

[54] **MORTAR SAFETY DEVICE FOR PREVENTING DOUBLE LOADING**

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[58] Field of Search**89/1 F, 1, 14; 42/1 F, 76**

[56] **References Cited**

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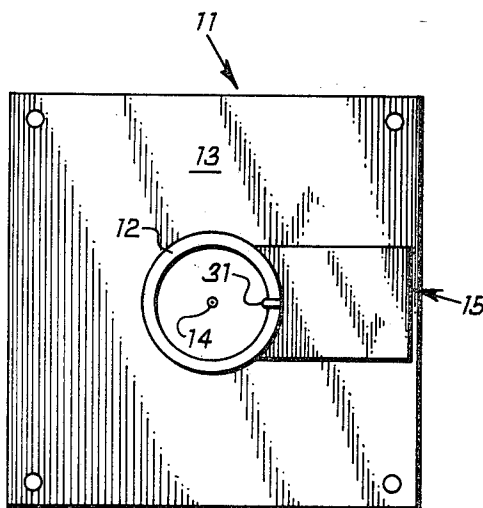
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[57] **ABSTRACT**

A safety device for preventing feeding a mortar round into a barrel already containing a round. A tripping arm of a bell crank extends into the barrel of a mortar and permits one mortar round to enter the barrel. The tripping arm then locks to prevent a second round from entering the barrel. The firing of the first round unlocks the tripping arm to permit a subsequent firing of the mortar.

