Feb. 23, 1960 J. VON NEMETH 2,925,778

HELIX TYPE DELAY DETENT

Filed March 15, 1957

FIG. 1

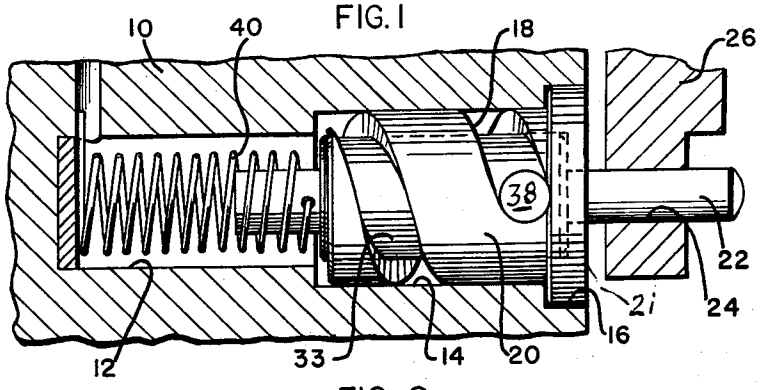


FIG. 2

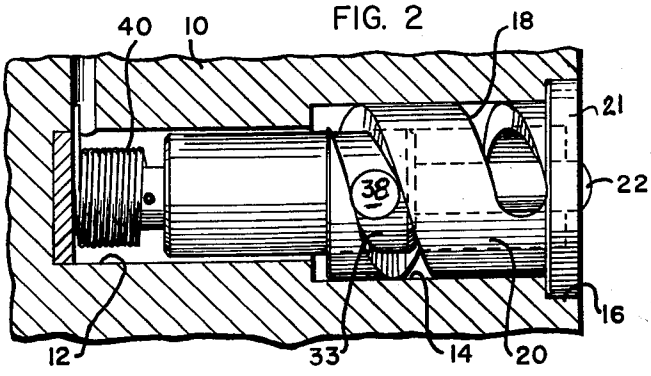


FIG. 3

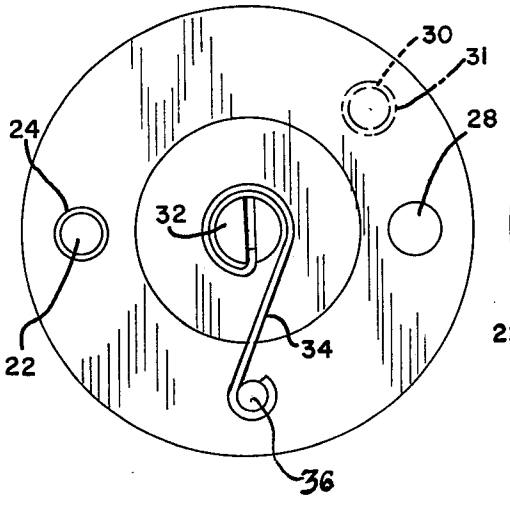
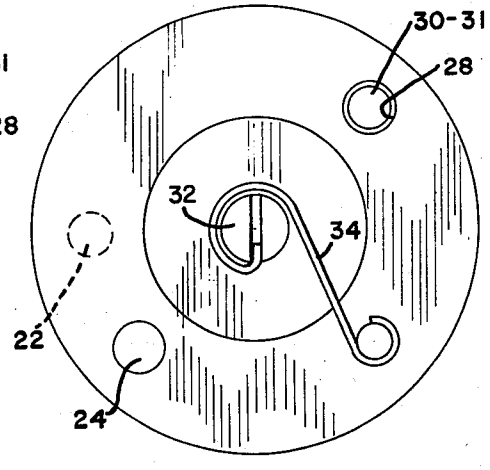


FIG. 4



INVENTOR.

JOSEF VON NEMETH

By Benjamin F. Wupper

Atty.

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HELIX TYPE DELAY DETENT

Josef von Nemeth, Chicago, Ill., assignor to Stewart-Warner Corporation, Chicago, Ill., a corporation of Virginia

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2 Claims. (Cl. 102—78)

My invention relates generally to fuzes and more particularly to an improved setback device, or detent, to provide at least one means for preventing premature explosion of an artillery projectile, rocket, or the like.

