Sept. 28, 1954 J. C. DARNALL, JR., ET AL 2,690,122

BOMB CLUSTER

Filed Nov. 15, 1945

4 Sheets-Sheet 1

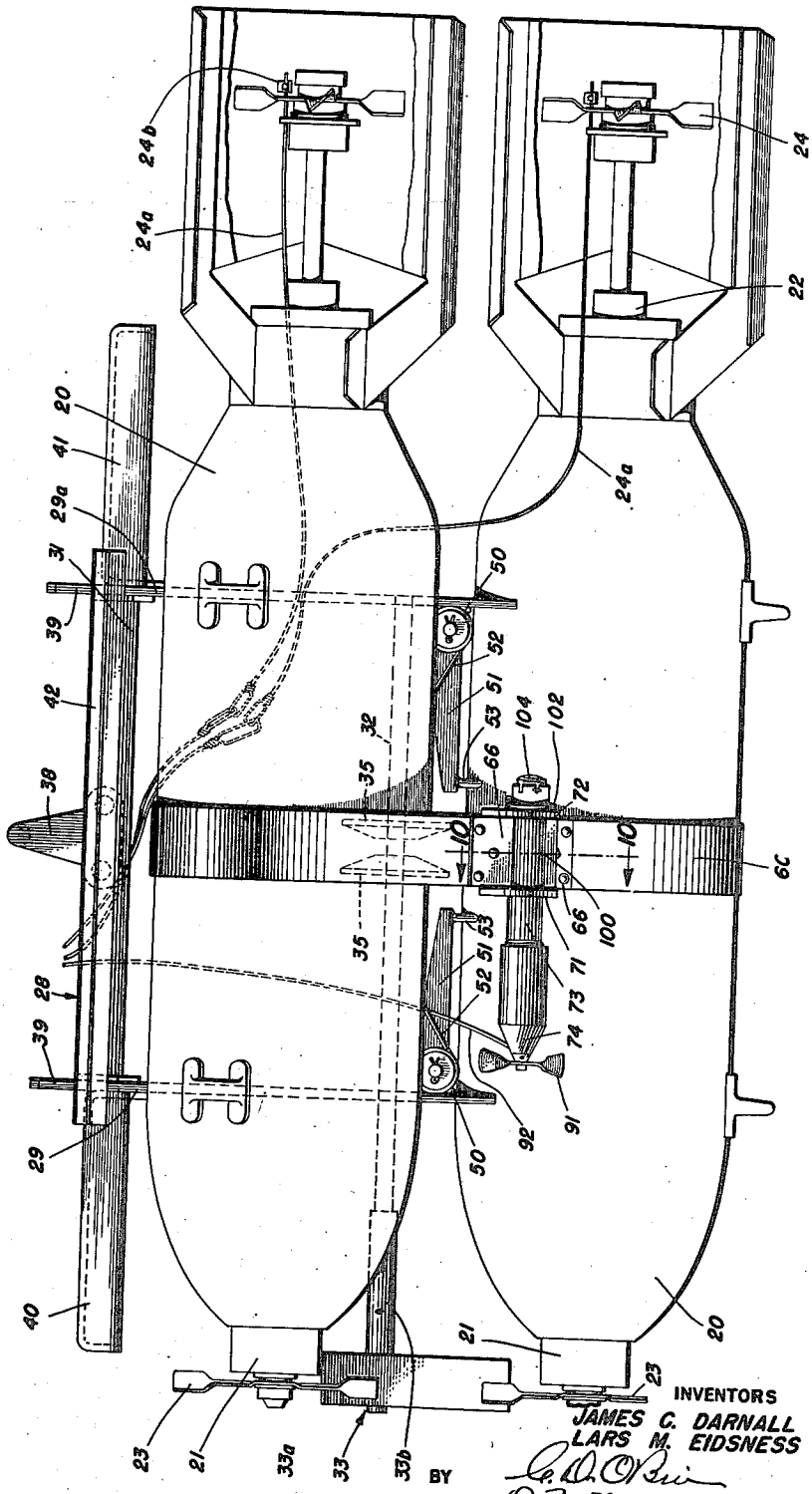


FIG. 1

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4 Sheets-Sheet 2

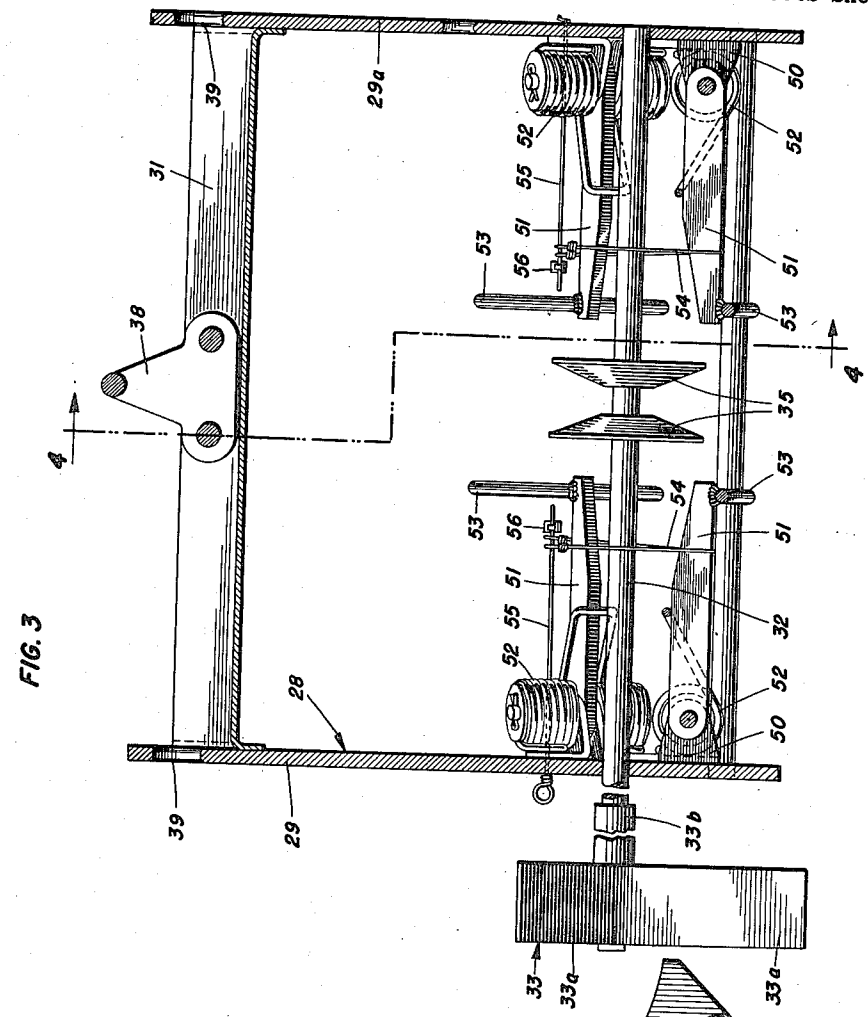


FIG. 3

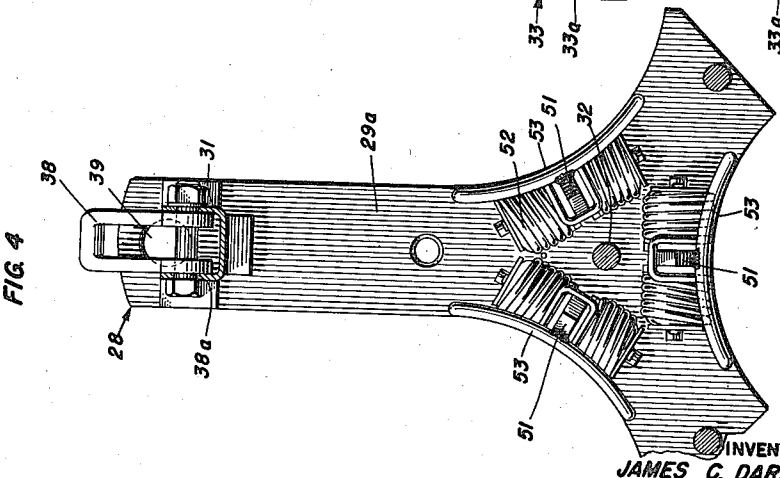


FIG. 4

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BOMB CLUSTER

Filed Nov. 15, 1945 4 Sheets-Sheet 3

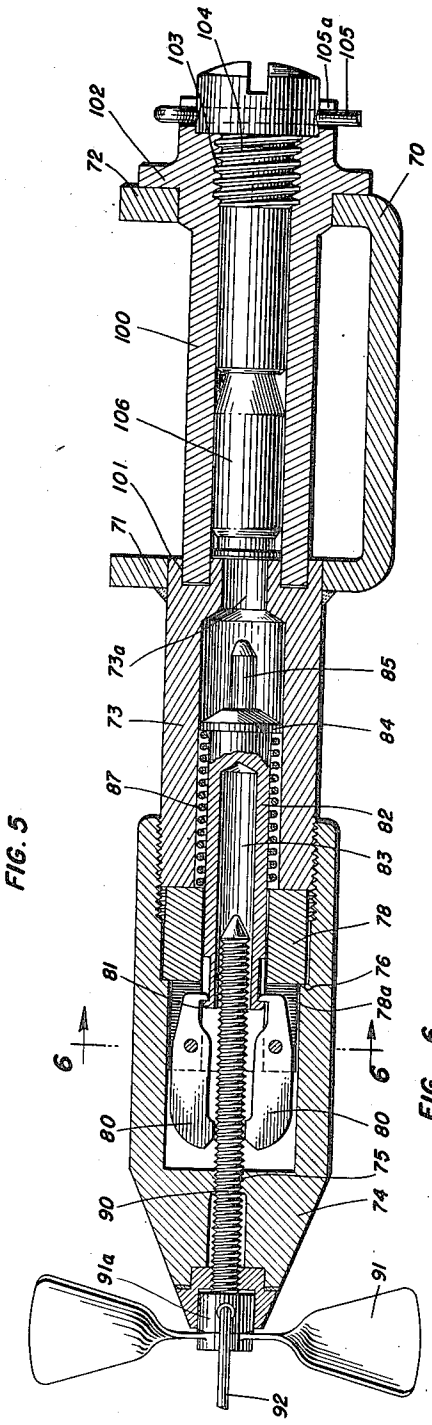


FIG. 5

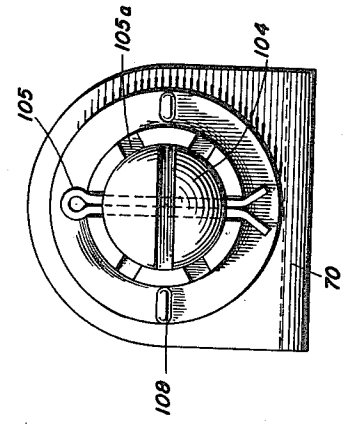


FIG. 8

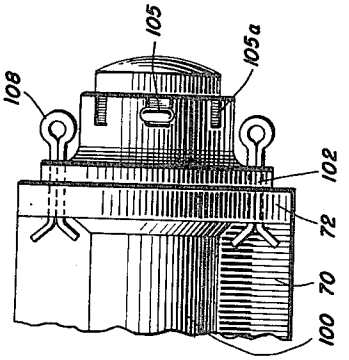


FIG. 7

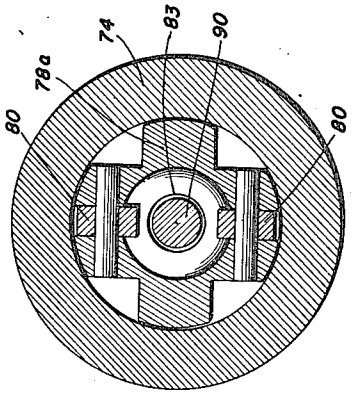


FIG. 6

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4 Sheets-Sheet 4

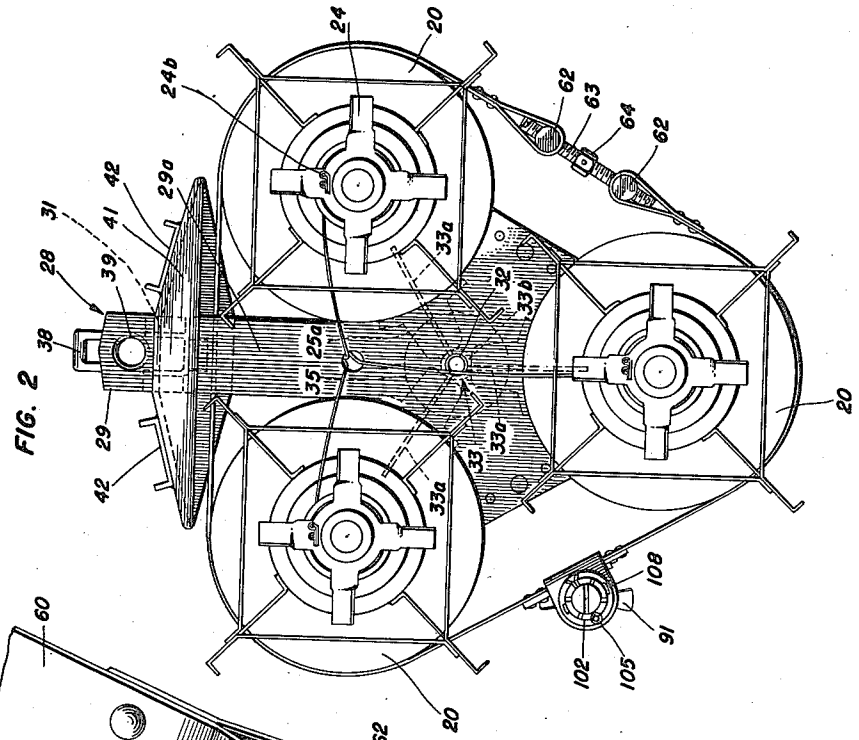


FIG. 2

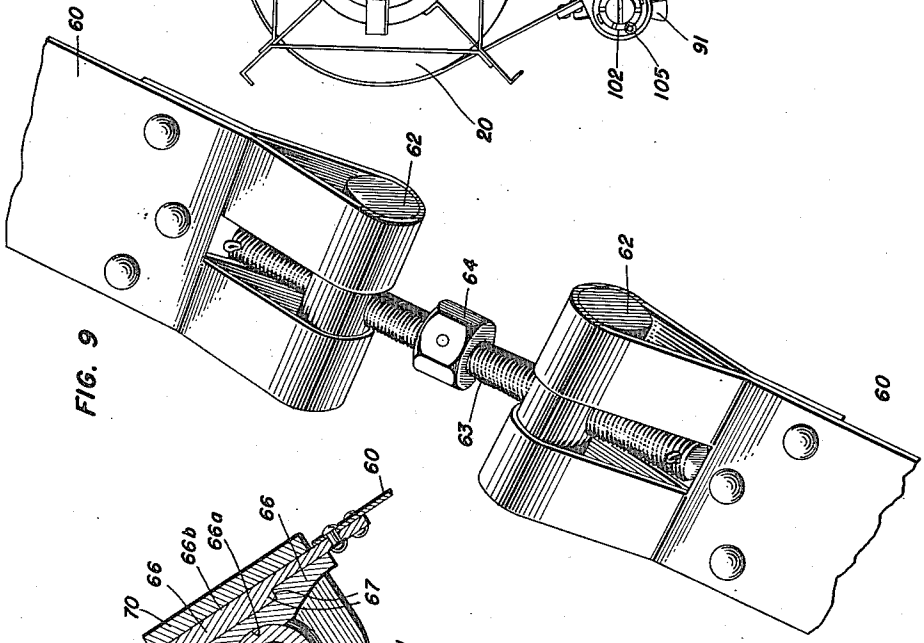


FIG. 9

FIG. 10

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2,690,122

