

Nov. 4, 1958

D. E. STARTZELL

2,858,765

SPRING-LOADED, LOCKING HINGE FIN ASSEMBLY

Filed Aug. 7, 1956

2 Sheets-Sheet 1

FIG. 1.

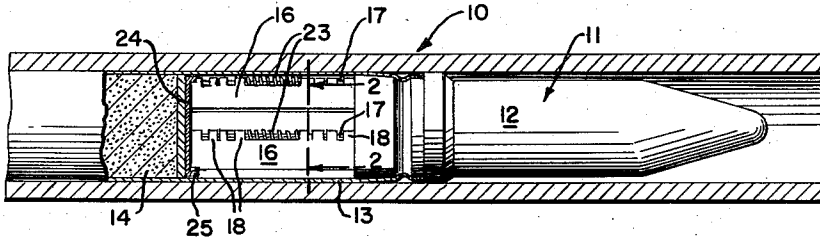


FIG. 2.

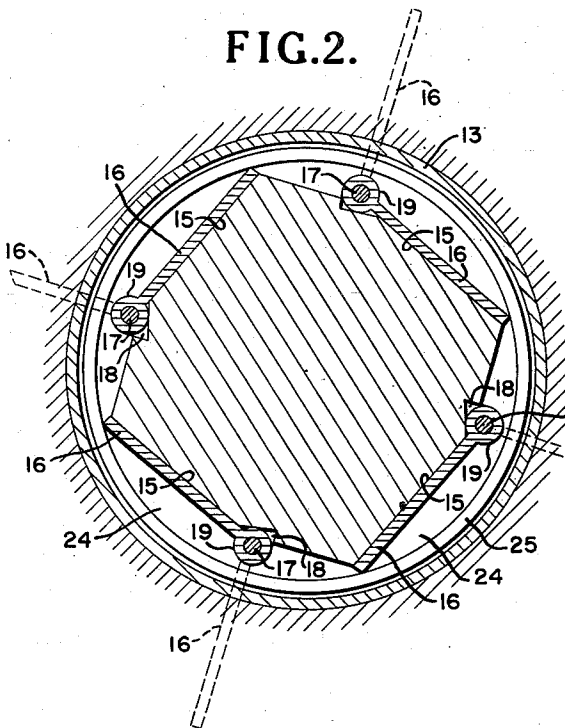


FIG. 3.

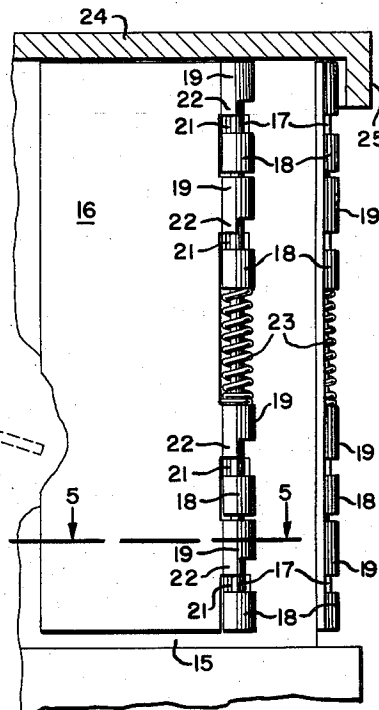
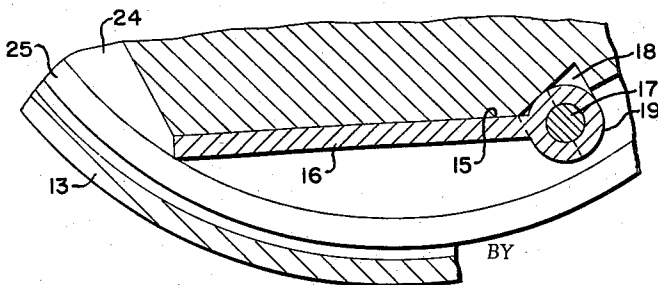


FIG. 5.



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FIG. 4.

