Nov. 7, 1944. R. I. MARKEY 2,362,210

BOMB RELEASING SHACKLE

Filed Aug. 7, 1941 3 Sheets-Sheet 1

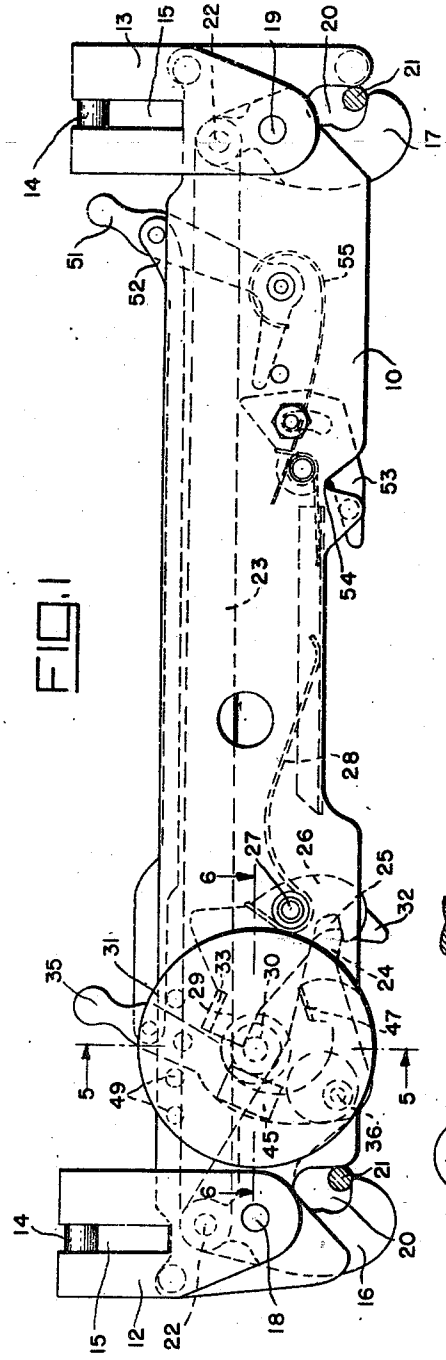


FIG. 1

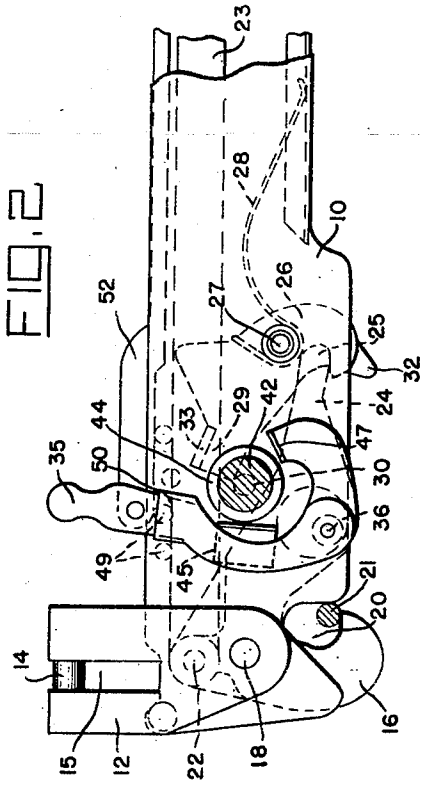


FIG. 2

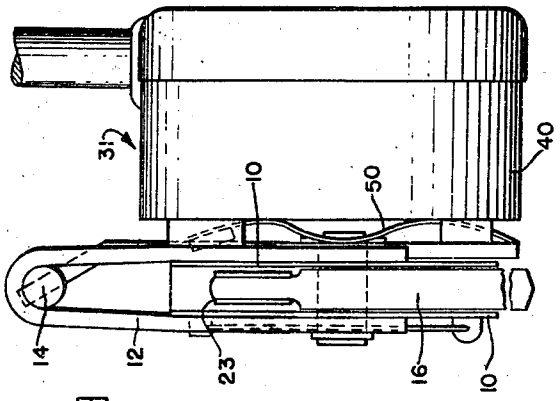


FIG. 3

INVENTOR
ROSCOE I. MARKEY

BY Geo. A. Senior
ATTORNEY

Nov. 7, 1944. R. I. MARKEY 2,362,210

BOMB RELEASING SHACKLE

Filed Aug. 7, 1941 3 Sheets-Sheet 2

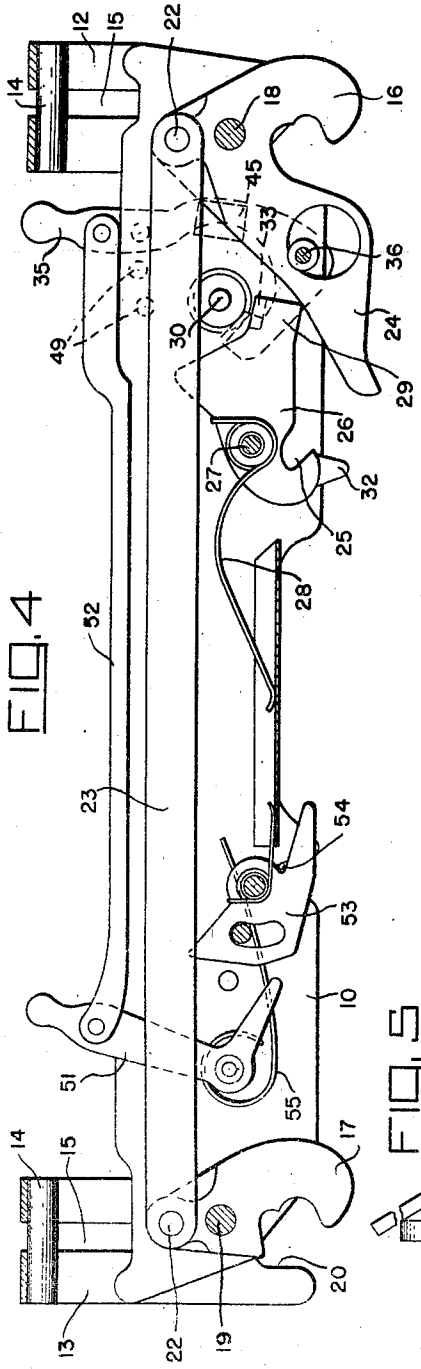


FIG. 4

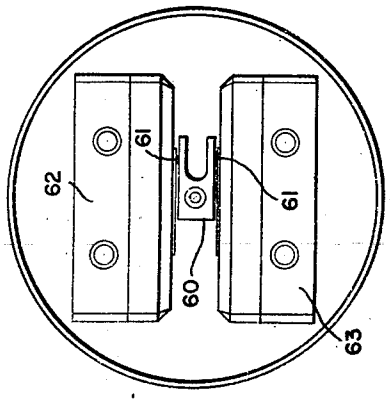


