Sept. 19, 1950 C. N. HICKMAN 2,522,514

ARMING DEVICE

Filed Aug. 22, 1946

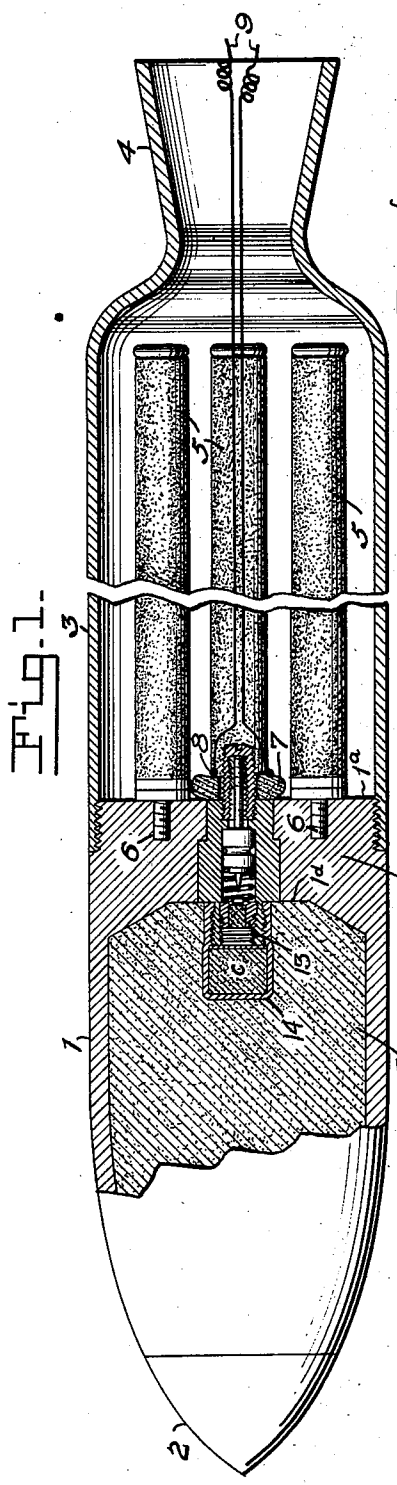

Fig. 1.

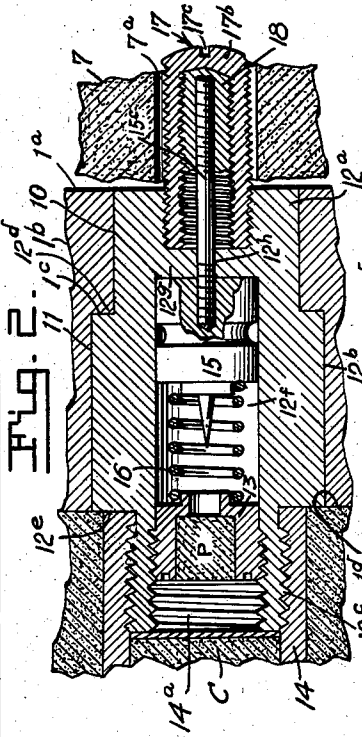

Fig. 2.

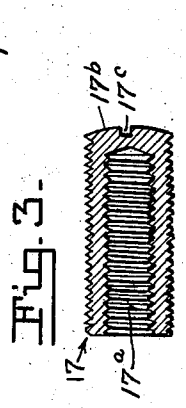

Fig. 3.

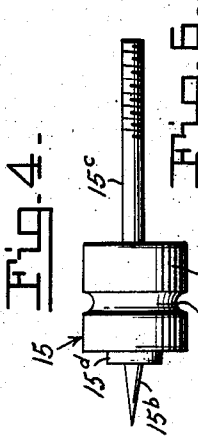

Fig. 4.

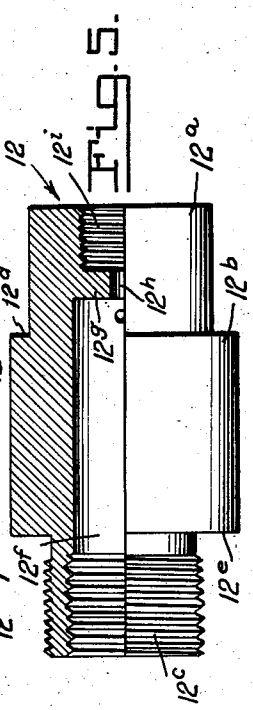

Fig. 5.

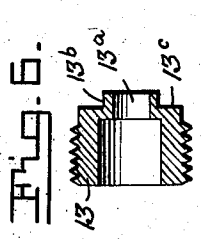

Fig. 6.

