Dec. 9, 1958 E. N. SHEELEY 2,863,393

SAFETY AND ARMING MECHANISM

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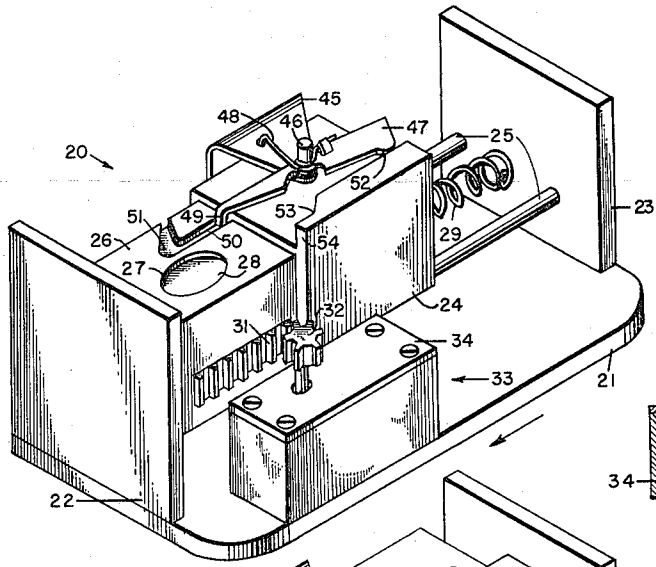


Fig. 1.

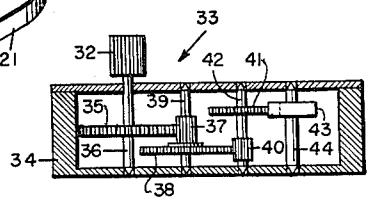


Fig. 4.

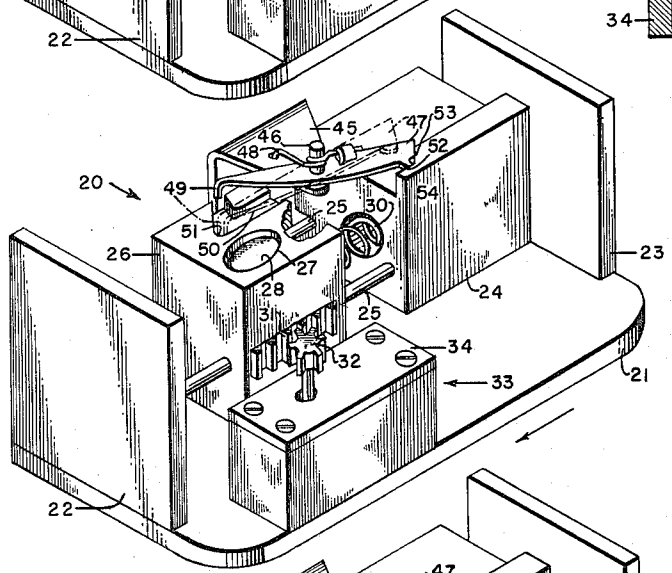


Fig. 2.

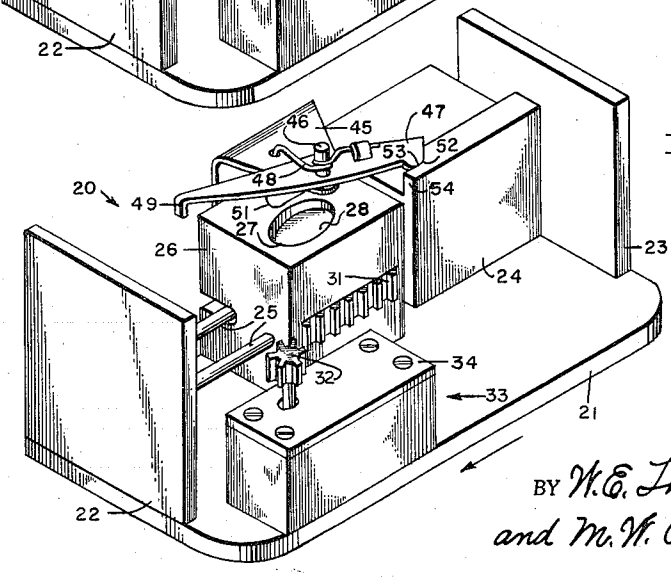


Fig. 3.

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Fig. 5.

