April 27, 1948. G. R. LEGHORN 2,440,282

AERIAL BOMB

Filed Jan. 20, 1945 4 Sheets-Sheet 1

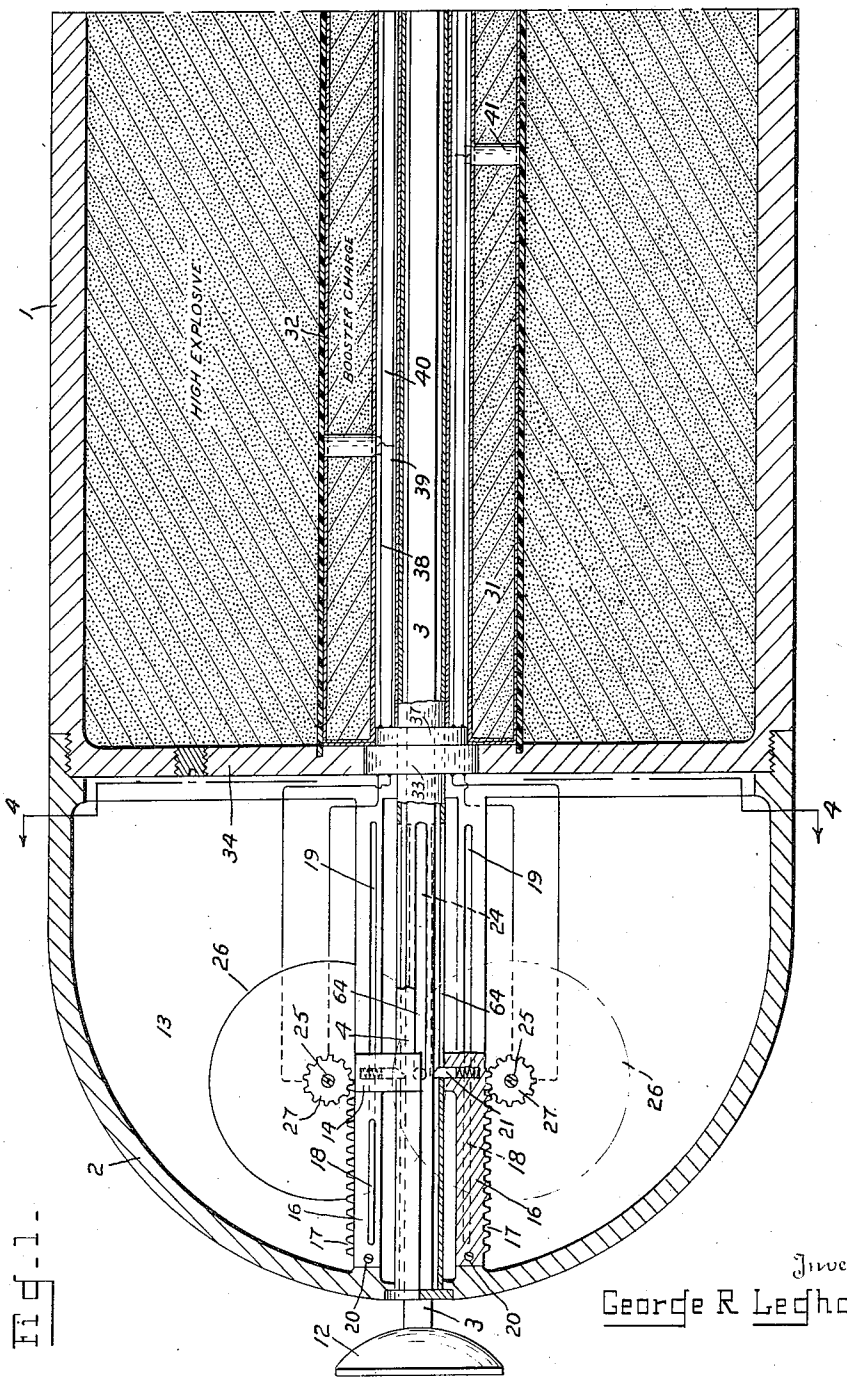

Fig. 1.

