Dec. 30, 1930. H. H. ZORNIG ET AL 1,786,640

COMBINATION FUSE FOR PROJECTILES

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Fig. 1.

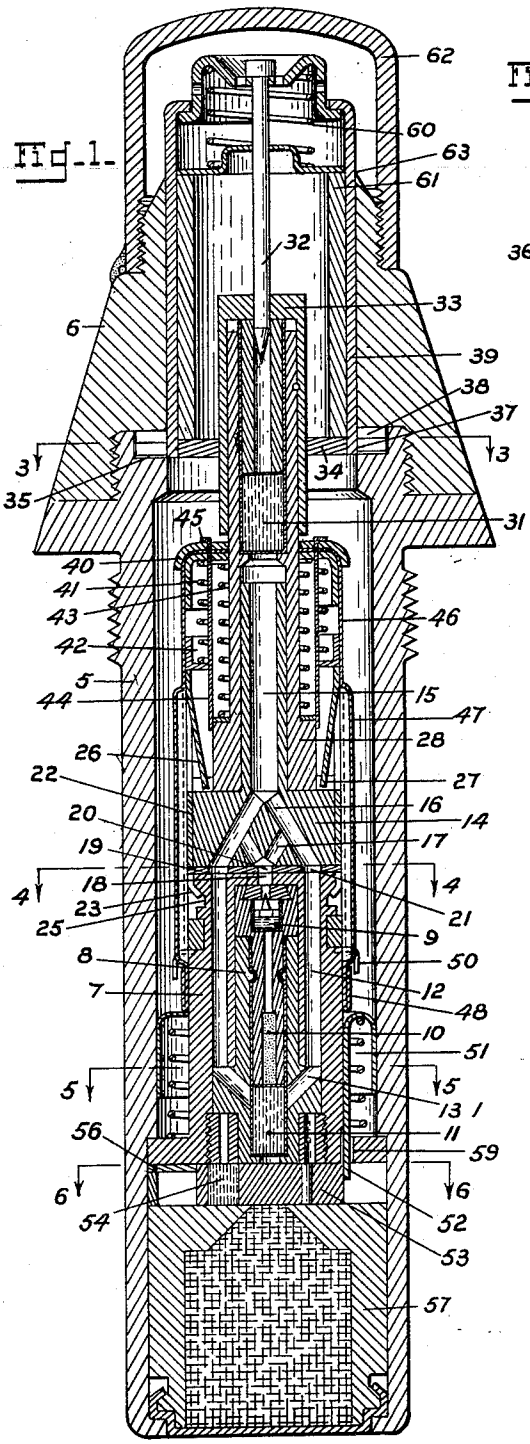


Fig. 3.

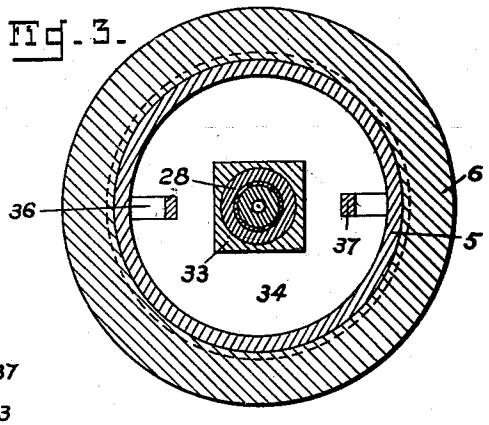


Fig. 4.

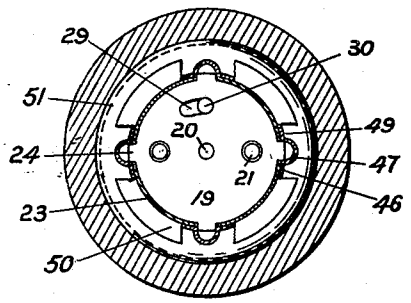
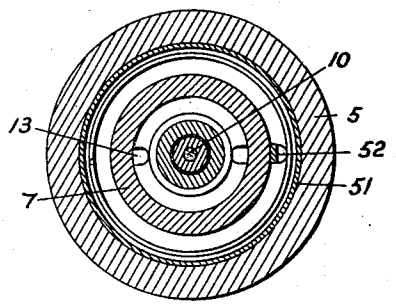


Fig. 5.



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Fig. 2.

