March 21, 1939. W. G. McNEILL ET AL 2,150,933

BOMB RELEASE MECHANISM

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FIG. 1.

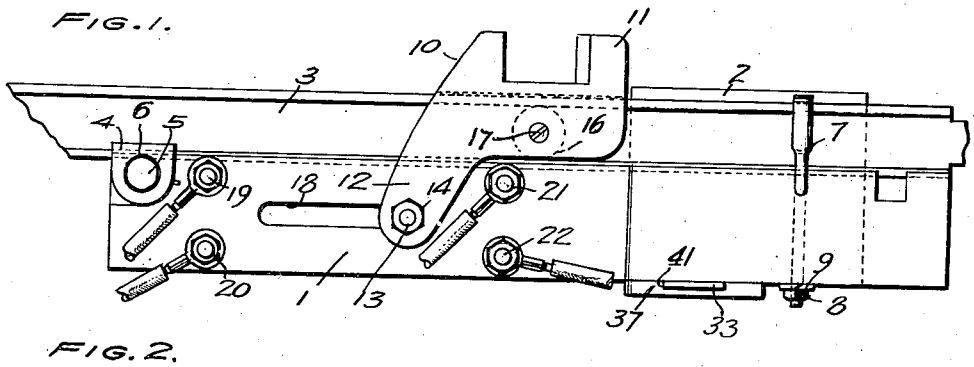


FIG. 2.

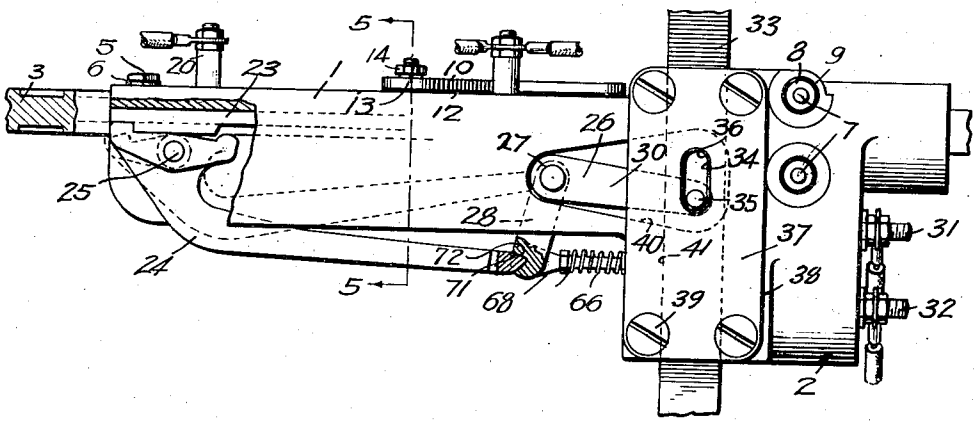


FIG. 3.

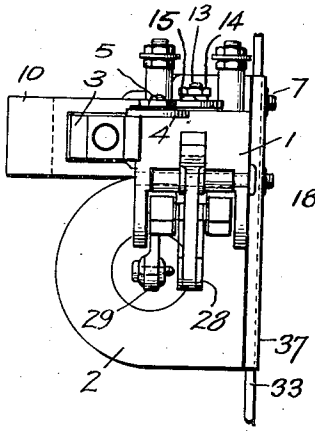


FIG. 5.

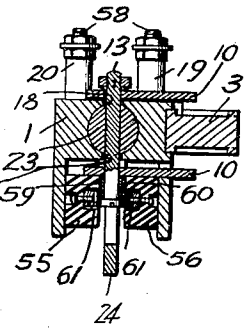
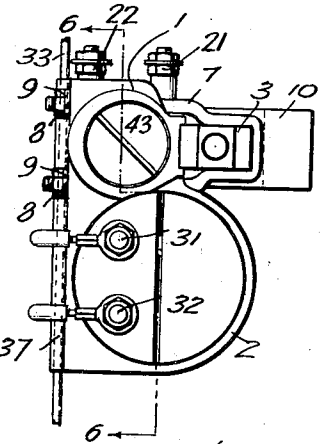


FIG. 4.