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April 27, 1948. G. R. LEGHORN 2,440,282

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Filed Jan. 20, 1945 4 Sheets-Sheet 2

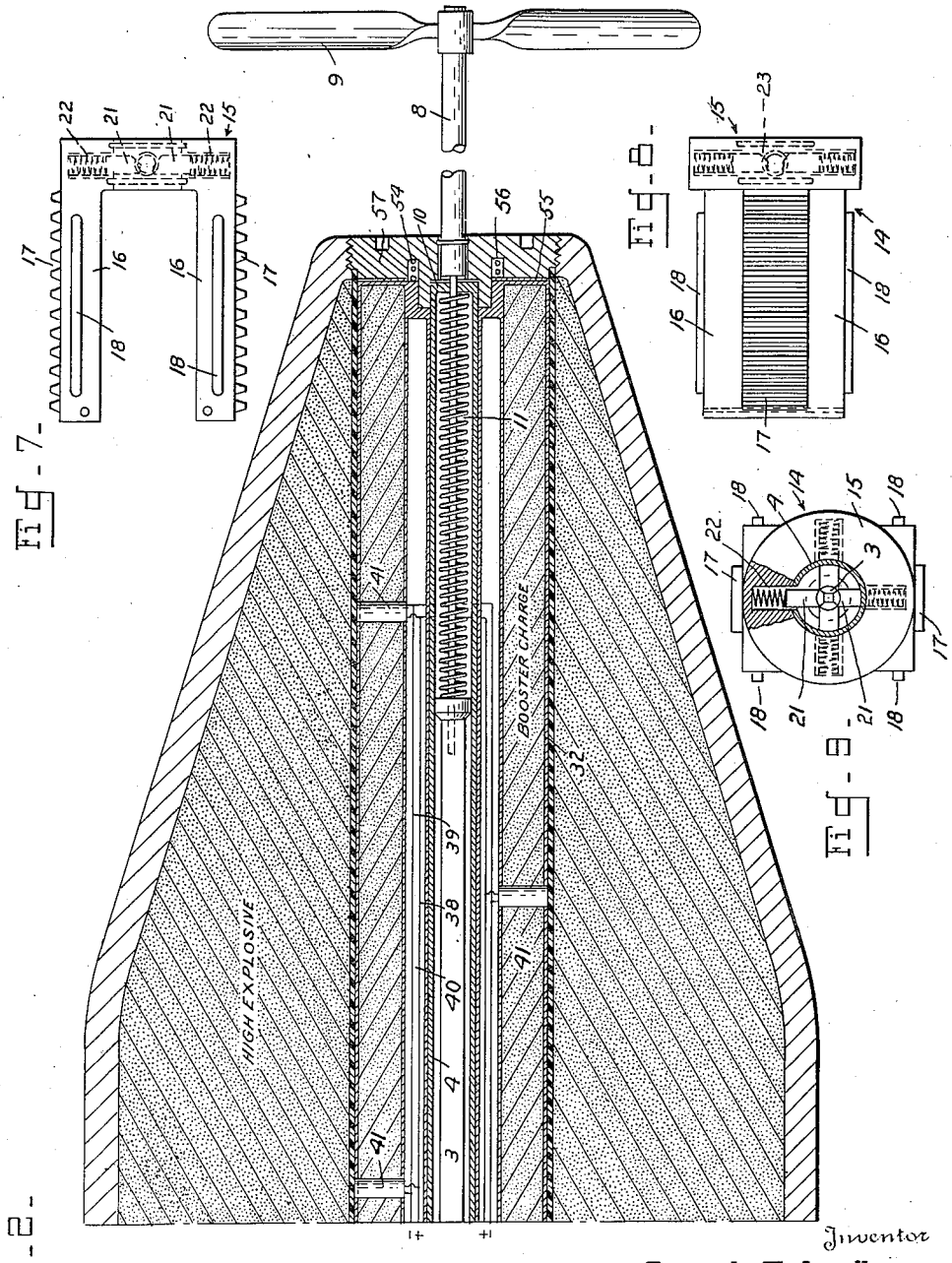

Fig. 2.

Fig. 7.

Fig. 8.

Fig. 9.