6 Claims, 4 Drawing Figures



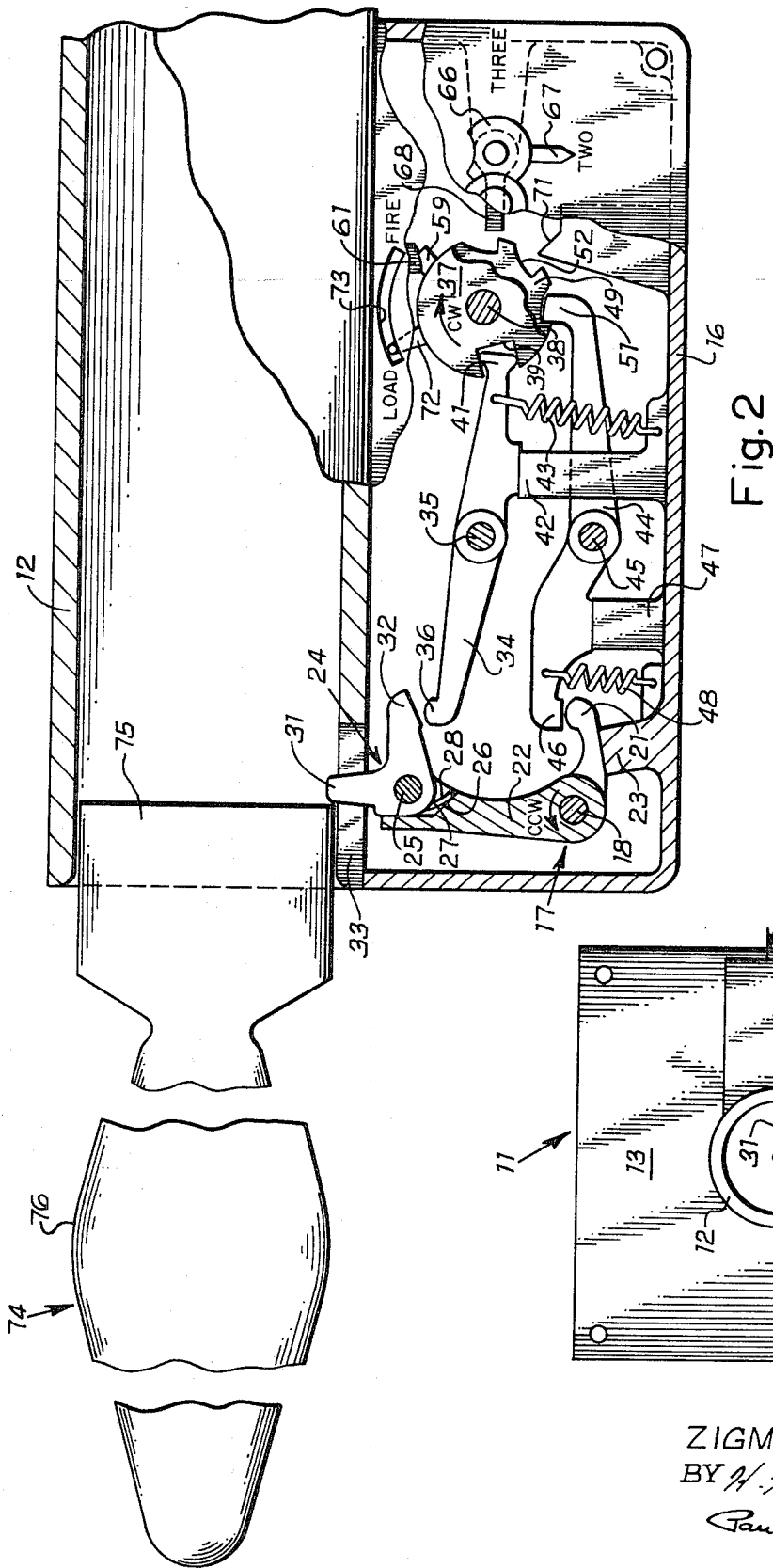
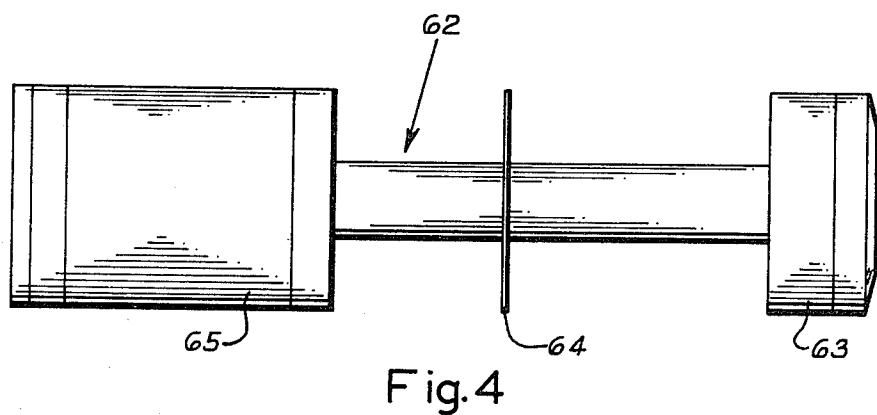
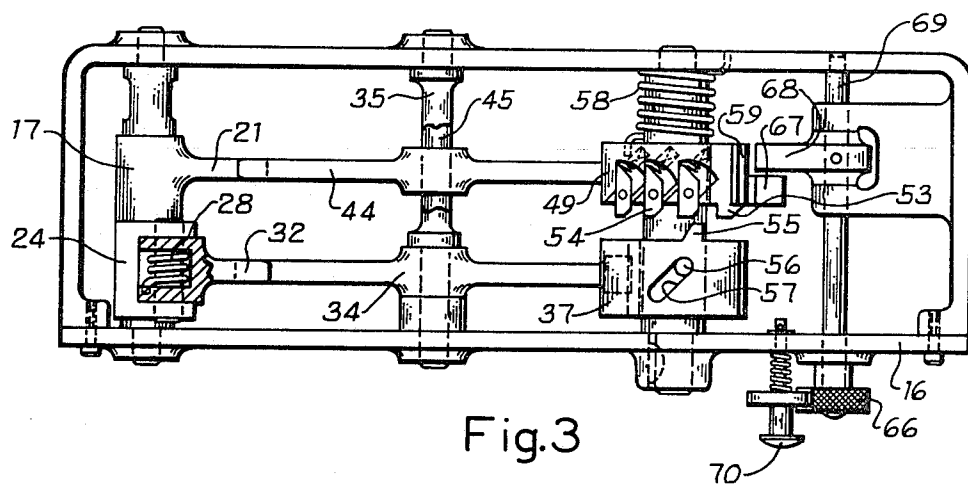


