Aug. 6, 1946. C. L. EKSERGIAN 2,405,415

ROCKET PROJECTILE

Filed April 25, 1944

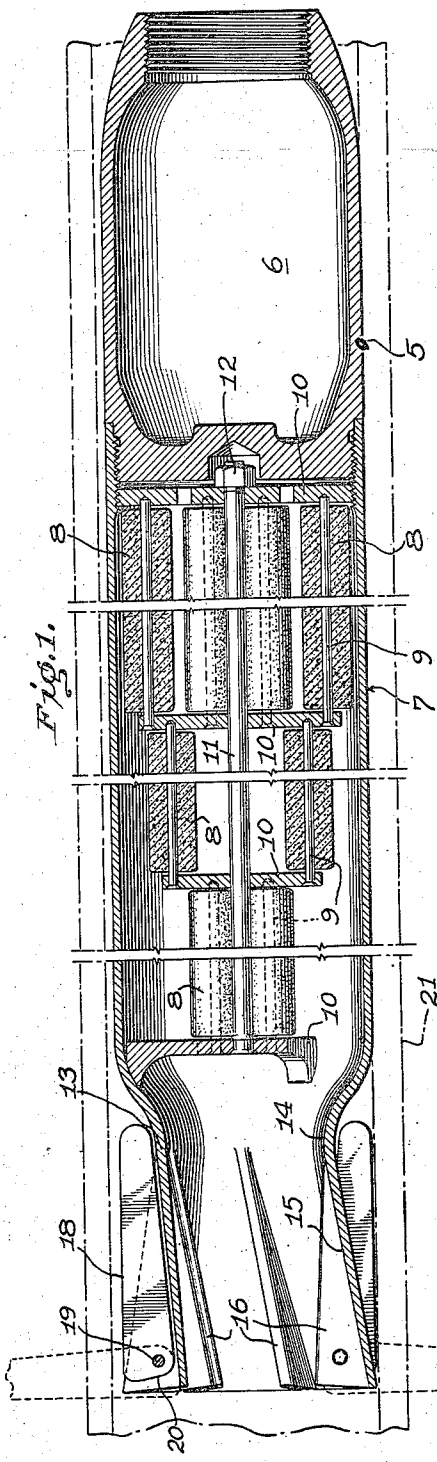


Fig. 1.

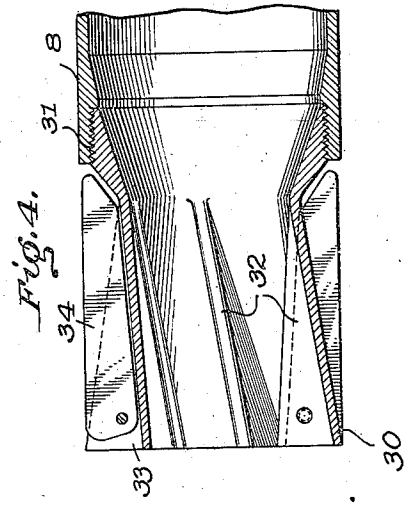


Fig. 4.

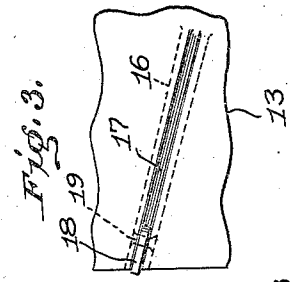


Fig. 3.

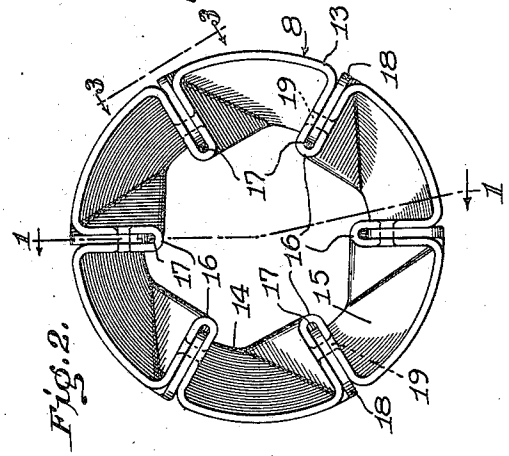


Fig. 2.

