

June 28, 1960

G. L. FOGAL ET AL

2,942,545

STABILIZING SYSTEM FOR MINE DROPPED FROM AIRCRAFT

Filed Nov. 23, 1954

3 Sheets-Sheet 1

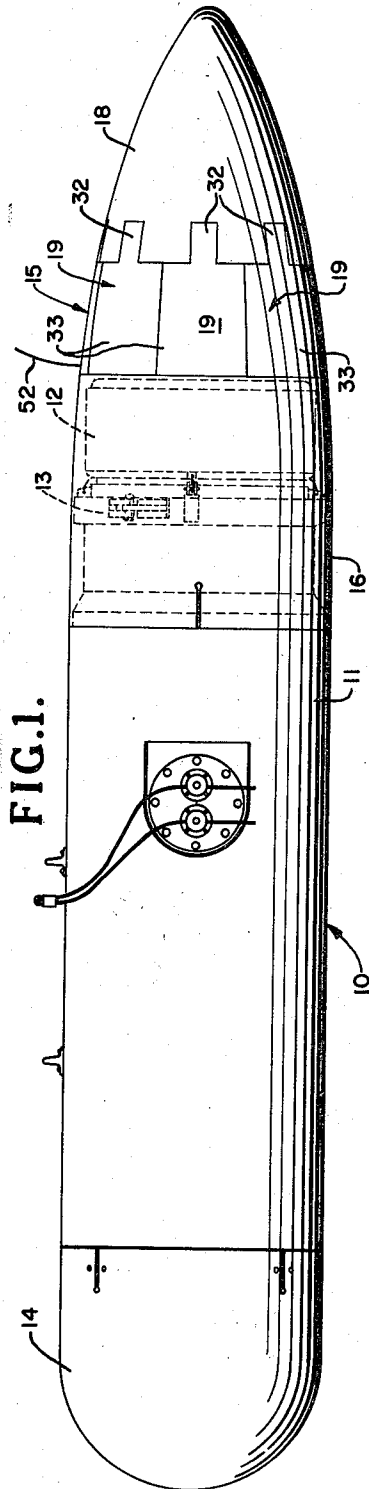


FIG. 1.

FIG. 6.

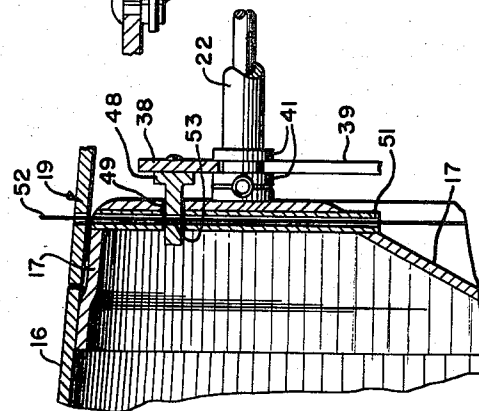


FIG. 7.

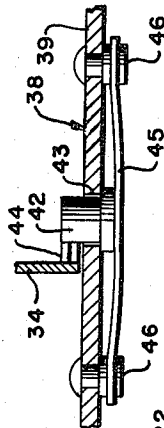
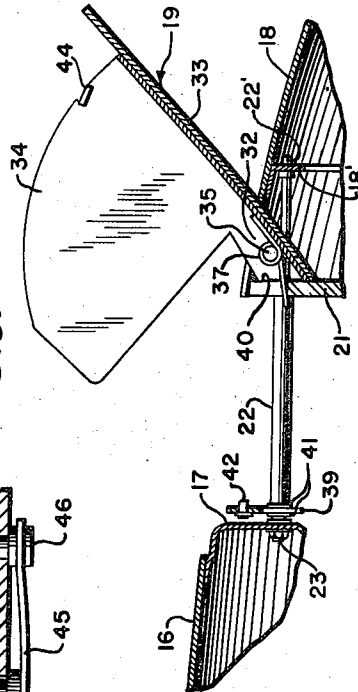


FIG. 5.