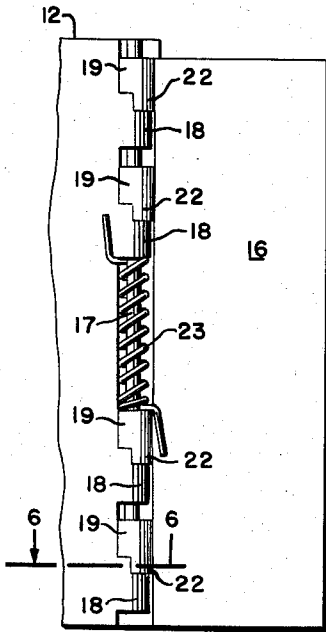


FIG. 10.

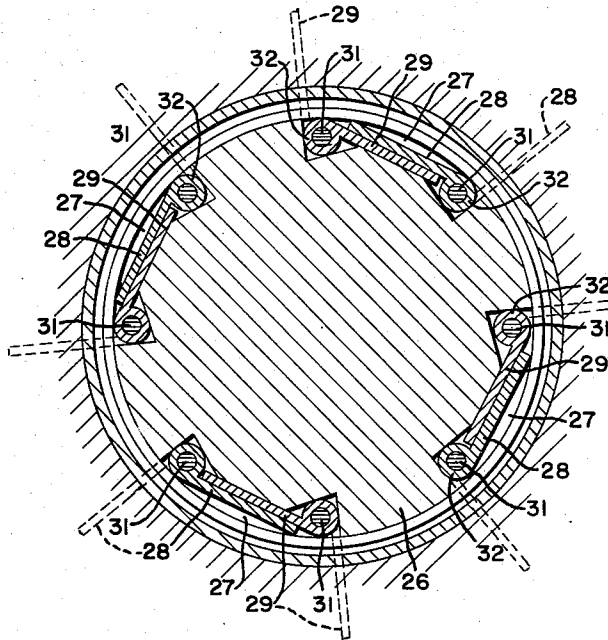


FIG. 7.

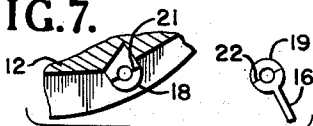
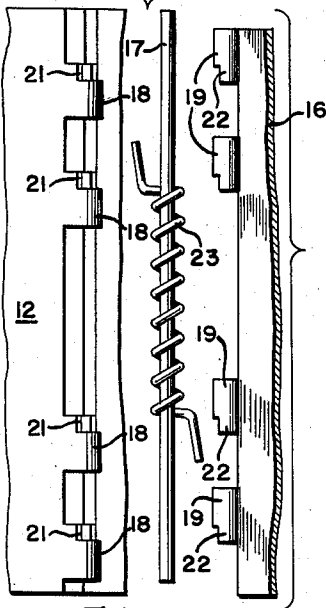


FIG. 8.

FIG. 11.

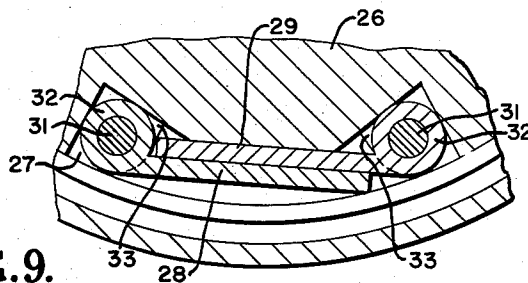


FIG. 9.

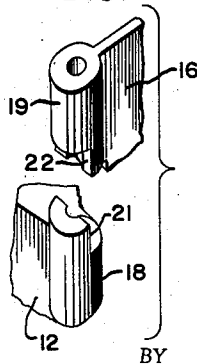
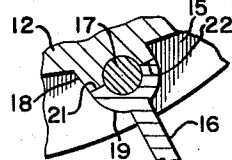


FIG. 6.



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SPRING-LOADED, LOCKING HINGE FIN ASSEMBLY

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Application August 7, 1956, Serial No. 602,674

1 Claim. (Cl. 102—50)

(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.

The present invention relates to an ordnance missile and more particularly to a new and improved collapsible stabilizing fin assembly for use with an explosively propelled ordnance missile.