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BOMB RELEASE MECHANISM

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FIG. 6.

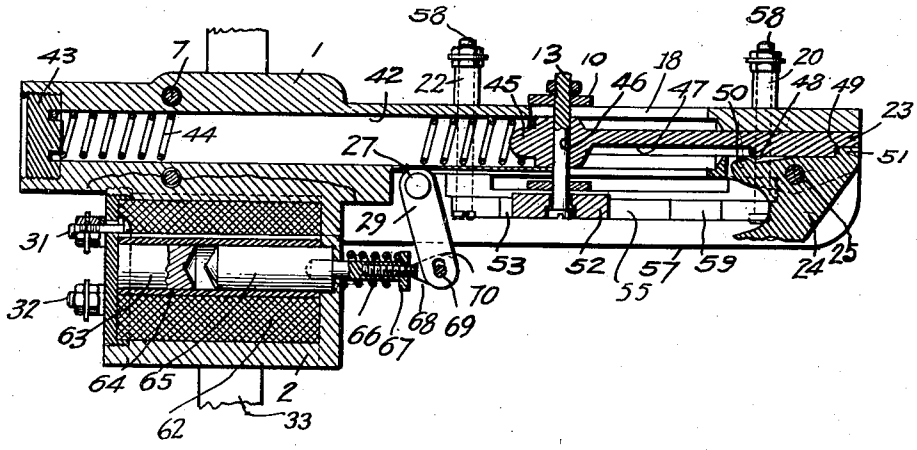


FIG. 7.

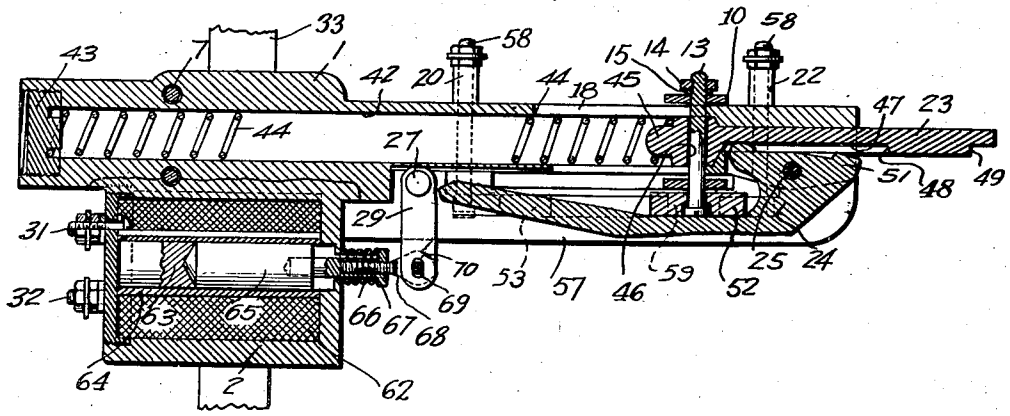
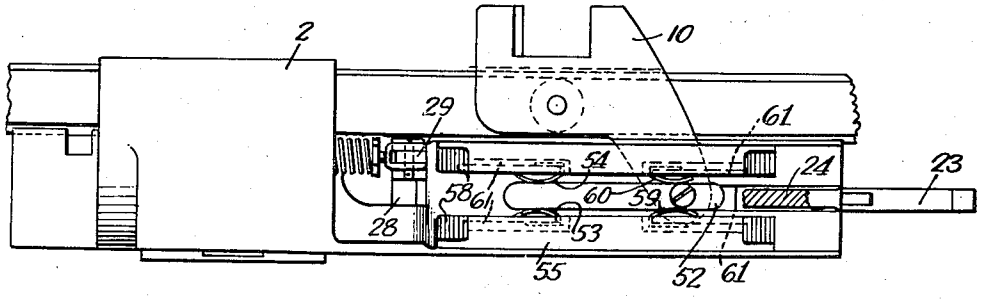


FIG. 8.



