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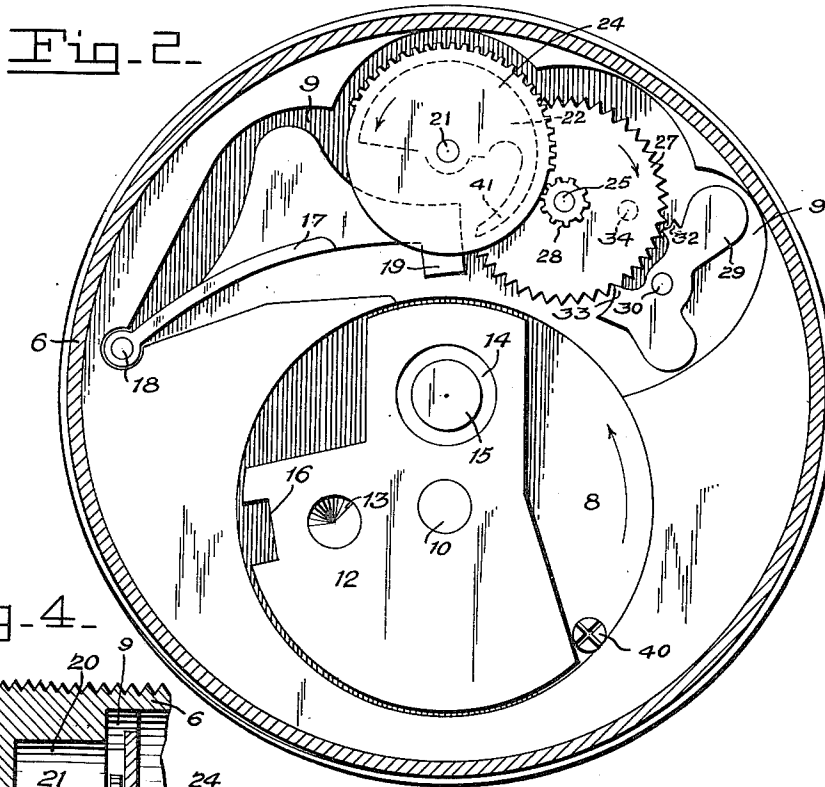
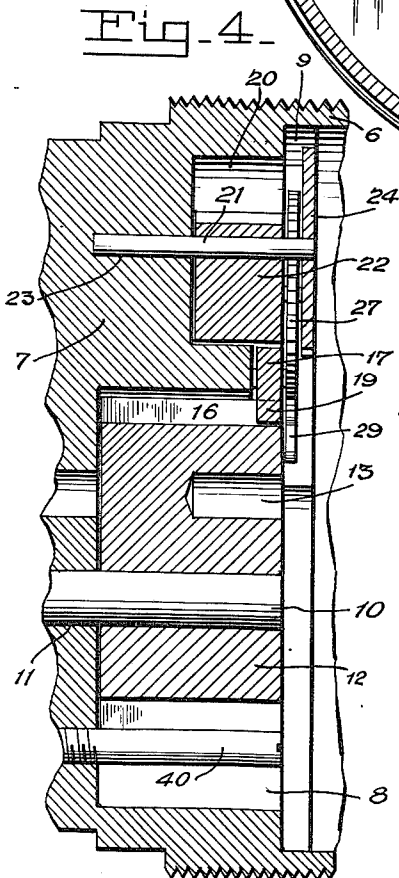
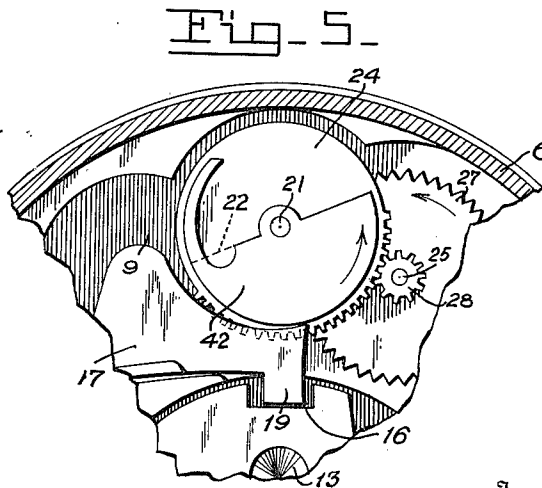
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DELAY ARMING DEVICE

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2 Sheets-Sheet 2



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DELAY ARMING DEVICE

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2 Claims. (Cl. 102—80)

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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.