Fig. 2

Fig. 1

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MORTAR SAFETY DEVICE FOR PREVENTING DOUBLE LOADING

STATEMENT OF GOVERNMENT INTEREST

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

BACKGROUND OF THE INVENTION

A mortar, such as the 60 mm or 81 mm mortar used by the military, is a relatively simple weapon and consists basically of a base plate, a barrel and a firing pin. The firing pin might be either of the fixed type or a movable type which is actuated by a trigger assembly. In a mortar having a fixed firing pin, the round slides down the barrel, strikes the firing pin and is then ejected. In the event of a misfire, the dud can be immediately removed by tipping the barrel and letting the round slide out. With a fixed firing pin, the chances of double loading is not too great, as the round is not loaded until it is to be fired.

With a triggered firing pin, however, a mortar may be loaded a considerable time in advance of firing, and there is always a chance that a second round might be inserted into a loaded mortar barrel. Upon actuation of the trigger, a double-loaded mortar will usually explode and cause serious injury or death to personnel near the weapon. Heretofore, there has not been any devices used by the military to prevent the loading of a second round into a loaded mortar.

SUMMARY OF THE INVENTION

The present invention consists of an auxiliary unit which is mounted to a mortar near the muzzle end and is designed to prevent double loading of a mortar. As mortar rounds have at least two sections with outside dimensions only slightly smaller than the bore of the barrel, that is, a fin section and a body section, it is necessary that a tripping lever be actuated at least twice before locking.

In the present invention, a tripping arm of a bell crank extends through a slot into the mortar barrel and a selector switch is provided to permit the tripping arm to be actuated either two or three times, and then it locks to prevent any further tripping, such as that done by loading a second round into the barrel. Upon firing of the first round, the round actuates the tripping arm in a reverse direction and unlocks the tripping arm to permit a new round to be loaded. As some rounds have three enlarged diameters, a selector switch is provided so that the tripping arm can be locked after either two or three trips, as desired.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a top view showing a preferred embodiment of the present invention attached to a mortar;

FIG. 2 is a side view, partially in section, of the preferred embodiment of the present invention;

FIG. 3 is a top view, partially in section, of the preferred embodiment of the present invention; and

FIG. 4 is a top view of a mortar round having three enlarged diameters.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1 of the drawing, there is shown a mortar 11 having a barrel 12 attached to a base plate 13 and a firing pin 14 for detonating the primer of a mortar round. A safety device 15 is attached to the outside of barrel 12 to prevent the loading of a second round into barrel 12 that contains a first round.

Referring now to FIGS. 2 and 3 of the drawing, there is provided a housing 16 which is attached, as by screws, to barrel 12 near the muzzle end. A first bell crank 17 is pivotally connected to housing 16 on shaft 18 and has arms 21 and 22. A stop 23 is provided on housing 16 to limit the clockwise rotation of bell crank 17. Arm 22 is forked and a second bell crank 24 is attached in the forked end of bell crank 17 by shaft 25. Arm 22 is provided with a cam surface 26 and a cam surface 27 is provided on bell crank 24. A spring 28 is provided around shaft 25 to retain bell crank 24 in a centered position relative to bell crank 17. Bell crank 24 is provided with two arms 31 and 32, with arm 31 extending through slot 33 in barrel 12 and into the bore of barrel 12.

An indexing arm 34 is pivotally attached by shaft 35 to housing 16 and has one end 36 engageable with arm 32 of bell crank 17. An indexing cylinder 37 is rotatably mounted about shaft 38 which is stationarily attached to housing 16. A notch 39 is provided in the periphery of indexing cylinder 37 and end 41 of indexing arm engages notch 39. Indexing arm 34 functions as a rocker arm and clockwise rotation of indexing arm 34 is limited by stop 42 on housing 16. A spring 43 is provided to bias indexing arm 34 against stop 42.