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2,405,415

ROCKET PROJECTILE

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2 Claims. (Cl. 102—49)

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This invention relates to projectiles and the like of the so-called "rocket-type."

The invention is directed particularly to that type of rocket projectile wherein the casing, which houses the propelling charge, is provided with a rearwardly opening, axial, Venturi passage. It has been the practice in this type of rocket projectile to provide a number of stabilizing fins which are pivoted to a mounting ring or the like carried by the rearward end of the casing, that is, the casing portion which forms the Venturi passage. This type of projectile is guided, when projection is initiated, by a projector tube only slightly greater in diameter than the projectile and it is for this reason that the fins are pivoted so as to be positioned longitudinally adjacent the rearward end of the casing during the passage of the projectile through the projector tube.

For most efficient operation of a rocket projectile of this nature, the area of the throat of the Venturi passage should be in the neighborhood of one-half of the area of the rearward outlet of the passage. It is well-known that the velocity attainable is a function of the total amount or weight of the propelling charge and also that the weight of the propelling charge is a function of the area of the Venturi passage throat. In other words, the area of the throat of the Venturi passage controls the amount of propelling charge that can be used and the amount of propelling charge controls the maximum projectile velocity that can be attained. By increasing the size of the Venturi throat, a greater amount of propelling charge can be used and this results in greater velocity and, hence, more effective operation as respects range and penetrating power.

In the type of rocket projectile described, the fin and fin mounting ring arrangement which must fit within the projector ring and be of a maximum diameter not greater than that of the projectile in order to insure proper projection, necessarily restricts the size of the Venturi passage.

The aim of the present invention is to provide a fin mounting arrangement of such new and improved construction that the Venturi passage may be of substantially maximum area for the diameter of propelling charge casing employed whereby to permit the use of a propelling charge of such character as to provide for most efficient operation.

Another object is to provide a rocket type projectile of the type herein referred to with a means forming the Venturi passage which is so shaped as to form mounting slots for the stabilizing fins

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and permit of a Venturi passage of substantially maximum size.

With the above and other objects in view which will be apparent from the following description to those skilled in the art to which the invention appertains, the present invention consists in certain features of construction and combinations of parts to be hereinafter described with reference to the accompanying drawing, and then claimed.

In the drawing which illustrates a suitable embodiment of the invention:

Figure 1 is a fragmentary longitudinal section of the rocket projectile, taken substantially on line 1—1 of Figure 2;

Figure 2 is an enlarged rear end view of the projectile shown in Figure 1;

Figure 3 is a reduced plan view of the Venturi end of the projectile, taken substantially in the direction of the arrows 3—3 of Figure 2; and

Figure 4 is a longitudinal section of a modified form of Venturi structure.

Referring to the accompanying drawing, the rocket projectile includes a projectile body 5 having a chamber 6 therein for the reception of an explosive charge (not shown). Threaded to the rearward end of the body 5 is an elongated tubular casing 7 which houses the propelling charge. The propelling charge is in the form of a plurality of annular arranged series of annular charge sticks 8 carried by rod elements 9. The rod elements 9 extend between spacer plates 10 which are secured together by a center rod 11 carried by the rearward spacer plate and extending through the intermediate plates and the forward plate, the extending end of the rod 11 being threaded to receive a nut 12 which holds the elements in assembled relation. The rearward plate 10 is in the form of a spider which engages the inner wall of the casing 7 to center the rearward end of the charge assembly, and the forward plate 10 is threadably supported within the threaded forward end of the casing 7. Other suitable arrangements, however, may be employed for supporting and properly locating the charge sticks 8 within the casing 7.