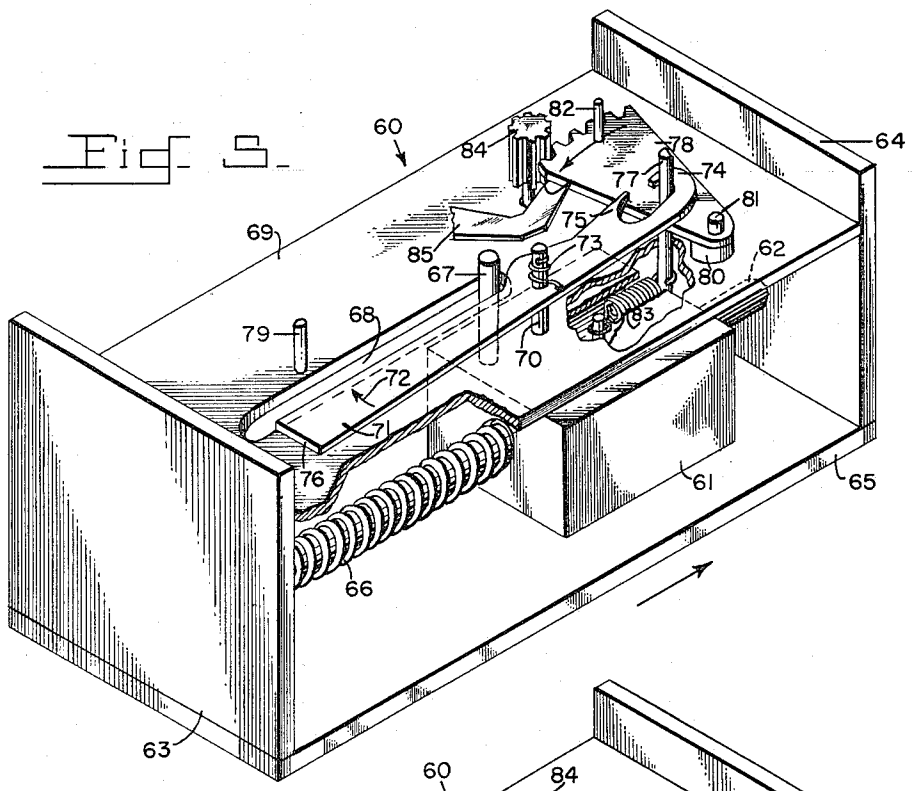
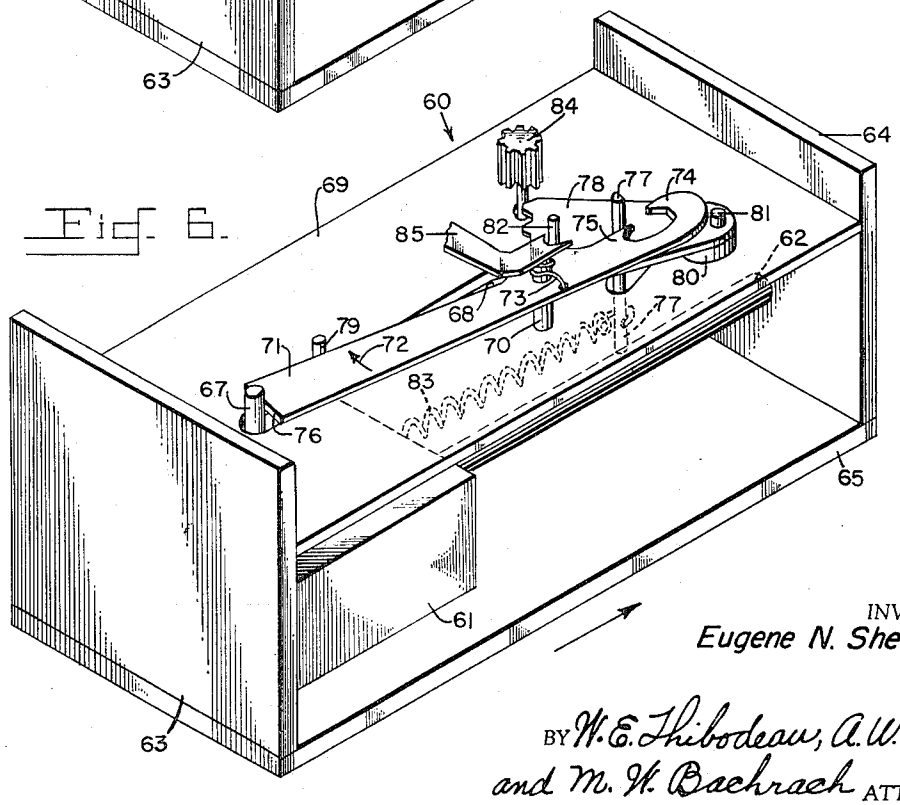


Fig. 6.



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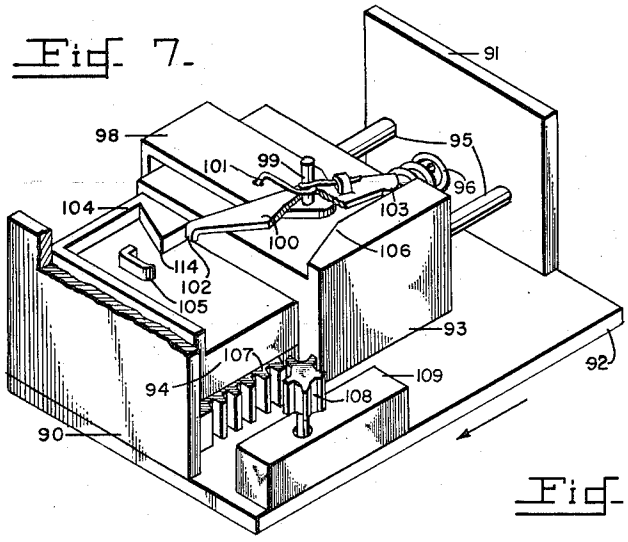
BY W. E. Thibodeau, A. W. Dew
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Fig. 7.



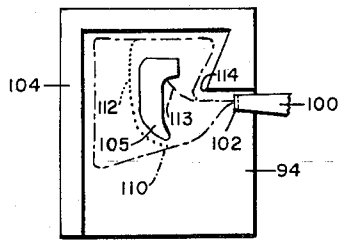


Fig. 15.