FIG. 7

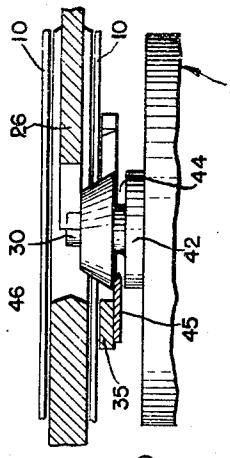


FIG. 6

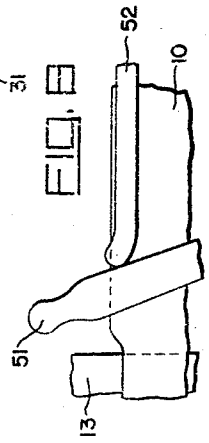


FIG. 8

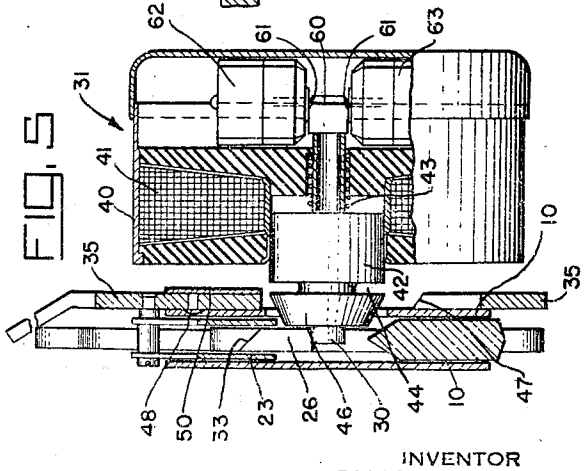


FIG. 5

INVENTOR
ROSCOE I. MARKEY

BY Geo A. Senior

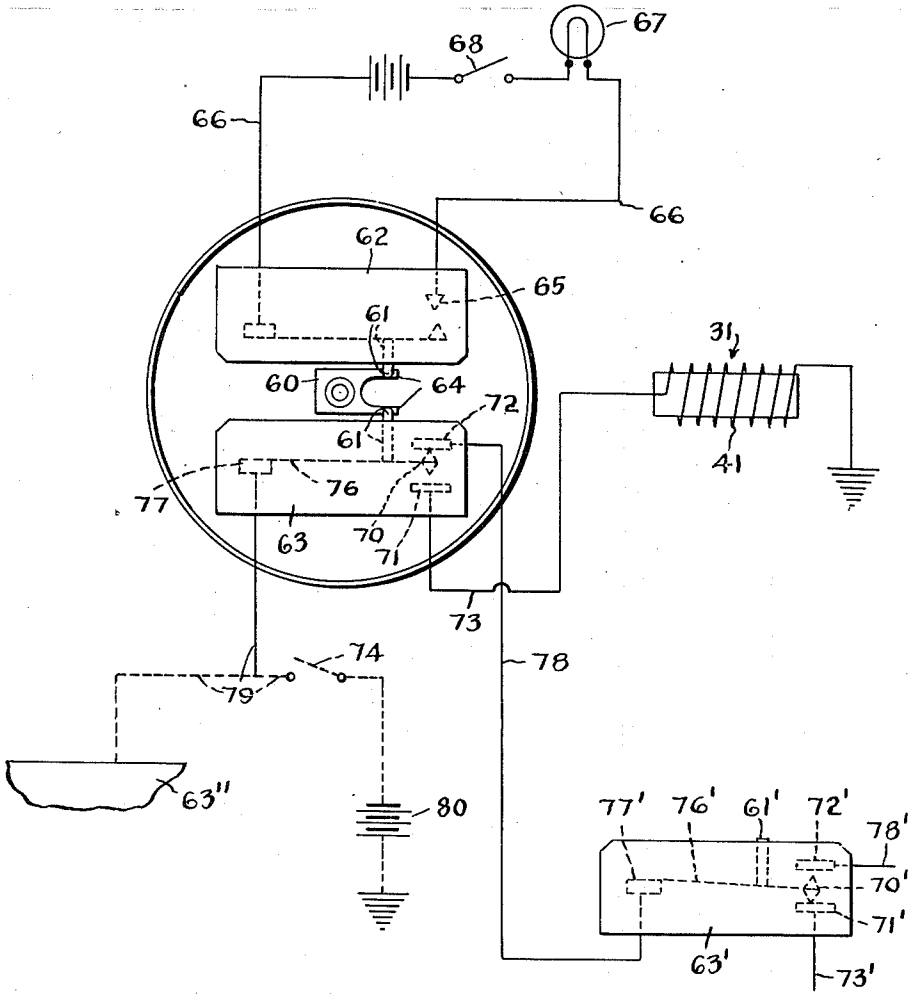
ATTORNEY

Nov. 7, 1944. R. I. MARKEY 2,362,210

BOMB RELEASING SHACKLE

Filed Aug. 7, 1941 3 Sheets-Sheet 3

FIG. 9



INVENTOR
ROSCOE I. MARKEY
BY Geo. A. Senior
ATTORNEY

Patented Nov. 7, 1944 2,362,210

UNITED STATES PATENT OFFICE

2,362,210

BOMB RELEASING SHACKLE

Roscoe I. Markey, East Orange, N. J., assignor to Pollak Manufacturing Company, Arlington, N. J., a corporation of New Jersey

Application August 7, 1941, Serial No. 405,729

3 Claims. (Cl. 89—1.5)

The invention relates to bomb releasing shackles, particularly adapted for use with aerial bombs.

In accordance with the invention a bomb shackle having a two point support for the bomb is provided with suitable means to release both of these supporters at precisely the same instant.