UNITED STATES PATENT OFFICE

2,690,122

BOMB CLUSTER

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Application November 15, 1945, Serial No. 628,956

7 Claims. (Cl. 102—7.2)

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

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This invention relates to aerial bombs, and more particularly to an improved aerial bomb cluster.

One object of the invention is to provide an improved aerial bomb cluster having novel means for maintaining the bombs in assembled relationship and for releasing said bombs after the cluster has fallen through the air a predetermined distance.

Another object of the invention is to provide an improved aerial bomb cluster having novel means for dispersing the bombs in the cluster.

A further object of the invention is to provide an improved aerial bomb cluster having novel means for maintaining the bombs in the cluster in alignment.

Another object of the invention is to provide an improved bomb cluster which safely retains a group of bombs in a compact cluster so long as they are carried within and until shortly after they are released from an aircraft, and which thereafter automatically disperses the individual bombs to permit them to fall as separate units.

Another object of the invention is to provide a bomb cluster of the type referred to which is easy to assemble, is safe and positive in operation, and which weighs only slightly more than the total weight of the bombs in the cluster.

These and other objects of the invention will be obvious from the following specification and the accompanying drawings, in which:

Fig. 1 is a side elevational view of the loaded bomb cluster ready for hoisting into the aircraft;

Fig. 2 is a rear end elevational view of the cluster shown in Fig. 1;

Fig. 3 is a longitudinal sectional view of the cluster frame assembly;

Fig. 4 is a cross sectional view taken on line 4—4 of Fig. 3;

Fig. 5 is a longitudinal sectional view of the pistol assembly used with the bomb cluster;

Fig. 6 is a cross sectional view taken on line 6—6 of Fig. 5;

Fig. 7 is a fragmentary plan view of the rear end of the pistol assembly;

Fig. 8 is a rear elevational view of the pistol assembly;

Fig. 9 is a detailed perspective view of the turnbuckle assembly for adjusting tension on the band of the cluster; and

Fig. 10 is a detailed cross sectional view taken on line 10—10 of Fig. 1 showing a cross sectional view of the rear portion of the pistol assembly and the means for holding the ends of the bands engaged.