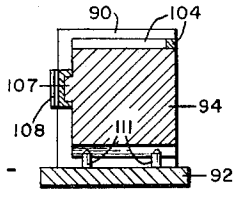


Fig. 14.

Fig. 8.

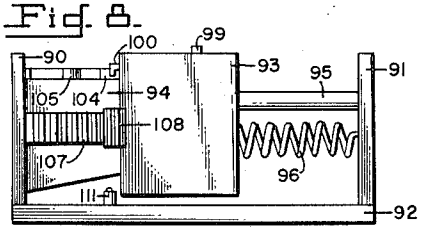


Fig. 11.

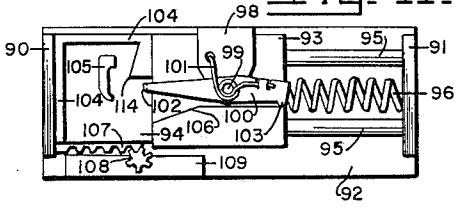


Fig. 9.

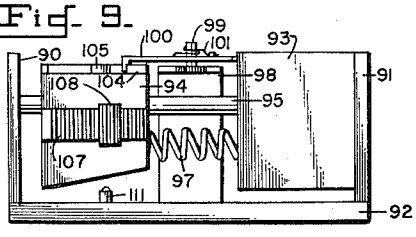


Fig. 12.

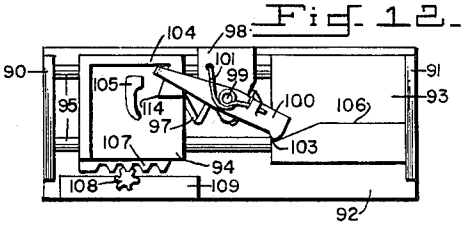


Fig. 10.

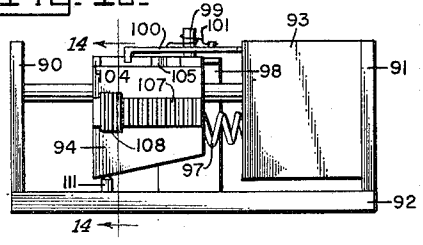
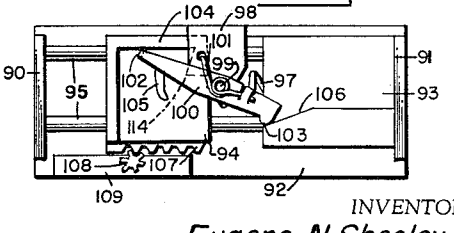


Fig. 13.



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SAFETY AND ARMING MECHANISM

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Fig. 16.

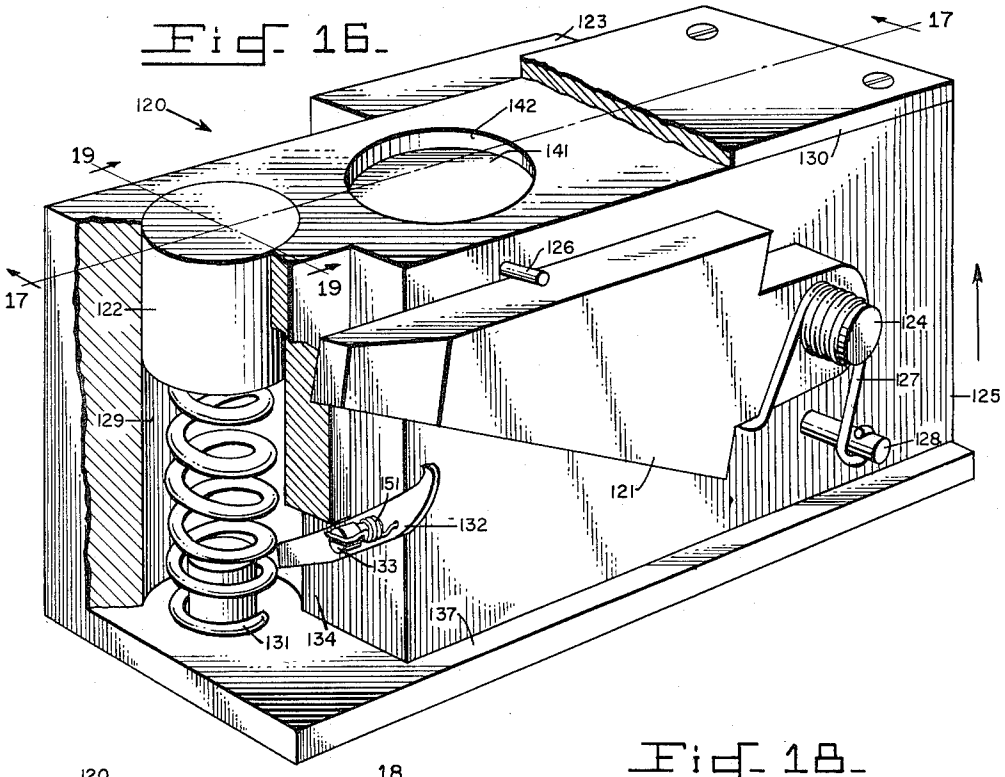
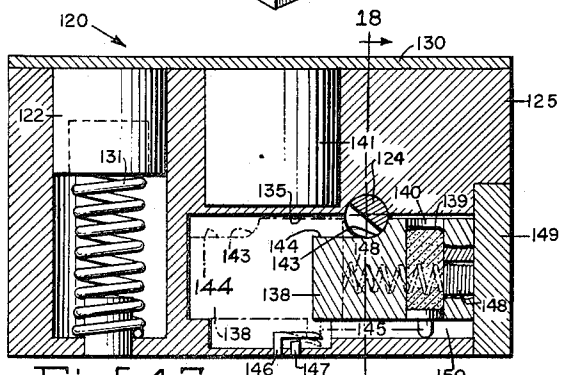


Fig. 18.



