Aug. 26, 1952 G. C. PEARCE 2,608,131

BOMB RELEASE SYSTEM

Filed Jan. 17, 1945 3 Sheets-Sheet 1

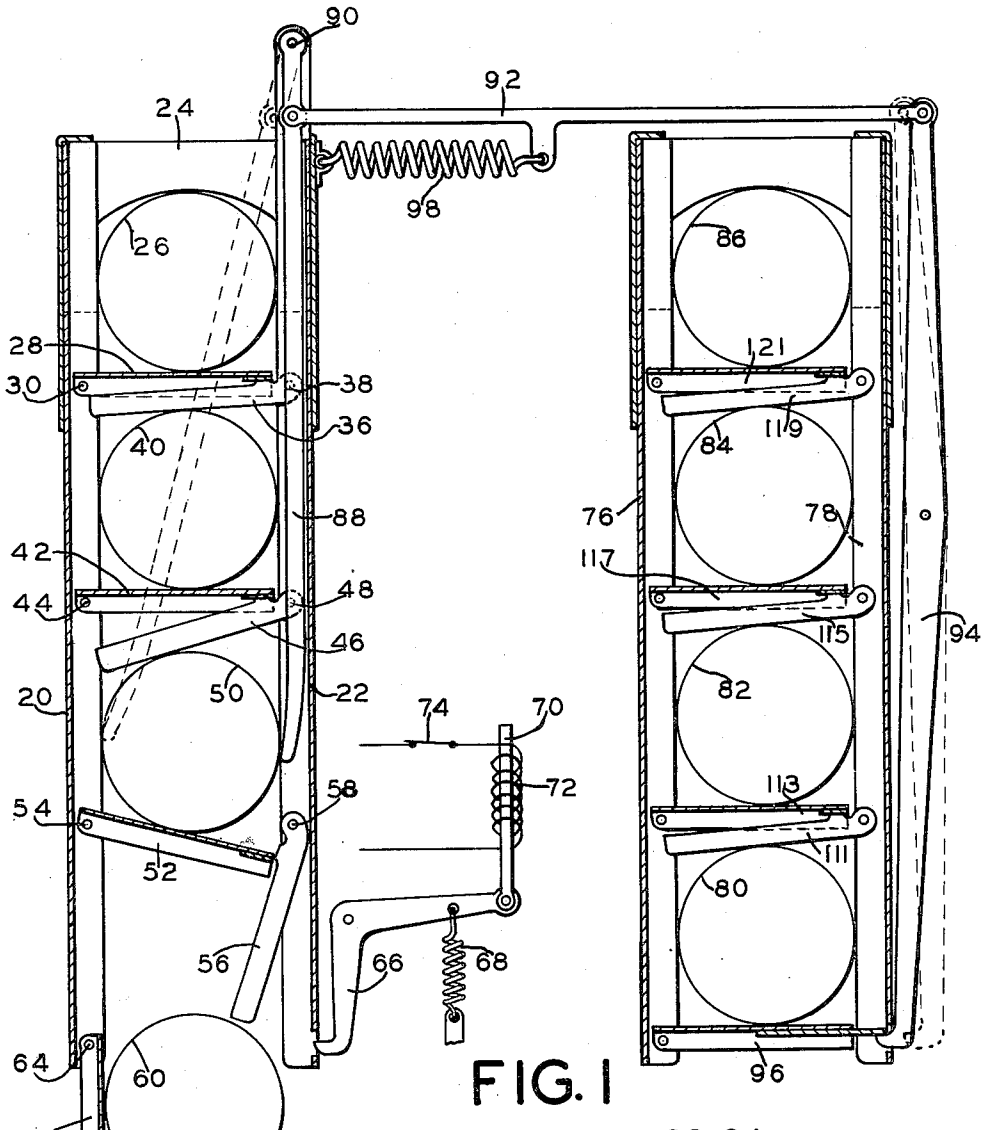


FIG. 1

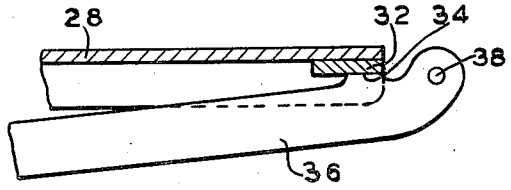


