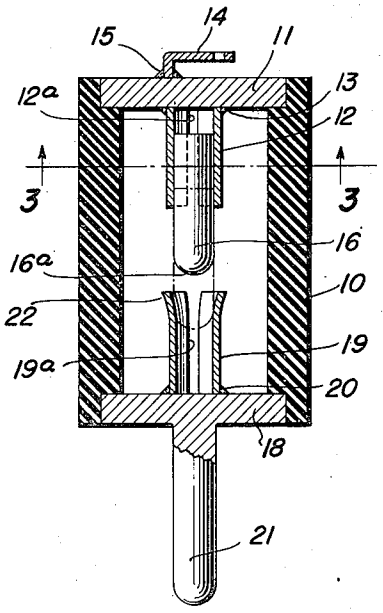


FIG. 3

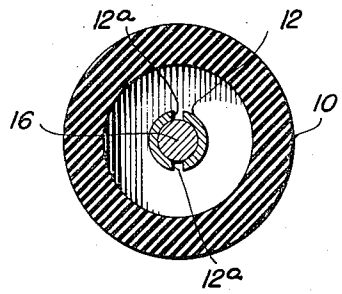
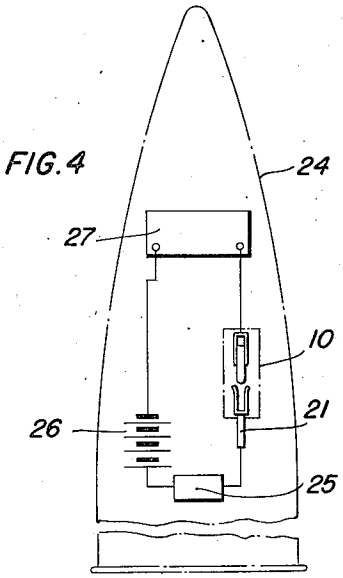


FIG. 4



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SETBACK SWITCH

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1 Claim. (Cl. 200—52)

1

This invention relates to switches and more particularly to a novel set-back switch for use in projectiles, and the like. The new switch is simple and compact in construction and positive in operation and may be used to particular advantage in a projectile as a safety device for controlling a detonating circuit in response to the force of set-back incident to firing the projectile in a gun.

One object of the invention resides in the provision of a set-back switch including an inertia element normally held by a clamping means and movable in the clamping means under a force of set-back to change the condition of the switch. Preferably, the inertia element is in the form of a plunger, and the clamping means includes a clip for receiving one end of the plunger and in which the plunger is movable when the force of set-back is sufficient to overcome the clamping action. The parts may be arranged to provide a normally open circuit with the plunger held by the clips in spaced relation to a second clip, whereby the force of set-back causes the plunger to move into the second clip while one end is still held by the first clip, so as to close the switch. Alternatively, the plunger and clips may be normally arranged in a closed circuit condition with the plunger clamped by both clips, so that the force of set-back causes the plunger to disengage one of the clips and open the switch.

Another object of the invention is to provide a novel set-back switch of compact construction including a movable plunger, a pair of clips for receiving the ends of the plunger, and a casing for housing the parts and insulating the clips. In the preferred form of the invention, the casing comprises a cylinder of insulating material closed at its ends by metal plates each of which supports a clip extending into confronting but spaced relationship in the cylinder, and a terminal extending outwardly from the plate. The plunger is normally clamped in the casing by one of the clips which exercises a permanent but slidable grip on one end of the plunger, the opposite end being disposed in line with the other clip but spaced therefrom so that the switch is normally open. When the plunger is subjected to a force of set-back, it moves endwise in the first clip into the second clip where it is progressively slowed by the compounded grip until clamped securely in circuit closing suspension between the clips.

These and other objects of the invention will be better understood by reference to the accompanying drawing, in which:

2

Fig. 1 is a perspective view of one form of the new switch;

Fig. 2 is a longitudinal sectional view of the switch shown in Fig. 1;

Fig. 3 is a sectional view in the line 3—3 in Fig. 2, and

Fig. 4 is a schematic view showing the new fuze embodied in a projectile.