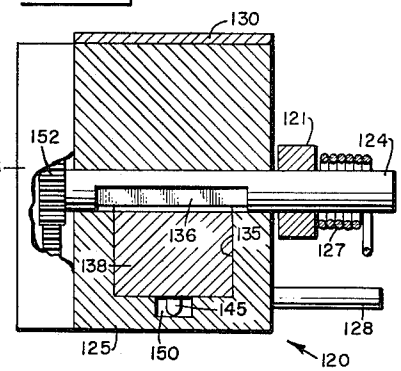


Fig. 17.

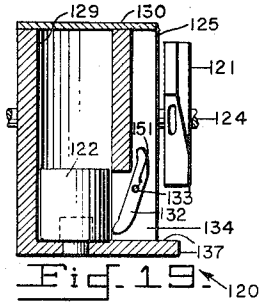


Fig. 19.

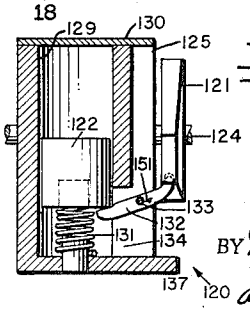


Fig. 20.

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United States Patent Office

2,863,393

Patented Dec. 9, 1958

2,863,393

SAFETY AND ARMING MECHANISM

Eugene N. Sheeley, Washington, D. C., assignor to the United States of America as represented by the Secretary of the Army

Application June 9, 1955, Serial No. 514,403

1 Claim. (Cl. 102—78)

(Granted under Title 35, U. S. Code (1952), sec. 266)

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 invention relates to ordnance missile fuzes and particularly to fuze safety and arming mechanisms.

A safety and arming mechanism may electrically arm a fuze, mechanically arm a fuze, or both. Electrical arming may be accomplished by such action as shunting a circuit through a pair of terminals or by moving a lever to close a switch. Mechanical arming may be accomplished by such action as moving two or more explosive elements into alignment or removing a barrier from between a pair of explosive elements. Although the embodiments of the invention described herein perform one or more of these actions, it is to be understood that any combination of actions can be accomplished using the basic principles of the present invention.

One object of the invention is a safety and arming mechanism which will not function until subjected to an acceleration above a predetermined minimum, properly directed, and sustained for a predetermined minimum time interval.

Another object is a safety and arming mechanism, which, if it fails to function properly, will fail safe.

Another object is a safety and arming mechanism which will delay fuze arming until the containing missile, having been fired, is a safe distance from the firing crew.

A further object is a safety and arming mechanism whose arming time is an inverse function of the launching velocity of the containing missile so that the missile will travel a predetermined distance after launching before fuze arming occurs regardless of the launching velocity, within the operative velocity range.

A still further object is a safety and arming mechanism which will function over a wide range of setback accelerations including very low setback conditions.

The specific nature of the invention as well as other objects and advantages thereof will clearly appear from the following description and drawings wherein:

Fig. 1 is a perspective view of one embodiment of the invention, the safety and arming mechanism being in the unarmed condition.

Fig. 2 is a view similar to Fig. 1, the device being in the intermediate condition.

Fig. 3 is a view similar to Fig. 1, the device being in the armed condition.

Fig. 4 is a detailed schematic diagram of the clock mechanism shown in Figs. 1–3.

Fig. 5 is a perspective view of a second embodiment of the invention, the safety and arming mechanisms being in the unarmed condition.

Fig. 6 is a view similar to Fig. 5, the device being in the armed condition.

Fig. 7 is a perspective view of a third embodiment of the invention, the device being in the normal "at rest" condition.

Figs. 8, 9, and 10 are schematic elevational views of the device of Fig. 7 showing the relationship of the sliding elements in the "at rest," intermediate, and functioned positions, respectively.

Figs. 11, 12, and 13 are schematic plan views of the device shown in Fig. 7, the views corresponding with Figs. 8, 9, and 10, respectively.

Fig. 14 is a cross sectional view of the invention taken on line 14—14 of Fig. 10.

Fig. 15 is a schematic plan view of the contact block of Fig. 7 showing the path of the lever with respect to the block under three different conditions of operation of the invention.

Fig. 16 is a perspective view, partly in section, of a fourth embodiment of the invention, the device being in the unarmed condition.

Fig. 17 is a longitudinal sectional view of the device taken on line 17—17 of Fig. 16.

Fig. 18 is a cross sectional view of the device taken on line 18—18 of Fig. 17.

Fig. 19 is a cross sectional view of the device taken on line 19—19 of Fig. 16, the device being in the armed position.

Fig. 20 is a view similar to Fig. 19, the device being "jammed" so that fuze function will not occur.