INVENTORS
G. L. FOGAL
R. E. FROELICH
S. E. WEST
M. BROCK

BY

G. L. Fogal
W. J. Rosenberg
ATTORNEYS

June 28, 1960

G. L. FOGAL ET AL

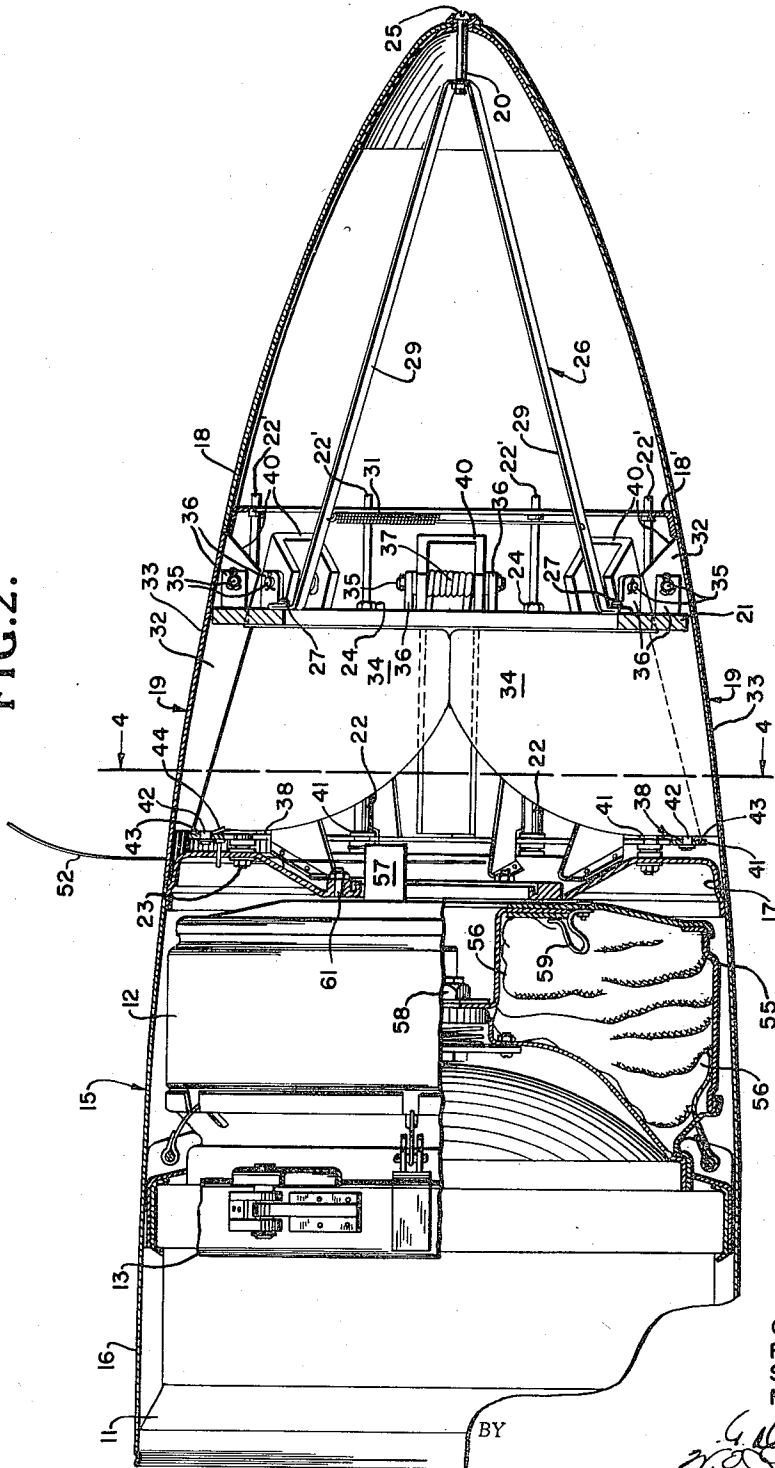
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FIG. 2.



INVENTORS
G. L. FOGAL
R. E. FROELICH
S. E. WEST
M. BROCK

G. M. O'Brien
W. E. Fuchsberg
ATTORNEYS

June 28, 1960

G. L. FOGAL ET AL

2,942,545

STABILIZING SYSTEM FOR MINE DROPPED FROM AIRCRAFT

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FIG.3.