This invention relates to a delay arming device forming a part of the booster charge and which is interposed between the fuze and booster charge to prevent a premature detonation of the booster charge through an inadvertent premature functioning of the fuze; and also prevents a regenerative action which could change a low order detonation, caused by initiation of the shell loading other than that caused by the fuze and booster combination, to a high order through the low order being sufficient to function the rotor detonator which in turn would build the action up to a high order.

More particularly, it is an aim of the invention to provide a centrifugally actuated means including a rotor having a detonator forming a part of a communicating flash passage between a fuze and booster charge, which passage is normally in a non-registering position and which is moved into a registering position by centrifugal force during flight of a projectile containing the device.

Still another further object of the invention is to provide a novel regulating means for releasing the rotor, which includes an escapement for regulating the time at which the rotor is released.

Still a further object of the invention is to provide a device of the above described character especially intended for use in projectiles of large calibers which will not only render the projectile positively bore safe, but which can be regulated to prevent arming of the projectile until it has traveled a sufficient distance from the muzzle of the weapon, from which it is fired, to be beyond a position at which the gun crew could be endangered by detonation of the projectile; to thereby prevent injury to the gun crew due to tree bursts or the projectile striking any mask during the initial stage of its flight.

Other objects and advantages of the invention will hereinafter become more fully apparent from the following description of the drawings, which illustrate preferred embodiments of the invention, and wherein:

Figure 1 is a horizontal sectional view, partly in plan, showing the delayed arming device in a non-registering or safe position;

Figure 2 is a view similar to Figure 1 showing the device in a registering or armed position;

Figure 3 is a sectional view taken along the line 3—3 of Figure 1;

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Figure 4 is a sectional view taken along the line 4—4 of Figure 1, and

Figure 5 is a fragmentary view, similar to Figure 1, of a slightly modified form of the device.

Referring more particularly to the drawings, wherein like reference characters designate like or corresponding parts throughout the several views, and referring particularly to Figures 1 to 4, 6 designates generally a housing which is adapted to be interposed between a booster charge and a fuze, not shown, and which is further adapted to function as a coupling means between the fuze and booster charge. The housing 6 includes a solid rear portion 7 which is provided with a forwardly opening, circular cavity 8 and a recessed portion 9 which likewise opens forwardly, and a portion of which communicates with the cavity 8. A shaft 10 is axially disposed in the cavity 8 and extends into a recess 11 in the portion 7. Shaft 10 may be either fixed or journaled in the recess 11 and provides a support for a rotor 12 which is rotatably mounted in the cavity 8 and through which the shaft 10 extends. The shaft 10 may be fixed to the rotor 12 or rotatably connected thereto, depending upon whether the shaft is fixed or rotatably mounted in the recess 11. As clearly illustrated in Figure 1, the rotor 12 is recessed so that the preponderance of its weight is in one segment thereof and within said segment portion 30 the rotor 12 is provided with a cavity or recess 13. The aforementioned segment of the rotor 12 is provided with a notch 16 which opens outwardly of the periphery thereof. Circumferentially spaced from the notch 16, the rotor 12 is provided with a bore 14 which extends therethrough, from end to end thereof, and which contains a detonator 15.