Among the objects of the present invention is the provision of a bomb releasing shackle having an extremely simple construction and one that is most efficient in operation.

A further important object is the provision of a safety feature whereby the bomb in an adjoining section cannot be electrically connected in the release circuit until the bomb has actually been released from the preceding station.

Another object is the provision of a control mechanism which in one position will prevent the bomb from being released should the current be inadvertently turned on, and in another position the bomb may be manually released if the electric current should fail.

Other important objects and advantages will become apparent as this specification proceeds. Referring to the accompanying drawings forming a part thereof and in which a preferred form of the invention is illustrated:

Fig. 1 is a side elevation, the parts being in the locked position;

Fig. 2 is a fragmentary elevational view of the left hand end of the bomb releasing shackle, the solenoid and switch mechanism being removed, the solenoid core being in section, and the parts being in position whereby the bomb may be released when the solenoid is energized;

Fig. 3 is an end view on a somewhat larger scale;

Fig. 4 is an elevational view looking from the opposite side of Fig. 1, one of the side plates being removed and parts being in section. In this view the operating lever has been moved its limit so the bomb could be dropped manually without energizing the solenoid, and the mechanism is shown in the position it would assume with the bomb dropped;

Figs. 5 and 6 are sectional views taken respectively on lines 5—5 and 6—6 of Fig. 1;

Fig. 7 is an end view of the solenoid with the cap removed to show the switches; and

Fig. 8 is a fragmentary detail view of a modified construction.

Fig. 9 is a wiring diagram.

This invention has to do with simplifications and a mechanism having additional advantages over that disclosed in my copending application Serial No. 333,921, filed May 8, 1940.

Referring again to the drawings the framework or supporting structure of the shackle comprises two spaced plates 10—10, resistance welded or otherwise secured to hinge-members 12 and 13.

The hinge-members comprise yokes to which short rods 14 are resistance welded or otherwise secured at their connecting portions. The yokes are bifurcated so as to form openings 15 to permit of entry of the supporting members of the bomb rack or hanger, the exposed parts of the rods 14 acting as bearings therefor.

Hooks 16 and 17 are pivoted at 18 and 19 in the plates 10 and hinge-members 12—13 at either end of the shackle. The hooks 16 and 17 in the locked position of the shackle as shown in Fig. 1 sufficiently close the entrances of openings 20 to support rings or other suitable members 21 which carry the bomb (not shown), thus providing a two point support for the bomb.

The upper portions of the hooks 16 and 17 are pivoted at 22 to a longitudinally extending tie member 23. It will be apparent the hooks 16 and 17 and tie member 23 are movable simultaneously, and further more that the weight of the bomb as it hangs on the hooks tends to move the tie-member toward the right in Fig. 1 and causes the hooks to move away from the openings 20.

Releasable locking means for tie member and its hooks are provided and this means will now be described. The hook 16 has an extending toe 24 the free end of which engages a notch 25 in a pawl 26 when the parts are in the locked position of Figs. 1 and 2. The pawl 26 is pivoted in the side plates 10 at 27 and is normally urged toward its releasing position by a spring 28.

The pawl 26 has an arm 29, the underside of which in the locked position engages a pin 30 forming part of the core of the solenoid 31 hereinafter described. It is thus thought to be apparent that when the pin 30 on the core of the solenoid is retracted either electrically or manually the pin will move out of the path of the arm 29 and the weight of the bomb will instantly cause the toe 24 to be disengaged from the notch 25 in the pawl 26 and the bomb will be dropped as heretofore described. The pawl 26 is provided with a finger piece 32 extending below the side plates so as to permit of easier manipulation.

The opposite side of the pawl arm 29 to that which engages the solenoid pin 30 is beveled as

indicated at 33 in Fig. 5. In resetting the mechanism when positioning a new bomb the beveled edge 33 cams the pin 30 out of its path until the locked position is reached.

Safety means are provided operating in conjunction with the solenoid whereby a bomb cannot be dropped should the solenoid become inadvertently energized such as by a short circuit or other things that might happen in an emergency. This safety means also contemplates manual control for releasing the bomb. This would be desirable at times and very important if the electrical means should fail.