In accordance with the present invention, the rearward or trailing end 13 of the casing 8 is so swaged down, or otherwise formed in manners well-known in the art, as to provide a rearwardly and axially opening Venturi passage having a restricted throat 14 and a rearwardly flaring wall 15. During the forming operation, portions of the metal of the Venturi passage wall are reversely folded inwardly to form a plurality of circumferentially spaced internal vanes 16, the re-

versely bent portions of each of the vanes 16 forming an elongated slot 17. The vanes 16 originate at regions rearwardly adjacent the throat 14 and may be disposed at an angle to the axis of the Venturi passage whereby to intersect the path of travel of the propellant gases flowing through the Venturi passage and impart rotation to the projectile, or, if rotation by the vanes is not desired, the vanes may be longitudinal.

It is to be noted from the drawing that the outer periphery of the Venturi wall at the outlet end is substantially of the same diameter as the outside diameter of the casing 8. The area of the throat 14 is substantially one-half that of this outlet.

Disposed in the rearward end of each of the slots 17 is a flat stabilizing fin 18 which is pivoted on a pivot pin 19 extending through the reversely bent walls which define the vane, to pivot from a position longitudinally adjacent the Venturi wall, as shown in solid outline in Figure 1, to the radially outwardly extending position shown in broken outline in the same view, the rearward end 20 of the vane abutting the bottom of the slot 17 to predetermine this outwardly extending position. Each vane is of such width that when it is longitudinally adjacent the bottom of the seat 17 will not project radially beyond the axially extended periphery of the casing proper, whereby the casing may be supported within and parallel to the projecting tube, diagrammatically shown in broken outline in Figure 1 and indicated by the numeral 21.

The finned and slotted Venturi end of the casing having its diameter at the outlet end substantially the same as that of the casing 8 may be formed in different manners. For example, it may be produced in the form of a casting 30, as shown in the modified construction of Figure 4, which is threaded at 31 to the rearward end of the casing 8. In this case, the vanes 32 are cast and the slots 33 for the fins 34 are either formed during the casting operation or machined in after the casting operation.

By forming the Venturi portion with the internal vanes and longitudinal slots for the fins, as contemplated by the present invention, there is thus provided a fin mounting arrangement which permits the elimination of the separate mounting ring which heretofore, by reason of its interference with the projector, prevented the provision of a maximum sized Venturi passage and the consequent maximum amount of propellant usable in a casing of a given size.

The features of the present invention thus very

advantageously improve the efficiency of operation of rocket projectiles of the character described.

Various changes may be made in the detailed construction and arrangement of the parts described without departing from the spirit and substance of the invention, the scope of which is defined by the appended claims.

What is claimed is:

1. In a rocket type projectile including a cylindrical casing for housing a propelling charge and having a trailing end, a Venturi device coaxial with and extending rearwardly from said trailing end, said device having an annular wall gradually reducing in diameter to define a restricted throat and flaring outwardly and rearwardly from said throat to an external diameter substantially the same as the outside diameter of said casing, said flaring wall defining an expansion passage coaxial with said throat and casing, said flaring wall having radially inwardly extending, circumferentially spaced vanes, and said vanes having longitudinally extending slots therein opening outwardly through said wall, and a plurality of flat stabilizing fins, each fin having one end fitting within a slot and pivoted to the walls thereof adjacent the rearward end of said annular wall, said vanes being pivotally movable from a position longitudinally adjacent said annular wall to a radially outward position.

2. In a rocket type projectile including a cylindrical casing for housing a propelling charge and having a trailing end, a Venturi device coaxial with and extending rearwardly from said trailing end, said device having an annular wall gradually reducing in diameter to define a restricted throat and flaring outwardly and rearwardly from said throat to an external diameter substantially the same as the outside diameter of said casing, said flaring wall defining an expansion passage coaxial with said throat and casing, said flaring wall having radially inwardly extending, circumferentially spaced vanes, and said vanes having longitudinally extending slots therein opening outwardly through said wall, and a plurality of flat stabilizing fins, each fin having one end fitting within a slot and pivoted to the walls thereof adjacent the rearward end of said annular wall, said vanes being pivotally movable from a position longitudinally adjacent said annular wall to a radially outward position, said fins in their longitudinally adjacent position being within a peripheral zone of a diameter no greater than the outside diameter of said casing.

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