A ratchet arm 44 is rotatably attached to housing 16 by shaft 45 and end 46 of arm 44 is engageable with arm 21 of bell crank 17. Counterclockwise rotation of ratchet arm 44 is limited by stop 47 on housing 16. A spring 48 is provided to bias arm 44 against stop 47. A locking cylinder 49 is rotatably mounted on shaft 38 and end 51 of ratchet arm 44 is engageable with notches 52 in the periphery of cylinder 49. Cylinder 49 has one fixed tooth 53 and three pivotal or ratchet teeth 54 and these teeth are engageable with a single tooth 55 on the side of indexing cylinder 37. As best shown in FIG. 3 of the drawing, a pin 56 is attached to stationary shaft 38 and passes through a skewed slot 57 in indexing cylinder 37. As shaft 38 and pin 56 are stationarily mounted with respect to housing 16, rotation of indexing cylinder 37 by movement of arm 34 will impart lateral movement of indexing cylinder 37 so that tooth 55 can engage the teeth on locking cylinder 49.

A spring 58 is provided around shaft 38 and has one end attached to locking cylinder 49 and the other end attached to housing 16. Clockwise rotation of locking cylinder 49 by indexing cylinder 37 winds spring 58 and, upon disengagement of indexing cylinder 37 with locking cylinder 49 and release of ratchet arm 44 from notches 52, spring 58 drives locking cylinder 49 so that stop 59 on locking cylinder 49 engages stop 61 on housing 16.

Most mortar rounds which are presently used by the military have two enlarged diameter portions which trip arm 31 of bell crank 24. A few, however, have three enlarged diameter portions, such as the anti-per-

sonnel cartridge 62 shown in FIG. 4 of the drawing, which has a fin assembly 63, a star washer 64 and an explosive body 65. A selector knob 66 is provided, and when pointer 67 points to "TWO", a stop arm 68 on shaft 69 is in position to engage stop 59 on locking cylinder 49. The distance between stop 61 and stop 68 is such that ratchet arm 44 will ratchet twice in notches 52 of indexing cylinder 37. When knob 66 is turned so that pointer 67 points to "THREE", stop 71 is in position to engage stop 59 on locking cylinder 49. The distance between stop 61 and stop 71 is such that ratched arm 44 will ratchet three times in notches 52 of indexing cylinder 37. When stop 59 is positioned against either stop 68 or stop 71, further rotation of locking cylinder 49 is prevented. A locking pin 70 is provided to retain selector knob 66 in a locked position.

As best shown in FIG. 2 of the drawing, a pointer 72 is attached to locking cylinder 49, and a window 73 is provided in housing 16 for viewing pointer 72. When stop 59 is against stop 61, pointer 72 indicates a "load" condition, and when stop 59 is against either stop 68 or 71, a "fire" condition is indicated. In the event that a round is present in barrel 12, pointer 72 will indicate a "fire" condition, thus providing a warning that another round should not be loaded, but in addition, bell crank 24 will not pivot sufficiently for arm 31 to become clear of the bore of barrel 12, and thus arm 31 will prevent a second round from entering barrel 12.

OPERATION

In operation, when a round having two enlarged diameter portions is to be fired, selector knob 66 is turned so that pointer 67 points to "TWO" and then locking pin 70 is used to lock knob 66 against any additional rotation. Stop arm 68 is now in a position to be engaged by stop 59. Pointer 72 will indicate a "LOAD" condition. As round 74 starts its descent down barrel 12, fin assembly 75 will strike arm 31 causing bell crank 24 to be pivoted about shaft 25. Arm 32 of bell crank 24 will engage end 36 of indexing arm 34 and cause indexing arm 34 to rotate about shaft 35 and turn indexing cylinder 37. As shaft 38 and pin 56 are stationary, rotation of indexing cylinder 37 by indexing arm 34 will cause lateral movement of indexing cylinder 37 and tooth 55 on cylinder 37 will engage tooth 53 on locking cylinder 49. Continued rotation of indexing cylinder 37 will cause locking cylinder 49 to ratchet. When fin assembly 75 clears arm 31, spring 28 will return bell crank 24 to its original position. Spring 43 will also return indexing arm 34 against stop 42 and indexing arm 34 will return indexing cylinder 37 to its original position. It can thus be seen that locking cylinder 49 has been rotated against the force of spring 58 and stop 59 will be positioned midway between stops 61 and 68. When the body portion 76 of round 74 engages arm 31, the ratcheting of locking cylinder 49 will be repeated and stop 59 will move against stop arm 68. Pointer 72 will now be indicating a "fire" condition.

