This invention relates to rocket projectiles, and more particularly, to the tail fins provided thereon to stabilize their flight. It has been heretofore proposed to provide a tail fin assembly for rocket projectiles of the same general construction herein employed, but the prior construction presented certain limitations therein, fully explained herein, which is the object of the instant invention to overcome. A further object of the invention is to improve the prior construction so that its parts, particularly the main member or spider, may be stamped instead of cast, and to otherwise improve and simplify the construction thereof. For the attainment of these objects and such other objects as may appear herein or be pointed out we have shown an embodiment of the improved device in the accompanying drawing, wherein:

Fig. 1 is a section through the port end of a rocket projectile showing the improved fin assembly in place with the blades in nested, ineffective position.

Fig. 2 is a similar section but showing the blades in effective protruding position.

Fig. 3 is a cross section taken on the line 3--3 of Fig. 2.

Fig. 4 is an end view of the port end of the projectile, with the blades in closed, ineffective position.

Fig. 5 is an elevational view of the main body or spider of the improved fin assembly.

Fig. 6 is a top view of a temporary retainer ring employed to hold the blades in closed, ineffective position.

Fig. 7 is a top view of a blade.

Fig. 8 is a section through the blade taken on line 8--8 of Fig. 7.

Fig. 9 is a modified form of blade construction, the showing being a sectional view similar to Fig. 8.

Both the prior construction and the improved construction of this invention comprises an annular slider 10, a plurality of blades 20 pivotally mounted on the spider, and a retainer ring 30.

The spider 10 which constitutes the main supporting member of the assembly, is an annular ring which in the prior construction is of quite irregular shape which makes it impossible to be stamped. The improved spider 10 of this invention is of much simpler sectional shape, best seen in Fig. 1, which enables it to be stamped from sheet material. As in the prior construction, the improved annular spider has two annuli of different diameter. The annulus of smaller diameter 11 is secured in any suitable manner at the rear edge 9 of the rocket port. The annulus 12 of larger diameter extends somewhat to the rear, Figs. 1 and 2, of the port edge, and is preferably internally rounded, as shown, as is the port 8, to offer less resistance to the efflux of gases. The portion of the annular spider connecting the securement annulus 11 of smaller diameter and the efflux annulus 12 of larger diameter forms a hub 13 in which are provided a plurality of slots 14 equidistanted from each other, to accommodate the same number of blades. Six such slots are shown in Fig. 9 for illustrative purposes, as the number of blades may be less or more than this number.

The blades 20 are provided with a small aperture 25, near one end thereof, Fig. 7. When the blades, or rather the said apertured ends thereof, are inserted through the slots 14 of spider hub 13, the said blade apertures 25 will be disposed inside the spider 10, as clearly seen in Figs. 1 and 2. Moreover, the said blade apertures will be annularly aligned so as to receive a small diametrical rod 15 which is curved in the shape of a circular ring. Ring 15 serves to hold the plurality of blades in place on spider 10 and also to pivotally mount the individual blades. Ring rod 15 may be made of resilient or springy material so that it may be retained in place within the spider 10 by its resiliency. The ring rod may be held in place within the annular spider by being spot welded thereto at one or more points.

The blades are made of the proper width and length to permit them to nestle in the annular space surrounding the narrowed neck 8 at the rear of the body 7 of the projectile. When the blades are nested in ineffective position, as shown in Fig. 1, they present no protruding part beyond the projectile body 7, as the projectile passes through the gun barrel. The distal edges of the blades, Fig. 8, are beved 26, to conform with the sloped shoulder 6 between the projectile neck 8 and body 7.