More especially the invention relates to a stabilizing assembly for an ordnance missile having a plurality of fins pivotally mounted on the missile and releasably maintained in a closed or retracted condition by the cylindrical wall of the gun barrel and in which means are provided for forcibly ejecting the fins into the airstream and concurrently therewith locking the fins in an extended position as the missile is fired and clears the muzzle of the gun thereby to stabilize the missile as the missile travels along its trajectory.

Although the invention is described with use on gun fired projectiles, for explanatory purposes, the novel fin arrangement herein disclosed has utility in any type of propelled missiles which requires fin-stabilization such, for example, as rockets, guided missiles, etc. Also, the fins need not necessarily be extended upon emergence from the gun barrel, but may be maintained in a retracted position by any suitable timing device or distance determining means until the missile has attained a predetermined point in its trajectory, at which point the timing device will be effective to enable forcible extension of the fins. As an example of this delayed operation, it is well known that some rockets have two stages, one of which is releasably disconnected therefrom at some point in its trajectory. Any suitable arrangement can be provided to extend the fins upon the occurrence of the aforedescribed disconnection.

An object of the present invention is to provide a new and improved collapsible stabilizing assembly for use with an ordnance missile.

Another object of the invention is the provision of a stabilizing assembly for use with an ordnance missile explosively propelled from a gun and in which the stabilizing means are forcibly ejected into the airstream as the missile clears the gun muzzle.

Still another object of the invention is the provision of a stabilizing assembly for use in an ordnance missile and having a plurality of stabilizing fins forcibly ejected into the airstream and which are locked and maintained in an extended position thereby to stabilize the missile during the flight of the missile along its trajectory.

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:

Fig. 1 is a central longitudinal sectional view partly in section and partly broken away illustrating the device of the present invention attached to an explosively propelled projectile;

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Fig. 2 is an enlarged sectional view taken on the line 2—2 of Fig. 1;

Fig. 3 is an enlarged elevational view of one of the fins in a retracted position;

Fig. 4 is a view similar to Fig. 3 with the fin in an extended locked position;

Fig. 5 is an enlarged sectional view taken on the line 5—5 of Fig. 3;

Fig. 6 is an enlarged sectional view taken on the line 6—6 of Fig. 4;

Fig. 7 is an exploded view in plan of a fragmentary portion of one of the fins and the body member;

Fig. 8 is an exploded view in elevation of the locking structure;

Fig. 9 is an exploded view in perspective of a fragmentary portion of one of the fins and the body member;

Fig. 10 is a view similar to Fig. 2 illustrating an alternative arrangement of the device of Fig. 1; and

Fig. 11 is an enlarged fragmentary sectional view of one of the fin arrangements of Fig. 10.

Referring now to the drawings and more particularly to Fig. 1 thereof, the numeral 10 indicates a mortar or gun barrel having disposed therein an explosively propelled projectile generally indicated by reference character 11. The projectile may be of any conventional type and comprises projectile body 12 carried by a shell 13 in which is arranged the propellant charge 14.

As more clearly shown on Fig. 2 the body 12 has formed therein a plurality of diametrically disposed recesses 15, each recess receiving a stabilizing fin 16 pivotally mounted on the body 12 by a pin 17 extending through a plurality of hinge barrels 18 formed on the body 12 and a plurality of complementary hinge barrels 19 formed on the fins 16. Barrels 18 are each provided with a lip or locking detent 21, and barrels 19 are each provided with a lip or locking detent 22, the aforesaid detents being normally out of locking engagement with respect to each other when the fins 16 are within the recesses 15 and in a retracted condition as shown on Fig. 3.

A torsion compression spring 23 is disposed about each of the shafts or pins 17, one end of the spring being in engagement with the body 12, the other end thereof being in engagement with the fin 16 as more clearly shown on Fig. 4. By this arrangement it will be understood that the fins are normally urged in an outwardly and downwardly direction by the torsion compression spring 23 and thus as the projectile is fired and the body 12 clears the end of the barrel 10 the fins are forcibly moved outwardly and downwardly by the spring 23 whereupon the fins are ejected into the airstream and concurrently therewith the detents 21 and 22 are moved into locking engagement with respect to each other thereby locking the fin in an extended and stabilizing position as more clearly shown on Figs. 4 and 6.