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BOMB RELEASE MECHANISM

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Application July 8, 1937, Serial No. 152,604

9 Claims. (Cl. 89—1.5)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to us of any royalty thereon.

The present invention relates to bomb releasing mechanisms for aircraft and more particularly to release mechanisms installed at each bomb carrying station of a bomb rack. While the present invention is adapted for use with a single bomb or torpedo, it is not limited to such use but may be employed in a rack carrying many bombs, and therefore equipped with equally many releasing units, which usage requires solenoid motors of minimum size (and weight) compactly disposed with reference to the spring energized draw bars which they release. Our invention constitutes an improvement in the bomb or torpedo release control mechanism described in detail in United States Letters Patent No. 1,562,572 granted to S. B. McMurrain. In the McMurrain device, the solenoid magnet operates against the energizing load of the draw bar, for releasing the same, with the result that the magnet will necessarily be large and heavy, depending upon the draw bar load. In accordance with our invention, a releasing mechanism operated by the solenoid motor indirectly releases the draw bar in a manner such that the load imposed upon the magnet proper is relatively small in comparison to the draw bar load released.

It is an object of our invention to provide an electric tripper unit for installation upon a bomb rack without other modification of the rack than the removal of the manual releasing mechanisms therefrom and the substitution of one of our tripper units at each bomb carrying station. Necessary control rods, electric wiring, etc. are thereafter added.

It is a still further object of our invention to provide an entirely self-contained tripper unit that can be bolted and clamped to the tripping and arming slide bar of a bomb rack at each bomb carrying station thereof.

Other objects and advantages of our invention will become apparent from the following description taken in connection with the accompanying drawings, it being clearly understood that the same are by way of illustration and example only and are not to be taken as in any way limiting the spirit or scope of our invention. The spirit and scope of our invention is to be limited only by the prior art and by the terms of the appended claims.

Referring to the drawings, in which numerals of like character designate similar parts throughout the several claims:

Fig. 1 is a top plan view of our invention fixed to the tripping and arming slide bar of a bomb rack.

Fig. 2 is a side elevation of Fig. 1.

Fig. 3 is a left hand end view of Fig. 2.

Fig. 4 is a right hand end view of Fig. 2.

Fig. 5 is a cross-sectional view taken on the lines 5—5 of Fig. 2.

Fig. 6 is a cross-sectional view taken on the lines 6—6 of Fig. 4.

Fig. 7 is similar to Fig. 6 except that the tripping slide is released.

Fig. 8 is a bottom view of Fig. 7.

In Figs. 1 through 4, our electrical tripper unit is shown encased within combined plunger housing portion 1 and solenoid housing portion 2. The plunger housing portion 1 is fixed to a tripping and arming slide bar 3, a plurality of which are carried by the bomb rack proper, by means of a clip 4, cap screw 5 and lock washer 6 at the left end of the combined housings and by further means of a U-bolt 7, nuts 8 and lock washers 9 at the right end thereof. Referring specifically to Fig. 1, the tripping and arming slide bar 3 is provided with a tripping slide 10. The tripping slide 10 is provided at its upper extremity with a U-shaped portion 11, adapted to engage the trigger of a bomb shackle installed upon the bomb rack proper, and a second downwardly extending U-shaped portion 12, to the open ends of which are secured a screw 13, nut 14 and lock washer 15. The upper inside portions of the U-shaped portion 12 are provided with washers 16 and screws 17 for retaining the tripping slide 10 in longitudinally slidable engagement with the tripping and arming sliding bar 3. Recesses for the washers 16 are best shown in Fig. 5. The plunger housing portion 1 is further provided with a slotted opening 18 for limiting fore and aft movement of the screw 13 and attached tripping slide 10. The forward end of the plunger housing portion 1 is provided with terminals 19 and 20, while the mid-portion thereof is further provided with terminals 21 and 22.