In many types of fuzes for projectiles there is provided a priming or relay charge which is aligned with the detonator and main charge only after the projectile has been discharged from the rifle, etc., for a predetermined time interval.

Thus shocks to which the projectile may be subjected in transportation, handling, and loading, even though sufficiently severe to cause the detonator to fire, will not cause the main charge of the projectile to explode. This is because the priming or relay charge is not in alignment with the detonator and a port, or passageway, leading to the chamber in which the main charge is located. The final, or at least one step in the arming of the projectile, is accomplished by means responsive to the axial or rotary acceleration of the projectile as it advances through the bore of the rifle or cannon.

In the present invention, the arming mechanism is responsive primarily to the axial acceleration of the projectile and is provided to delay the arming until the projectile being fired is a safe distance beyond the muzzle of the rifle.

It is thus an object to provide an improved setback means for delaying the arming of the fuze of a projectile, in response to its discharge from a rifle.

It is a further object to provide a safe fuze means for projectiles which will prevent accidental explosion of the main charge of a projectile due to shock in transportation, loading, or handling.

Other objects will appear from the following description, reference being had to the accompanying drawings, in which:

Fig. 1 is a transverse sectional view of a portion of a projectile showing, in enlarged scale, the improved detent or setback means being shown in shutter locking position;

Fig. 2 is a similar view showing the detent in armed position, withdrawn from engagement with the shutter;

Fig. 3 is a fragmentary end elevation showing the shutter held in unarmed position by the detent; and

Fig. 4 is a view, similar to Fig. 3, showing the shutter in armed position.

In some types of fuzes, shutters carrying a relay or priming charge are mounted for rotary or angular movement, by the force of a tensioned spring, or by rotary inertia, to bring such charge into alignment, or effective operative relation, with an impact operated detonator and the main explosive charge. To prevent accidental explosion of the main charge, the shutter is normally locked against such movement by a detent which, either in response to axial or rotary acceleration of the projectile, releases the shutter for movement to its armed position.

The present invention pertains particularly to the provision of improved means for delaying the release of

the shutter so that it will not be moved to armed position in response to shocks incurred in the transportation, handling, dropping, or in ramming the projectile into the chamber of the rifle. Instead, the shutter will be released only in response to the application to its detent of a force sustained over an appreciable time interval, of somewhat less duration than the time the projectile is accelerated during its travel through the barrel of the rifle and its projection therefrom.

Thus, although manually set arming devices be incorporated in the projectile, and if these should fail in preventing accidental brisance of the detonator, the explosion of the main charge is prevented.

Referring to Figs. 1 and 2 the body **10** of the fuze, which in some instances may be the body of the projectile, is shown in fragmentary section and has a bore **12**, counterbore **14**, and coaxial recess **16** formed therein. A helically slotted cam **18** is formed in a hollow cylinder **20** which has a flange **21** pressed into the recess **16** and provides a guide for a setback pin **22**. This pin normally projects through a hole **24** in a rotary shutter **26**.

As shown in Fig. 3, the shutter **26** is provided with a priming or relay charge **28** which is normally out of alignment with a passageway **30**, which may or may not contain a booster charge, and which is also out of alignment with the brisance discharge passageway **31** of the detonator, the latter being in alignment with the passageway **30**.

The shutter **26** is mounted for rotation, or oscillation, on a stub shaft **32**, fixed with respect to the housing **10**, and is urged to move counterclockwise by a torsion spring **34**, one end of which may be anchored to the stub shaft **32** and the other end of which hooks around a pin or projection **36** on the shutter **26**. The counterclockwise movement of the shutter **26** is limited by suitable stop means so that when setback pin is withdrawn from holding position, the shutter swings counterclockwise to the position shown in Fig. 4 in which the priming or boosting charge **28** carried by the shutter **26** is in alignment with the passageways **30** and **31** leading to the main charge and from the detonator respectively, so that the projectile is fully armed for explosion of the main charge upon brisance of the detonator resulting from impact of the projectile with the target.