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UNITED STATES PATENT OFFICE

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ARMING DEVICE

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3 Claims. (Cl. 102—76)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

1

The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

My invention relates to a new and useful improvement in arming devices for fuzes and is more especially designed for use in impact fuzes for explosive charges in rocket projectiles. Such fuzes must be made "projector safe" by some form of safety device disarming the fuze until the projectile has left its projector. Heretofore it has been usual in such fuzes to arm them by the force of inertia due to the linear acceleration of the projectile or by centrifugal force due to the rotation of the projectile. However, in the use of rocket projectiles, these forces are often slight, and in many cases the projectile is non-rotative in flight. Consequently, arming devices so actuated would be so sensitive that arming might be due to accidental dropping of the projectile.

My invention is designed to provide a fuze having an arming device obviating such objectionable features, since the device maintains the fuze unarmed irrespective of shock or impact prior to the launching of the rocket projectile. The essential feature of my improved arming device is the provision of a thermally frangible bond for the firing means for detonating the explosive charge of the projectile. This bond maintains the firing means inoperative prior to launching, and is dissolved by the heat effect of the combustion of the propellent charge of the projectile on launching. The fuze is armed only after the projectile has been launched, and functions to detonate the explosive charge by impact of the projectile on the target.

While I have illustrated in the drawing filed herewith and have hereinafter fully described one specific embodiment of my invention, it is to be distinctly understood that I do not consider my invention limited to said specific embodiment, but refer for its scope to the claims appended hereto.

In the drawing:

Fig. 1 is a longitudinal section partly in elevation, of a rocket projectile provided with my improved arming device for an impact fuze.

Fig. 2 is a fragmentary enlarged section of the fuze and arming device.

Fig. 3 is a section of a socket member for a mass of fusible material effecting the thermally frangible bond.

Fig. 4 is a side elevation of the firing means assembly.

2

Fig. 5 is a side elevation, partly in section of the fuze body.

Fig. 6 is a section of a container for a primer.

As illustrated in the drawing, the rocket projectile has a charge-carrying head 1 with a removable nose 2, and a motor casing 3 threaded to the head 1, and having the rear nozzle 4. Suitably mounted in the casing 3 is the propellent assembly comprising the powder grains 5 on cage wires 6 carried by the head 1. A doughnut igniter 7 for the propellent assembly has an electric squib 8 with wiring 9 introduced through nozzle 4.

The head 1 has an axial bore 10, in the rear face 1—*a* of the rear wall 1—*b*, which connects forwardly with a bore 11 of larger diameter, forming the shoulder 1—*c*, and extended forwardly through the front face 1—*d* of the rear wall 1—*b*. The fuze body 12 is received in these bores 10 and 11 in the rear wall 1—*b* of the head and extends forwardly of front walls 1—*d* into the head 1. The body 12 has a reduced cylindrical rear portion 12—*a*, an enlarged intermediate portion 12—*b*, and a reduced exteriorly threaded forward portion 12—*c*. When the fuze body 12 is seated in rear wall 1—*b*, the rear end of the rear portion 12—*a* registers with rear face 1—*a*, the rear shoulder 12—*d* between reduced portion 12—*a* and enlarged portion 12—*b* seats against shoulder 1—*c* and the forward shoulder 12—*e* between enlarged portion 12—*b* and reduced portion 12—*c* registers with front face 1—*d* of rear wall 1—*b*. The body 12 has an axial bore 12—*f* extending rearwardly from the front end of body 12, through portions 12—*c* and 12—*b* and into portion 12—*a*, to a transverse wall 12—*g* having an axial bore 12—*h* communicating with an axial bore 12—*i* extending rearwardly from the wall 12—*g* to the rear end of body 12. The axial bore 12—*f* is threaded at its forward end and has threaded therein a container 13 for the primer P for the booster charge C in container 14 threaded on the forward end portion 12—*c* of body 12, and having a sleeve 14—*a* threaded into the bore 12—*f* ahead of container 13. The booster charge C is suitably disposed in the explosive charge E in the head 1, by the container 14 projecting forwardly of wall 1—*b* into the charge E. The container 13 has an axial bore 13—*a* (Fig. 6) and a peripheral flange 13—*b* on its rear face 13—*c* about rear end of bore 13—*a*. The firing pin assembly 15 is slidably mounted in bore 12—*f*, and comprises a body 15—*a* (Fig. 4) from the forward end of which projects the firing pin 15—*b* and from the rear end of which