FIG. 2

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BOMB RELEASE SYSTEM

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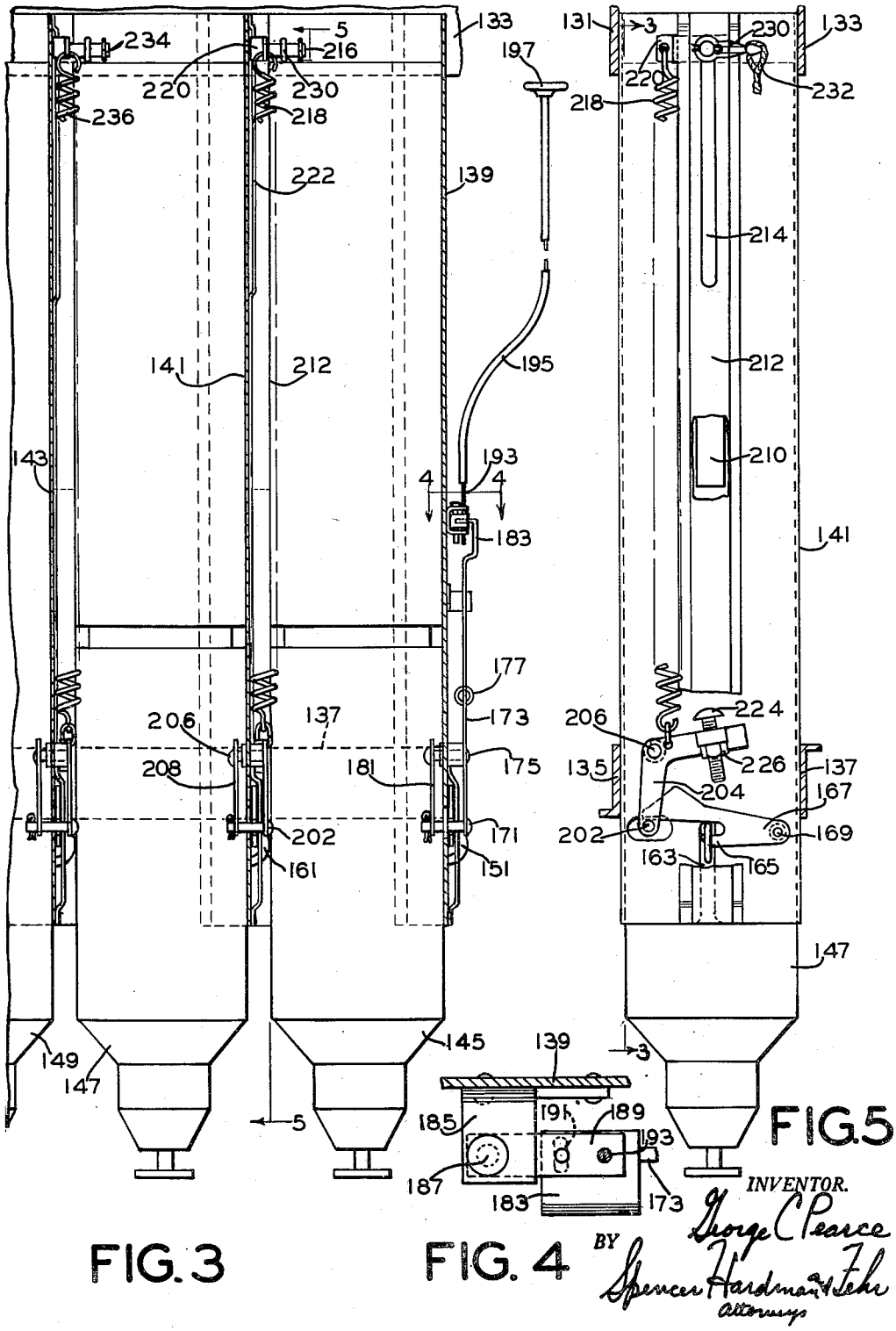