One of the objections found in the prior construction was the liability of the blade pins to be snapped and broken as a result of stress imposed upon the pins due to the considerable momentum imparted to the blades in being thrown outwardly to effective position upon discharge of the gun. The improved construction of this invention overcomes this objection by removing all blade-opening strain from the ring rod 15 which is the counterpart of the individual blade pins of the prior construction. Instead of taking the impact of the opening blades on the pins, as in
the prior construction, two abutting surfaces are provided on the blade which contact two abutting surfaces of the annulus 11. The blade abutting surfaces, designated 27 and 28 and best shown in Fig. 7, are on opposite sides of aperture 26 although they need not be diametrically opposed. The spider abutting surfaces, designated 17 and 18 and best shown in Fig. 3, are respectively, the edge of the hub slot 14 at or substantially at the juncture of hub 13 and the securement annulus 11, and the other edge of the slot at or substantially at the juncture of hub 13 and the efflux annulus 12. As clearly seen in Fig. 3, blade surface 26, abuts spider surface 17, the spider surfaces 17 and 18 being angularly and radially related to the ring rod 15 as are the corresponding blade abutting surfaces 27 and 28 related to blade aperture 26. The blade aperture 25 is made over-sized in comparison with the diameter of ring rod 15 so that the respective abutting surfaces of the blade and spider, 17—27 and 18—28, come into contact when the blades are thrown out in a manner precluding the reacting of the blade material surrounding its aperture 25, with the ring rod 15.

A retainer ring 30, detailed in Figs. 6—7, is provided for the purpose of holding the blades in a retracted, ineffective position during loading and handling of the projectile. Retainer ring 30 is fabricated of sheet metal in washer shape, Fig. 6. The outer edge of the ring is provided with a number of cam surfaces 32 equal to the number of the number of blades, six as illustrated. As best seen in Fig. 4, the outer edge of the ring and cam surfaces 32 are so dimensioned that the radial distance at the low point or beginning of the cam is somewhat less than the radial distance to blade contacting surface 21 when the blade is in nestled ineffective position, as they are in Fig. 4. The high point of the cam, however, is at a greater radius distance from the center, this distance being such that the cam surface, when the retainer ring is turned counterclockwise, as viewed in Fig. 4 will bear firmly against blade surface 31 to securely hold the blade in closed or ineffective position (as shown in Fig. 4). Limiting stops 36 are provided at the terminal or high point of cam surfaces 32. To facilitate this turning of the retainer ring, its inner edge may be provided with a pair of opposed notches 33 to receive an appropriate tool. The retainer ring is blown off by the rocket blast, to permit the blades to be turned to open or effective position, upon discharging the gun. For this reason the retainer ring is made sufficiently wide to present its inner edge portion in the path of the rocket blast.

To hold the blades firmly in their open or effective position one or both faces of the blade near its distal end is provided with a pronounced punched burr 29, see Fig. 8, conveniently made by striking it with a punch. The punch burr 29 is so positioned, see Fig. 1, that it will be forced into the slot, upon the sudden opening of the blades, to securely hold the blades in their opened position. As an alternate form, the projection may be made by cold forging a lip 24, see Fig. 5.

We claim:
1. In a tail fin assemblage for a rocket projectile having a reduced discharge neck, of the type having an annular spider, a plurality of blades pivotally mounted thereon and a retainer ring, the combination of an annular spider stamped from sheet metal to present two annuli of different diameter joined by a hub portion, the annulus of larger diameter beyond the rocket port, a plurality of blades having an aperture at one end and a pair of abutting surfaces disposed on opposite sides of the said aperture, the said hub portion of the spider being provided with a plurality of equidistanted slots adapted to receive the said apertured end of the blades, a rod in the form of a ring disposed within the said annular spider and received in the said blade apertures to pivotally mount the said plurality of blades, the ends of the said spider hub slots serving as stops for the said abutting surfaces of the blades when turned to their effective, protruding position, the said blade apertures being larger than the said ring rod whereby the blade turning is stopped by abutment of the said blade surfaces with the said ends of the spider hub slots without straining the said ring rod, the face of the said blades being provided with a projection at the apertured end thereof adapted to be jammed, i.e., the blade material surrounding its aperture 25, with the ring rod 15.