One embodiment of the safety and arming mechanism of this invention, indicated generally by reference 20, Figs. 1–3, comprises a base number 21 to which is affixed two vertical supporting members 22 and 23. A weight 24 is slidably mounted upon a pair of rails 25, the rails being affixed perpendicular to and supported by members 22 and 23. Slidably mounted upon rails 25, also, is detonator block 26 containing aperture 27 in which is housed an explosive detonator 28. Compression spring 29, affixed to weight 24 and to support member 23, urges the weight away from support member 23. Tension spring 30, Fig. 2, affixed to weight 24 and to detonator block 26, urges the block to move with the weight. At the juncture of spring 29 with weight 24, a recessed portion is conveniently provided in weight 24, and, at the junctures of spring 30 with weight 24 and with block 26, respectively, similar portions are provided in the weight and block, respectively, in order to permit weight 24 to move into contact with support member 23 and to permit block 26 to rest against and to move into contact with weight 24. Detonator block 26 has rack 31 integral therewith. The rack engages pinion 32 which is an element of the "clock" indicated generally by reference 33, the elements of which are shown in detail in Fig. 4.

Referring to Fig. 4, numeral 34 indicates the clock case, adapted to be secured to base 21, the case providing a housing for the elements of clock 33. Pinion 32 and gear 35 are adapted to turn together upon shaft 36, gear 35 being engaged with pinion 37 which is adapted to turn with gear 38 upon shaft 39. Gear 38 is engaged with pinion 40 which is adapted to turn with escapement wheel 41 upon shaft 42. Escapement wheel 41 cooperates with pallet 43 to regulate the speed of the clock and of the elements engaged therewith. Pallet 43 is mounted upon shaft 44. All clock shafts are journaled within the walls of case 34.

Referring again to Fig. 1, bracket 45, affixed to base 21, has pin 46 depending therefrom. Lever 47 is mounted upon said pin and adapted to rotate thereabout, torsion spring 48, affixed to bracket 45 and to lever 47, urging the lever to rotate in a clockwise direction. Lever 47 has finger 49 which cooperates with groove 50 provided in detonator block 26 in a manner to be described hereinafter. It should be noted that groove 50 has a crook indicated by reference 51. Lever 47 has toe 52, also, which cooperates with detent 53 in shoulder 54 of weight 24 in a manner to be described hereinafter.

Fig. 1 shows the safety and arming invention in its normal position prior to the time its containing missile, not shown, is launched. The normal direction of travel of the safety and arming mechanism is indicated by the arrow shown adjacent the base 21. When the containing missile is launched, the resulting setback force causes weight 24 to move rapidly to a position in contact with

support member 23, Fig. 2, overcoming the urging of compression spring 29. As weight 24 moves away from block 26, spring 30 becomes elongated and urges the block to move with the weight. The movement of block 26 toward weight 24 is retarded by clock 33, engaged therewith. The block moves at a predetermined rate which is dependent upon the design of the system. As block 26 moves toward weight 24, finger 49 of lever 47 moves within groove 50 toward crook 51. Providing block 26 is moving toward weight 24 at the predetermined rate when finger 49 reaches crook 51, the finger will rotate past crook 51 and "snap" out of groove 50 under the urging of torsion spring 48.

Should block 26 be moving at a rate greater than the predetermined rate, such as would be the case if a clock element should fail, then, when finger 49 reaches crook 51, the finger will not have time to "snap" out of groove 50 and will be caught in the crook, block 26 being prevented from moving into the armed position. This situation is illustrated by the lever 47 shown in dot-dash outline in Fig. 2.

Assuming finger 49 has "snapped" out of groove 50 in the normal manner, block 26 continues its movement toward weight 24 until the teeth on rack 31 "run out" of engagement with pinion 32. At that time block 26 "snaps" into the armed position as seen in Fig. 3.

The device is designed to function only under a given set of conditions. This is to prevent accidental functioning or functioning due to an unintended shock. In order to function, the device must be acted upon by an acceleration above a predetermined minimum which is sustained for a minimum time interval. The device assures that the acceleration is ample by requiring that weight 24 overcome the bias of spring 29 and move to a position in contact with member 23. It assures the persistance of the acceleration by requiring that the weight be in contact with member 23 when block 26 moves to the "committed" position. Clock 33 delays the movement of block 26 to the "committed" position until the expiration of the minimum time interval. The device will be rendered inoperative unless block 26 is moving at the regulated rate when it passes the "committed" position. This assures that the device will function only if the clock is performing its function properly.

When lever 47 "snaps" out of groove 50, clear of the path of block 26, the device is actually "committed." As finger 49 of lever 47 moves out of groove 50, toe 52 moves into detent 53 to lock weight 24 in the position in contact with member 23. Block 26 will continue to its armed position regardless of the external forces acting upon the device thereafter. The period between the time the device becomes "committed" and the time block 26 moves into its armed position adjacent weight 24 provides an additional safety interval.

A second embodiment of the safety and arming mechanism in accordance with this invention, indicated generally by reference 60 is shown in Figs. 5 and 6. Weight 61 is slidably mounted upon rail 62, the rail being affixed perpendicular to parallel support members 63 and 64, these latter members being affixed to base member 65. Compression spring 66, concentric with rail 62, has one end thereof connected with weight 61 and the other end connected with member 63, the spring adapted to urge weight 61 away from member 63, weight 61 being recessed at the juncture of the weight and the spring in order to permit weight 61 to assume juxtaposition with member 63 when the weight moves into the armed position. Sliding pin 67, depending from weight 61, is slidable within slot 68 provided in plate 69, the plate being affixed to members 63 and 64. In its unarmed position sliding pin 67 rests against the forward end of slot 68, the forward direction being indicated by the arrow shown adjacent base 65.

