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CENTRIFUGAL SAFETY DELAY SWITCH

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FIG. 1.

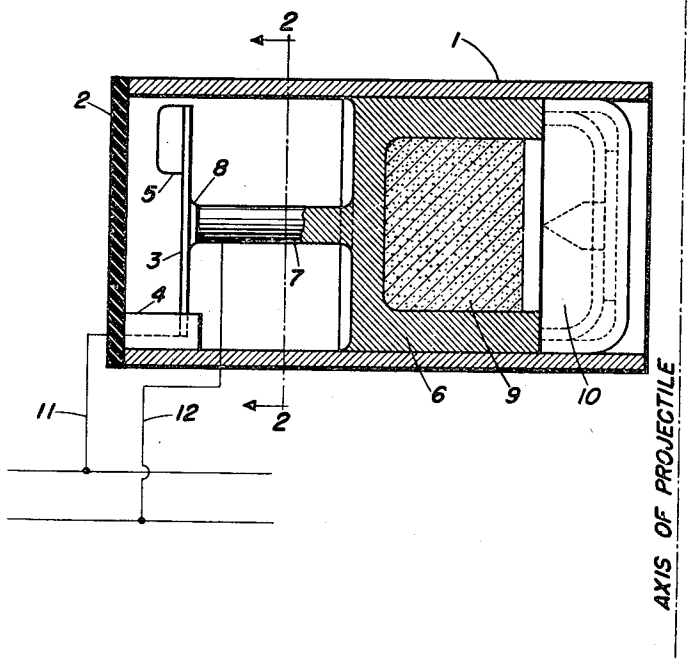
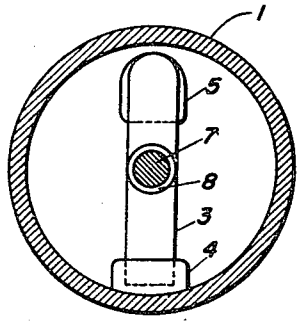


FIG. 2.



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CENTRIFUGAL SAFETY DELAY SWITCH

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3 Claims. (Cl. 200—80)

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The present invention relates generally to electrically detonated projectiles, and more especially to a safety delay shorter mechanism and circuit of the projectile intermediate the electric detonating mechanism and the primer or squib, to prevent accidental or premature explosion of the discharged projectile.

The primary object of the invention is the provision of a safety device that is simple in construction and operation, and reliable in the performance of its functions, and at the same time small and compactly arranged to occupy a minimum of space within the projectile.

The safety device includes an initially and normally closed electric switch, and heater, together with accessories to complete the unit, which is located within the projectile and disposed in a plane with its longitudinal axis perpendicular to the longitudinal axis of the projectile. The initially and normally closed switch of the safety device is designed to open automatically after a short delay, say approximately five seconds after setback, when the projectile is discharged from the gun.

The heater portion of the safety unit includes a pellet ignited by percussion from a striker mechanism actuated under impulse from spin, and heat is then transmitted from the ignited pellet to a thermally operated release device which, when activated, permits automatic separation of the switch contacts, and breaking of the circuit. These contacts of the safety delay short circuiting mechanism, when released, are immediately separated under centrifugal force generated by spin of the projectile.

The delivery of heat from the ignited pellet to the thermal release device, here shown as a solder joint of the switch, is delayed by thermal conduction, and upon melting of this soldered joint, the safetv switch will be opened as an effect of spin forces.

The invention involved in the safety device consists essentially in the use of an initially and normally closed electric switch interposed in the circuit of the projectile and held in closed position by means of a solder-joint, the solder-joint being melted by heat from a percussion-ignited heater to permit the switch to be opened under action of centrifugal force; and in other combinations and arrangements of parts as hereinafter set forth.

In the accompanying drawings:

Fig. 1 is an enlarged view showing the safety unit, with parts in section, together with a line

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representing the longitudinal axis of the projectile.

Figure 2 is a transverse sectional view of the unit on line 2—2 of Fig. 1.

In carrying out the invention, a metal container or case 1, of cylindrical shape and provided with a closed end or head 2 of electrically insulating material, is used to form an interior compartment in which a transversely disposed leaf spring or resilient conductor arm 3 is located, with one end rigidly anchored in a bracket or block 4. The free end of this resilient contact arm, or spring 3 has fastened thereto a laterally projecting weight 5, which aids in swinging the arm, under centrifugal force, to open the switch as hereinafter described.

Within the casing is enclosed a hollow cup-shaped steel holder 6 having an integral axial heat-conducting bar 7 that is soldered at 8 to the contact face of the conductor arm 3. This solder-joint uniting the perpendicular bar and the arm, forms part of a closed safety circuit or shorter for the squib of the projectile. Thus, when the solder of joint 8 is melted, and the two contacts 3—7 separate under influence of spin of the projectile, this safety circuit becomes opened or broken and thereby the projectile becomes armed.

The holder 6 contains a percussion-ignited heater-pellet indicated as 9, and preferably comprising a mixture of finely divided iron and potassium permanganate thoroughly mixed and compressed into pellet form within the holder.

The thermal mixture is ignited by the action of a striker in the projectile on a cap 10, mounted in the otherwise open end of the casing, in position to ignite the pellet in the holder, under force of spin of the projectile. However, if preferred, the thermal mixtures may be ignited by the closing of an electric circuit.

Heat from the ignited mixture is conducted from the holder or cup through its integral bar 7 to the solder-joint 8, and the solder of the joint is melted, thus releasing the spring 3 from its connection with the bar. Then, due to centrifugal force exerted acting radially outward from the longitudinal axis of the projectile, the weighted, resilient contact arm 3 is swung to the left in Figure 1 thus separating the contact 3 from contact bar 7, and consequently the shorter, or safety lines 11 and 12, are electrically disconnected from each other.

I claim:

1. A delay switch in a projectile comprising a mass of thermally and electrically conductive

material, said mass forming one member of a switch, a second switch member coacting therewith, an easily fusible substance holding the two switch members in electrical contact with one another, said substance being in thermal contact with said mass, a pyrotechnic material, said material being in thermal contact with a different portion of said mass, means actuated by and in response to centrifugal force, produced by the spin of the projectile, to ignite the material, whereby the combustion thereof heats the mass and after a delay determined by the heat conductivity of said mass, causes the substance to melt and thus releases the switch member previously held thereby.

2. A delay switch as defined in claim 1, including additional means, operable by said centrifugal force, to cause the switch members to separate upon melting of the easily fusible substance.

3. A delay switch for a projectile, said switch comprising a container having its axis substantially radially located with respect to the projectile, a pyrotechnic material in said container, means actuatable by centrifugal force due to spin of the projectile when fired from the gun, to ignite said material to produce heat, a weight coacting with one element of the switch and tending to open the switch when the centrifugal force acts thereon, and a substance of relatively low melting point holding said switch in the closed position against the force produced by said weight, said substance being so located that there is a predetermined delay in the transmission of said heat thereto and its consequent fusion and opening of the switch.

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