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April 27, 1948. G. R. LEGHORN 2,440,282

AERIAL BOMB

Filed Jan. 20, 1945 4 Sheets-Sheet 3

Fig - 4 -

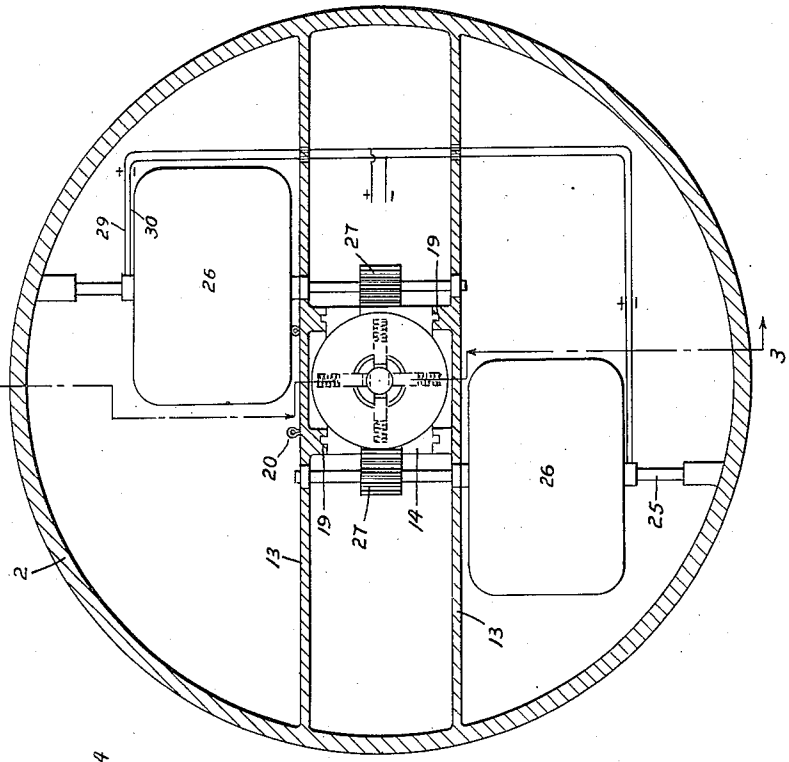
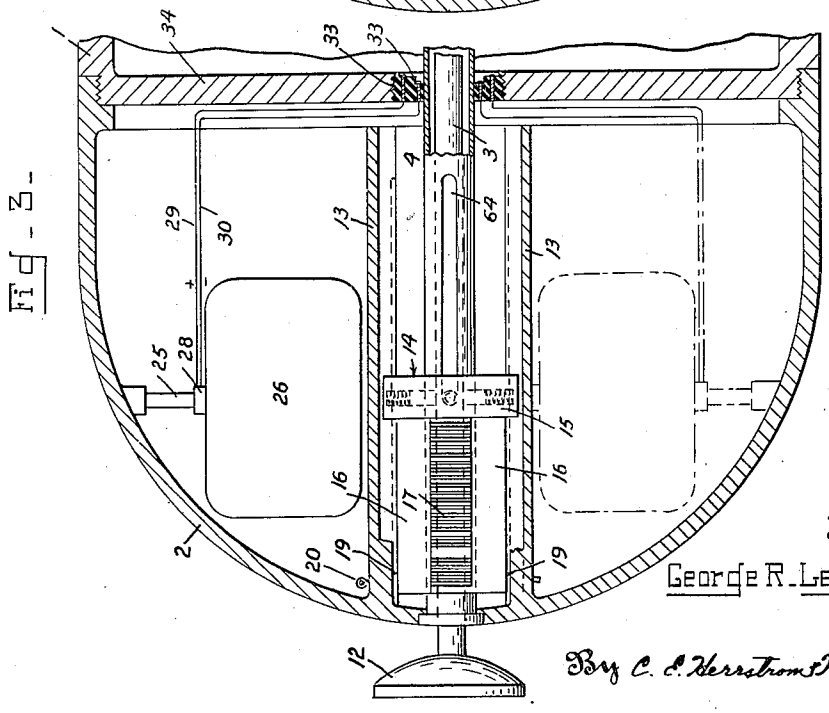


Fig - 3 -



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AERIAL BOMB

Filed Jan. 20, 1945 4 Sheets-Sheet 4

Fig. 5.

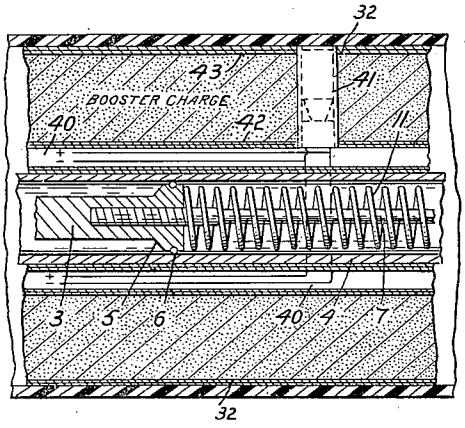


Fig. 6.