Plate 69 has stationary pin 70 affixed thereto, lever 71 being rotatably mounted upon the pin, the lever being biased in the clockwise direction, arrow 72, by torsion springs 73 which has one end thereof affixed to the lever and the other end affixed to pin 70. Lever 71, which contains forward hook 74, rearward hook 75, and butt end 76, discussed hereinafter, is normally prevented from turning by the engagement of the forward hook 74 with elongated pin 77, the pin being affixed to and extending above and below segment gear 78. Stop 79 is provided for the purpose of arresting the motion of lever 71 after it has been released to rotate to the armed position. Segment gear 78, which is spaced from plate 69 by bushing 80, is adapted to rotate about shaft 81 which is affixed to plate 69. Actuating pin 82 is affixed to and depends upwardly from segment gear 78. Tension spring 83, one end of which is affixed to elongated pin 77 and the other end of which is affixed to weight 61, urges segment gear 78 to rotate counterclockwise when weight 61 moves away from its "at rest" position.

Pinion 84, which is engaged with segment gear 78, is an element of a clock, shown in Fig. 4, which retards and regulates the speed of rotation of gear 78. The actuating arm 85, which is engaged with the fuze arming means, not shown, is adapted to move, when engaged by pin 82, to arm the fuze, not shown, in which the present invention is adapted to function.

The missile and fuze, not shown, containing the safety and arming mechanism of Figs. 5 and 6, moves in the direction of the arrow shown adjacent base 65 when the missile is launched. The resulting setback force acting upon weight 61 causes that weight to move rapidly toward support member 63 against the urging of compression spring 66. As weight 61 moves, tension spring 83 is elongated and segment gear 78 is urged by tension spring 83 to rotate counterclockwise, the gear being retarded and regulated in its movement by the clock, not shown, acting through pinion 84.

Provided weight 61 is in juxtaposition with member 63 and that gear 78 is moving at the regulated speed when elongated pin 77 moves out of engagement with hook 74 of lever 71, the lever will revolve clockwise under the urging of torsion spring 73, the lever coming to rest against stop 79, butt end 76 of lever 71 trapping sliding pin 67 and, consequently weight 61, in the armed position as seen in Fig. 6. When pin 67 becomes trapped by lever 71, the system is "committed." Thereafter, fuze arming will proceed regardless of the external forces acting upon the system. This provides an additional safety time interval after the fuze is "committed" before fuze arming occurs.

Gear 78 continues to rotate counterclockwise until the gear teeth "run out" of engagement with pinion 84. At that time gear 78 "snaps" into the armed position adjacent pin 70, pin 82 engaging and moving arm 85 as the gear moves. By this movement, actuating arm 85 actuates the fuze arming means, not shown, in a manner not germaine to this invention. The fact that the teeth of gear 78 "run out" with respect to pinion 84 before pin 82 engages arm 85 assures that the velocity of the gear-pin combination is sufficient to move arm 85.

The invention provides a number of safety features. In the first place, it is necessary, in order that the device function, that it be subjected to an acceleration greater than a predetermined minimum, properly directed along the axis of the device, and sustained for a predetermined time interval. The device functions when pin 82 engages actuating arm 85. In order for this engagement to take place gear 78 must rotate through a given angle. Should lever 71 be prevented from revolving clear of elongated pin 77 by pin 67, pin 77 would move into engagement with rearward hook 75 of lever 71 and prevent gear 78 from moving through the necessary angle to cause the device to function.

Two conditions must prevail before lever 71 will be able to revolve to its armed position. Sliding pin 67 must have moved to its armed position at the rearward end of

slot 68. That action will occur only when the device is being subjected to an acceleration above a predetermined minimum so as to overcome the bias of spring 66 and allow weight 61 to move to its armed position. In addition, gear 78 must be moving at the predetermined rate as elongated pin 77 leaves forward hook 74 of lever 71 in order for lever 71 to move out of engagement with pin 77. This assures that the force of set back acting against the device persist for a predetermined time interval before the device is able to function. This is the basic safety interval. If, on the other hand, an element of the clock should fail as setback occurs and gear 78 moves unrestrained toward its armed position, elongated pin 77 moves into rearward hook 75 of lever 71 to stop the motion of the gear and prevent the device from functioning.

Should setback abate before lever 71 revolves, spring 66 returns weight 61 to its "at rest" position, weight 61 driving elongated pin 77 and, consequently, gear 78 to their "at rest" positions. Were gear 78 not so returned to its "at rest" position after the abatement of each short impulse applied to the system, it would be possible for the device to arm as the result of a succession of shocks, each causing a slight movement of gear 78 toward its "committed" position.

In the third embodiment of the invention shown in Figs. 7–15, support members 90 and 91 are affixed to base plate 92. Weight 93 and contact block 94 are slidably mounted upon parallel rails 95 which are affixed to members 90 and 91. Weight 93 is biased away from support member 91 by compression spring 96, one end of the spring being connected with weight 93 and the other end being connected with support member 91. Tension spring 97, Fig. 9, which connects contact block 94 with weight 93, urges the block to move with the weight. Weight 93 is recessed on two sides and block 94 is recessed on one side to receive the connecting ends of springs 96 and 97 to permit weight 93 to rest against block 94 and to move into juxtaposition with support member 91.