When round 74 is fired from the mortar, the body portion 76 of round 74 will strike arm 31 and cause bell crank 17 to be rotated in a counterclockwise direction. Arm 21 of bell crank 17 will pivot ratchet arm 44 about shaft 45, and end 51 of arm 44 will disengage from

notch 52. Spring 58 will then return locking cylinder 49 to its starting position with stop 59 being in engagement with stop 61. Pointer 72 will again indicate a "LOAD" condition.

Until round 74 is fired, pointer 72 will indicate a "fire" condition, which will warn that an additional round 74 should not be loaded into barrel 12. In the event, however, that an attempt is made to load, arm 31 of bell crank 24 will not pivot sufficiently for arm 31 to clear the bore of barrel 12. Arm 32 will engage indexing arm 34 and partially rotate indexing cylinder 37 so that tooth 55 will engage ratchet tooth 54 on locking cylinder 49. Locking cylinder 49 will not turn, however, and indexing cylinder 37 will stop thus preventing arm 31 from clearing the bore of barrel 12.

When a mortar round having three enlarged diameters is to be fired, such as the anti-personnel cartridge 62 which is shown in FIG. 4 of the drawings, selector knob 66 is turned to "THREE". Stop arm 68 is rotated by the turning of knob 66 and is not in position to be engaged by stop 59 on locking cylinder 49. Stop 59 is then free to travel until it strikes stop 71. The distance between stops 61 and 71 is such that locking cylinder 49 will ratchet three times, that is, once for each enlarged diameter on round 62.

I claim:

1. A safety device for preventing the loading of a mortar round into a barrel already containing a mortar round comprising,

a housing adaptable for mounting to the outside of a mortar barrel having a slot adjacent to its muzzle end,

a first bell crank pivotally attached to said housing having first and second arms,

a second bell crank pivotally attached to said first arm of said first bell crank and having a tripping arm extending through said slot of said barrel and having a driving arm,

an indexing cylinder rotatably mounted in said housing,

a locking cylinder rotatably mounted in said housing and having a plurality of ratchet notches, said locking cylinder having means for intermittently engaging said indexing cylinder,

an indexing arm pivotally attached to said housing having one end engageable with said indexing cylinder and one end engageable with said driving arm of said second bell crank,

a ratchet arm pivotally attached to said housing having one end engageable with said ratchet notches in said locking cylinder and one end engageable with said second arm of said first bell crank, and stop means for limiting the amount of rotation of said locking cylinder.

2. A safety device for preventing the loading of a mortar round into a barrel already containing a mortar round as set forth in claim 1 wherein said stop means includes a first stop attached to said locking cylinder and second and third stops attached to said housing, said first stop being movable between said second and third stop.

3. A safety device for preventing the loading of a mortar round into a barrel already containing a mortar round as set forth in claim 2 wherein said third stop includes a stationary member and a movable member

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and means for selecting either said stationary member or said movable member to be engaged by said first stop on said locking cylinder.

4. A safety device for preventing the loading of a mortar round into a barrel already containing a mortar round as set forth in claim 2 having spring means for biasing said locking cylinder so that said first stop engages said second stop.

5. A safety device for preventing the loading of a mortar round into a barrel already containing a mortar

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round as set forth in claim 1 wherein said indexing cylinder has one gear tooth and said locking cylinder has a plurality of ratchet gear teeth engageable with said one gear tooth on said indexing cylinder.

6. A safety device for preventing the loading of a mortar round into a barrel already containing a mortar round as set forth in claim 4 having means for moving said one gear tooth on said indexing cylinder into engagement with said teeth on said locking cylinder.

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