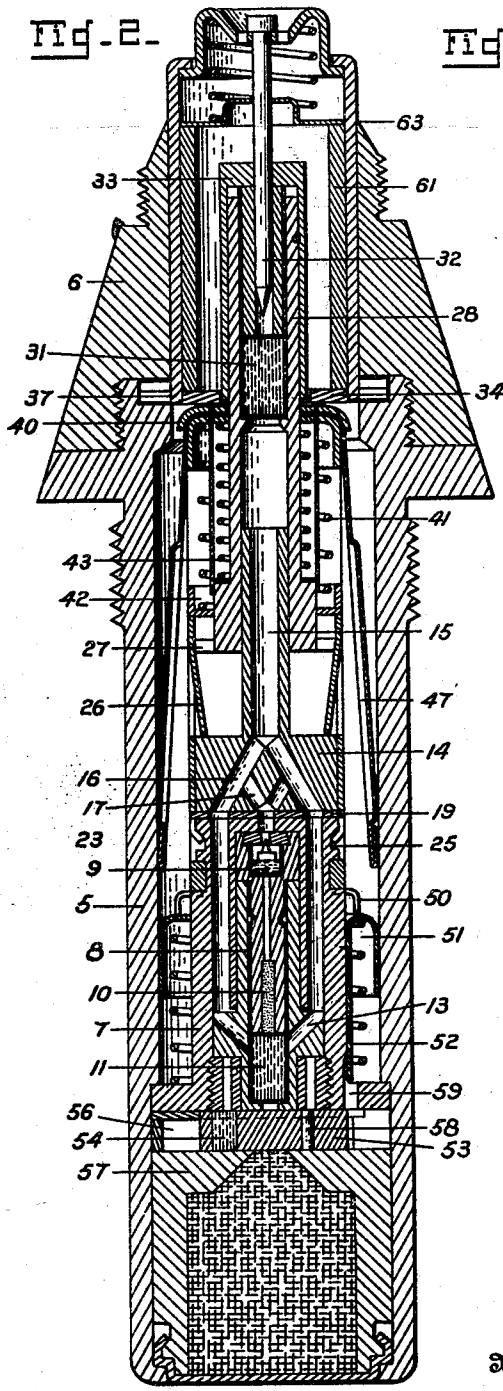


Fig. 6.

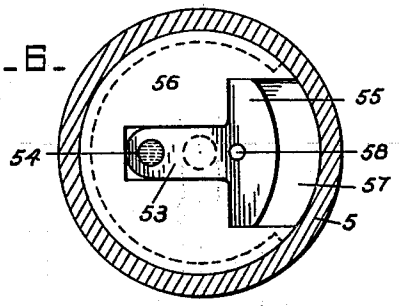
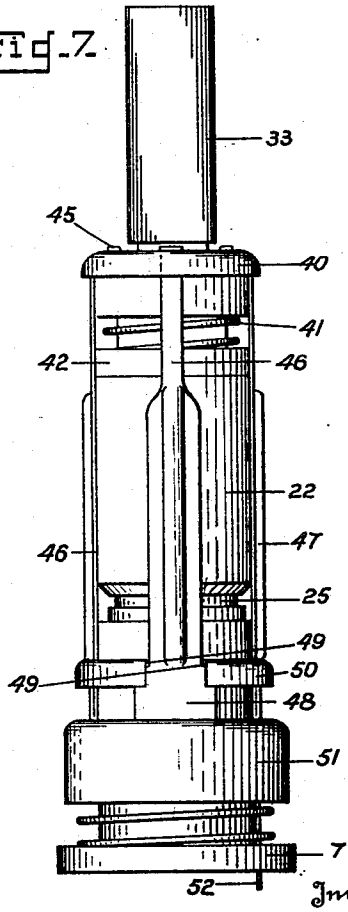


Fig. 7.



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UNITED STATES PATENT OFFICE

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COMBINATION FUSE FOR PROJECTILES

Application filed August 13, 1928. Serial No. 299,382.

(GRANTED UNDER THE ACT OF MARCH 3, 1883, AS AMENDED APRIL 30, 1928; 370 O. G. 757)

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.

The subject of this invention is a combination fuse for projectiles.

In separate loading ammunition the muzzle velocity and consequent speed of rotation of the projectile varies in accordance with the powder charge. A consideration of the variation in the speed of rotation of the projectile has led to the incorporation in the fuse of an arming device whose movement to released position is initiated on set-back and completed by centrifugal force due to rotation of the projectile.