Bracket 98, affixed to base 92, has pin 99 depending therefrom. Rotatably mounted upon said pin is lever 100 which is biased in the clockwise direction by torsion spring 101 having one end affixed to lever 100 and the other end affixed to bracket 98. Lever 100 has finger 102 and toe 103 located at opposite ends thereof. Finger 102 cooperates with guide members 104 and 105 of contact block 94, and toe 103 of lever 100 acts against shoulder 106 of weight 93 in a manner described hereinafter.

Contact block 94 has rack 107 integral therewith, the rack adapted to engage pinion 108 of clock 109 to regulate the speed of movement of block 94. Clock 109 is similar to the clock shown in Fig. 4.

Referring to Fig. 15, dot-dash line 110 represents the path of finger 102 of lever 100 relative to contact block 94 as the device functions in the normal manner to short terminals 111, Figs. 10 and 14, and then reset in the normal operation of the invention. Dotted line 112 represents the path of finger 102 relative to block 94 under the condition of setback abatement before contact block 94 has had an opportunity to engage terminals 111, the device resetting thereafter in the normal manner. Dash line 113 represents the path of finger 102 relative to block 94 in the case wherein the device fails so that block 94 moves unrestrained into engagement with finger 102, the motion of block 94 being arrested by the engagement of guide member 105 with lever 100 to render the device inoperative. Point 114 of guide member 104 has a significance which is discussed hereinafter.

In operation, when the missile, not shown, containing this invention moves in the direction indicated by the arrow shown adjacent base 92, Fig. 7, the inertia of weight 93 causes said weight to move rapidly into juxtaposition with support member 91, against the bias of spring 96, compressing the spring.

Contact block 94 is urged by spring 97 to move with weight 93, the block being retarded and regulated in its movement by clock 109 acting through pinion 108 and rack 107. Provided block 94 is moving at the regulated speed when finger 102 moves past point 114 of guide member 104, the finger will "snap" clockwise and follow guide 104 thereafter until block 94 functions the device by engaging terminals 111.

The terminals remain shorted until the force of setback abates, at which time spring 96 drives weight 93 away from support member 91, weight 93, in turn, driving block 94 out of engagement with terminals 111. Sping 96 continues to drive weight 93 and block 94 toward their normal "at rest" positions until the device is "reset" and ready for another operation. The path of finger 102 of lever 100 with respect to block 94 is shown in Fig. 15 as the device first functions to short terminals 111 and then resets is indicated by dot and dash line 110.

Inasmuch as it is the purpose of this device to have contact block 94 engage terminals 111 under a given set of operating conditions, the device is designed to assure that engagement is not made under any other set of conditions. The device requires that a setback force greater than a predetermined minimum acting in the proper direction parallel to the axis of the device persist for a predetermined time interval in order that the device function. The device assures that these conditions are fulfilled by requiring that weight 93 move into juxtaposition with support member 91 and that the weight remain in that position for a predetermined time interval before the device is able to function. In order that weight 93 move against member 91 the force acting upon that weight must be sufficient to overcome the bias of spring 96.

Lever 100 permits the device to function if the device is operating properly and prevents the device from functioning if the device is operating improperly. In order that lever 100 not "jam" the device and render it inoperative at the time finger 102 of lever 100 passes point 114 of guide member 104 two conditions must be met: weight 93 must be in juxtaposition with support member 91 and block 94 must be moving at the regulated speed relative to finger 102. If these conditions are met lever 100 will rotate clockwise and avoid engaging guide member 105.

Normally, toe 103 of lever 100 bears against shoulder 106 of weight 93 to prevent the lever from rotating. In order that shoulder 106 not prevent lever 100 from rotating, toe 103 must move along the beveled portion of shoulder 106. In order that shoulder 106 not prevent lever 100 from rotating clear of the path of guide member 105, weight 93 must be in juxtaposition with support member 91.

Should contact block 94 be moving at a speed greater than the predetermined rate when finger 102 passes point 114, such as would be the case were a clock failure to occur, lever 100 would not have time to rotate clear of the path of guide member 105. Finger 102 would engage guide member 105 to "jam" the device and render it inoperative. The path of finger 102 under these conditions is indicated by dash line 113, Fig. 15.

Assuming lever 100 does rotate clear of the path of guide member 105, the required force of setback must persist for an additional time interval in order that block 94 engage terminals 111. Should setback abate before this engagement occurs the device will not function but will be automatically "reset," the path of finger 102 with respect to block 94 under these conditions being indicated by dotted line 112, Fig. 15.

A fourth embodiment of the invention is indicated generally by reference 120, Figs. 16–20. In this embodiment the actuating member, arm 121, as well as the weight member 122, is setback sensitive. The clock 123 is engaged with arm 121 through shaft 124, the shaft being journaled within body member 125. In the unarmed "at rest" position, arm 121 rests against stop 126,

affixed to body 125, the arm being biased in the clockwise direction by torsion spring 127 which has one end engaged below arm 121, the other end of the spring being affixed to pin 128, depending from body 125.

Weight 122, which is slidable within recess 129, normally rests against cover plate 130, the weight being biased toward that position by compression spring 131 which is located below weight 122 within recess 129.