2. In a tail fin assemblage for a rocket projectile having a reduced discharge neck, of the type having an annular spider, a plurality of blades pivotally mounted thereon and a retainer ring, the combination of an annular spider stamped from sheet metal to present two annuli of different diameter joined by a hub portion, the annulus of small diameter being secured at the rocket port of the said reduced neck to position the annulus of larger diameter beyond the rocket port, a plurality of blades having an aperture at one end and a pair of abutting surfaces disposed on opposite sides of the said aperture, the said hub portion of the spider being provided with a plurality of equidistanted slots adapted to receive the said apertured end of the blades, a rod in the form of a ring disposed within the said annular spider and received in the said blade apertures to pivotally mount the said plurality of blades, the ends of the said spider hub slots serving as stops for the said abutting surfaces of the blades when turned to their effective, protruding position, the said blade apertures being larger than the said ring rod whereby the blade turning is stopped by abutment of the said blade surfaces with the said ends of the spider hub slots without straining the said ring rod, the face of the said blades being provided with a projection at the apertured end thereof adapted to be jammed, i.e., the blade material surrounding its aperture 25, with the ring rod 15.
blades pivotally mounted thereon and a retainer ring, the combination of an annular spider stamped from sheet metal to present two annuli of different diameter joined by a hub portion, the annulus of small diameter being secured at the rocket port of the said reduced neck to position the annulus of larger diameter beyond the rocket port, a plurality of blades having an aperture at one end and a pair of abutting surfaces disposed on opposite sides of the said aperture, the annulus of the blade being provided with a plurality of equidistanted slots adapted to receive the said apertured end of the blades, a rod in the form of a ring disposed within the said annular spider and received in the said blade apertures to pivotally mount the said plurality of blades, the ends of the said spider hub slots serving as stops for the said abutting surfaces of the blades when turned to their effective, protruding position, the said blade apertures being larger than the said ring rod whereby the blade turning is stopped by abutment of the said blade surfaces with the said ends of the spider hub slots without straining the said ring rod, and a retainer ring adapted to hold the blades in their ineffective position.

6. In a tail fin assemblage for a rocket projectile having a reduced discharge neck, of the type having an annular spider, a plurality of blades pivotally mounted thereon and a retainer ring, the combination of an annular spider stamped from sheet metal to present two annuli of different diameter joined by a hub portion, the annulus of small diameter being secured at the rocket port of the said reduced neck to position the annulus of larger diameter beyond the rocket port, a plurality of blades having an aperture at one end and a pair of abutting surfaces disposed on opposite sides of the said aperture, the said hub portion of the spider being provided with a plurality of equidistanted slots adapted to receive the said apertured end of the blades, a rod in the form of a ring disposed within the said annular spider and received in the said blade apertures to pivotally mount the said plurality of blades, the ends of the said spider hub slots serving as stops for the said abutting surfaces of the blades when turned to their effective, protruding position, the said blade apertures being larger than the said ring rod whereby the blade turning is stopped by abutment of the said blade surfaces with the said ends of the spider hub slots without straining the said ring rod, and a retainer ring adapted to hold the blades in their ineffective position.
8. In a tail fin assembly for a rocket projectile having a reduced discharge neck, of the type having an annular spider, a plurality of blades pivotally mounted thereon and a retainer ring, the combination of an annular spider stamped from sheet metal secured at the rocket port of the said reduced neck, a plurality of blades having an aperture at one end and a pair of abutting surfaces disposed on opposite sides of the said aperture, the said spider being provided with a plurality of equidistanted slots adapted to receive the said apertured end of the blades, a rod in the form of a ring disposed within the said annular spider and received in the said blade apertures to pivotally mount the said plurality of blades, the ends of the said spider slots serving as stops for the said abutting surfaces of the blades when turned to their effective, protruding position, the said blade apertures being larger than the said apertured end of the blades whereby the blade turning is stopped by abutment of the said blade surfaces with the said ends of the spider slots without straining the said ring rod.