In the left hand cut-a-way portion of Fig. 2, it will be noted that the plunger housing portion 1 is provided with a spring actuated plunger 23, which is being held in a "cocked" position by means of a plunger release lever 24, journalled on a pin 25. The plunger release lever 24 is held in the attitude of Fig. 2 by means of a trigger release 26. The release 26 is composed of a trigger shaft 27 to which are fixedly secured a

depending arm 28 (plunger release lever), a second parallelly depending arm 29 (solenoid lever) and a horizontally extending arm 30 (safety lever), as shown in Figs. 2, 3 and 6. The solenoid housing portion 2 is provided with terminals 31 and 32, as well as a vertically disposed sliding bar 33, having a central lost motion slot 34. A driving pin 35 is fixed to the outer end of the safety lever arm 30. As shown in Fig. 2, it is disposed at the bottom of the lost motion slot 34, being visible through a second inspection slot 36 provided in a sliding bar retaining plate 37 fixed to a bossed face 38 of the solenoid housing portion 2 by means of screws 39. It will be noted that the housing portion 2 is provided with recesses 40 and 41 for proper movement of the safety lever arm 30 and the sliding bar 33. As shown in Fig. 2, the sliding bar 33 is so positioned that the slot 34 in no wise interferes with full movement of the safety lever arm 30. By "slot width" downward movement of the sliding bar 33, the plunger release lever 24 is positively safetied against solenoid release. On the other hand, the plunger release lever 24 may be manually released by "slot width" upward movement of the sliding bar 33.

In Fig. 6, a view from the opposite side of Fig. 2, the plunger housing portion 1 is cut away along its longitudinal axis to show provision of a retaining cavity 42 for the spring actuated plunger 23. The left extremity of the cavity 42 is provided with a screw plug 43 recessed at its inner end to receive the left extremity of a spring 44 utilized to energize the spring actuated plunger 23. It will be noted that the latter is provided with a spring receiving projection 45 and a vertical hole 46 for driving engagement with the screw 13. The major length of the spring actuated plunger 23 is square in cross-section in order to provide for a recess 47 having a cocking cam 48 and an engaging notch 49. By manually pushing the tripping slide 10 about 1/8 inch to the left of the showing of Fig. 6, a cammed projection 50, provided upon the plunger release lever 24 (to left of pin 25), forces that lever into the "cocked" attitude of Figs. 2 and 6. Upon manual pushing release, the spring actuated plunger 23 returns to the positioning of Fig. 6, from whence it cannot escape as long as a projection 51, provided upon the plunger release lever 24 (to right of pin 25) remains in engagement with the notch 49.

In Figs. 7 and 8, the lower extremity of the screw 13 retains a sliding contact block 52 in operable engagement with oppositely disposed brushes 53 and 54 provided on further oppositely disposed insulation blocks 55 and 56 (shown in Figs. 5 and 8). The latter blocks are fixed within a channel portion 57 provided in the plunger housing portion 1 by means of retaining screws 58, forming part of each heretofore mentioned terminals 19 through 22. With release of the spring actuated plunger 23, the sliding contact block 52 moves forward to operably connect a second pair of oppositely disposed contact brushes 59 and 60, similarly carried by the insulation blocks 55 and 56. The lower extremities of the four screws 58, forming part of terminals 19 through 22, are electrically connected with contact brushes 53, 54, 59 and 60, by means of four conductors 61 all of which are shown in Fig. 8.

Fig. 6 is also cut away on the longitudinal axis of the solenoid housing portion 2 to show a solenoid coil 62, a solenoid core 63, a solenoid core liner 64, a plunger 65, a plunger restraining spring 66, and a spring retainer 67 with inner end threaded to the forward extremity of the solenoid core 63. The outer extremity of the spring retainer 67 is tapped to receive a clevis 68 and a clevis pin 69, both of which cooperate to maintain the plunger 65 in predetermined longitudinal adjustment with reference to a slotted hole 70 provided in the depending arm 29 (solenoid lever) forming an integral part of the trigger release 26.