FIG. 3

FIG. 4

FIG. 5

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BOMB RELEASE SYSTEM

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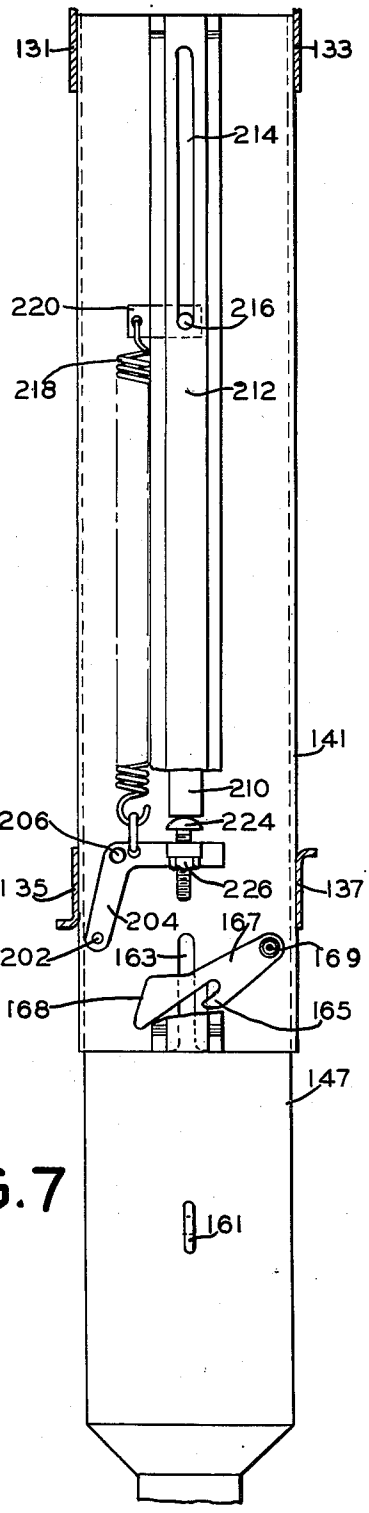


FIG. 7

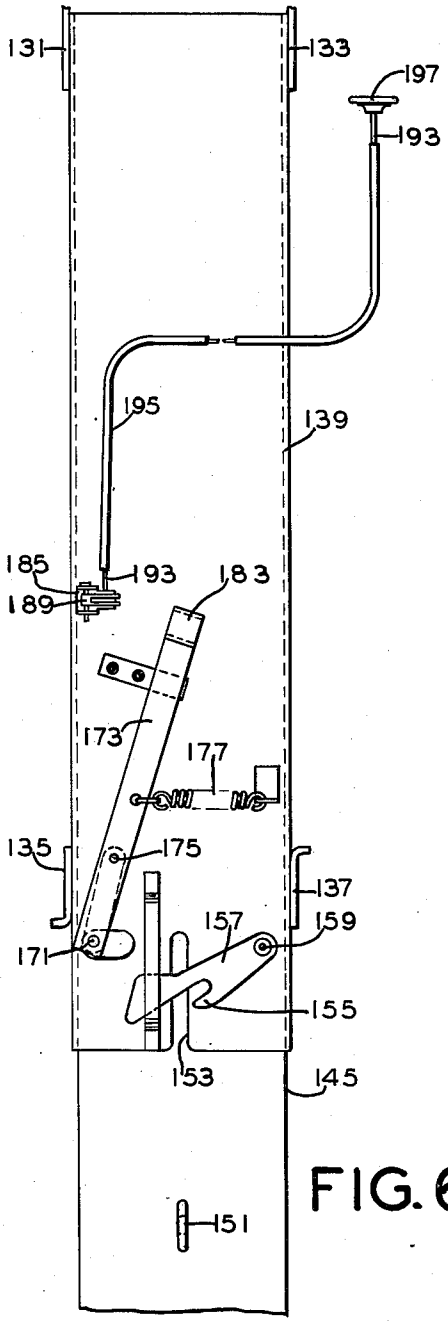


FIG. 6

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UNITED STATES PATENT OFFICE

2,608,131

BOMB RELEASE SYSTEM

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2 Claims. (Cl. 89—1.5)