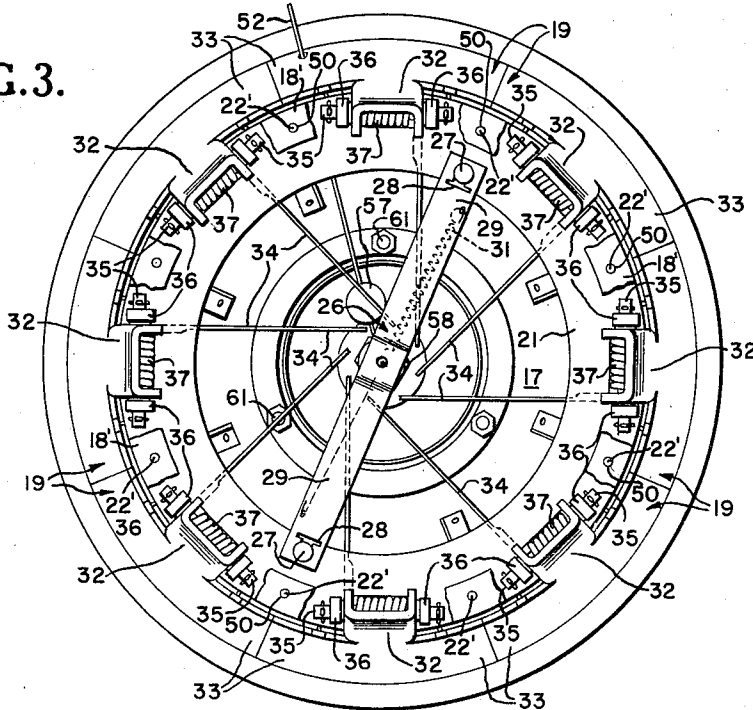
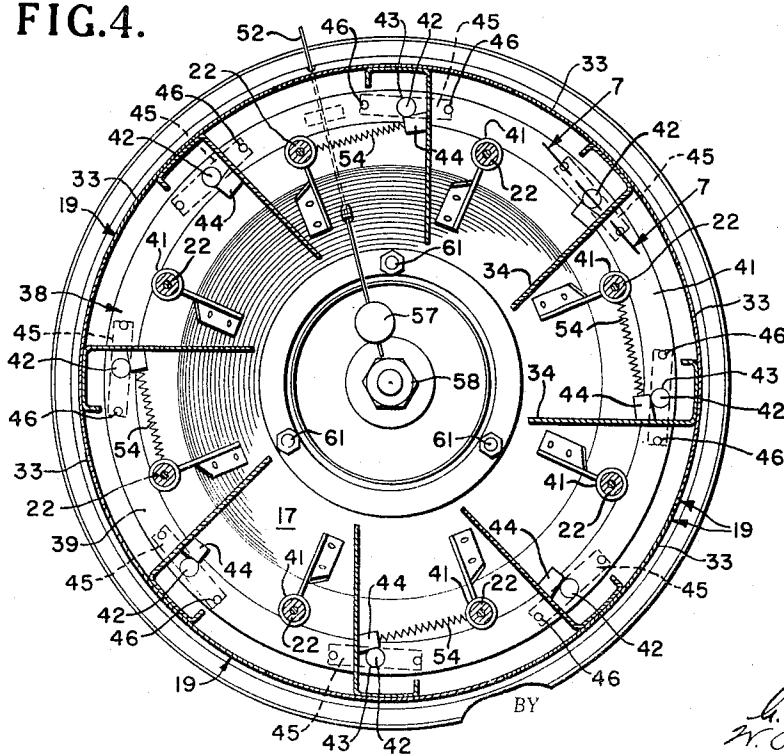


FIG.4.



INVENTORS
G. L. FOGAL
R. E. FROELICH
S. E. WEST
M. BROCK

BY *L. O. Quinn*
W. O. Sweeney
ATTORNEY

1

2,942,545

STABILIZING SYSTEM FOR MINE DROPPED FROM AIRCRAFT

Gordon L. Fogal, 2607 Parker Ave.; Richard E. Froehlich, 10213 Douglas Ave.; and Stanley E. West, 9902 Dallas Ave., all of Silver Spring, Md.; and Millard Brock, 4111 Warner St., Kensington, Md.

