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2,984,181

WEDGE CRUCIFORM FIN

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FIG.1.

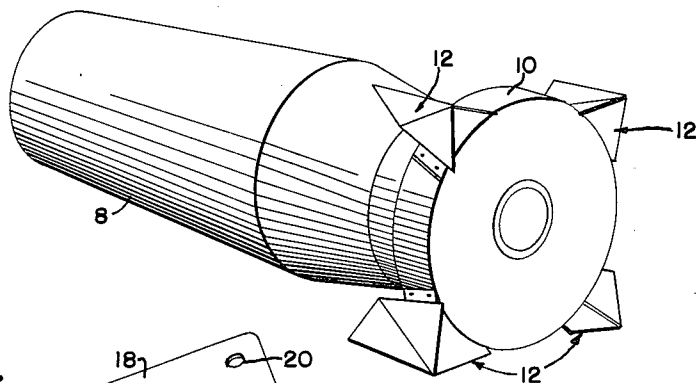


FIG.2.

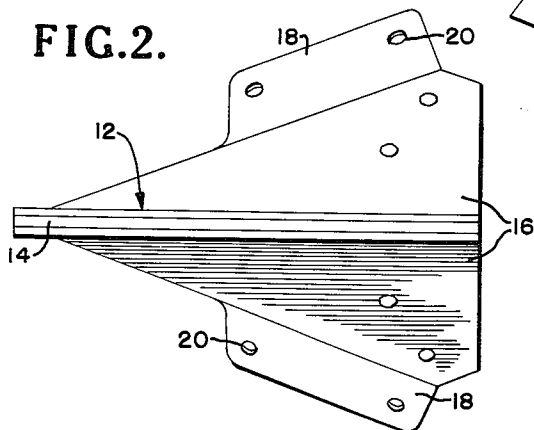


FIG.3.

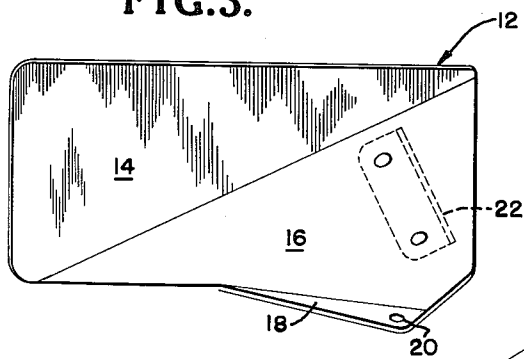
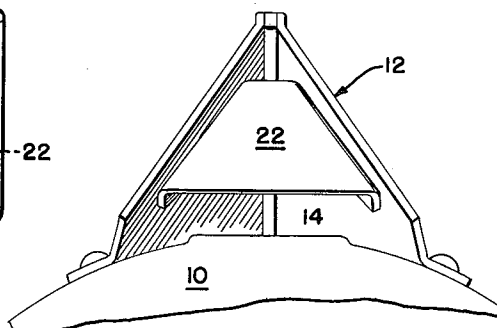


FIG.4.



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WEDGE CRUCIFORM FIN

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7 Claims. (Cl. 102—3)

(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 of any royalties thereon or therefor.

This invention relates to a stabilizing fin for a mine of substantially cylindrical contour to be dropped into the sea from planes, the mines first having free fall and later during the fall, ejecting a parachute to check the fall previous to entering the water.

When mines of this type leave the plane, the angle of attack, that is the angle between the stream of air flowing past the mine and the center line or longitudinal axis of the mine should be as close to zero as possible. As this angle is constantly changing during the fall of the mine, it is advisable to have controlling fins which will react with this current of air to maintain the mine in the desired position. Heretofore plane surfaces in the form of fins parallel to the center line of the mine have been used and have been found to be effective in restoring the mine to the proper flight angle. These fins operate by an increased pressure of the air stream on one side or the other to return the mine to a zero angle of attack. These devices, however, required too large a deviation from the zero angle before they were effective to return the mine to the proper position, thus setting up a wobbling course which was undesirable. A fin which would operate to check the deviations more quickly and which would maintain the mine more effectively on the zero angle was needed.

The present invention provides a fin which has both a plane surface which is parallel to the center line of the mine and pairs of plane surfaces which are at an angle to the center line.

One of the objects of this invention is to provide a stabilizing fin to be attached in pairs or more to a mine which will maintain the mine at approximately a zero angle of attack during the free flight or fall of the mine.

A further object of the invention is to provide a fin to be used to stabilize a mine which is dropped from a great height and under high forward speeds, where the angle between the center line of the mine and the air stream flowing past the mine should be maintained at zero, which will react quickly upon any deviation from this angle and so prevent wobbling of the mine during free flight.

It is a further object of the invention to provide a stabilizing fin which is formed with a plane surface substantially parallel to the center line of the mine and is also formed with other surfaces which are at equal and opposite angles to the center line.

It is a still further object to provide a stabilizing fin which is formed with pairs of plane surfaces which are at opposite and equal angles to the center line of the mine and which present angled flat surfaces to the air stream flowing past the mine during the fall, said surfaces balancing each other so long as the zero angle is maintained, but reacting quickly to any change of pressure due to deviation of the mine from the zero angle and which exert a torque on the mine to return it to its desired position.