Lever 132, which is pivotably mounted upon screw 133, extends through slot 134, provided in body 125, into recess 129 to engage weight 122, and without body 125 to engage arm 121. Lever 132 is biased in the clockwise direction by torsion spring 151, one end of which is affixed to the lever and the other end of which is affixed to screw 133.

Device 120 is provided with a cavity 135, within body 125, Figs. 17 and 18. Shaft 124 is so positioned with respect to cavity 135 that a portion of the shaft extends within the cavity at all times other than when flat 136, with which shaft 124 is provided, is parallel to the roof of the cavity. The device is so designed that flat 136 is parallel with the roof of cavity 135 when arm 121 rests against shoulder 137 of body 125.

Detonator block 138, carrying detonator 139 within recess 140 provided therein, is slidable within cavity 135. The detonator is normally maintained out of alignment with booster charge 141, within booster cup 142, by the engagement of the arcuate section 143 of milled portion 144 of detonator block 138 with shaft 124. Button 145, affixed to the lower side of detonator block 138 and riding in slot 150 of cavity 135, is adapted to cause the engagement of leaf spring contact 146 with terminal 147. Detonator block 138 is urged toward the armed position by spring 148, one end of which acts against the block and the other end of which acts against end plate 149.

Device 120 is adapted to function only if subjected to an acceleration above a predetermined minimum value properly directed along a line parallel to the axis of weight 122 and sustained for a predetermined interval of time. These requirements assure handling safety of the device and, in addition, assure that the device will not permit the containing fuze, not shown, to arm before the containing missile, not shown, is beyond the lethal range to the launching crew. This device performs an additional function, one which is not performed by other embodiments of the invention shown. It provides that the safe arming delay be an inverse function of the acceleration applied to the device so that arming is a function of distance traveled and not of flight time. In other words, the distance from the launching crew at which the device functions is constant regardless of the launching velocity of the containing missile within the operative range of launching velocities.

When the containing missile is subjected to acceleration conditions normally present at launching, device 120 moves in the direction indicated by the arrow shown adjacent body 125, Fig. 16. At the same time weight 122 begins to move rearwardly and arm 121 begins to rotate counterclockwise under the setback forces present. Normally, weight 122 comes to rest against the base of recess 129 before arm 121 comes to rest against shoulder 137 of body 125 inasmuch as the motion of arm 121 is retarded by its engagement with clock 123 through pinion 152.

As weight 122 moves against lever 132 it causes the lever to move out of its path, the lever being caused to rotate counterclockwise. The result is that the lever, in the act of rotating, moves out of the path of arm 121, Fig. 19, before the arm has advanced to the position of the lever. The path of arm 121 is unobstructed, therefore, as it moves from its unarmed position adjacent stop 126 to its armed position adjacent shoulder 137.

When arm 121 engages shoulder 137 the flat 136 of shaft 124 moves parallel to the roof of cavity 135. Shaft 124 does not restrain detonator block 138 thereafter so that the block, driven by spring 148, moves to its armed position, aligning detonator 139 and booster 141. At the same time button 145 engages and depresses leaf spring contact 146 so that the contact engages terminal 147 to complete the arming of the device.

The device provides several safety features to assure that arming occuring only under the acceleration conditions associated with normal missile launching.

The requirement that weight 122 move against lever 132 to remove the lever from the path of arm 121 assures that arm 121 does not move unrestrained to its armed position assuring, consequently, a proper arming delay for the device. In order that weight 122 be caused to move requires that the acceleration to which the weight is subjected be sufficient to overcome the bias of spring 131. In addition, that acceleration must be sustained for ample time to permit arm 121 to move, retarded by clock 123, to its armed position adjacent shoulder 137. Should the force of setback abate before arm 121 has moved to its armed position, spring 127 will return the arm to its "at rest" position adjacent stop 126 and spring 131 will return weight 122 to its "at rest" position adjacent cover plate 130.

Should a clock failure occur the device will be a dud. Both weight 122 and arm 121 would move at approximately the same speed, each member engaging one end of lever 132, jamming the device and rendering it inoperative.

It will be understood that the speed of rotation of arm 121, in the normal operation of the device, will be a function of the force of setback acting against it. The arming delay of this device is equal to the time required for arm 121 to move from its unarmed position to its armed position.

It will be apparent that the embodiments shown are only exemplary and that various modifications can be made in construction and arrangement within the scope of the invention as defined in the appended claim.

I claim:

In a fuze for ordnance missiles, a safety and arming mechanism comprising a body member, a setback sensitive weight member slidably mounted within said body member and adapted to move rapidly from a first position to a second position, spring means adapted to bias the weight member toward the first position, detent means adapted to lock said weight member in said second position, an arming member slidably mounted within said body member, the arming member being provided with a guide groove on the surface thereof, spring means urging said arming member to move with said weight member from an unarmed position to an armed position, clock escapement means adapted to retard and regulate the rate of movement of the arming member, a spring biased lever rotatably mounted upon said body member, the lever being provided with a finger at one end thereof and a butt end at the other end thereof, said finger adapted to move within the guide groove of said arming member, said lever adapted to rotate clear of the path of said arming member provided said arming member is moving at the regulated rate so that said finger can "snap" out of said groove and provided said weight member is in said second position so that said weight member does not engage said butt end, the weight member becoming locked in the second position as said arming member continues to move toward the armed position.

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