Dec. 19, 1961 A. FLATAU 3,013,490

TAIL FIN STRUCTURE FOR VASE OR FISH-SHAPED BOMBS

Filed May 25, 1955

Fig. 1.

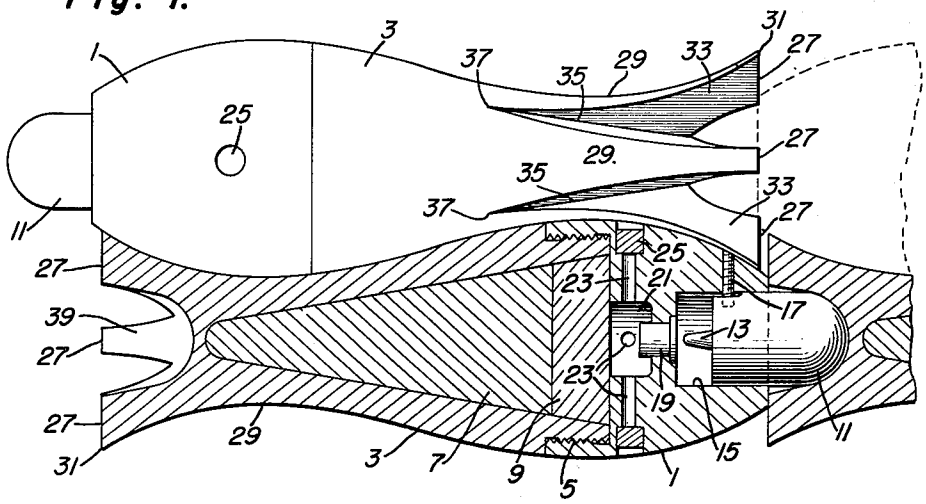


Fig. 2.

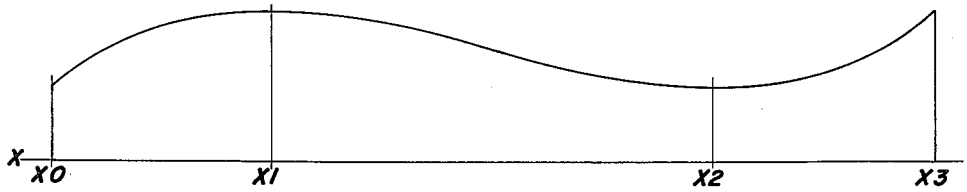


Fig. 3.

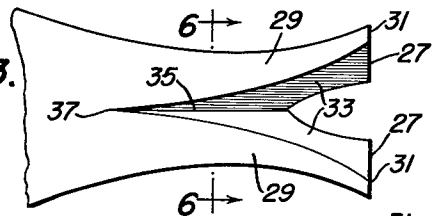


Fig. 4.

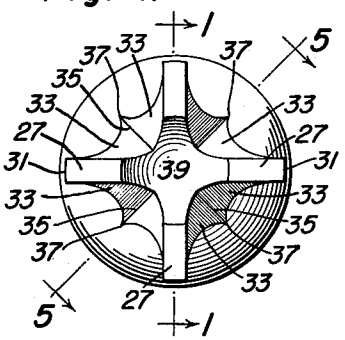


Fig. 5.

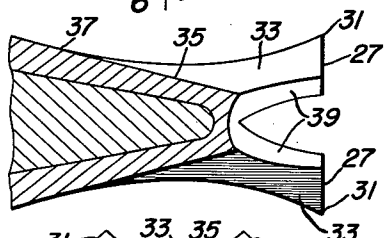
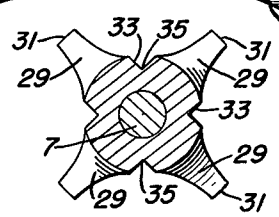


Fig. 6.



INVENTOR.
Abraham Flatau
BY George Renehan
ATTORNEY

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TAIL FIN STRUCTURE FOR VASE OR FISH-SHAPED BOMBS

Abraham Flatau, New York, N.Y., assignor to the United States of America as represented by the Secretary of the Army

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4 Claims. (Cl. 102—7.2)
(Granted under Title 35, U.S. Code (1952), sec. 266)

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

This application relates to a cluster bomb and is an improvement on that disclosed in an application of Abraham Albert Alperstein, Serial Number 346,545, filed April 2, 1953.

The object of this invention is to improve the aerodynamic characteristics of the bomb described in the above mentioned application, while providing a structure which is sturdy and cheap to manufacture.

In the drawing, FIGURE 1 is a side view of several bombs clustered together, some bombs being shown in elevation and others in section on the line 1—1, FIG. 4.

FIG. 2 is a diagrammatic view showing the shape of the bomb surface.

FIG. 3 is a partial side view of a bomb, shown rotated 45° from the position shown in FIG. 1.

FIG. 4 is a tail-end view of the bomb.

FIG. 5 is a longitudinal section on the line 5—5, FIG. 4.

FIG. 6 is a transverse section on the line 6—6, FIG. 3.