This invention is characterized by a structure which is particularly suited for an arming device of the character mentioned and also by a novel method of arranging and setting the firing mechanism to produce a delay or non-delay functioning under the conditions of nose or graze impact.

With the foregoing and other objects in view, our invention resides in the novel arrangement and combination of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention herein disclosed may be made within the scope of what is claimed without departing from the spirit of the invention.

A practical embodiment of the invention is illustrated in the accompanying drawings, wherein:

Fig. 1 is a longitudinal sectional view of the improved fuse shown in the unarmed position;

Fig. 2 is a similar view showing the fuse in the armed position;

Figs. 3 to 6 are sectional views taken on the respective lines of Fig. 1;

Fig. 7 is a view in elevation of the explosive train assembly before insertion in the fuse casing.

In carrying out the invention a fuse container is provided which consists of a relatively long tubular body 5 to which is attached a tubular head 6. Inserted from the rear of the body is a casing 7 in which is secured a carrier 8 having an axial delay train consisting of a primer 9, a delay element 10 and a detonator 11. The casing 7 is formed with diametrically opposed longitudinal passages 12 which are in alinement with inclined passages 13 formed in the carrier 8 and converging to the detonator 11.

Mounted forwardly of the casing 7 is a flash tube 14 whose passage 15 is divided adjacent the casing to establish communication with each of the passages 12. These divided portions 16 of the passage 15 are in communication through passage 17 with a central aperture 18 in the casing 7 leading to the primer 9.

Interposed between the casing 7 and flash tube 14 is a shutter 19 having a central opening 20 and diametrically opposed openings 21 which in one position of adjustment of the shutter will be in alinement with the passages 12 and 16 and in any other position they will be out of alinement. Movement of the shutter is accomplished by a sleeve 22 which embraces the flash tube and is formed at its lower end with spaced prongs 23 between which are disposed peripheral lugs 24 of the shutter. The prongs of the sleeve are bent inwardly to engage in an annular recess 25 in the casing 7. A pair of opposite fingers 26 stamped from the upper portion of the sleeve are bent inwardly to restrain the flash tube against longitudinal displacement and also to engage in peripheral recesses 27 in the flange of a rotatably mounted plunger 28 so that upon rotation of the plunger the shutter 19 may be moved within limits of a slot 29 formed therein and receiving a pin 30 fixed in the casing 7.

The plunger is in the form of a tube which is mounted on the flash tube and carries intermediate its ends a primer detonator 31 which is to be fired by a striker 32 mounted in the head of the fuse. The forward portion of the plunger is squared and this is preferably accomplished by pinning to the plunger a squared cap 33. The cap is inserted through a squared aperture in a setting disk 34 which is marginally seated on annular shoulder 35 in the forward end of the fuse body. The disk is formed with peripheral recesses 36

in which are inserted fingers 37 stamped from the flange 38 of a setting sleeve 39 so that upon rotation of the sleeve the disk and plunger will partake of its movement. The flange 38 of the sleeve rests on the margin of the disk and both members are secured against longitudinal displacement when the fuse head is attached to the fuse body.

Embracing the plunger in rear of the squared cap 33 is a cage 40 confining an arming spring 41 which is seated on a ring 42 on the forward end of the sleeve 22 and also confining a creep spring 43 which is seated on the base of the plunger. The springs 41 and 43 are separated by a sleeve 44 having forwardly extending projections 45 which serve for securing blades 46 to the cage. The blades are preferably four in number, spaced equi-distantly, and reinforced by a longitudinal rib 47. Their free extremities each terminate in a latch head 48 engageable in notches or cavities 49 in a retaining ring 50 fixed in the casing 7 (see Figs. 4 and 7). When the blades are thus engaged the cage will be held against the action of the arming spring 41 and the plunger will correspondingly be held in the unarmed position as illustrated in Fig. 1.

Disengagement of the blades is initiated when the force of set-back occasioned by firing the projectile causes the cage and blades to travel to the rear and when this force has abated the centrifugal force due to rotation of the projectile will throw the blades outwardly until the latch heads contact the inner wall of the fuse body in which position they will be clear of the retaining ring 50. The arming spring 41 then acts to move the cage forwardly until it is brought up against the setting disk. The cage by engaging the squared cap 33 of the plunger carries the plunger to the armed position as shown in Fig. 2 where the primer detonator will be within the stroke of the firing pin on impact.