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This invention relates to aeronautical apparatus and more particularly to means for releasing bombs or other articles at spaced intervals from an airplane or any other place of support.

It has been found for many military missions a great number of small bombs uniformly distributed over a particular area is more effective than a few large bombs.

It is therefore an object of my invention to provide a simple, safe, reliable means for releasing bombs and other articles at spaced intervals which may be easily and safely loaded.

It is another object of my invention to provide a rack for holding a plurality of bombs or articles in a horizontal position and for releasing them at spaced intervals.

It is another object of my invention to provide a rack for holding a plurality of bombs or articles in a vertical position and for releasing them at spaced intervals.

It is another object of my invention to provide means for holding bombs or articles in a horizontal position one above another and to provide a means for releasing the bombs or articles at spaced intervals.

It is another object of my invention to provide means for releasably supporting a plurality of bombs or articles one above the other in such a way that the weight on the lowermost bomb or article will be far less than the total weight of the bombs or articles above.

It is still another object of my invention to provide means for starting the releasing of a second set of bombs or articles at spaced intervals a definite time after the release of a first set of bombs or articles at spaced intervals.

These objects are attained in one arrangement by holding the bombs or articles in a horizontal position one above the other on individual retaining levers pivoted to one side of a guideway. The free end of each of the retaining levers is supported by a projection on a latch lever pivoted to the opposite side of the guideway. The free end of each latch lever rests upon the bomb or article immediately below. The lowermost retaining lever is held by a manually or externally controlled latch member. The interval between the release of each of the bombs or articles is controlled by the length of the latch lever and the arrangement of the contact between the free end of the retaining lever and the projection on the latch lever.

A follower lever normally retained in inoperative position by the bombs or articles in the rack is released by the last bomb or article of a set or

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group to initiate release of the lowermost retaining lever of the next set or group.

In a second arrangement, the bombs are held in a vertical position and each of the bombs is held in place by a hook on the retaining lever which extends through an aperture in the ear on each of the bombs. The retaining lever for the first bomb is held in place by a manually controlled latch lever. The retaining lever for the remainder of the bombs in the set is retained in place by a bell crank latch lever having a pin at one end extending beneath and supporting the retaining lever. This bell-crank latch lever is normally held in this position by a tension spring extending to a vertical slide member having a pin resting on top of the preceding bomb or article. The bell crank latch lever extends into the path of movement of the slide member so that after the first bomb or article is manually released its slide member will strike the bell crank latch lever under the influence of the tension spring to release the support of the retaining lever to permit release of the second bomb. The third bomb is released by a similar arrangement with the second bomb and the remaining bombs likewise in succession.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred form of the present invention is clearly shown.

In the drawings:

Fig. 1 is a view, partly diagrammatic, disclosing one application of my invention;

Fig. 2 is an enlarged sectional view of one of the details of Fig. 1;

Fig. 3 is a sectional view taken substantially along the line 3—3 of Fig. 5 of another form of my invention;

Fig. 4 is a sectional view taken substantially along the line 4—4 of Fig. 3;

Fig. 5 is a sectional view taken substantially along the line 5—5 of Fig. 3;

Fig. 6 is an end view of the structure shown in Fig. 3 showing a bomb partially out of the rack; and

Fig. 7 is a sectional view similar to Fig. 5 with the bomb shown partially out of the rack.

