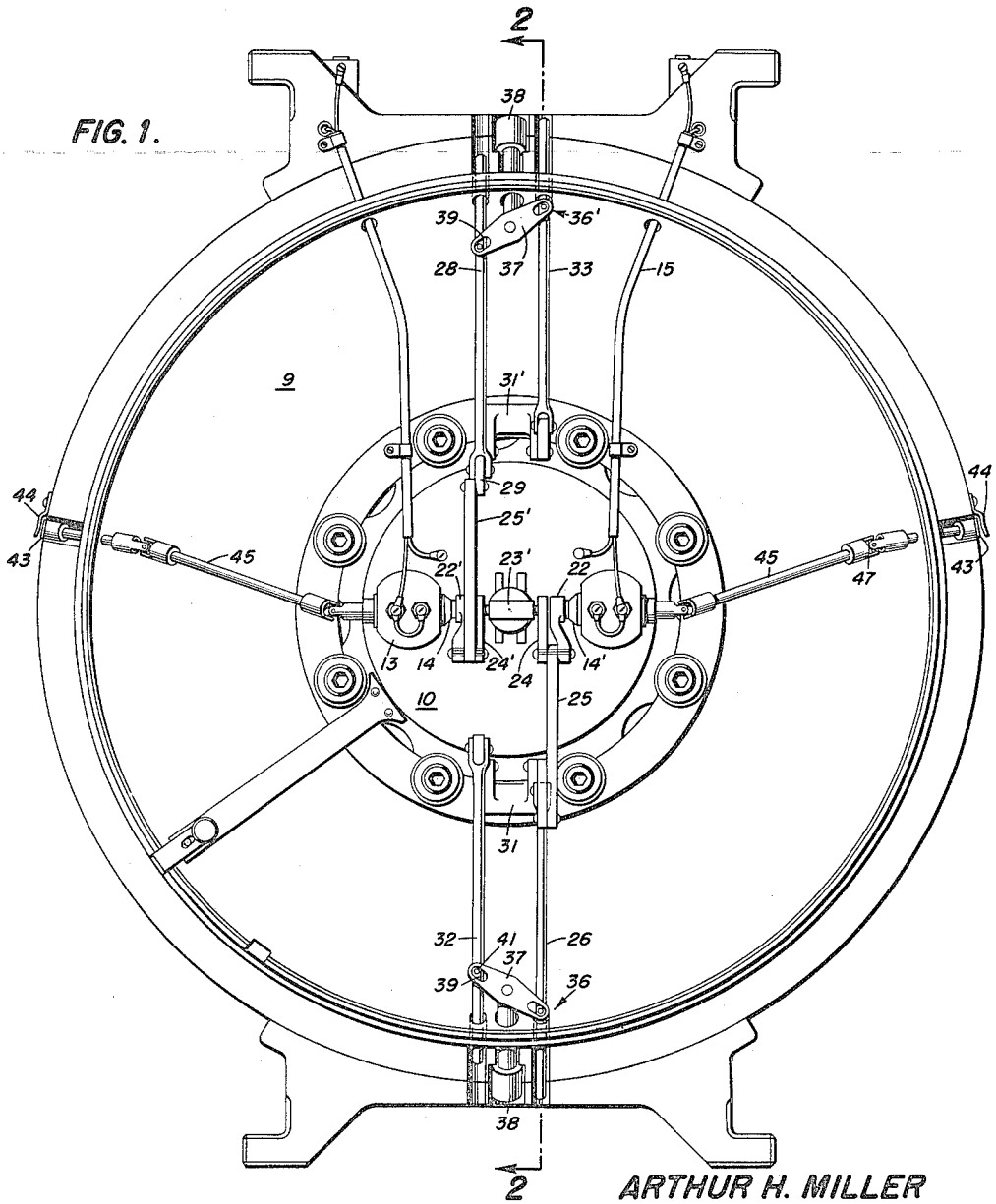
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MISSILE BOOSTER ARMING DEVICE

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FIG. 1.