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5 Claims. (Cl. 102—4)

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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.

The present invention relates to a mine and more particularly to a new and improved fairing for a mine adapted to be released from a high-speed aircraft in flight.

More especially the invention relates to the streamlining of a mine casing in such a manner as to improve the aerodynamic characteristics thereof by rendering the mine less sensitive to the aerodynamic forces to which the mine is subjected when the mine is mounted and carried externally of a high-speed aircraft, including means forcibly ejected into the airstream as the mine is released from the high-speed aircraft to stabilize and increase the drag force on the free falling mine. The fairing comprises a nose portion and an aft or tail portion. The nose portion is secured to the mine casing and remains attached thereto until the mine strikes the surface of a body of water whereupon the aforesaid nose portion is torn from the mine casing or crushed sufficiently to permit proper functioning of the mine after the mine enters the water. The aft or tail portion is secured to the detachable cover of the conventional parachute pack similar to the one described and claimed in the copending application of Gordon L. Fogal et al., Serial No. 114,444, filed September 7, 1949, titled Delay Opening Parachute Pack, now Patent No. 2,812,148, issued November 5, 1959. The tail portion is provided with a plurality of retardation elements forcibly ejected into the airstream for stabilizing and increasing the drag force on the free falling mine after the mine is released from a high-speed aircraft, the retardation elements being actuated to a release position as the arming wire is withdrawn therefrom and from the conventional parachute initiating device which initiates the time delay cover release mechanism of the pack whereupon the cover is actuated to a release position and thus the cover and tail portion are detached from the mine in time delayed relation with respect to the release of the mine from the aircraft. As the cover and tail section fall away from the mine, the parachute is withdrawn from the pack by the conventional static line secured to the cover and parachute.

An object of the present invention is to provide a new and improved fairing structure for an aerial launched mine.

Another object of the invention is the provision of a streamlined fairing for an aerial launched marine mine wherein means are provided for rendering the mine less sensitive to aerodynamic forces as the mine is transported by a high-speed aircraft.

Another object of the invention is the provision of a fairing structure for an aerial launched mine for stabilizing and increasing the drag force on the mine as the mine is released from a high-speed aircraft and travels a predetermined distance therefrom.

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Still another object of the invention is the provision of a new and improved streamlined mine casing wherein the faired detachable tail portion is released from the mine casing a predetermined period of time after the mine is released from a high-speed aircraft in flight and in which a faired nose portion is forcibly detached or crushed upon impact of the mine with the surface of a body of water.

Other objects and many of the attendant advantages of the 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 drawings wherein:

Figure 1 is an elevational view of a mine illustrating the fairing constructed in accordance with the present invention secured thereto;

Figure 2 is a fragmentary longitudinal sectional view of the tail fairing and mine casing;

Figure 3 is an end elevation of the device of Figure 2 with the hood or cover removed;

Figure 4 is a sectional view taken on the line 4—4 of Figure 2;

Figure 5 is a fragmentary sectional view of the device illustrating one of the retardation or deceleration elements in an extended position;

Figure 6 is a fragmentary sectional view of the device illustrating locking means for the retardation elements; and,

Figure 7 is a detail sectional view taken on the line 7—7 of Figure 4.

Referring now to the drawings and more particularly to Figure 1 thereof, the numeral 10 generally indicates a mine comprising an elongated cylindrical casing 11 having a conventional parachute pack 12 releasably secured to the tail or trailing end thereof by a conventional release mechanism indicated by the reference character 13.

The fairing consists primarily of a nose and aft or tail section generally indicated by the reference numerals 14 and 15. The tail section comprises a cylindrical member 16 having a diaphragm or annular member 17 disposed within and secured to one end thereof and a hollow conic element 18 having a plurality of spoiler flaps 19 pivotally and releasably locked therein.