In the preferred embodiment shown in the drawings, the cluster contains three bombs, although it is to be understood that greater or smaller numbers of bombs may be used with the cluster without departing from the spirit of the invention.

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In the drawings, three bombs of the conventional type are indicated by the numeral 20 and are provided with suitable nose fuzes 21 and tail fuzes 22 having arming vanes 23 and 24, respectively. Suspension lugs 25a are attached to the casing of each bomb. Suitable arming wires 24a prevent premature rotation of vanes 24 as is conventional practice.

The bombs are supported by a framework denoted generally by the numeral 26. A pair of flat inverted Y-shaped end frame members 29 and 29a are maintained in spaced relation by an upper channel-shaped spacing member 31 welded to the upper ends of frame members 29 and 29a and by a lower spacing rod 32 comprising a rod which passes through the lower portions of the frame members 29 and 29a approximately at the point of intersection of the three arms of the Y. Rod 32 extends forwardly beyond the frame member 29 a short distance to support a forward arming vane detent 33 which comprises three radially extending arms 33a mounted on a tube 33b so that the arms extend into the paths of the forward arming vanes 23 to prevent unwanted rotation of the forward arming vanes 23 and subsequent accidental arming of the nose fuzes of the bombs prior to dispersal of the bombs from the bomb cluster. The vanes are positioned on rod 32 by means of cotter pins passing through holes in tube 33b and matching holes in the forward end of rod 32.

A pair of bomb aligning disks 35 are mounted on the rod 32 between frame members 29 and 29a to engage the bomb suspension lugs 25a of each of the bombs to insure against axial movement of the bombs while they are held in the cluster.

In order to provide means for hoisting and/or suspending the cluster in an aircraft bomb bay, a hoisting lug 38 is removably bolted to the channel-shaped spacing member 31 by screws passing through holes 38a in member 31 midway between the frame members 29 and 29a. For double suspension, holes 39 are provided near the upper ends of each of the frame members 29 and 29a.

In order to facilitate the use of the new bomb cluster with exterior bomb racks having sway braces such as those shown in U. S. Patents 1,528,942 and 2,069,996, bearing surfaces consisting of a pair of plates 40 and 41 are welded to the forward surface of frame member 29 and

to the rear surface of the frame member 29a, respectively. Plates 40 and 41 extend a short distance transversely of spacer 31 and support a pair of longitudinal bracing members 42 welded to the two sway brace bearing members 40 and 41 on either side of spacer 31.

Three pivot brackets 50 are welded to the inner surfaces of each of the frame members 29 and 29a adjacent to rod 32. Each bracket 50 pivotally supports a dispersing arm 51. Coil springs 52 are provided on each of the arms 51 to urge the free ends of the arms 51 outwardly away from the rod 32 so as to throw the bombs 20 outwardly at the proper time, as will be discussed presently. Transverse members 53 are welded to the free ends of arms 51 and are curved to approximate the outer contour of the bombs 20. Members 53 increase the area over which the pressure from arms 51 is applied to the bombs when the bombs are dispersed.

As shown in Fig. 3, the arms 51 are maintained in their cocked positions during assembly of the bomb cluster by means of wires 54 which are passed around the arms 51. A loop is provided at each end of the wires 54 so that the wires may be maintained in place by passing the inner ends of arming wires 55 through the two loops. The wires 55 pass through frame members 29 and 29a so as to be easily accessible and are maintained in place by means of resilient clips 56.

The bombs 20 are maintained in their clustered relationship by means of a band 60 which actually comprises two separate resilient metal sections. The two band sections are joined at one end by means of a turnbuckle arrangement shown in detail in Fig. 9. Two band ends are provided with rod shaped nuts 62 which have central threaded openings into which are threaded the opposite ends of a screw 63. A nut 64 is fixed to the central portion of the screw 63 and the portions of the screw on either side of nut 64 are oppositely threaded so that rotation of the screw 63 by means of nut 64 brings the ends of the band sections together when turned in one direction and moves them apart when turned in the other direction.