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Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawing wherein:

Fig. 1 is a perspective view of the mine with the fins attached;

Fig. 2 is a top elevation of a single fin;

Fig. 3 is a side elevation of the fin of Fig. 2; and

Fig. 4 is a rear view of the fin and a portion of a mine secured thereto.

Referring to the drawing wherein like numerals refer to like parts in the several views, a mine 8 is shown of the type which is dropped from a great height into the sea, the first portion of the fall or free flight of the mine being free and the latter portion being checked by a parachute which is self-detachable upon the mine entering the water.

The mine 8 has a parachute containing compartment 10 in which a parachute (not shown) is housed. The chute is released by an air pressure control so that the mine is checked in flight a predetermined distance above the water and because of this checking of its fall it enters the water without damage. It is advantageous to have the mine in a vertical position or a position where the center line of the mine is parallel to the air stream at the time the parachute is released to avoid a possible chance of snapping the parachute lines or other damage should the mine be checked when in a position other than vertical, with the parachute compartment uppermost. Also there is a possibility that should the mine be upside down, the parachute would never open. To insure the mine being in an upright position, some guidance is necessary.

Attached to the rim of the parachute compartment are fins 12. These fins may be of any desired number and are, for the purposes of illustration, here shown in cruciform formation. They should be equally spaced around the parachute compartment to provide an aerodynamically balanced guiding unit.

The fin proper is formed with a forward or outboard section 14 and an aft or inboard section 16. The outboard or forward section 14 consists of a flat substantially right triangular plate substantially parallel to the center line of the bomb. The aft section is made up of two substantially right triangular plates, each joined along its hypotenuse to the hypotenuse of the plate 14 and to the hypotenuse of the other plate 16. The pair of plates 16 are joined at an angle to each other and at an angle to the plate 14 presenting, to the air stream, a flat surface parallel to the center line of the mine and a pair of flat surfaces, one on each side of the parallel surface, at an angle to the center line of the mine, the angles being equal and opposite to the parallel surface.

The outboard surface 14 at a zero angle of attack presents very little obstacle to the air stream while the aft surfaces 16 serve to deflect the passing air from the center line, equally in either direction to hold the mine along the zero angle. If the aircraft launched mine becomes oriented, upon release, so that its center line and the free air stream lines are not parallel, the air presses on the windward side of the fin with a higher pressure than normal while the leeward side feels less pressure than normal. The pressure differential results in a force which tends to stabilize the mine or store.

Because of the angle of the aft fin surfaces, a slight change in direction results in a greater force tending to restore the mine to the zero angle than would result from a single surface such as the surface 14. The combination of the surface parallel to the center line of the mine and a pair of surfaces at equal but opposite angles with the center line produces a quick reaction to any deviation from the zero angle.

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The aft sections 16 are formed with flanges 18 which have holes 20 so that the fins may be riveted or bolted to the parachute section of the mine. A brace 22 extends from one aft section to the other to prevent buckling or collapsing of the sections under the air pressure.

The wedge cruciform fin produces a stabilizing force at low angles of attack, which is larger than that produced by previous fin design. The constant pressure when the mine is at the zero angle stabilizes the mine and any deviation is reacted to quicker and at lower angles than that of previous fins.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. In combination, a mine to be dropped from an aircraft in flight, said mine having a casing of cylindrical configuration throughout a substantial portion of the length thereof and a cylindrical tail portion of reduced diameter, a parachute compartment secured to said tail portion, said compartment having an outer cylindrical surface of substantially the same diameter as the maximum diameter of the mine, a plurality of individual cruciform stabilizer fins secured in equidistant spaced relation to the outer surface of said parachute compartment, each of said fins having a forward section arranged parallel to the center line of the mine and a pair of aft sections intersecting the forward section along a line which, if extended, would form an angle with the longitudinal axis of the mine, said pair of aft sections being at an acute angle with each other and to a plane through the intersection of said forward and aft sections and said center line.

2. The combination of a cruciform stabilizer with a cylindrical mine according to claim 1 wherein the pair of sections are arranged at an angle to the center line in a manner to form equal angles with the plane through

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said center line and the intersection of said forward and aft sections.

3. The combination of a cruciform stabilizer with a substantially cylindrical mine according to claim 1 wherein the angles which said pair of sections make with the plane are equal and the sections are on opposite sides respectively of the forward section, whereby the pressure exerted by the air on the fin is balanced when the center line of the mine coincides with the free flight of said mine.

4. The combination of a stabilizing fin with a cylindrical mine having a parachute compartment secured thereto, said fin comprising a thin flat outboard section and an aft section, the outboard section being substantially parallel to the longitudinal axis of the mine when attached thereto and the aft section comprising a pair of surfaces arranged at an angle to and on opposite sides of said outboard section in such a manner that the meeting line of the outboard section with the aft section, if continued, would form an acute angle with the longitudinal axis of the mine, and means including a pair of flanges on said aft section for connecting the fin to said parachute compartment.

5. A stabilizing fin for a mine according to claim 4 wherein the surfaces forming the aft section are arranged at equal and opposite angles from the plane of said outboard section.

6. A stabilizing fin according to claim 4 and including means for bracing the surfaces of the aft section, said means being wholly within the confines of the aft section.

7. A stabilizing fin according to claim 6 wherein the bracing means comprises a plate extending between and connected to each of the surfaces of the aft section.

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