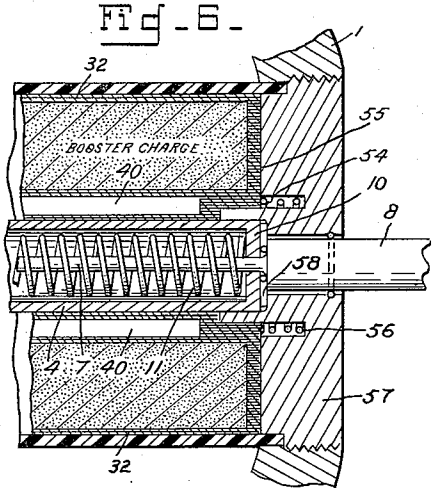


Fig. 11.

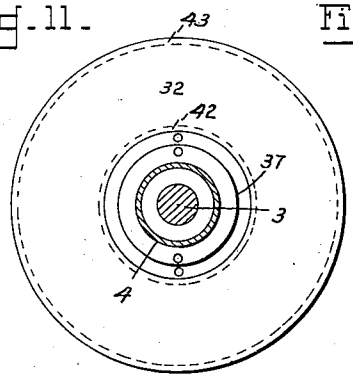


Fig. 10.

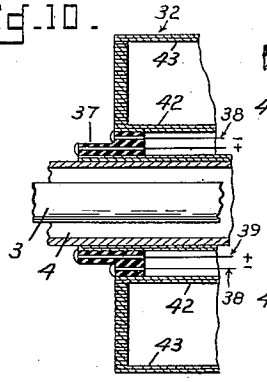


Fig. 12.

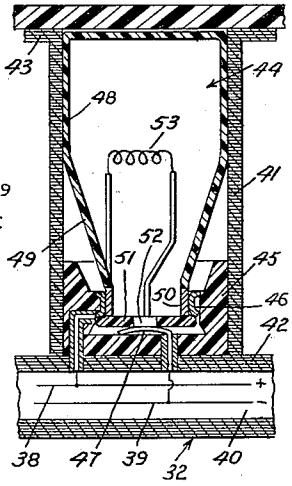
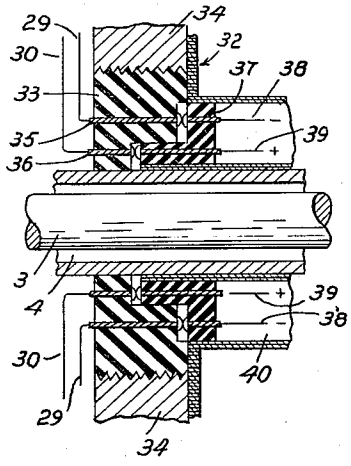


Fig. 13.



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UNITED STATES PATENT OFFICE

2,440,282

AERIAL BOMB

George R. Leghorn, San Francisco, Calif.

Application January 20, 1945, Serial No. 573,796

1 Claim. (Cl. 102—7.4)

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

1

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

This invention relates to aerial bombs, and more particularly, to an aerial bomb adapted to explode while still above ground after impact.

A main object of this invention is to provide an aerial bomb which will automatically be prepared for detonation responsive to being dropped from an aircraft and which will be detonated by impact with its target while the body portion thereof which contains the main explosive charge is still above ground, so that the bomb will have maximum destructive effect.

A further object of this invention is to provide a detonating system for an aerial bomb comprising multiple electrically actuated detonating units furnished with detonating energy from an electrical generating system operated by contact of the forward portion of the bomb with the ground or the sea as the bomb completes its descent.

A further object of this invention is to provide a detonating system for a bomb comprising multiple electrical detonating actuators which are easily removable or insertable in the bomb for convenience of assembly and safety.

Further objects of this invention will appear from the following description and claims, and from the accompanying drawings, wherein:

Figure 1 is a longitudinal cross-sectional view of the forward portion of an aerial bomb in accordance with this invention.

Figure 2 is a longitudinal cross-sectional view of the rear portion of the aerial bomb of Figure 1.

Figure 3 is a cross-sectional view of the war-head assembly taken on line 3—3 of Figure 4.

Figure 4 is a cross-sectional view taken on line 4—4 of Figure 1.

Figure 5 is a detail view of the structure at the rear end of the striker rod in the bomb of Figure 1.

Figure 6 is a detail view of the structure at the rearward end of the body of the bomb.