The other two ends of the band sectors carry band clamps 66 which are provided with mating shoulders 67. The outer surface of the outer clamp is concave at 66a while the inner surface of the inner clamp is flat at 66b for a purpose which will be described presently. The clamps 66 are held together by means of a delay opening pistol shown in detail in Fig. 5 which maintains the mating shoulders 67 of the clamps in engagement.

The firing pistol as shown in detail in Figs. 5 through 8 comprises a U-shaped band aligning bracket 70 having upstanding arms 71 and 72, both of which contain a circular opening. A firing pin housing 73 having an axial bore tapering at its rear end to form opening 73a of diminished diameter is mounted in the opening in arm 71 and is welded thereto. The forward end of the member 73 is threaded for engagement with the interior threads in the rear end of a forward housing member 74. The forward portion of member 74 is frusto-conical and has an axial bore which communicates with the hollow rear portion of the member by means of a smaller interiorly threaded opening 75. A shoulder 76 in the interior of the rear portion of housing 74 defines the limit of forward movement of a collar 78 which is held against the shoulder by the forward end of member 73 when it is screwed into the rear end of member 74. The collar 78 has an integral forwardly extending portion 78a of X-shaped cross section which supports a pair of pivoted arms 80 as shown in Fig. 6. The rear ends of the arms 80 are hook shaped to engage a flange 81 on the forward end of a firing pin 82 which slides in the bore of member 73. The firing pin comprises a shaft having a hollow axial bore 83 in its forward end portion, a flange 84 at its rear end, and a tapering striker member 85 extending rearwardly from the flange 84 and adapted to project through opening 73a. A helical spring 87 surrounds the firing pin 82 and bears against the flange 84 and the collar 78 to urge the firing pin rearwardly. Flange 84 also serves to define the limit of rearward movement of the firing pin by its contact with the tapering rear end of the bore of housing 73.

The forward ends of the pivoted arms 80 are maintained separated by a threaded arming vane shaft 90 which engages the threaded portion 75 in the member 74 and extends rearwardly between the arms 80 into the bore 83 of the firing pin 82. The rear end of the threaded shaft 90 is of conical configuration and the forward end of the shaft 90 is fixed to an arming vane 91. By maintaining the forward ends of the arms 80 separated, the shaft 90 retains the hook shaped rear ends of the arms 80 in engagement with the flange 81 on the firing pin to hold the firing pin in its cocked position against the tension of spring 87. An arming wire 92 extends through the arming vane hub 91a to prevent premature rotation of the vane. This arming wire is withdrawn with arming wires 24a when the bomb cluster is released from the aircraft.

A tubular latch member 100 extends through the opening in arm 72 of the pistol into engagement with an annular channel 101 in the rear end of housing 73. A flange 102 on the rear end of the latch 100 defines the limit of forward movement of the latch. The rear end of latch 100 is interiorly threaded at 103 to receive a bolt 104 which is locked against rotation relative to the latch by means of a cotter pin 105 which engages slots 105a in the rear end of the latch. The latch is maintained in its retaining position as shown in Fig. 5 by means of cotter pins 108 (Fig. 7) which extend through openings in flange 102 arm 72 as shown in Fig. 7.

The pistol shown in Fig. 5 holds the ends of the band sections together by the means shown in detail in Fig. 10. The two engaging clamps 66 attached to the ends of the band sections are placed adjacent each other with the shoulders 67 in engagement and are then positioned against the bottom of bracket 70 with the curved surface 66a facing outwardly. The latch 100 is then slid into place through the opening in arm 72 of the aligning member 70 and cotter pins 108 are inserted to hold the detent member 100 in its retaining position. The latch fits tightly into convex surface 66a of the outer clamp to hold it against slipping out of the bracket 70. With the bolt member 104 removed, a blank cartridge 106 may be inserted base first into the central opening in the latch 100 after which the bolt 104 is screwed into place to hold the cartridge 106 with its base end against the member 73. The cotter pin 105 is then inserted to prevent the bolt 104 from unscrewing and the pistol is ready for use.