Referring to the drawing, the switch there shown comprises a casing having a cylinder 10 of insulating material and a metal plate 11 closing one end of the cylinder. The plate is received in an enlargement of the bore in the cylinder, where it may be secured by any suitable means, such as a sealing compound (not shown). On the inner face of the plate 11 is a clip 12 made of spring metal, the clip being cylindrical and having longitudinal slots 12*a* extending to its free end. The clip may be secured to the end plate in any desired manner, as by means of solder 13. On the outer face of plate 11 is a terminal 14 which may be secured to the plate by solder 15. A cylindrical plunger 16 is received in the clip 12 where it is clamped firmly by the spring action of the leaves of the clip defined by the slots 12*a*. The plunger projects from the clip 12 for a substantial distance and is rounded at its free end, as shown at 16*a*.

The opposite end of the cylinder 10 is closed by a metal plate 18 seated in an enlargement of the cylinder bore. A metal clip 19 is secured to the inner face of plate 18, as by means of solder 20, and extends inwardly toward the plunger 16, the clip being generally cylindrical and having two longitudinal slots 19*a*. On the outer face of the plate 18 is a terminal plug 21 for connecting the switch in a circuit. The inner end of clip 19 is spaced from the adjacent free end of the plunger 16 and is flared outwardly, as shown at 22.

While the new switch is adapted for various uses where it is desired to change the condition of a circuit in response to a force of set-back, it may be used to particular advantage as a safety device in a detonating circuit of a projectile. As shown in Fig. 4, the switch is mounted in in the nose portion of a projectile 24 having a detonating squib 25 for exploding the main charge (not shown) in the projectile. The squib 25 is included in a detonating circuit comprising a current source 26, a circuit closing device 27, which may be a timing mechanism or a switch responsive to proximity of a target, and the set-back switch 10.

In the operation of the switch, the plunger

16 is normally clamped by the spring clip 12 in its open circuit position in spaced relation to the clip 19. The clamping force of the leaves of the clip 12 is sufficient to hold the plunger securely in its retracted position during handling and loading of the projectile 24. When the projectile is fired from a gun, the force of set-back incident to the acceleration of the projectile in the gun barrel overcomes the friction due to the clamping action of the clip 12 and causes the plunger to slide endwise in the clip toward the clip 19. As a result, the rounded end 16*a* of the plunger enters the flared end of clip 19, as shown in dotted lines in Fig. 2, forcing the spring leaves of clip 19 apart so that they exert a compounded clamping action on the plunger. Thus, the plunger which is progressively slowed in its penetration of the clip is suspended at its ends midway of the clips in spaced-bridging and circuit closing position. It will be apparent that when the plunger moves into the clip 19 under the force of set-back, the switch is closed and provides a current conducting path from the terminal plug 21 through plate 18, clip 19, plunger 16, clip 12, plate 11 and terminal 14. Accordingly, the detonator circuit is prepared for firing the detonator 25 as soon as the control device 27 operates.

With the new construction, accidental closing of the switch is prevented by the clamping action of the clip 12, so that the switch provides an effective safety device in the detonating circuit to prevent accidental or premature explosion of the projectile. The mass of the plunger 16 may be so proportioned in relation to the clamping action of clip 12 that endwise movement of the plunger in the clip is possible only under a heavy force, such as that to which the plunger is subjected by the force of set-back when the projectile is fired. When the force of set-back moves the plunger to its circuit-closing position in the clip 19, the plunger is thereafter held securely by the clamping action of the two clips to prevent accidental

opening of the switch while the projectile is in flight. The switch includes relatively few parts and has only one moving element, and, accordingly, it may be made in a compact form and is adapted for manufacture at low cost. The clips and the plunger are shielded in the casing 10, which also serves as an insulator between the switch terminals. The casing and terminals may be embedded in a suitable potting compound in the projectile 24 to provide further protection for the parts.

I claim:

A switch operable solely by the set-back action of sustained acceleration, said switch consisting of a casing, an inherently free circuit-closing rod-plunger operable in the casing, and axially confronted but spaced spring clips fixed in the casing, one of the clips slidably but permanently gripping the plunger at one end in circuit-open position, the grip of said clip yielding to set-back action under sustained acceleration for end movement into the embrace of the other spring clip, said other spring clip adding its grip to compound the total grip on the plunger, thereby progressively slowing the penetration of the plunger and stopping it in circuit-closing suspension between the clips.

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