ARTHUR H. MILLER
SERGE N. SAMBUROFF
INVENTORS

BY

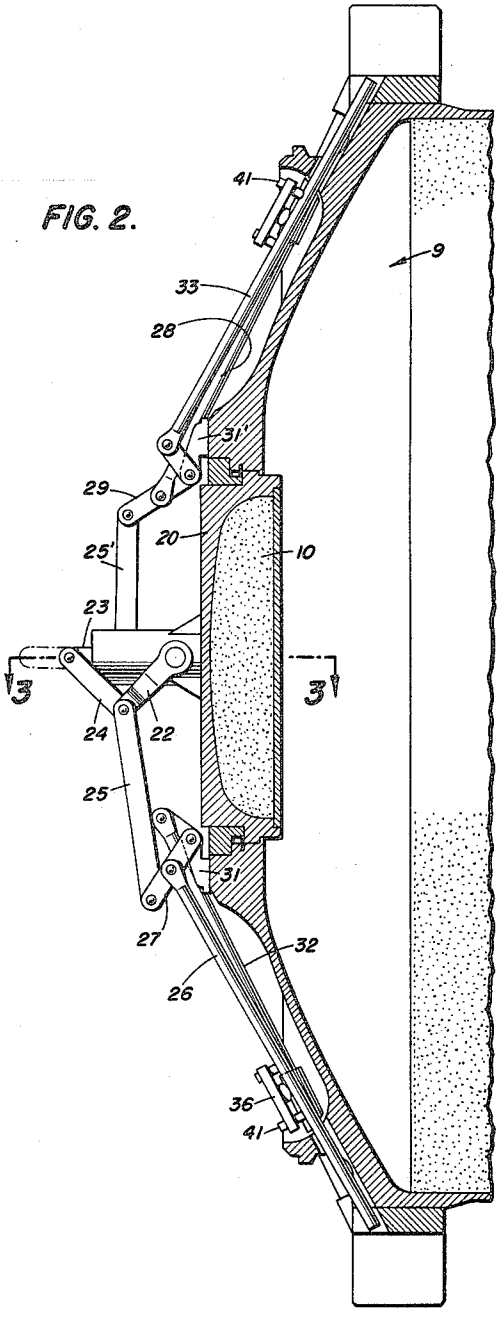
ATTORNEYS

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FIG. 2.



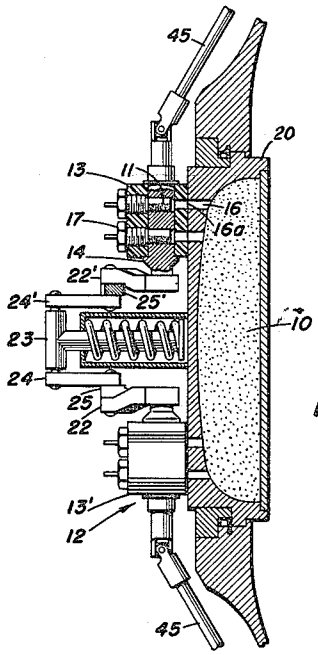
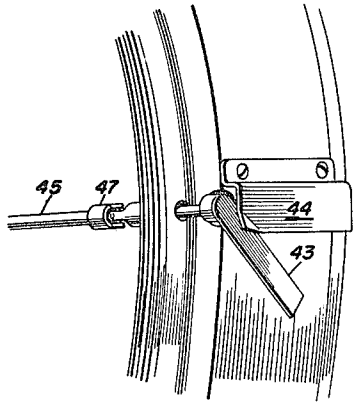


FIG. 3.

FIG. 4.



ARTHUR H. MILLER
SERGE N. SAMBUROFF
INVENTORS

BY A. D. O'Brien
O. B. Baxter Warner
ATTORNEYS

United States Patent Office

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MISSILE BOOSTER ARMING DEVICE

Serge N. Samburoff and Arthur H. Miller, Silver Spring, Md., assignors to the United States of America as represented by the Secretary of the Navy

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5 Claims. (Cl. 102—70)

The present invention relates to safety devices for guided missiles. More specifically, it relates to a mechanism for moving an explosive firing squib into and out of engagement with a firing circuit provided for igniting the missile booster propellant.