Figure 7 is a plan view of a barrel rider ring employed in the bomb of this invention.

Figure 8 is a side elevational view of the barrel rider ring of Figure 7.

Figure 9 is an end elevational view of the barrel rider ring of Figure 7.

Figure 10 is a detail view of the forward portion of a booster charge housing and a portion of the striker rod as used in the bomb of this invention.

Figure 11 is a detail view of the structure of

2

Figure 10 showing the booster housing in end elevation.

Figure 12 is a detail view of one of the electrical detonating elements employed with the bomb of this invention.

Figure 13 is an enlarged detail of the insulating connection between the war head and the main body portion.

Referring to the drawings, 1 designates the body portion of a generally cylindrical aerial bomb. Secured to the forward end of the bomb is the war head portion 2. Extending axially through the bomb is a striker rod 3, slidably mounted in a barrel 4 appropriately secured to body portion 1. The diameter of rod 3 is substantially less than the inside diameter of barrel 4 except at its rear end, where it is provided with a flared portion 5 of enlarged diameter carrying a ring bearing 6 which slidably engages the inner surface of barrel 4. Axially threaded to the rear end of rod 3 is a propeller spindle 7. Propeller spindle 7 extends rearwardly and is provided with a thickened shaft portion 8 which carries a propeller 9 rigidly secured thereto at its end. The shape of the blades of propeller 9 is such that air resistance will tend to rotate the propeller in the direction for unscrewing spindle 7 from rod 3 when the bomb is dropped from an aircraft.

Barrel 4 is provided with an end wall 10 forming an abutment surface against which the inner end of the thickened portion 8 normally bears under the pressure of a coiled spring 11 which is positioned in barrel 4 between flared portion 5 of rod 3 and end wall 10 of barrel 4.

The front end of rod 3 is supported in appropriate bearings at the forward end of war head 2 and normally projects a short distance ahead of said war head. A striker plate 12 is threadedly or otherwise secured to the front end of rod 3.

War head 2 is provided with a pair of integral longitudinal web elements 13, 13, between which is slidably mounted a barrel rider ring 14, shown in Figures 7, 8 and 9.

Barrel rider ring 14 comprises a cylindrical ring element 15 provided with a pair of forwardly extending rack arms 16, 16, the outer surfaces of which carry rack teeth 17. The top and bottom surfaces of rack arms 16 are provided with longitudinal studs 18 adapted to slidably engage corresponding longitudinal grooves 19 formed in the adjacent web members 13, so that the barrel rider ring 14 may at times be moved rearwardly and be guided for longitudinal motion by studs 18 and grooves 19.

Web members 13 and the end portions of rack

arms 16 are provided with holes to receive a shear pin 20 to normally maintain barrel rider ring 14 in its forward position.

The cylindrical ring element 15 of barrel rider ring 14 is provided with a plurality of radially movable catch studs 21 contained in appropriate radial recesses in said ring element and biased toward the center of ring element 15 by springs 22 positioned behind catch studs 21 in said radial recesses. Catch studs 21 are formed at their exposed ends with bevelled cam surfaces 23 adapted to at times cooperate with the rear flared portion 5 of rod 3 to be pushed back into the radial recesses and to allow portion 5 of rod 3 to slip past. This occurs when propeller 9 has rotated sufficiently to unscrew spindle 7 from rod 3, whereupon spring 11 will expand and force rod 3 all the way forward. Thereafter, rod 3 cannot move rearwardly without shearing pin 20 which occurs on impact of the striker plate 12 with the ground, or with the surface of the sea.

Longitudinal slots 24 are provided in barrel 4 to provide passage therethrough for studs 21 and to allow barrel rider ring 14 to move rearwardly with respect to barrel 4 with said studs projecting through said barrel. One or more guide grooves 24 may be provided in rod 3 to normally receive the inner end of one or more of studs 21 to prevent rotation of rod 3.

A pair of generators 26 are mounted in war head 2, having armature shafts 25 journalled in appropriate bearings provided in the wall of war head 2 and in webs 13. Each armature shaft 25 carries a pinion member 27 adapted to mesh with rack teeth 17 on the respective arms 16 whereby said armature shafts 25 will be rotated upon rearward movement of the barrel rider ring 14.