Dual release (electrical or manual), as well as positive locking of the spring actuated plunger 23, may best be understood by reference to Figs. 2, 6 and 7. In Fig. 2, the right hand extremity of the plunger release lever 24 is provided with a bearing surface 71 adapted to be maintained in operable engagement with an inner bearing surface 72 of a notch provided upon the lower extremity of the plunger release lever arm 28, through forward compressive action of the spring 66. It should be noted that both the bearing surfaces 71 and 72 are substantially tangent to a predetermined radius struck about the longitudinal axis of the trigger shaft 27 such that a minimum rotational moment is required to break contact therebetween. Since parts 27, 28, 29 and 69 of the trigger release 26 all bear a fixed relationship to one another, it is at once evident that energizing of the solenoid coil 62 will cause left hand movement of the plunger 65 with resultant clockwise movement of the solenoid lever arm 29 of Fig. 6 such that the bearing surface 72 of the plunger release lever arm 28 no longer restrains the plunger release lever 24 against upward or counter-clockwise rotation (Fig. 2) whereby disengagement of the projection 51 provided thereupon from the engaging notch 49 of the spring actuated plunger 23 will cause the latter to be free to spring forward into the position shown in Figure 7.

Exactly the same release as that described above may also be accomplished by upward movement of the sliding bar 33 from the position shown in Fig. 2 whereby the safety lever arm 30 of the trigger release 26 is caused to rotate in a counter-clockwise direction with resultant manual disengagement of the bearing surfaces 71 and 72. It should be further noted that the sliding bar 33 performs three functions: first, non-interference with solenoid release of the spring actuated plunger 23 through the parts disposition shown in Fig. 2; secondly, it provides a positive locking means against accidental release of the spring actuated plunger 23 upon full downward movement of the slot 34 into engagement with the driving pin 35 of the trigger release 26 such that counter-clockwise rotation of the safety lever arm 30 is positively restrained; and thirdly, the sliding bar 33 provides for manual release of the spring actuated plunger 23 through full upward movement of the slot 34 from the positioning of Fig. 2 until the lower portion thereof comes within close proximity of the upper portion of the slot 36 provided in the outer surface of the sliding bar retaining plate 37, which vertical movement will cause counter-clockwise rotation of the safety lever arm 30 from the positioning shown in Fig. 2. Upon accomplishment of each of the three releases referred to above, parts dispositions within the plunger housing portion 1 and the solenoid housing portion 2 will be those of Fig. 7.

Fig. 5 is a cross-sectional view of Fig. 2 taken through the screw 13 driving the tripping slide

10. It should be noted that the terminals 19 and 20 provide a ready and positive means for remote reading electrical indication that the spring actuated plunger 23 is in the released position of Fig. 7, while the terminals 20 and 21 make possible utilizing of similar remote indication that the cocked parts positioning of Fig. 6 obtains.

Although the description is specific to the illustrations in the drawings, it is to be understood that there may be numerous departures therefrom which will still be within the field and scope of our invention, so that we do not wish to be restricted thereto, but only in so far as the appended claims are so limited.

What we claim is:

1. In a bomb release mechanism, a spring actuated pull rod having a notch, a cocking lever with oppositely extending arms in the plane of said pull rod and adapted to be moved into and out of parallelism with the longitudinal axis of said pull rod when pivoted about the junction of said arms, the open end of one of said arms having a projection normal thereto adapted to engage with said notch when said lever is in cocked position, and the open end of said other arm having a bearing surface adjacent to said pull rod, a release lever disposed between and adapted to be rotated into and out of normalcy with said pull rod and said cocking lever, the pull rod end of said release lever being pivoted and the other end thereof being provided with a notch adapted to engage said cocking lever bearing surface, spring means for holding said release lever notch in engagement with said bearing surface when cocked, and solenoid means for counteracting said spring means and actuating said release lever.

2. In a bomb release mechanism, a spring actuated pull rod having a notch, a cocking lever with oppositely extending arms in the plane of said pull rod and adapted to be moved into and out of parallelism with the longitudinal axis of said pull rod when pivoted about the junction of said arms, the open end of one of said arms having a projection normal thereto adapted to engage with said notch when said lever is in cocked position and the open end of said other arm having a bearing surface adjacent to said pull rod, a bi-forked release lever having one fork in the plane of said pull rod and said cocking lever and both forks disposed between and adapted to be rotated into and out of normalcy with said pull rod and said cocking lever, the joined ends of said release lever forks being pivoted normal to and adjacent said pull rod and the open end of said first mentioned fork being provided with a notch adapted to engage said cocking lever bearing surface, spring means associated with the open end of said second mentioned fork for holding said release lever notch in engagement with said bearing surface when cocked, and solenoid means for counteracting said spring means and actuating said release lever.