Missile booster rockets normally employ solid grain propellant charges which are ignited by squibs firing into a black powder igniter, which in turn, ignites the main grain. Black powder is comparatively inert and requires no special handling to guard against premature ignition. Squibs, on the other hand, are quite sensitive to shock and must be handled with a high degree of care to prevent unintentional detonation. The energy released by a squib explosion, however, is relatively small, and ignition of the booster grain can usually be prevented by diverting the squib energy path from direct communication with the booster igniter.

It is an object of the present invention to provide an arming device to move explosive squibs from a relatively safe unarmed position to an armed operative position with respect to a larger less sensitive charge.

A further object of the present invention is to provide a simple, positive arming device which is actuated by a direct pushing motion.

Another object of the present invention is to provide an arming device which is capable of reversible action to move firing squibs from an armed position to an unarmed position with an action comparable to that required for arming.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings, wherein:

Fig. 1 is a front end view of a missile booster illustrating the arming mechanism of the present invention;

Fig. 2 is a sectional view along the line 2—2 of Fig. 1;

Fig. 3 is a sectional view taken along the line 3—3 of Fig. 2; and

Fig. 4 is a perspective of a portion of the booster illustrating the construction of a warning flag for indicating safe and armed conditions of the booster igniter.

Referring to the drawings, and particularly to Figs. 1 and 3, the booster igniter 10 comprises a dish shaped housing 20 containing a black powder charge mounted on the face of the booster rocket 9. Electrically fired squibs 11 are mounted adjacent the igniter 10 in a squib diverter 12. The squib diverter 12 includes terminal blocks 13 and 13′ which are constructed of insulating material and bored to receive a cylindrical squib carrier 14 constructed of conductive material. Squib carrier 14 is transversely bored to receive the squibs 11. Holes 16 are provided in the forward wall of the igniter 10 to permit communication between the charge therein and the squibs 11. A thin foil barrier 16*a* rupturable by detonation of the squibs 15 normally seals the holes 16. In the safe position, squib carrier 14 is rotated to a position interposing the walls of squib carrier 14 between the

squibs and communication holes 16. In the safe position the squib firing circuit, normally established through spring loaded contacts 17 carried by the terminal blocks 13 and 13′ and an external conductive lead 15, is disrupted.

Referring to Figs. 1 and 2, the squib carriers 14 terminate toward the boosters center in offset crank arms 22 and 22′. Crank arms 22 and 22′ are joined to a spring loaded plunger 23 by pin jointed links 24 and 24′. Plunger 23 acts rearwardly along the booster axis so as to cause link 24 and crank 22 to assume an eccentric equilibrium position.

Actuating links 25 and 25′, pinned to crank arms 22 and 22′ and to links 24 and 24′ at their common joints, provide a toggle mechanism for shifting said cranks from one equilibrium position constituting the safe condition to opposite equilibrium position constituting the armed condition. Force is applied to actuating link 25 through a push rod 26 and pivot link 27. A similar arrangement, including a push rod 28 and pivot link 29, applies force to actuating link 25′. Pivot links 27 and 29 are pivotally mounted on lugs 31 and 31′ secured to the booster face. Push rods 32 and 33 are carried along with the motion of push rods 26 and 28, respectively, through the action of reversing cranks 36 and 36′. The reversing cranks 36 and 36′ are identical and comprise cross links 37 which are centrally pivoted to a rotatable pin 38. The cross links 37 are provided with end slots 39 through which transverse pins 41 on the various push rods are passed.

Referring to Fig. 4, warning flags 43, concealed from view in the safe position by an overlaying flange 44, are rotated into view by the action of shafts 45 connected through an arrangement of universal joints 47 coupled to the outer ends of squib carriers 14 and 14′. An immediate visual indication of the safety condition of the missile booster is thereby provided.