As more clearly shown on Figure 2 an annular ring 21 is disposed within the member 18 in spaced relation with respect to the diaphragm 17, the ring being supported by a plurality of mutually spaced rods 22 having one end secured to the diaphragm 17 as at 23 and the other end thereof secured to the ring 21 as at 24. The member 18 is detachably secured to the ring 21 by a bolt 20 and nut 25, the securing means including a flange 18' welded to member 18 and a shaft 22' carried by each rod 22 with each shaft disposed within an opening 50 formed in flange 18', Fig. 3. The rod is carried by a V-shaped support 26 detachably secured to the ring 21 by pins 27 mounted on the ring and slots 28 formed in the diverging legs 29 of the support 26. A spring 31 disposed between the legs 29 and having the ends thereof secured to the legs maintains the pins 27 within the slots 28 thereby to releasably lock the support 26 to the ring 21.

The spoilers or retardation elements 19 each comprises a substantially U-shaped tongue portion 32 having a relatively broad flap 33 and a reinforcing web 34 formed thereon. As more clearly shown on Figures 2 and 3, each tongue is disposed between and pivotally mounted by a pin 35 carried by a pair of mutually spaced brackets 36 respectively, the brackets being secured to ring 21 in any suitable manner such, for example, as being welded thereto. A spring 37 is disposed about the pin 35 having one end in engagement with the ring 21 and the other end in engagement with the flap 33, Figure 5, whereupon

the flaps are forcibly urged into the airstream as the locking mechanism generally indicated by the reference 38 is actuated to a release position. The tongues 32 are each provided with a bevel portion 40 adapted to engage the member 21 when the spoilers 19 are extended into the airstream thereby to limit the movement of the spoilers and thus maintain the spoilers in the airstream.

The locking mechanism comprises an annular element 39 rotatably mounted within the member 15 between a pair of mutually spaced flanges 41 formed on each of the supporting rods 22. The member 39 is provided with a plurality of locking detents 42, each detent being arranged within an opening 43 formed in the locking ring 39 and normally urged into locking engagement with a latch element 44 formed on each of the webs 34 by a leaf spring 45 in engagement with each detent and secured to the ring 39 as at 46 as more clearly shown on Figures 4 and 7.

As more clearly shown on Figure 6 the locking ring 39 is provided with a latch member 48 disposed in a slot 49 formed in the member 17 and a guide tube 51 secured to the disc 17 for supporting one end of the conventional parachute arming wire 52. The arming wire is disposed within the tube 51 and an opening 53 formed in the latch 48 whereupon the detents 42 are maintained in locking engagement with latch elements 44 on the webs 34 and rotation of the locking ring to a release position is prevented until the arming wire is withdrawn and the locking ring 39 is rotated a predetermined amount. The locking ring 39 is adapted to be rotated to a release position by a plurality of springs 54, Figure 4, each spring having one end secured to the locking ring and the other end thereof secured to one of the supports 22.

The conventional parachute pack 12 as more clearly shown on Figure 2 may be of any type suitable for the purpose such, for example, as the pack release mechanism disclosed and claimed in the copending application of Gordon L. Fogal et al., for Delayed Opening Parachute Pack, Serial No. 114,444, filed September 7, 1949, now Patent No. 2,812,148, and comprising a releasable cover 55 enclosing the parachute 56, initiating or arming means 57 actuated by the arming wire 52 as the mine is released from the aircraft, cover release mechanism 58 detachably secured to the cover for releasing the cover from the parachute pack in time delayed relation with respect to the release of the mine from an aircraft in flight, and a static line 59 secured to the cover and parachute 56 adapted to withdraw the parachute from the pack as the cover is released therefrom. The cover 55 is attached to the diaphragm 17 by bolts 61 as more clearly shown on Figures 2 and 4 and thus by this arrangement tail fairing 15 remains attached to the cover of the parachute pack until the cover release mechanism is actuated to a release position.