The Alperstein application cited above discloses a cluster bomb having a surface generated by rotating about the axis of a bomb a smooth reverse curve which is symmetrical about a point intermediate its ends. A specific example of such a curve is shown in FIG. 2. The portion of the curve from x_0 to x_1 is a portion of a parabola having a vertical axis, with its vertex at x_1. From x_1 to x_2 the curve is a half-cycle of a cosine wave extending from a maximum at x_1 to a minimum at x_2. The portion from x_2 to x_3 is a portion of a parabola identical in shape with that from x_1 to x_0, but reversed in direction. Since at points x_1 and x_2 the tangents to the cosine curve and the parabolas are identical and parallel to the x-axis, a smooth curve results which is symmetrical about a point midway between x_1 and x_2, i.e. the point of inflection of the cosine curve.

Depending on the particular parabola and cosine curve employed, the bomb may be of different proportions. Whatever these proportions, however, the bombs will nest in nose-to-tail relationship, as best shown in FIG. 1. They have higher terminal velocities than the cylindrical or prismatic cluster bombs previously employed and have better clustering characteristics than conventional streamlined bombs having attached fins. They are also more sturdy and more economical to manufacture than bombs of the last named type.

I have further improved the aerodynamic characteristics of these bombs by modifying the tail structure while retaining the same clustering characteristics.

A specific embodiment of my invention will now be described.

The drawings disclose an incendiary cluster bomb having a heavy steel nose portion 1 and a unitary body-and-tail portion 3 formed of an inflammable material. Preferably the body-and-tail portion 3 is a magnesium casting. These two portions are joined by screw threads 5. Within body and tail portion 3 is an incendiary charge 7 and a booster charge 9 of any suitable composition.

The nose portion 1 contains an impact-sensitive fuse.

A firing pin carrier 11 which carries a firing pin 13 is slidably mounted in outer bore 15 and held in place by shear pin 17. A primer 19 is mounted in alignment with firing pin 13 and communicates with inner bore 21. Radial bores 23 extend from the inner bore to the surface of the bomb and are closed by blowout plugs 25.

When the bomb strikes a surface, the shear pin 17 is broken and carrier 11 driven rearwardly. Firing pin 13 detonates primer 19, igniting booster charge 9. At the same time, blowout plugs 25 are expelled, allowing air to enter by passages 23. Incendiary charge 7 and the magnesium body-and-tail portion 3 then burn.

The specific embodiment as thus far described is the same as that described in the Alperstein application. The fin structure which constitutes the novel feature of my invention will now be described.

The fins 27 have outer surfaces 29 of substantial width which lie on the surface of revolution already described. Each fin, beginning in its rear, radially outer tip 31, increases in thickness forwardly and also radially inwardly. The side surfaces 33 of adjacent fins intersect along lines 35 which, as shown in FIG. 5, are inclined radially outwardly and forwardly. At points 37 the fins merge into the surface of revolution.

The location of points 37 is critical. I have found the performance of the bombs to be greatly improved in regard to terminal velocity and stability in flight when points 37 are forward of the minimum diameter of the bomb (point x_2, FIG. 2). While I do not wish to be bound by theory, I believe the explanation of this improved behavior to be as follows: In the bomb described in the Alperstein application, the boundary layer separates from the bomb surface in the region of the minimum diameter, forming a large wake which reduces the effect of the notches shown in FIG. 3 of the Alperstein application. By extending the vanes forwardly of the point of minimum diameter, the air flow is channeled into the "cuts" between the vanes in that region where, in the previous design, separation of the boundary layer took place.

Whether or not the above explanation is correct, tests have shown that not only is the terminal velocity of the bombs considerably increased but there is also a marked increase in the proportion of bombs which strike the target nose-first, and a decrease in the time required for the bombs to attain their stable flight after release from the cluster.

The rear radially inner surfaces 39 of the vanes are shaped so as to define a cavity of proper side and shape to receive firing-pin carrier 11 of an adjacent bomb when the bombs are clustered.

While I have described one embodiment of my invention in detail, it will be apparent that various changes are possible. I therefore wish my invention to be limited only by the scope of the appended claims.

I claim:

1. A cluster bomb comprising a nose portion and a unitary body-and-tail portion, said bomb having its outermost surface throughout its length lying on a surface of revolution generated by the rotation of a smooth curve about the axis of the bomb, said curve beginning at the nose end of the bomb and increasing to a maximum measured from said axis, then decreasing to a minimum and finally increasing again to the tail end of the bomb, said curve being symmetrical about a point intermediate its ends, whereby said bomb is adapted to nest in nose-to-tail relationship with other bombs of substantially identical structures, said unitary body-and-tail portion comprising vanes, each of said vanes having an outer surface of substantial width on said surface of revolution and having lateral surfaces which diverge radially and longitudinlly, said vanes beginning at the tail end of said

bomb and extending forwardly of said minimum and merging into said surface of revolution.

2. A bomb as defined in claim 1 wherein the rear portions of said vanes comprise radially inner surfaces defining a cavity.

3. A bomb as defined in claim 1, said nose portion being formed of heavy steel, said unitary body-and-tail portion being formed of inflammable material, and further comprising an incendiary charge in said body-and-tail portion and means for igniting said charge.

4. A bomb as defined in claim 3, wherein said unitary body-and-tail portion is a magnesium casting.

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