In operation, as the cluster falls through the air after the arming wire 92 has been removed from the arming vane by release of the cluster from the aircraft, the arming vane 91 and shaft

90 are rotated by the air stream resulting in forward movement of the shaft 90 out of the pistol due to its threaded engagement with the reduced portion 75 of the interior bore of forward housing 74. When the cluster has fallen far enough to position the conical rear end portion of the shaft 90 between the two forward ends of the pivoted arms 80, the hook shaped rear ends of the arms 80 are no longer held in their position of engagement with the flange 81 on the forward end of firing pin 82, whereupon the firing pin is released for movement under the influence of coil spring 87 into firing engagement with the blank cartridge 106. Detonation of the cartridge 106 forces the bolt 104 rearwardly, and because of the threaded engagement of the bolt 104 with the latch 100, the force is also exerted on the latch. The force of the explosion is sufficient to overcome the cotter pins 108 so that the entire latch is blown rearwardly out of the aligning bracket 70. When this occurs, the two members 66 are no longer held in engagement, the resilient band 60 flies open, and springs 52 operate the pivoted arms 51 to throw the bombs outwardly away from the frame member 28.

The bomb cluster is assembled in the following manner. The frame 28 is placed on the deck in upright position as shown in Fig. 3 with the bomb dispersing arms 51 maintained in proximity with the rod 32 by means of wires 54 and 55. With the frame in this position, bombs are placed in the two upper positions with their lugs 25*a* projecting between disks 35 and are temporarily secured in place by means of a length of wire (not shown). The band 60 with the turnbuckle arrangement extended to approximately full length is then placed on the deck with its outer surface down and a third bomb is placed on the band approximately 12'' from either end of the band with the single suspension lug 25*a* of the bomb up. The frame with the two bombs temporarily secured to it is then lifted into place on the single bomb on the deck and the band 60 is wrapped around the loaded frame, the band clamps 66 are engaged and the pistol assembly is slipped over the clamps with the arming vane 91 forward. The latch 100 is then slipped into place on the pistol and is secured by insertion of the cotter pins 108. The band is then tightened by rotation of nut 64 in the turnbuckle until the bombs are held securely in the frame, after which the wire which temporarily held the two upper bombs in place is removed. Wires 55 are then removed to release wires 54 and permit arms 51 and 53 to move outwardly against the bombs in the cluster. The fuze arming vane detent 33 is then installed on the forward end of rod 32 with tubular portion 33*b* pointing rearwardly and is locked in place by means of cotter pins. It should be noted that the vane detent 33 may be placed on the rod 32 backwardly, that is, with the vanes 33*a* adjacent the forward surface of frame member 29 and tubular portion 33*b* pointing forward when smaller bombs are used in the cluster. Arming wire 92 is then passed through the hub 91*a* of vanes 91 and the conventional resilient clip is placed on the free end of the wire to prevent it from accidentally slipping out of the hub. Arming wires 24*a* are also positioned in the arming vanes 24 and are held against accidental displacement by means of resilient clips 24*b*.

The cluster is next hoisted into the place of suspension from the aircraft. When a single suspension means is used, the cluster is hoisted by means of openings 39 in the upper ends of frame members 29 and 29*a* and is suspended by means of lug 38. When double suspension means are utilized, the single suspension lug 38 is removed and the cluster is hoisted to the bomb rack by inserting a hoisting pin or bolt (not shown) through the forward hole of the two screw holes 38*a* in the spacer member 31. The cluster is then suspended by means of the two openings 39 which engage the bomb rack. If sway braces are used with the bomb suspension means in the case of exterior racks, the sway brace means are tightened against the members 40, 41 and/or 42.

After installing the cluster on the bomb rack, the bolt 104 of the pistol is unscrewed and a caliber .45 blank cartridge is inserted in the interior of the latch 100 with its base forward. The bolt 104 is then screwed into place and cotter pin 105 inserted to insure against accidental unscrewing of bolt 104.

When the cluster is released from the aircraft the arming wires 92 and 24*a* are retained with the aircraft so that the cluster falls without them. After the arming vane 91 of the pistol has rotated the required number of turns, the firing pin 82 is released as explained above and cartridge 106 is fired to drive the latch 100 rearwardly out of the aligning bracket 70. The resiliency of the band 60 then disengages the band clamps and since the bombs are then no longer positively held on the frame 28, the springs 52 actuate arms 51 to throw the bomb 20 outwardly away from the frame 28.

When it is desired to use bombs of a smaller diameter with the cluster, adapters (not shown) may be fastened to the ends of the two lower arms of the frame members to decrease the radius of curvature of the frame members where the bombs are positioned.

The bomb cluster described constitutes an efficient method of dispersing a plurality of bombs suspended from a single bomb rack and adds a minimum of weight to the total weight of the bombs carried. The cluster is easy to load, requires a minimum of maintenance, and is safe and efficient in its operation.