While I have shown my invention as applied to bomb racks it should be understood that it is applicable wherever it is desired to release articles at spaced intervals into or onto any medium. Referring now to the drawings and more particularly to Fig. 1, there is shown a bomb rack for holding bombs or articles in a horizontal position one above the other in two sets of four

bombs or articles each. To this end there is provided a guideway extending between the vertical channel members 20 and 22. These channels are fastened together at the top by a transverse member 24. The uppermost bomb or article 26 is held by a retaining lever 28 which is sufficiently wide to properly support the bomb or article 26. This lever 28 is pivoted by the pin 30 to the channel member 20. The distance between the channel members 20 and 22 should be just slightly greater than the diameter or width of the bomb or article 26, while the distance between the retaining lever 28 and the transverse member 24 should be just equal to the diameter or height of the bomb or article 26. The retaining lever 28 preferably extends substantially the entire distance across the guideway from the pivot pin 30.

As is better shown in Fig. 2 it is preferable to provide a hardened plate 32 upon the bottom-side of the retaining lever 28. This hardened plate 32 rests upon and slightly overlaps a projection 34 provided upon the upper edge of the latch lever 36 pivoted by the pivot pin 38 to the vertical channel member 22 substantially directly opposite the pivot pin 30. The lower edge of this latch lever 36 rests directly upon the bomb or article 40 immediately below. Preferably the projection 34 and the upper surface of the lever 36 adjacent the projection 34 is hardened or plated with chromium to prevent wear. If desired the hardened plate 32 and the projection 34 may be omitted and the retaining lever 28 may be permitted to rest directly upon the straight upper surface of the latch lever 36.

The bomb or article 40 rests directly upon a retaining lever 42 similar to the retaining lever 28 which is pivoted by the pin 44 to the channel member 20. The free end of the retaining lever 42 rests upon the upper surface of the latch lever 46 which is pivoted by the pin 48 to the vertical channel member 22. The latch lever 46 normally rests upon the bomb 50 immediately below. The bomb 50 normally rests upon the retaining lever 52 pivoted by the pin 54 to the vertical channel member 20 and the free end of this retaining lever 52 is normally supported by the latch lever 56 pivoted by the pin 58 to the vertical channel member 22. The free end of this latch lever normally rests upon the bomb or article 60 which in turn, is normally supported by the retaining lever 62 pivoted by the pin 64 to the vertical channel member 20. This retaining lever 62 is provided with a projecting plate 64 normally held in place by a bell crank latch lever 66 under the influence of the tension spring 68. This bell crank lever 66 is connected to the armature 70 of a solenoid 72 which when energized by the closing of the switch 74 as shown, will pivot the bell crank lever 66 in a counterclockwise direction against the tension of the spring 68, so that the lowermost retaining lever 62 will be released as shown in Fig. 1. This permits the lowermost bomb or article to be released under the force of gravity as shown.

As shown the lowermost article or bomb 60 has fallen far enough to permit the latch lever 56 to fall almost to a vertical position which releases the retaining lever 52 as shown, since the projection 34 has moved out of the way of the hardened plate at the free end of the retaining lever 52. After this takes place the bomb or article 50 begins to fall immediately. The spacing between the bombs is controlled principally by the length of the lever 56. If the lever 56 is made shorter the intervals between the release of the bombs will be proportionately less. The lengths of the various levers may be made the same to obtain uniform spacing of the bombs or they may be made of different lengths to obtain a variable spacing of the bombs. The overlap of the hardened plate 32 over the edge of the projection 34 forms a snap acting arrangement with the preceding bomb 60 which permits the sharp release of the succeeding bomb immediately after the complete release of its latching lever by the preceding bomb with a consequent reduction in wear. If this is not important a plain latch lever without a projection may be used, if desired. The falling of the second lowermost bomb or article 50 will permit the complete release of the latch lever 46 since the free end of the latch lever 46 then can clear the bomb 50. This freeing allows the retaining lever 42 to drop to release its bomb or article 40. Likewise when the bomb 40 falls far enough to permit the extreme end of the latch lever 36 to clear, the retaining lever 28 will be released to allow the release of the uppermost bomb or article 28. Through this arrangement the bombs or articles are released at spaced intervals in close succession.