In order to provide a safe delay of the complete arming of the projectile by the pivotal movement of the shutter, the setback pin **22** has an enlarged diameter portion **33** which is guided in the sleeve **20** and has a transverse pin **38**, one end of which projects into the helical cam slot **18** formed in the sleeve **20**. A compression and torsion spring **40** has one end anchored to the reduced diameter (left hand—Figs. 1 and 2) portion **42** of the setback pin **22**, the other end of the spring being anchored to the projectile body or housing **10**.

In operation, when the projectile is fired from a rifle, or the rocket is launched, the acceleration thereof (in the present construction mainly axial), causes the setback pin, due to its inertia, to move leftwardly relative to the body **10** (Figs. 1 and 2), because it is assumed that the projectile is discharged from the rifle in a rightward direction, but such arming movement of the setback pin is delayed or retarded by the engagement of the pin **38** with the helical slot **18** and by the fact that the resistance to relative rearward movement of the setback pin **22** increases in accordance with Hooke's law. Thus the complete arming of the projectile is substantially delayed.

For example, a setback device of a construction, similar to that shown and described, but not provided with the helix slotted cam sleeve **20** and the pin cooperating therewith, might move .250" and release the shutter, but

in the construction shown (assuming a helix slot of 15° pitch), the pin must travel about four times as far (timewise), before it will move to shutter releasing position. In other words, a sudden shock of a given degree of acceleration, as might be caused by dropping the projectile, would move the setback pin only .062", and would not release the shutter, whereas a sustained acceleration of the projectile, as occurs when the projectile is fired, will cause the spring loaded setback pin to move approximately .250" before the shutter **26** is released and thus assure that the main charge of the projectile will not be prematurely ignited despite failure of the impact operated detonator, or the failure of other arming devices.

While I have shown and described a preferred embodiment of my invention, it will be apparent that numerous variations and modifications thereof may be made without departing from the underlying principles of the invention. I therefore desire, by the following claims, to include within the scope of the invention all such variations and modifications by which substantially the results of my invention may be obtained through the use of substantially the same or equivalent means.

I claim:

1. In an impact fuse mechanism of the type in which a shutter in an inoperative position thereof prevents alignment of a detonator and a main charge and in which a detent normally engages the shutter to hold the latter in its inoperative position prior to being subjected to set back forces, the combination with the detent of a safety arming device comprising a stationary element defining a helical groove about a predetermined axis, a second element received within the stationary element and connected to the detent, the second element and the detent disposed for reciprocable movement along the axis from a shutter holding position to a shutter release position spaced therefrom, the detent engaging the shutter through a substantial portion of its movement from the holding to the release position, a pin secured to and projecting radially from the second element and extending into the helical groove to cause rotation of the second element and detent relative to the stationary element incident to coaxial movement of the second element and detent, a biasing spring engaging the second element to urge the second element and the detent to the holding position, the spring effective to return the second element and the detent to the holding position subsequent to their movement from the holding position by shock forces of an intensity insufficient to move the second element and detent to the release position.

2. In an impact fuse mechanism of the type in which a shutter in an inoperative position thereof prevents alignment of a detonator and a main charge and in which a detent normally engages the shutter to hold the latter in its inoperative position prior to being subjected to set back forces, the combination with the detent of a safety arming device comprising a stationary annular sleeve defining a helical slot along its periphery, a coaxial piston received within the sleeve and connected to the detent. the piston and the detent disposed for reciprocable axial movement from a shutter holding position to a shutter release position spaced therefrom, the detent engaging the shutter through a substantial portion of its movement from the holding to the release position, a pin secured to and projecting radially from the piston and extending into the helical groove to cause rotation of the piston and detent relative to the sleeve incident to axial movement of the piston and detent, a biasing spring secured in fixed position at one end thereof and secured at the other end to the piston to urge the piston and the detent axially and rotatively to the holding position, the spring effective to return the piston and the detent to the holding position subsequent to their movement from the holding position by shock forces of an intensity insufficient to move the piston and detent to the release position.

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