The blades are also utilized to releasably hold a spring actuated ring 51 which embraces the casing 7 and is formed with a depending finger 52 positioned in the path of a movable detonator carrier which in the present instance is shown as a transversely movable slide 53 carrying a detonator 54. The slide is formed with a winged head 55 to supply sufficient mass to insure movement under the influence of centrifugal force and enable the detonator 54 to be well removed from the axis of the fuse when the slide is unarmed. The slide and its casing 56 are retained in place by a booster casing 57. When the cage is moved to the armed position the ring 51 will be moved by its spring to withdraw the finger 52 and permit the slide to arm. Movement of the ring 51 is arrested by the retaining ring 50. A lock pin 58 is carried by the slide and on impact it may be driven forward to partially enter an aperture 59 in the flange of the casing 7 to prevent movement of the slide out of the armed position. The aperture 59 is also utilized by the finger 52 to gain access to the slide:

The striker 32 is of the air-balanceable type and after set-back it is returned to the extruded position by a spring 60, seated on a capped tube 61 within the setting sleeve 39. A protective cap 62 is threaded to the nose of the fuse head and is removed before firing. A suitable inscription indicating the direction of turning the setting sleeve 39 is provided preferably on the foremost edge 63 of the fuse head.

When the fuse is set for instantaneous action and impact occurs on the nose the striker will set off the primer detonator 31 in the plunger and the flash will pass through the flash tube and passages 12 in the casings 7 and function the detonator 11. The flash will likewise pass through the passages 17 to ignite the primer 9.

When the fuse is set for delay action by moving the shutter 19 to interrupt communication between the flash tube and passages 12 then the flash will only ignite the primer 9 and functioning of the detonator 11 must occur through the delay element 10.

When a graze impact occurs the retardation of the shell will cause the plunger to be moved forwardly until its detonator reaches the striker and the resulting flash will be communicated according to the disposition of the shutter and produce functioning which will be substantially identical in time with that occurring on normal impact.

I claim:

1. A fuse including a tubular body, a head attached to the body, a casing secured in the rear portion of the body and having opposed longitudinal passages, a carrier fixed in the casing and having converging passages in communication with the passages in the casing, an axial explosive train in the carrier including a primer, a delay element and a detonator, the latter positioned between the converging passages, a flash tube mounted forwardly of the casing and having communication with the primer and the passages in the casing, a shutter interposed between the flash tube and casing for closing the passages in the casing, a plunger having a squared front portion mounted on the flash tube, a primer detonator in the plunger, means operable during flight for arming the plunger, a sleeve rotatably secured to the casing and connected to the shutter, fingers on the sleeve restraining movement of the flash tube and engaged with the plunger for rotary movement therewith, a setting disk fitting on the squared portion of the plunger, a setting sleeve rotatably mounted in the fuse head and engaging the setting disk and a striker mounted in the setting sleeve.

2. A fuse including a body, a head attached

thereto, a casing fixed in the body and having non-axial flash passages converging at the rear, an axial delay train in the casing, an axial detonator in the casing between the converging passages, a flash tube forwardly of the casing and in communication with the axial delay train and non-axial passages, a shutter interposed between the flash tube and casing for closing the non-axial passages in the casing, a plunger having a squared front portion mounted on the flash tube, a primer detonator in the plunger, means operable during flight for arming the plunger, a sleeve rotatably secured to the casing and connected to the shutter, fingers on the sleeve restraining movement of the flash tube and engaged with the plunger for rotary movement therewith, a setting disk fitting on the squared portion of the plunger, a setting sleeve rotatably mounted in the fuse head and engaging the setting disk and a striker mounted in the setting sleeve.

3. A fuse including a body, a head attached thereto, a casing fixed in the body and having non-axial flash passages converging at the rear, an axial delay train in the casing, an axial detonator in the casing between the converging passages, a flash tube forwardly of the casing and in communication with the axial delay train and nonaxial passages, a shutter interposed between the flash tube and casing for closing the nonaxial passages in the casing, a plunger mounted on the flash tube, a primer detonator in the plunger, a connection between the plunger and shutter for moving the shutter to passage open or closed positions and means operable during flight for arming the plunger.

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