It should be noted, however, that although each bomb in a sense is supported by the bomb beneath it, the weight upon the lowermost bomb is far less than the sum of the weights of the bombs above. This is due to the use of the lever principle to reduce the force or weight transmitted from one to another. The bomb or article 26, for example, rests substantially at the midpoint of the retaining lever 28 so that substantially half its weight is carried by the pivot pin 30, while the other half is carried by the projection 34 and the latch lever 36. The projection 34, however, is placed about four-fifths of the distance between the point of contact of the latch lever 36 with the bomb or article 40 and the pivot pin 38 so that four-fifths of the force received from the hardened plate 32 at the end of the retaining lever 28 is applied to the pivot pin 38 and the remainder or one-fifth of this force is transferred to the bomb 40. Since the retaining lever 28 has already divided the weight of the bomb applied to the lever 36 by two, this one-fifth of the force upon the lever 36 amounts to only about one-tenth of the weight of the bomb or article 26.

The weight of the bomb 40 plus one-tenth of the weight of the bomb 26 is applied to the retaining lever 42, but by virtue of the 1 to 10 leverage or arrangement only one-tenth of this total is applied to the bomb 50 immediately below, which amounts to about 11% of the weight of one bomb. The weight of the bomb 50 plus this 11% is applied to the retaining lever 52, but only one-tenth of this total approximately is applied to the lowermost bomb 60. This one-tenth only amounts to about 12% of the weight of one bomb so that the total weight upon the lowest retaining lever is only about 113% of the weight of one bomb. Since the forces upon the levers and pivot pins vary less than 17% it is possible to make them of equal size and yet make them substantially as light as possible. Since the bombs are quite heavy and the elimination of any unnecessary weight is important, this feature is of particular advantage.

Space limitations often prevent the making of the guideway high enough to accommodate more than four bombs, one above the other. Since it

is customary to drop bombs in a series of eight, there is provided a second guideway formed by the channels 76 and 78 at one side of the first guideway for carrying the second set of four bombs or articles 80, 82, 84 and 86. To release the lowermost bomb 80 at the proper time following the release of the bomb or article 26 I provide a pivoted lever 88 which is normally held in the position shown in Fig. 1 by the bombs. The lever may be made as long as desired and when the last bomb clears the lever, the lever 88 is free to move. This lever 88 is pivoted to the pivot pin 90 and connected by a link 92 to the latch lever 94 provided with a hooked end for latching the retaining lever 96 which supports the bomb or article 80. A tension coil spring 98 acts upon the link 92 so as to urge the lever 88 into contact with the bombs and to move the latch lever 94 to the releasing position shown in dotted lines. The bombs in the first section of the rack, however, prevent this from taking place until they are free of the lever 88 which allows the lever 88 to move to the dotted line position.

Above the bomb 80 is the latch lever 111 which supports the retaining lever 113 upon which the bomb 82 rests. Resting upon the bomb 82 is the latch lever 115 which supports the retaining lever 117 while the latch lever 119 rests upon the bomb 84 and supports the retaining lever 121, which supports the bomb or article 86. These latch levers and retaining levers are similar to the latch lever 36 and the retaining lever 28, as shown in Fig. 2.

Referring now to the remaining figures of the drawings, there is shown a bomb rack provided with a series of vertical guideways for supporting a series of bombs side by side in a vertical position. The bomb rack is formed of the longitudinal structural members 131, 133, 135 and 137 between which are supported the vertical channel members 139, 141, 143 and similar channels uniformly distributed along the rack in as great a number as desired. These channel members divide the rack into vertical guideways which receive the bombs 145, 147 and 149 and succeeding bombs in the remaining guideways of the rack. The bomb 145 is provided with a pierced ear 151 projecting from the side of the bomb through a slot 153 provided in the bottom portion of the vertical channel member 139. This ear is engaged by a hook 155 provided on the bottom of a retaining lever 157 which is pivoted by the pin 159 to the channel member 139. The bomb 147 is likewise provided with an ear 161 which extends through the slot 163 in the channel member 141, and which is engaged by hook 165 on the bottom portion of the retaining lever 167 which is pivoted to the channel member 141 by the pin 169.