A sear 17, in the form of a lever, is disposed in a part of the recess 9 and has one end thereof pivotally mounted on a pin 18 which extends into the housing portion 7. The opposite, free end of the sear 17 is provided with a radially projecting finger 19 which extends into the cavity 8 and into the notch 16 for normally retaining the rotor 12 in its position, as seen in Figure 1. As seen in Figure 4, the recess portion 9 includes a substantially circular forwardly opening cavity 20 and a shaft 21 extends axially therethrough and is journaled in a forwardly opening recess 23 of the housing portion 7. A centrifugally actuated weighted detent 22 is keyed to the shaft 21 and is rotatably mounted in the cavity 20. A disk 24, provided with teeth extending a part of the way therearound and forming a gear segment, is keyed to the outer or forward end of the shaft 21 and is disposed in

front of the detent 22 and to the front of the cavity 20 and within the recess 9. The free end portion of the sear 17, as seen in Figure 4, is disposed behind the gear segment 24 and partially in overlapping relationship thereto for engagement with the detent 22 which functions to retain the sear finger 19 in engagement with the notch 16.

As seen in Figure 3, a shaft 25 journaled in the forwardly opening recess 26 of the housing portion 7 and projects forwardly therefrom into the recess 9 and is provided with an escapement wheel 27 which is keyed thereto and disposed in the recess 9. The escapement wheel 27 is disposed behind the gear segment 24 and in partially overlapping relationship thereto, and a pinion 28 is keyed to the forward end of the shaft 25 and is disposed to mesh with the teeth of the gear segment 24. An escapement pallet or verge 29 is keyed to one end of a shaft 30 which is journaled in a forwardly opening recess 31, of the housing portion 7, and said escapement 29 is likewise disposed in the recess portion 9. Escapement 29 is in the same plane as the escapement wheel 27 and is positioned adjacent thereto so that pawls 32 and 33 thereof alternately engage the teeth of the escapement wheel 27 and by a camming action therewith, in a conventional manner, permit a regulated step by step movement of the escapement wheel 27, pinion 28 and the gear segment 24, when said segment teeth are enmeshed with the pinion 28. A setback pin 34 is reciprocally mounted in a restricted portion 35 of a bore 36, which is formed in the housing portion 7 and has an inner end which extends into the bore 36 and to which is secured a collar 37. An expansion spring 38 is contained in the bore 36 and bears against collar 37 for urging the pin 34 forwardly and toward the escapement wheel 27. Escapement wheel 27 is provided with an opening 39 to receive the pin 34 which functions, when in its normal position, as seen in Figures 1 and 3, to prevent movement of the gear segment 24, escapement wheel 27 and the parts connected thereto.

The cavity 8 is provided with a fixed pin 40 which is disposed therein and within a recessed portion of the rotor 12 to engage the rotor, upon rotation, to limit the rotational movement thereof.

As clearly illustrated in Figures 1 and 2, all of the parts previously described and contained within the housing 6 are located so as to be responsive to the centrifugal force produced by the rotation of the housing 6 when contained in a projectile, while in flight.

Assuming the parts to be in the positions, as seen in Figure 1, and further assuming the housing 6 to be connected to a fuze and booster and disposed in a projectile, not shown, upon said projectile being fired from a weapon, pin 34 will be set back by inertia against the force of its spring 38 and will thereby move out of engagement with the opening 39 to release the escapement wheel 27. Pin 34 is preferably locked out of engagement with wheel 27 by means of its inability to again find its way into the restricted portion of 35 of bore 36. The rotation of the housing 6, by the projectile in flight, will cause a centrifugal force to be applied to the combined driving arm and detent 22 which will thereby be swung in a counterclockwise direction, as seen in Figure 1. The counterclockwise swinging movement of the detent 22 will be regulated by the escapement 27, 29 due to the fact that the detent 22 and gear segment 24 are both keyed to the shaft 21 and the pinion 28 which is in mesh with gear segment