When rod 4 is in its extended position after the bomb has been dropped and the enlarged end 5 of said rod is in abutment with the forward sides of studs 21, impact of striker plate 12 with the ground or the surface of the sea will be transmitted to barrel rider ring 14 resulting in the shearing of safety pin 20 and the rapid rearward movement of rack arms 16 with respect to armature pinions 27. Rack arms 16 will drive pinions 27 for several turns, building up speed, and then pass rearwardly out of engagement with the pinions. The rotation of the armatures will continue for some time thereafter, and a substantial voltage will be developed across the output terminals of the generators.

Barrel rider ring 14 is provided with appropriate ring bearings to allow rearward movement thereof on striker barrel 4 with a minimum of friction.

Each generator armature is provided with a slip ring assembly 28 and appropriate brushes cooperating therewith, said brushes being connected respectively to wires 29 and 30 leading to the electrical detonating system.

A booster charge 31 is provided in a hollow cylindrical container 32 adapted to be mounted concentrically with respect to striker rod 3 and striker barrel 4. Insulating bushing 33 is provided in the forward end wall 34 of the main body portion 1. The ends of wires 29 and 30 are respectively connected to brass conductor rings 35, 36 concentrically mounted in insulating bushing 33. An insulating collar 37 is provided on the forward end of container 32, said collar being provided with contact points adapted to respectively engage conductor rings 35 and 36 and electrically connect wires 29 and 30 to wires 38 and 39 extending internally of booster container 32, in a space 40 provided therein, to the various electrical detonating elements.

The hollow booster charge container 32 is provided with a plurality of longitudinally spaced cylindrical wells 41 extending from the inner wall 42 to the outer wall 43 of said container 32, said wells being open at the outer wall 43 to receive a removable electrical detonating element 44. The bottom of each well 41 is provided with a socket member 45, preferably of "Bakelite" or the like, wherein is securely mounted a spring contact ring 46 which is electrically connected to wire 38 in space 40. A spring contact 47 is provided at the bottom of socket 45, substantially at the center thereof, and electrically connected to wire 39.

Each detonating element 44 comprises a flask portion 48 and a tapered neck portion 49 having moulded therein a contact ring 50. A base portion 51 is provided below contact ring 50, said base portion being slightly enlarged in diameter so that when element 44 is inserted in well 41, base portion 51 will squeeze past spring contact ring 46 and resiliently lock the detonating element 44 in operating position.

A center contact 52 is provided in base portion 51 adapted to make electrical contact with spring contact 47.

The various walls of detonating element 44 are made of "Bakelite" or the like, with the exception of contact ring 50 and contact 52, which are made of metal.

A filament 53 is connected between contact ring 50 and base contact 52 by appropriate wire support members.

The interior of detonating element 44 contains a detonating composition such as mercury fulminate or the like, adapted to be set off when filament 53 is energized. The detonation of the fulminate sets off the adjoining booster charge, which in turn sets off the main charge in the bomb casing.

Container 32 is maintained in position with its forward contact points pressed firmly against conductor rings 35 and 36 by a coiled spring 54 which is compressed between the end wall 55 of container 32 and an annular seat 56 provided in end plug 57 of the bomb. End plug 57 is also formed with a bearing cup 58 to receive the end portion of striker barrel 4. When end plug 57 is unscrewed, the striker barrel and the striker rod may be withdrawn, as well as booster container 32. Booster container 32 may be thus withdrawn when the electrical detonating elements 44 are to be inserted in wells 41 to prepare the bomb for its mission, or when it is desired to remove the detonating elements from a bomb for reasons of safety.

While a specific embodiment of an aerial bomb has been disclosed in the foregoing description, it is to be understood that various modifications within the spirit of the invention will occur to those skilled in the art. Therefore it is intended that no limitations be placed on the invention other than as defined by the scope of the appended claim.

I claim:

An aerial bomb having means comprising an axial passage, said bomb comprising a rod member slidable in the passage, spring means biasing said rod member forwardly of the bomb, a detent for said rod member and wind vane means associated with said detent means to release the rod on downward flight of the bomb, electric generating means for detonating the bomb, and means

on the rod constructed and arranged to engage with said generating means at a predetermined degree of distension of the rod whereby said generating means is motivated on regression of the rod at impact of the bomb.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,052,606	Maxim	Feb. 11, 1913
1,322,083	Barlow	Nov. 18, 1919
1,383,106	Hadaway	June 28, 1921
1,516,009	Grant et al.	Nov. 18, 1924
1,884,125	Murrow	Oct. 25, 1932

FOREIGN PATENTS

Number	Country	Date
831,486	France	June 7, 1938