3. In a bomb release mechanism, a spring actuated pull rod having a notch, a cocking lever with oppositely extending arms in the plane of said pull rod and adapted to be moved into and out of parallelism with the longitudinal axis of said pull rod when pivoted about the junction of said arms, the open end of one of said arms having a projection normal thereto adapted to engage with said notch when said lever is in cocked position and the open end of said other arm having a bearing surface adjacent to said pull rod, a bi-forked release lever having one fork in the plane of said pull rod and said cocking lever and both forks disposed between and adapted to be rotated into and out of normalcy with said pull rod and said cocking lever, the joined ends of said release lever forks being pivoted normal to and adjacent said pull rod and the open end of said first mentioned fork being provided with a notch adapted to engage said cocking lever bearing surface, a compression spring parallelly disposed to said pull rod having one end associated with the open end of said second mentioned fork for holding said release lever notch in engagement with said bearing surface when cocked, and a solenoid coaxially disposed with reference to said compression spring for simultaneously depressing the same and positively actuating the open end of said second mentioned fork for releasing said pull rod.

4. In a bomb release mechanism, a spring actuated pull rod having a notch, a cocking lever with oppositely extending arms in the plane of said pull rod and adapted to be moved into and out of parallelism with the longitudinal axis of said pull rod when pivoted about the junction of said arms, the open end of one of said arms having a projection normal thereto adapted to engage with said notch when said lever is in cocked position and the open end of said other arm having a bearing surface adjacent to said pull rod, a bi-forked release lever having one fork in the plane of said pull rod and said cocking lever and both forks disposed between and adapted to be rotated into and out of normalcy with said pull rod and said cocking lever, the joined ends of said release lever forks being pivoted normal to and adjacent said pull rod and the open end of said first mentioned fork being provided with a notch adapted to engage said cocking lever bearing surface, an auxiliary release lever laterally spaced from but with closed end fixed to the pivoted end of said release lever such that its arm portion is disposed normal to the plane of the release lever forks, spring means associated with the open end of said second mentioned fork for holding said release lever notch in engagement with said bearing surface when cocked, and manually operated means for actuating the open end of said auxiliary release lever to counteract said spring means and release said pull rod.

5. In a bomb release mechanism, a spring actuated pull rod having a notch, a cocking lever with oppositely extending arms in the plane of said pull rod and adapted to be moved into and out of parallelism with the longitudinal axis of said pull rod when pivoted about the junction of said arms, the open end of one of said arms having a projection normal thereto adapted to engage with said notch when said lever is in cocked position and the open end of said other arm having a bearing surface adjacent to said pull rod, a bi-forked release lever having one fork in the plane of said pull rod and said cocking lever and both forks disposed between and adapted to be rotated into and out of normalcy with said pull rod and said cocking lever, the joined ends of said release lever forks being pivoted normal to and adjacent said pull rod and the open end of said first mentioned fork being provided with a notch adapted to engage said cocking lever bearing surface, an auxiliary release lever laterally spaced from but with closed end fixed to the pivoted end of said release lever such that its arm portion is disposed normal to the plane of the release lever forks, and means

positively locking said auxiliary release lever against movement from cocked position.

6. In a bomb release mechanism, a spring actuated pull rod having a notch, a cocking lever with oppositely extending arms in the plane of said pull rod and adapted to be moved into and out of parallelism with the longitudinal axis of said pull rod when pivoted about the junction of said arms, the open end of one of said arms having a projection normal thereto adapted to engage with said notch when said lever is in cocked position and the open end of said other arm having a bearing surface adjacent to said pull rod, a bi-forked release lever having one fork in the plane of said pull rod and said cocking lever and both forks disposed between and adapted to be rotated into and out of normalcy with said pull rod and said cocking lever, the joined ends of said release lever forks being pivoted normal to and adjacent said pull rod and the open end of said first mentioned fork being provided with a notch adapted to engage said cocking lever bearing surface, an auxiliary release lever laterally spaced from but with closed end fixed to the pivoted end of said release lever such that its arm portion is disposed normal to the plane of the release lever forks, spring means associated with the open end of said second mentioned fork for holding said release lever notch in engagement with said bearing surface when cocked, and means positively locking said auxiliary release lever against movement from cocked position.