The retaining lever 157 is normally supported by the transverse pin 171 provided at the lower end of the latching lever 173 which is pivoted upon the pin 175 and normally biased in a clockwise direction by a tension coil spring 177. The pin 171 extends through an aperture in the channel member 139 and is supported on the opposite side by a link 181. The upper end of the lever 173 is bent laterally to form a hook 183 provided with two holes therein. The channel member 139 is provided with a bracket 185 connected by the pin 187 to a block 189 having two holes therein adapted to register with the two holes provided in the hook portion 183 of the lever 173. The first set of holes are adapted to receive a cotterpin 191, shown in dotted lines in Fig. 4, which serves as a safety device to prevent the accidental release of the latching lever 173 while the bomb rack is being handled or pulled into a plane. This cotterpin is normally removed just before the plane takes off.

A Bowden control wire 193 extends through the second set of holes and prevents the release of the lever 173 after the cotterpin 191 has been removed. This Bowden control wire 193 extends through a Bowden wire casing 195 to the pilot or bombardier's compartment where the end of the control wire 193 is provided with a suitable button 197 which can be pulled to pull the end of the Bowden control wire 193 out of the block 189 and the hook 183 so as to release the lever 173. This permits the spring 177 to rotate the lever 173 in a clockwise direction about the pivot pin 175 to remove the supporting pin 171 from beneath the end of the retaining lever 157 which allows it to fall to the position shown in Fig. 6 releasing the hook 155 from engagement with the ear 151 releasing the bomb 145.

The retaining lever 167 for the next bomb 147 is supported by the transverse pin 202 provided at the lower end of the bell crank latch lever 204 pivoted upon the pivot pin 206. This pivot pin 206 extends through the channel member 141 and on the opposite side is connected by the link 208 with the pin 202.

To release the bomb 147 a definite interval after the release of the bomb 145, I provide a slide bar 210 enclosed in a slideway provided by a channel-shaped member 212 fastened to the side of the channel member 141. This channel member 212 is provided with a long slot 214 through which a pin 216 projects outwardly from the upper end of the slide bar 210. This pin 216 normally rests on top of the bomb 145 and is normally held in this position by a tension coil spring 218 hooked at its upper end to an arm 220 extending from the top of the slide bar 210 beneath the raised flange portion 222 of the channel member 212. The lower end of this tension coil spring 218 is hooked to a ring connected to the bell crank lever 204 immediately adjacent the pivot pin 206. This connection tends to rotate the bell crank retaining latch lever 204 in a counterclockwise direction so as to normally hold the pin 202 beneath the retaining lever 167. The bell crank retaining latch lever 204 beneath the slide bar 210 is provided with an adjustable screw 224 threaded through the bell crank retaining latch lever 204 and provided with a lock nut 226 on its lower side.

As soon as the latch lever 173 is released by a pull on the Bowden wire 193, the pin 171 will be removed from beneath the retaining lever 157 and the bomb 145 will be propelled downwardly under the force of the spring 218 as well as the force of gravity. Before the pin 216 reaches the lower end of the slot 214 the lower end of the slide bar 210 will strike the top of the set-screw 224 and cause it to pivot in a clockwise direction under the force applied by the upper end of the spring 218, so as to remove the pin 202 from beneath the retaining lever 167 so as to permit the release of the hook 165 from the ear 161 to release the bomb 147.