In operation, as the mine is released from a high-speed aircraft in flight the arming wire is withdrawn from the latch member 48 and the initiating mechanism 57 whereupon the locking ring 39 is released for rotation and concurrently therewith the parachute arming device 57 is set in operation. As the locking ring 39 is rotated in a counterclockwise direction by the springs 54, the detents 42 are moved out of locking engagement with the latches 44 carried by the webs 34 of flaps 33. When this occurs the flaps or spoilers 33 are forcibly moved into the airstream by springs 37 thereby to reduce the forward movement of the mine and cause stabilization during the free flight thereof. It will be understood, however, that the tail fairing will remain attached to the parachute pack until a predetermined altitude is reached during the descent of the mine whereupon the release mechanism 58 is actuated to a release position thereby to release the cover 55. Upon release of the cover, the cover and tail fairing 15 is forcibly detached from the mine in response to impingement of the air with the flaps 33. As the cover and tail fairing 15 move away from the mine the static line 59 pulls the parachute into the airstream and

thereafter the static line is forcibly detached therefrom as the mine moves with respect to the fairing and cover.

The aforesaid tail fairing 15 is adapted to stabilize and increase the drag force on the mine when the mine has been released from a high-speed aircraft and during the free flight of the mine toward the target sufficiently to prevent damage to the parachute as the parachute is pulled into the airstream in time delayed relation with respect to release of the mine from the aircraft. Moreover, the aforesaid fairings 14 and 15 are particularly adapted to streamline the mine casing thereby to reduce the aerodynamic forces acting thereon such, for example, as drag and buffet forces as the mine is transported externally of a high-speed aircraft, the nose section 14 is constructed and arranged to be displaced, crushed or torn from the mine casing as the mine strikes the surface of the body of water, the tail section 15 being adapted to be detached from the mine case after the mine is released from the aircraft and reaches a predetermined altitude, controlled by the time delayed mechanism and the cover release device.

Obviously many modifications and variations of the present invention are possible in the light of the above teaching. 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 in the United States is:

1. A device for stabilizing and increasing the aerodynamic drag force on a cylindrical mine as the mine is released from a high-speed aircraft in flight comprising a tapered circular tail section carried by said mine, a plurality of extendible drag flap elements, each of which is releasably locked in a retracted position with the entire outer surface thereof in coincidence with the outer surface of said tail section and pivoted transversely to the axis of the mine in a manner to be forcibly moved outwardly into the airstream as the mine is released from said aircraft, a plurality of reinforcing web members each having a pair of planar surfaces mutually parallel and respectively secured to said drag elements and movable from a concealed position within the tail section to an outwardly extending position as the drag elements are moved into said air stream for maintaining the mine on a course during free flight thereof through the air, latch means on said web members, rotatable locking means having a plurality of detents carried thereby and yieldably urged into locking engagement with said latch means respectively for releasably locking said web members and drag elements to the tail section in a retracted position until said locking means are released and rotated a predetermined amount, means in engagement with said locking means for releasing said aircraft, means connected to said locking means for rotating the locking means as the mine is released from said locking means said predetermined amount as the locking means is released, and means mounted on said extendible elements for forcibly moving said drag elements and web members into said airstream as the locking means is released.

2. A device for stabilizing and increasing the aerodynamic drag force on a cylindrical mine as the mine is released from a high-speed aircraft in flight comprising a tapered circular tail section carried by said mine, a plurality of extendible drag flap elements, each of which is pivoted transversely to the axis of the mine and releasably locked in a retracted position with the entire outer surface thereof in coincidence with the outer surface of said tail section and forcibly moved from a retracted position within the tail section to an extended position in the airstream as the mine is released from said aircraft, a plurality of reinforcing web members each having a pair of planar surfaces mutually parallel and respectively secured to said flap elements and movable therewith from a position interiorly of said tail portion

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into said airstream for maintaining the mine on a course during free flight thereof through the air, latch means carried by each of said web members, an annular member rotatably supported within said tail section and releasably locked to said tail section, a plurality of mutually spaced elements carried by said tail section and each having an annular groove therein respectively for receiving and rotatably supporting said annular member, a plurality of elements carried by said annular member and yieldably urged into locking engagement with said latch means respectively for releasably locking said flap elements and web members to the tail section in a retracted position, said last-named elements being adapted to release said latch means as said annular member is rotated a predetermined amount, means in engagement with said rotatable member for releasing said rotatable member for rotation as the mine is released from said aircraft, means secured to said member for rotating said annular member said predetermined amount as the member is released, and resilient means for forcibly urging the drag flap elements and web members into said airstream as the flap elements are released.