The arming operation may be carried out from either above or below the booster, as conditions may require. The device appears in Figs. 1 and 2 in the safety position. Arming is accomplished by pressing either push rod 26 or push rod 33 inwardly so that cranks 22 and 22′ rotate past dead center. Past dead center, the force of spring plunger 23 is sufficient to carry cranks 22 and 22′ positively into the armed position. It will be seen that if arming is accomplished by actuation of push rod 33 rather than push rod 26, motion is communicated through reversing crank 36′ to retract push rod 28 and thereby rotate cranks 22 and 22′ into the armed position. After arming, the booster may be returned to a safe condition by actuation of push rods 28 or 32 which rotate cranks 22 and 22′ in the reverse direction from the arming push rods.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. A safety and arming device for handling explosive firing squibs used in a booster rocket igniter, said igniter including a housing and a combustible charge contained therewithin, comprising a pair of terminal blocks mounted adjacent the exterior of the booster igniter housing, said terminal blocks being provided with independent electrical firing connections, said housing having a pair of apertures in the wall thereof adjacent each of said terminal blocks, a pair of squib carriers rotatably mounted in each of said terminal blocks, said squib carriers being provided with apertures arranged to communicate with the apertures in the wall of said igniter and thus constitute the armed condition, and means including a

toggle mechanism for rotating said squib carriers in said terminal blocks to disrupt communication between the apertures of said squib carriers and the apertures of said igniter housing thereby to provide a safe condition.

2. A safety and arming device for a booster rocket igniter including a housing and a combustible charge contained therewithin, comprising a terminal block mounted adjacent the exterior of the booster igniter housing, a squib carrier rotatably mounted in said terminal block, said terminal block, squib carrier and igniter housing being provided with an aligned bore transverse to the axis of rotation of said squib carrier, an electrically fired squib mounted in the bore of said squib carrier, an electrical contact mounted in the bore of said terminal block for contacting said firing squib, and means including a toggle mechanism for rotating said squib carrier to move the squib carrier bore out of alignment with the bore in the igniter housing and to disrupt the electrical circuit between said firing squib and said terminal block contact.

3. A safety and arming device for a booster rocket igniter, said igniter including a housing and a combustible charge contained therewithin, comprising, a terminal block mounted adjacent the exterior of the booster igniter housing, said housing having an aperture in the wall thereof adjacent said terminal block, a squib carrier rotatably mounted in said terminal block, a crank arm secured to said carrier, a spring loaded plunger, a link connecting said plunger with said crank arm for forcing said crank arm into an eccentric equilibrium position, an actuating lever bearing on said crank arm to rotate the same upon the application of force sufficient to overcome the spring forces of said plunger, and a push rod linked to said actuating lever for transmitting forces thereto.

4. Apparatus as claimed in claim 3, with additionally a second push rod arranged for reciprocating motion and a pivotally mounted cross link connecting said first named push rod with said second push rod whereby motion of

one of said push rods in one direction is communicated to the other of said push rods in the reverse direction.

5. In a booster igniter having an igniter housing containing a combustible charge and including a passageway in said igniter housing for communicating said charge with the exterior of said igniter housing, the combination therewith of an arming device for placing said igniter in a safe or armed condition, comprising, a rotatable housing having an aperture therein and mounted externally to said igniter housing, said aperture containing an explosive squib and being communicable with said passageway, and means on said igniter housing for rotating said rotatable housing and aperture out of communication with said passageway, said means including a crank arm secured to said rotatable housing, a spring loaded plunger, a link connecting said plunger with said crank arm, and an actuating lever bearing on said crank arm for urging the latter into first and second eccentric equilibrium positions, said igniter being in the safe condition in said first equilibrium position wherein said aperture and passageway are out of communication, and in the armed condition in said second equilibrium position wherein said aperture and passageway are in communication.

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