In Fig. 6 the bomb 145 is shown released while in Fig. 7 bomb 147 is shown released. Peculiarly enough the lower end of the spring 218 tends to pull the bell crank retaining latch lever 204 in a counterclockwise direction while the upper end of the spring 218 pulls the slide bar 210 into en-

gagement with the bell crank lever to force it to turn in the opposite direction. This is accomplished by reason of the fact that the slide bar 210 engages the set-screw 224 near the end of the bell crank lever so that it has a mechanical advantage of four or five to one over the lower end of the lever which is ample to cause this action. The spacing between the bombs may be varied by changing the length of the slide bar 210. The distances between the top of the set-screw and the bottom of the slide bar determines the spacing of the bombs. The set-screw 224 may be adjusted to vary this spacing within its limits of adjustment.

Fastened to the channel member 143 is a similar mechanism for causing the release of the next bomb 149 a similar interval after the release of the bomb 147. Similar separate mechanisms are provided between each of the remaining bombs within the rack so that all the bombs are released in succession at spaced intervals. When used for parachute bombs, the pin 216 may be provided with a clip 230 to which may be attached a wire 232 which may be connected to a means for opening the compartment in the top of the bomb containing the parachute.

In loading the rack, the first bomb 145, to be released is first loaded by pushing it upwardly in the guideway between the channel members 139 and 141. The upper end of the bomb first contacts the pin 216 and moves this pin 216 together with the slide bar 210 upwardly until it reaches the upper end of the slot 214. This tensions the spring 218. The ear 151 on the bomb 145 contacts the retaining lever 157 and raises it to the horizontal position so that the hook 155 enters the aperture in the ear 151. The latching lever 173 is then moved to the vertical position in which the supporting pin 171 is moved beneath the free end of the retaining lever 157 and the Bowden control wire 193 is inserted through the registering apertures in the block 189 and the hook 183 at the upper end of the latching lever 173.

The succeeding bombs 147, 149, etc., may be loaded in succession merely by forcing them upwardly into position. In so doing each bomb engages the projecting pin to stretch the long vertical tension spring which connects to the latch mechanism of the succeeding bomb. For example, the bomb 147 will contact the projecting pin 234 to stretch the spring 236 which connects to the latch mechanism for the bomb 149. The ear 161 will contact and lift the retaining lever 167 causing the hook 165 to project through the aperture in the ear 161. Since the spring 218 has been tensioned by the previous insertion of the bomb 145, the bell crank latch lever 204 will be in the latching position shown in Fig. 5. To permit the latching to take place, the retaining lever 167 as well as the other retaining levers are provided at their free ends with an inclined cam surface 168 for engaging and camming in a clockwise direction the supporting pin 202 at the lower end of the bell crank latch lever 204 against the opposing force of the spring 218. At the completion of the camming operation the bell crank latch lever 204 snaps back to the latching position shown in Fig. 5. Where it is possible to remove this entire rack, it may be conveniently loaded by performing the loading operations with the rack in the inverted position.

While the form of embodiment of the invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, as may come within the scope of the claims which follow.

What is claimed is as follows:

1. A mechanism for releasing articles at spaced intervals which comprises releasable retaining means for the first article to be released, a slide means having means contacting the first article to be released, a second releasable retaining means for retaining the second article to be released, latch means normally preventing the release of the second retaining means, said latch means being provided with an adjustable releasing projection extending into the path of movement of a portion of the slide means, and spring means for holding the contacting means of the slide means in contact with and for following the movement of the first article to be released whereby the slide member upon engaging the projection causes the latch means to release the second retaining means and the second article, said releasing projection being adjustable in the direction of movement of said portion of the slide means to vary the interval between the releases of the first and second articles.

2. A mechanism for releasing articles at spaced intervals which comprises releasable retaining means for the first article to be released, a slide means having means contacting the first article to be released, a second releasable retaining means for retaining the second article to be released, a pivoted latch means normally in engagement with the second retaining means, said pivoted latch means having a portion extending into the path of movement of a portion of the slide means so that the slide means upon engagement therewith can pivot the latch means to release the second retaining means, and spring means extending between the slide means and the latch means and having a greater mechanical advantage at one end for forcing the slide means to pivot the latch means and a lesser advantage at the other end for normally preventing the release of the second retaining means.

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