3. A device for stabilizing and increasing the aerodynamic drag force on a cylindrical mine as the mine is released from a high-speed aircraft in flight comprising a tapered circular tail section mounted on said mine, a plurality of extendible drag flaps, each of which is releasably locked in an initial retracted position with the entire outer surface thereof in coincidence with the outer surface of said tail section and forcibly moved from said retracted position to an extended position in the airstream as the mine is released from said aircraft, a plurality of reinforcing web-members each having a pair of planar surfaces mutually parallel and respectively secured to said drag flaps and movable from an initial concealed position within the tail section to an outwardly extending position as the drag flaps are moved into said air stream for maintaining the mine on a course during free flight thereof through the air, latch means on each of said web members, a normally locked annular rotatable element including a plurality of spring actuated detents carried thereby in locking engagement with said web members respectively for releasably locking said web members and drag flaps to said tail section in a said initial position, said detents being adapted to release said latch means as the annular element is rotated a predetermined amount, a flexible member in engagement with said rotatable element for releasing said rotatable element for rotation as the mine is released from said aircraft, spring means secured to said rotatable element and tail section for rotating said rotatable element said predetermined amount as the element is released, and a resilient element in engagement with said flaps and said tail section for forcibly urging the drag flaps and web members into said airstream as said latch means are released.

4. A device for stabilizing and increasing the aerodynamic drag force on a cylindrical mine casing as the mine is released from a high-speed aircraft in flight comprising a streamline tapered circular tail section mounted on said mine, a plurality of extendible drag flaps, each of which is releasably locked in an initial retracted position with the outer surface thereof in coincidence with the outer surface of said tail section in an initial position, said flaps being each pivoted transversely to the axis of the mine in a manner to be forcibly moved outwardly from said retracted position to an extended position in the airstream as the mine is released from the aircraft, a plurality of reinforcing web members each having a pair

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of planar surfaces mutually parallel and respectively secured to said drag flaps and movable from an initial concealed position within the tail section to an outwardly extending position as the drag flaps are moved into said air stream for maintaining the mine on a course during free flight thereof through the air, a normally locked annular member rotatably supported on said tail section, a latch member carried by each of said web members, a plurality of spring actuated detents arranged on said annular member in locking engagement with the latch members respectively for releasably locking the web members and drag flaps to the tail section in said initial position, said detents being adapted to release said latch members as the annular member is rotated a predetermined amount, means in engagement with said annular member for releasing the annular member for rotation as the mine is released from the aircraft, a plurality of coil springs secured to said annular member and said tail section for rotating said annular member said predetermined amount, resilient means in engagement with said flaps and the tail section for forcibly moving the flaps and web members outwardly into said airstream as said latch members are released, and means on said flaps movable into engagement with said tail section for limiting said outward movement of the flaps.

5. A fairing for an aerial launched cylindrical mine comprising a streamlined nose and tapered circular tail section, a plurality of extendible drag flaps releasably locked to said tail section and pivotally movable about a plurality of axes each normal to the axis of the mine, from an initial position in which the flaps are a smooth continuation of the exterior surface of said tail section in a direction outwardly when released, a plurality of reinforcing web members respectively secured to said flaps and movable therewith from an initial position within the tail section to an outward position within the air stream for maintaining the mine on a course during free flight thereof through the air, a normally locked annular member rotatably supported within said tail section, a plurality of mutually spaced elements carried by said tail section and having an annular groove therein respectively for receiving and rotatably supporting said annular member, detent means carried by said annular member in locking engagement with said web members for locking said web members and flaps to said tail section in said initial position until the annular member is rotated a predetermined amount, flexible means releasably secured to said annular member for releasing said annular member for rotation as the flexible means is withdrawn therefrom, means secured to said annular member in engagement with said detent means for yieldably urging said detent means into locking engagement with said web members, spring means secured to the annular member and said tail section for rotating said annular member said predetermined amount as the annular member is released, and means mounted on said flaps for forcibly moving the flaps and web members in said outwardly direction.

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