A control lever 35 is pivoted at 36 and is adapted to assume one of three positions. The position illustrated in Fig. 1 is the locked position and in this position as will be apparent hereinafter the bomb cannot be released even if the solenoid should be energized unintentionally. In the position of the parts illustrated in Fig. 2 the bomb may be released by energizing the solenoid. In the position shown in Fig. 4 which might be termed an emergency position the bomb has been released manually by engagement of the end of the operating lever with the core of the solenoid as will be apparent hereinafter.

The solenoid 31 which is mounted on one of the side plates 10 comprises a casing 40 with the usual winding 41. The core 42 is forced outwardly or to what might be termed the locked or holding position by a spring 43. In this position it will be apparent as heretofore described that the pin 30 on the end of the solenoid core will engage the pawl 26 and the mechanism will be held in its locked position.

The solenoid core is provided with an annular groove 44 and in the locked position as particularly shown in Figs. 1 and 6 a plate 45 secured to the control lever 35 will prevent movement of the solenoid core even though the solenoid should be inadvertently energized.

Fig. 2 illustrates the control lever 35 moved to its second position. It will be apparent from an inspection of this figure that the core of the solenoid is free to move and when the solenoid is energized its core will be retracted and the pin 30 will be moved out of the path of the arm 29 of the pawl 26 and the bomb will be released.

That part of the solenoid core between the pin 30 and the groove 44 is made in the form of a truncated cone 46. The free end of the control lever 35 beyond its pivot 36 is beveled as indicated at 47, see Fig. 5. When the control lever is moved to its third position the beveled end 47 engages truncated portion 46 of the solenoid core and cams the solenoid core to its retracted position, thus moving the pin 30 out of the path of the pawl arm 29 and causing the bomb to be released. It will therefore be apparent that the bomb may be manually released if the electric means should fail or if one wants to release it without using the electric means.

The control lever 35 is provided with a protuberance 48 and this protuberance engages one of three indentations 49 in one of the side plates 10, depending upon the position to which the control lever is moved. A flat spring 50 urges the control lever toward the plate 10 (Figs. 2 and 3).

An arming mechanism is provided and this is similar to one of the forms of arming mechanism disclosed in my aforesaid mentioned patent application. As illustrated the operating lever 51 is connected by a link 52 to the control lever 35. However, the link might be omitted and the arming mechanism and control lever operated separately or the link 52 might be a push link, that is not connected to the operating lever 51 and thereby movable in one direction only by the operating lever as illustrated in Fig. 8.

The operating lever 51 of the arming mechanism works in conjunction with a latch member 53 which is adapted to retain the arming wire 54 when it is desired to drop the bomb armed, and to release the arming wire with the bomb when it is desired to drop the bomb unarmed. A spring 55 normally urges the operating lever 51 towards the right in Fig. 1, or to what might be termed the safety or locked position.

In the position illustrated in Fig. 1 as heretofore explained the mechanism is locked and the bomb cannot be dropped. In the position shown in Fig. 2 the bomb may be dropped when the solenoid is energized and in this position the arming wire would be retained by the latch member 53 and the bomb would drop armed. As illustrated in the position of Fig. 4 the bomb would drop unarmed but as heretofore explained by a slightly different arrangement of parts the bomb could be dropped armed with the control lever in the position of Fig. 4. As the details of the arming mechanism do not form part of the present invention it is thought the foregoing explanation will suffice.

Fig. 8 diagrammatically illustrates the form in which the link 52 is not connected to the operating lever 51. With this arrangement the bomb may be dropped armed or unarmed, either electrically or manually. When it is desired to drop the bomb manually, the control lever is manipulated as heretofore described and the operating lever 51 of the arming mechanism may be moved so that the bomb may drop armed or unarmed. When it is desired to drop the bomb electrically the control lever 35 as heretofore described is moved to its central position. If the bomb is to be dropped unarmed the operating lever 51 of the arming mechanism remains in the position of Fig. 1 and when the solenoid is energized the bomb will drop unarmed. When the bomb is to be electrically dropped in its armed condition the operating lever 51 is moved to its central position and when the solenoid is energized and the bomb drops, the arming wire will be retained and the bomb will be dropped armed.