projects the rod 15—c. The assembly 15 is displaced rearwardly in bore 12—f by a coil spring 16 having its forward end seated against the rear face 13—c of container 13 about flange 13—b and its rear end seated against the forward end of body 15—a about a boss 15—d. The body 15—a has a peripheral groove 15—e for receiving therein a safety pin (not shown) passed through the rear wall 1—b and body 12, to secure the fuze against accidental discharge prior to firing the projectile. The socket for the fusible element comprises a tubular sleeve or thimble 17 exteriorly threaded and received into the threaded bore 12—i of the fuze body 12. The rod 15—c of the firing pin assembly 15, extending rearwardly from body 15—a, passes loosely through bore 12—h of body 12 and extends rearwardly into the sleeve 17. A mass 18 of any suitable form of fusible material, such as low melting solder, is introduced into sleeve 17 so as to surround the rear end of rod 15—c. The outer surface of the rear end portion of rod 15—c, and the inner surface 17—a of sleeve 17 may be threaded, knurled or otherwise roughened to fortify the bonding of the parts by the mass 18. The sleeve 17 extends rearwardly from the fuze body 12 into the bore 7—a of the igniter 7, and its rear end is closed by a rear wall 17—b provided with transverse slot 17—c for a tool for seating the sleeve 17 in bore 12—i.

When the body 12 containing only the firing pin assembly 15 has been seated in rear wall 1—b of head 1 (nose 2 being removed) by passing the body 12 through the front end of wall 1—b, the sleeve 17 containing the mass 18 is passed partially over the rear portion of rod 15—c. Heat is then applied to sleeve 17 sufficient to fuse the mass 18 and the sleeve is then set up in bore 12—i (as illustrated in Figs. 1 and 2). On cooling, the mass 18 bonds the rod 15—c to sleeve 17, thereby preventing movement of firing pin assembly 15 until mass 18 is fused by application of a sufficient degree of heat. When these parts have been thus assembled, with the safety pin seated in groove 15—e, the spring 16 is inserted and container 13 is screwed into its place against forward end of spring 16 in bore 12—f. The primer P is placed in container 13 and container 14 is placed with its booster charge C. The propellent assembly is then mounted on the rear head 1 by attaching wires 6, and igniter 7 with squib 8 and wires 9 is positioned about the rear end of sleeve 17. The casing 3 is then passed about wires 9 and grains 5 and attached to head 1. The head 1 is then charged with the explosive charge E through its open forward end, and the nose 2 is positioned to close head 1.

When the projectile is to be launched, the safety pin is withdrawn from groove 15—e and the propellent assembly is fired in the conventional manner by an electrical charge conveyed by wires 9 to squib 8 firing the igniter 7 and grains 5. The heat generated by the combustion of the propellent assembly fuses the mass 18, releasing rod 15—c from sleeve 17, and arming the fuze which functions on impact of the projectile on the target, causing the firing pin 15—b to move forwardly against pressure of spring 16 to fire primer P by percussion, exploding booster charge C and explosive charge E.

It is obvious that my device may be utilized to arm a "detonator safe" fuze, viz. a fuze in which the lead in train is interrupted until the projectile has been fully launched. In such fuzes premature discharge of the explosive charge is prevented even if the detonating charge should be accidentally discharged. By the use of my improved thermally frangible bond a slide may be held against spring action to maintain the lead in train interrupted. In firing, the bond is destroyed and the spring moves the slide to position the lead in train uninterrupted, to arm the fuze.

Having described my invention, what I claim is:

1. In an arming device for a projectile fuze, the combination of a body; a firing pin slidable in said body and having a shank; a sleeve mounted on said body and surrounding a portion of said shank; a mass of fusible material in said sleeve bonding said shank to said sleeve; and a combustible charge adjacent said sleeve, said charge being fired on launching of the projectile and said mass being fused by the heat of combustion of said charge to release said shank from said sleeve to arm the fuze.

2. In an arming device for a projectile fuze, the combination of a body, a percussion primer in said body; a firing pin for firing said primer, slidable in said body; a spring spacing said pin from said primer, said spring being so compressed by said pin that the pin fires the primer on impact of the projectile on the target; a sleeve adjustably mounted on said body; a rod slidable in said body and said sleeve and having said pin mounted thereon; a fusible mass in said sleeve immobilizing said rod and said pin by a thermally frangible bond of said rod to said sleeve; and combustible means adjacent said sleeve to fuse said mass by the heat of combustion of said means to dissolve said bond, said means being fired on the launching of the projectile.

3. In a projectile having a forward explosive-containing section and a rearward motor chamber section, a transverse wall separating said sections, a fuze body fixed in said wall and having a longitudinally-extending passageway, a primer closing the forward end of said passageway, a firing pin slidable in said passageway in response to impact to engage and initiate said primer, a thimble having its open end secured in said fuze body and its closed rearward end exposed to the motor chamber, a rod secured at one end to said firing pin and having its other end extending into the rearward end of said thimble, and a mass of low melting point alloy in said thimble and connecting the exposed end of the same with the adjacent end of the rod whereby the firing pin is positively held out of engagement with the primer until the alloy is melted by heat generated in the motor chamber.

CLARENCE N. HICKMAN.

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