7. In a bomb release mechanism, a spring actuated pull rod having a notch, a cocking lever with oppositely extending arms in the plane of said pull rod and adapted to be moved into and out of parallelism with the longitudinal axis of said pull rod when pivoted about the junction of said arms, the open end of one of said arms having a projection normal thereto adapted to engage with said notch when said lever is in cocked position and the open end of said other arm having a bearing surface adjacent to said pull rod, a bi-forked release lever having one fork in the plane of said pull rod and said cocking lever and both forks disposed between and adapted to be rotated into and out of normalcy with said pull rod and said cocking lever, the joined ends of said release lever forks being pivoted normal to and adjacent said pull rod and the open end of said first mentioned fork being provided with a notch adapted to engage said cocking lever bearing surface, an auxiliary release lever laterally spaced from but with closed end fixed to the pivoted end of said release lever such that its arm portion is disposed normal to the plane of the release lever forks, spring means associated with the open end of said second mentioned fork for holding said release lever notch in engagement with said bearing surface when cocked, and a draw bar laterally spaced from through normal to said pull rod and in operable connection with the open end of said auxiliary release lever for actuating the same to counteract said spring means and release said pull rod.

8. In a bomb release mechanism, a spring actuated pull rod having a notch, a cocking lever with oppositely extending arms in the plane of said pull rod and adapted to be moved into and out of parallelism with the longitudinal axis of said pull rod when pivoted about the junction of said arms, the open end of one of said arms having a projection normal thereto adapted to engage with said notch when said lever is in cocked position and the open end of said other arm having a bearing surface adjacent to said pull rod, a bi-forked release lever having one fork in the plane of said pull rod and said cocking lever and both forks disposed between and adapted to be rotated into and out of normalcy with said pull rod and said cocking lever, the joined ends of said release lever forks being pivoted normal to and adjacent said pull rod and the open end of said first mentioned fork being provided with a notch adapted to engage said cocking lever bearing surface, a compression spring parallelly disposed to said pull rod having one end associated with the open end of said second mentioned fork for holding said release lever notch in engagement with said bearing surface when cocked, a solenoid coaxially disposed with reference to said compression spring for simultaneously depressing the same and positively actuating the open end of said second mentioned fork for releasing said pull rod, an auxiliary release lever laterally spaced from but with closed end fixed to the pivoted end of said release lever such that its arm portion is disposed normal to the plane of the release lever forks, the open end of said arm having a fixed pin projecting therefrom in a direction parallel to the axis of pivotation of the whole, and a manually actuated draw bar laterally spaced from though normal to said pull rod, said draw bar being provided with a lost motion slot so adapted to engage the fixed pin of said auxiliary release lever that extreme outward positioning of said slot away from said pull rod will lock the same against solenoid release, that extreme inward positioning of said slot toward said pull rod releases the same, and that intermediate positioning of said slot will permit solenoid release of said pull rod without corresponding actuation of said draw bar.

9. In a bomb release mechanism, a spring actuated pull rod having a cam surface and a notch spaced therefrom, a cocking lever provided with a complemental cam surface adapted to engage with said first mentioned cam surface for positioning a lug also provided on said cocking lever within the notch provided in said pull rod, said cocking lever being positioned in the plane of said pull rod and consisting of an arm with open end surmounted by said lug, of a like though oppositely positioned second arm with open end surmounted by said cam surface and of a third arm parallelly spaced from but with open end extending beyond said second arm and having a bearing surface adjacent to said pull rod with which all three arms remain in substantial parallelism, a release lever disposed between and adapted to be rotated into and out of normalcy with said pull rod and said cocking lever, the pull rod end of said release lever being pivoted and the other end thereof being provided with a notch adapted to engage said cocking lever bearing surface, spring means for holding said release lever notch in engagement with said bearing surface when cocked, and solenoid means for counteracting said spring means and actuating said release lever.

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