Simple means are provided whereby the bomb shackle in the adjoining section of the rack cannot be electrically connected in the release circuit until the bomb has actually been released from the preceding station.

This means comprises a fork 60 mounted on the outer end of the solenoid core. When the solenoid is energized and the core is retracted into the coil of the solenoid the fork will be projected and the arms of the fork will engage plungers 61 on a pair of switches 62, 63. The prongs of the fork are resilient or in other words comprise an elastic or spring element. This construction prevents excessive loads on the switches and provides an adjustment which is effected at the time of installation. Thus, if the switches are not accurately positioned, the prongs may be slightly spread or pushed toward each other depending upon conditions. The switch 62 as illustrated particularly in Fig. 9 is a single pole normally open switch or in other words the circuit is always open until the plunger 61 is depressed by one of the prongs 64 of the fork 60 which is carried by the core of the solenoid. The plunger 61 of the switch 62 is always depressed when the shackle is loaded, that is when

a bomb is in position in the shackle. In the position of Fig. 9, the bomb has been dropped and it will be noted the circuit to the fixed contact 65 is broken.

The switch 62 controls a pilot light circuit 66, the pilot light 67 of said circuit preferably being located in the bombardier's station. It will be understood there is a pilot light at the bombardier's station for each bomb shackle and its respective switch 62. All of the pilot lights 67 and the switches 62 may be suitably wired together and controlled by a master switch 68. From the foregoing it is thought to be apparent when the shackle is loaded the plunger 61 will be depressed, the light circuit completed and the pilot light will inform the bombardier the bomb is in position to be dropped. After the bomb has been dropped the circuit will be broken as hereinafter described and the absence of the light will enable the bombardier to know there is no bomb in that particular shackle.

The switch 63 is a single pole double throw switch in which the movable contact 70 is always in engagement with one or the other of the fixed contacts 71 or 72. When the shackle is loaded and the plunger 61 of the switch 63 is depressed by one of the prongs 64 the movable contact 70 engages the fixed contact 71 and the current is directed through the connection 73 to the wiring 41 of the solenoid 31 of the bomb shackle. When this circuit is closed by a master switch hereinafter referred to the solenoid will operate the mechanism heretofore described to drop the bomb.

After the bomb has been dropped and the circuit cut by opening the master switch 74 the fork 60 will be retracted under pressure of the solenoid spring 43 and the plunger 61 will be released so that the movable contact 70 will spring into engagement with the fixed contact 72. The movable contact 70 is carried by a spring finger 76 which is mounted on a fixed contact 77. Connected to the contact 72 is a feed wire 78 which directs the current to a fixed contact 77' on a similar switch illustrated at 63', the same being located on the succeeding shackle, the parts of which are designated by the same reference numerals, primed. From the foregoing it is thought to be apparent that a simple, foolproof and efficient arrangement has been devised whereby in one position of the single pole double throw switch only the solenoid on the particular shackle from which the bomb is to be dropped may be energized and no current can be supplied to the succeeding shackles until that bomb has been dropped. Thus when the master switch 74 is closed, it energizes only one solenoid and drops one bomb. Before another bomb can be dropped the master switch 74 must be opened, then closed, and likewise with all succeeding bombs to be dropped.

The line 79 which connects to the contact 77 to complete the circuit either to the solenoid 31 or to the switch 63' on the succeeding shackle leads from a switch 63'' on the preceding shackle or to a battery or other source of power 80 located in the vicinity of the first shackle of the series. The master switch 74 is preferably located in the bombardier's station and taps into the circuit or line 79 between the battery or source of power 80 and the first shackle in the series. On succeeding shackles the line 78 becomes in effect the line 79 to connect the feed line to the switch. Thus the current from the battery 80 through the master switch 74 always flows through line 79 leading to the switch 63 on the first shackle in the series and on through line 78 to similar switches on succeeding shackles.

As the parts are shown in Fig. 9 the master switch 74 has been closed to energize the solenoid 31 connected to the switch 63, the bomb in that respective shackle has been dropped and the master switch 74 again opened as is shown in the figure to cut the current and allow the solenoid spring to retract the solenoid core permitting the plungers 61 to move outwardly. At this time the movable contact 70' on the switch 63' of the succeeding shackle is engaging the fixed contact 71' to direct the current to its solenoid through the lead 73'. When the master switch 74 is again closed the solenoid connected to the switch 63' will be energized and the bomb in its shackle dropped.