It will be noted, Fig. 3, that when the fins 16 are in a retracted position the terminal ends of detents 21 and 22 are in abutting engagement with respect to each other and thus the detents are maintained out of alignment in an unlocked position. In this position it will be understood that the spring 23 is under compression and a substantial amount of torque is applied thereto. Thus when the fins are released and in response to the torsion force applied thereto by the spring the fins are rotated outwardly until the corresponding locking surfaces on detents 21 and 22 are aligned with respect to each other whereupon the fins are moved downwardly in response to the force applied thereto by the spring and thus detents 22 are moved into and maintained in locking engagement with detents 21 with the fins 16 extending into the airstream.

The fins 16 may be maintained in a retracted position

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and within the recesses 15 in any suitable manner such, for example, as by a member 24 detachably arranged on the end of the body 12 and having an annular flange 25 formed thereon in engagement with the fins. The member 24 is adapted to receive the force of the explosion as the charge 14 is fired thereby to prevent damage to the fin assembly, it being understood, however, that when the body 12 clears the gun barrel the member 24 will fall away from the body and the fins will be actuated and locked in an extended position in the manner heretofore set forth.

In the arrangement of Fig. 10, the body 26 is provided with a plurality of recesses 27, each of the recesses having radially disposed planar surfaces at the two longitudinal sides thereof and a planar surface disposed intermediate the side surfaces and generally perpendicular to the radius midway between the side surfaces. Supported within each recess is a pair of fins 28—29, fins 28—29 being pivotally mounted on the body 26 by pins 31, there being a pin 31 adjacent each of the two planar side surfaces of the recess, respectively. The fins are provided with hinge barrels 32 similar to hinge barrels 19, the body being provided with hinge barrels 33 similar to barrels 18. It will be understood that the barrels 32—33 are each provided with lips or locking detents similar to the locking detents on barrels 18—19 adapted to lock the fins 28—29 in an extended position. It will be further understood that in this arrangement the pins 31 are each provided with a torsion compression spring for actuating fins 28—29 to an extended locked position when the fins are released such, for example, as by the member 24 as the projectile clears the gun barrel or by a conventional arming wire used in connection with an air-borne bomb, the arming wire being adapted to maintain the fins in a retracted position until the bomb is released from an aircraft in flight and to release the fins for actuation to an extended position as the bomb is released from an aircraft in flight. Moreover, each pin 31 is positioned adjacent its respective planar side surface of the recess so that the associated fin, in the extended radially-disposed position thereof, abuts the respective side surface and is disposed radially of the body.

Although the invention has been described in particularity in connection with a projectile, it will be understood that, if desired, it may be advantageously used with rockets, bombs and the like wherein the fins are maintained in a retracted position by any suitable releasing means adapted to be released as the missile is launched from an aircraft in flight or from a launching rack as the

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case may be whereupon the fins are ejected into the airstream by the springs and locked in the extended position by the complementary lips or locking detents formed on each of the hinge barrels carried by the fins and body.

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 claim 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:

A stabilizing fin assembly for an ordnance missile comprising an elongated body having a plurality of pairs of diametrically-disposed longitudinal recesses formed in the periphery thereof, each recess having radially-disposed planar side surfaces and an intermediate planar surface, said intermediate planar surface being disposed generally perpendicular to the radius midway between said side surfaces, a pair of sets of support members disposed in each of said recesses respectively, one set of members of said pair being fixed to said body adjacent one side surface of the respective recess and the other set of members of said pair being fixed to said body adjacent the opposite side surface of said recess, a plurality of hinge shafts, each of said hinge shafts being carried by each set of said sets of members respectively, a plurality of pairs of flat planar fins, each of said pairs of fins being mounted for pivotal movement on the pair of hinge shafts of each recess respectively, one of said pair of fins being normally folded inwardly and in contact with said intermediate planar surface, the other of said pair of fins being normally folded inwardly and in overlapping contact with said one fin, a spring mounted on each of said hinge shafts respectively, each spring being operatively connected to said body and its respective fin and exerting a torsional force tending to pivot the fin outwardly to a position in which the fin is abutting the adjacent side surface and is radially disposed, and means locking said fins in said radially-disposed positions.

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