24 is keyed to escapement wheel 27. Thus, the speed at which the detent 22 is swung outwardly will be governed. As the arcuately shaped extension 41 of the detent 22 approaches its position of Figure 2 the teeth of gear segment 24 will move out of engagement with pinion 28 allowing the weighted detent 22 to move freely thereafter, to thus insure that detent 22 will move out of engagement with the free end of the sear 17, to thereby release the sear to permit it to be swung outwardly by centrifugal force, from its position of Figure 1, to its position of Figure 3. This outward movement of the sear 17 will cause the sear finger 19 to move out of engagement with the notch 16 and permit the rotor 12 to be moved by centrifugal force in a counterclockwise direction, from its position of Figure 1 to its position of Figure 2. The rotor 12, in its position of Figure 3, is disposed so that the flash passage 14, containing the detonator 15, is registering with aligned passages, not shown, of the booster and fuze through which a flash from an explosive charge or train in the fuze, not shown, is adapted to be conveyed to the booster by ignition of the detonator 15, which thus forms a part of the explosive train. It will thus be readily apparent that the release of the rotor 12 and its movement to its position of Figure 2 will arm the booster arming device, comprising the invention, to enable the fuze and booster, with which it is associated, to function when the fuze is set off. Further, it will be readily apparent that prior to the time that the sear 17 is released from the rotor 12 and moves to its position of Figure 2, the device will prevent detonation of the booster charge should the fuze be prematurely set off, due to the fact that the flash from the fuze would then be trapped in the blind cavity 13 and be rendered harmless thereby.

It will be noted that when the rotor 12 is in its armed position of Figure 2, the preponderance of its weight is still so disposed that said rotor is under a stress exerted by centrifugal force and is held from further swinging movement by engagement of a portion thereof with stop 40, so that the rotor is held effectively in an armed position by centrifugal force. Obviously, if desired, a conventional spring latch could be provided for positively latching the rotor in its armed position. It will also be readily apparent that when pin 34 is set back by acceleration, the escapement wheel will begin its rotational movement to thereby move the opening 39 out of alignment with pin 34. The detent 22 will complete the swinging movement to release the sear 17 after the time factor governing the opening point has been passed.

A slightly modified form of the invention is disclosed in Figure 5 and which differs from the device as shown in Figures 1 to 4 only in that the sear 17 is set further to the front and in front of and partially overlapping the gear segment 24. A separate detent 42 is keyed to the shaft 21, and disposed in front of the gear segment 24 and in the same plane as the sear 17, to engage the free end of the sear for holding its finger 19 in engagement with the notch 16. The shape of the detent 42 corresponds to the shape of the weighted detent 22, as clearly illustrated in dotted lines in Figures 1 and 2 and is utilized in addition thereto.

As the functioning of the parts shown in Figure 5 are the same as those shown in Figures 1 to 4, a further description of the modification is considered unnecessary.

Various other modifications and changes are

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likewise contemplated and may obviously be resorted to without departing from the spirit and scope of the invention as hereinafter defined by the appended claims.

I claim:

1. A delay arming booster for a projectile of the type which rotates during flight comprising a booster housing interposed between a fuze and its booster charge, said housing having a circular, off center cavity and an off center recess in the same plane with said cavity and communicating therewith; a rotor turnably mounted in said cavity about a rotor shaft, said rotor being eccentrically weighted for rotation about its shaft by centrifugal force upon projectile rotation; a flash passage in said booster housing; a flash hole in said rotor initially out of line with said flash passage to block same; a notch in the periphery of said rotor; a sear eccentrically pivotally mounted in said recess for rotation by centrifugal force from an initial safety position into an armed position; a finger on said sear engaging said rotor notch to maintain said rotor in its initial position; an eccentrically weighted pivotally mounted detent in said recess arranged to initially main-

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tain said sear in the safety engaged position, but rotatable by centrifugal force upon projectile rotation to release said sear; a gear train and escapement mechanism energized by rotation of said detent to delay rotation of same; a stop for said rotor to position same with said flash hole aligned with said flash passage upon disengagement of said sear finger from said peripheral notch.

2. The invention recited in claim 1, including a set-back actuated release for said escapement mechanism arranged to normally block movement of same.

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