In Fig. 9 alternate current feed lines are illustrated in broken lines. If the illustrated shackle were to be considered the first in the series the connection 79 would lead to the battery 80. If the illustrated shackle were an intermediate one in the series the line 79 would lead to a switch 63'' on a preceding shackle.

It is to be understood the plungers 61 are in line and are operated simultaneously. As heretofore stated when the shackle is loaded the plungers 61 are depressed, the pilot light circuit is completed and the circuit leading the current to the solenoid is formed so that the solenoid may be energized at the proper time by the master switch 74. After the solenoid has been energized and its core 42 moved to operate the control and release mechanism the prongs 64 on the fork 60 maintain contact with both plungers 61. After the bomb has been dropped and the current has been cut by opening the master switch 74 the solenoid spring 43 throws the core 42 beyond the point of loaded position, thus permitting the plungers 61 to return to their normal position and break the pilot light circuit and direct the current to the switch 63' on the succeeding shackle. If the hooks 16, 17 have not opened, it is impossible for the solenoid core to move to its opposite end of travel so as to permit of the succeeding shackle being connected into the circuit, as the solenoid core will contact the top edge of the hook 16, thus preventing any possibility of jamming bombs in the bomb bay.

I claim:

1. A bomb releasing shackle having in combination, a supporting frame, bomb carrying hooks pivoted in said frame, a tie rod connecting said hooks so that they will operate simultaneously, releasable locking means for the tie member and its hooks said releaseable locking means being mounted in said frame, a solenoid for operating said releasable locking means, the core of said solenoid being provided with an annular groove intermediate its outer end and a beveled portion adjacent said groove, and a control lever for said releasable locking means, said control lever being pivotally mounted in said frame and at substantially right angles to the core of said solenoid in one position having a portion thereof engaging said annular groove in the core of said solenoid so as to prevent operation of the releasable locking means, in another position being free of said core so as to permit the solenoid to operate the releasable locking means, and in another position having its free end engaging said beveled portion on the core of said solenoid so as to cam said core inwardly and

manually operate the releasable locking means.

2. A bomb releasing shackle having in combination, a supporting frame, bomb carrying hooks pivoted in said frame, a tie rod connecting said hooks so they will operate simultaneously, a toe on one of said hooks, said toe extending in a direction toward the other of said hooks, a pawl pivoted in said frame adjacent said hook carrying said toe and being in the same plane as said hook and its toe, a hook portion on said pawl, said toe engaging said hook portion so as to prevent movement of said tie member and its hooks, and a solenoid, the core of which is movable at right angles to the plane of said pawl, said solenoid core in its extended position being in the path of movement of said pawl so as to prevent movement of said pawl and maintain the hooks and tie rod in bomb supporting position, and said solenoid core in its retracted position permitting movement of said pawl so it may be disengaged from said toe and allow the hooks to release the bomb.

3. A bomb releasing shackle having in combination, a supporting frame, bomb carrying hooks pivoted in said frame, a tie rod connecting said hooks so they will operate simultaneously, releasable locking means for the tie member and its hooks, said releasable locking means comprising a toe on one of said hooks, said toe extending in a direction toward the other of said hooks, a pawl pivoted in said frame adjacent said hook carrying said toe, a hook portion on said pawl, said toe engaging said hook portion so as to prevent movement of said tie member and its hooks, a solenoid, the core of said solenoid in one position being in the path of movement of said pawl and preventing movement of said pawl, and in another position permitting movement of said pawl so it may be disengaged from said toe and allow the hooks to release the bomb, the core of said solenoid being provided with an annular groove intermediate its outer end and a beveled portion adjacent said groove, and a control lever positioned at substantially right angles to the core of said solenoid, said control lever being pivotally mounted in said frame and in one position having a portion thereof engaging said groove in the core of said solenoid so that the releasable locking means cannot be operated, and in another position being free of said core to permit the solenoid to operate the releasable locking means, and in another position having its free end engage said beveled portion to cam the core of said solenoid inwardly so as to manually move said core and operate the releasable locking means.

ROSCOE I. MARKEY.