9. In a tail fin assembly for a rocket projectile having a reduced discharge neck, of the type having an annular spider, a plurality of blades pivotally mounted thereon and a retainer ring, the combination of an annular spider stamped from sheet metal, secured at the rocket port of the said reduced neck, a plurality of blades having an aperture at one end and a pair of abutting surfaces disposed on opposite sides of the said aperture, the said spider being provided with a plurality of equidistanted slots adapted to receive the said apertured end of the blades, pin means hingedly securing the blades at their said apertures to the said spider, the ends of the said spider slots serving as stops for the said abutting surfaces of the blades when turned to their effective, protruding position, the said blade apertures being larger than the said pins whereby the blade turning is stopped by abutment of the said blade surfaces with the said ends of the spider slots without straining the said pins.

10. In a tail fin assembly for a rocket projectile having a reduced discharge neck, of the type having an annular spider, a plurality of blades pivotally mounted thereon and a retainer ring, the combination of an annular spider stamped from sheet metal secured at the rocket port of the said reduced neck, a plurality of blades having an aperture at one end, the said spider being provided with a plurality of equidistanted slots adapted to receive the said apertured end of the blades, pin means hingedly securing the blades at their said apertures to the said spider, the face of the said blades being provided with a projection at the apertured end thereof adapted to be jammed in the said spider slot to hold the blade in effective protruding position.

11. The combination according to claim 10 in which the said projection is formed by punching a burr in the blade face.

12. The combination according to claim 10 in which the said projection is formed by cold forming a lip on the blade face.

13. In a tail fin assembly for a rocket projectile having a reduced discharge neck, of the type having an annular spider, a plurality of blades pivotally mounted thereon and a retainer ring, the combination of an annular spider stamped from sheet metal secured at the rocket port of the said reduced neck, a plurality of blades having an aperture at one end, the said spider being provided with a plurality of equidistanted slots adapted to receive the said apertured end of the blades, a rod in the form of a ring disposed within the said annular spider and received in the said blade apertures to pivotally mount the said plurality of blades.

14. The combination according to claim 13 wherein the said ring rod is formed of springy material and retained in place within the said annular spider by its resiliency.

15. The combination according to claim 13 wherein the said ring rod is spot welded in place within the said annular spider.

16. For use with a rocket having a pivoted tail fin assembly, a retaining member comprising a flat annulus having its outer edge formed in recurring spiral portions to form a camming means for the pivoted tail fins.

17. In a retaining member as in claim 16, stop means at the outermost extremity of each spiral means.

18. In a projectile having a trailing portion, fin mounting means carried by said trailing portion and having a plurality of circumferentially spaced slots, each slot extending longitudinally of the projectile and having circumferentially spaced side walls, a flat fin disposed in each slot, pivot means extending transversely of said slots and through said fins and pivotally supporting said fins for pivoting movement from a position longitudinally adjacent the projectile to a radially outward position, said slots and fins having sufficient clearance to permit unrestrained pivoting movement of said fins to said radially outward position and an integral portion on each fin extending outwardly from one face thereof, said integral portion being effective only upon the fin reacting its approximate radial outward position to engage one wall of the slot within which the fin is positioned to wedge the fin firmly in the slot upon reaching its final radially outward position.

19. In a projectile having a trailing portion, fin mounting means carried by said trailing portion and having spaced wall portions defining a fin receiving recess, said wall portions being radially and longitudinally disposed relative to the projectile, and a flat fin element disposed in said recess and pivotally pivotable means for movement from a position longitudinally adjacent the projectile to a radially outward position, said fin element having at one face portion an integral protuberance so arranged relative to said wall portions and the pivotal axis of said fin element as during pivotal movement of said fin element to said outward position to engage with one of said wall portions as said fin element approaches said outward position to frictionally engage said one wall portion and firmly wedge said fin element between said wall portions.

HARRY J. LEBHERZ.
LESLIE A. SKINNER.

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