The above described embodiment of the invention is a preferred embodiment thereof, and it is to be understood that the invention is susceptible to other embodiments without departing from the spirit of the invention as defined in the appended claims.

The invention herein described 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.

We claim:

1. In a multiple bomb cluster, a frame adapted to position a plurality of bombs in parallel cluster formation, a band adapted to encircle said bombs having interlocking ends and serving to secure against dispersal of bombs in said cluster, means carried by said band for releasing said bombs, comprising an aligning member for receiving said interlocking band ends, a latch member carried by said aligning member and normally locked thereto, said latch member cooperable with said aligning member normally to maintain said band ends in interlocking engagement, and means secured to said aligning member for explosively unlocking said latch member from said alignment member, whereby said band ends are free to disengage to release said bombs for dispersal.

2. In a multiple bomb cluster, a frame adapted to position a plurality of bombs in parallel cluster formation, a band adapted to encircle said bombs having interlocking ends and serving to secure against dispersal of bombs in said cluster, means carried by said band for releasing said bombs, comprising an aligning member for receiving said interlocking band ends, a detent member carried by said aligning member and normally locked thereto, said detent cooperable with said aligning member normally to maintain said band ends in interlocking engagement, explosive means within said detent member for explosively removing said detent member from its locked position, and air motion responsive means secured to said aligning member for detonating said explosive, whereby said band ends are free to disengage to release said bombs for dispersal.

3. In a multiple bomb cluster, a frame adapted to position a plurality of bombs in parallel cluster formation, a band adapted to encircle said bombs having interlocking ends and serving to secure against dispersal of bombs in said cluster, means carried by said band for releasing said bombs, comprising an aligning member positioned at the point of engagement of said band ends, a tubular detent member carried by said aligning member and removably connected thereto, said detent being positioned for cooperation with said aligning member normally to maintain said band ends in interlocking engagement, an explosive charge within said detent member for explosively disconnecting said detent from said aligning member thereby removing said detent member from its detent position, means for removing and replacing said explosive charge through one end of said detent member, and air motion responsive means fixed to said aligning member and operable to detonate said explosive, whereby said band ends are free to disengage to permit dispersal of said bombs.

4. In a cluster of elongate bombs having a suspension lug secured to the exterior of each bomb and a frame member for positioning the bombs in the cluster with their longitudinal axes radially offset from the longitudinal axis of said frame member, means for securing against axial movement of the bombs relative to the frame member, comprising a rod carried by and coaxial with the frame member, and a pair of spaced angularly faced detent disks mounted on said rod and so positioned that said angular faces engage said bomb suspension lugs to facilitate positioning of the bombs in the frame and to prevent unwanted axial movement of said bombs.

5. A multiple bomb cluster release mechanism normally serving to secure the bombs against dispersal comprising; a bomb cluster encircling band, overlapping interlocking ends on said band, an aligning member for receiving said band ends, a removable latch secured to said aligning member and normally retaining said ends in overlapping interlocking position within said aligning member, explosive latch removing means secured to said aligning member, and means operated by flight of the bomb cluster through the air to explode said latch removing means and remove said latch thereby freeing the band ends from the aligning member to permit their disengagement from interlocking engagement whereby the bombs are released for dispersal.

6. In a multiple bomb cluster a release mechanism means to secure the bombs against dispersal comprising; a band normally encircling the bombs, overlapping interlocking ends on said band, clamping means normally retaining said ends in overlapping interlocking engagement, means responsive to the flight of the bomb cluster through the air for disengaging said clamping means whereby said band ends are released thereby freeing the bombs for dispersal.

7. In a multiple bomb cluster a release mechanism serving to secure against dispersal of the bombs comprising; an air motion actuatable pistol, a removable cartridge receiving chamber for said pistol, a band normally encircling the bombs, overlapping interlocking ends on said band, an alignment member secured to said pistol, said alignment member and said chamber forming a clamp to normally retain said bend ends in overlapping interlocking engagement therebetween, said clamp being released by operation of said pistol whereby said band ends are released to free the bombs.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,346,177	Chanard	July 13, 1920
2,071,594	Trimbach	Feb. 23, 1937
2,161,082	Ovtschinnikoff	June 6, 1939
2,346,494	Leland	Apr. 11, 1944
2,364,302	Malone et al.	Dec. 5, 1944
2,379,364	Leland	June 26, 1945
2,434,162	Imber	Jan. 6, 1948