Sept. 23, 1969 R. J. ROSSER 3,468,127

ROCKET PROJECTILES

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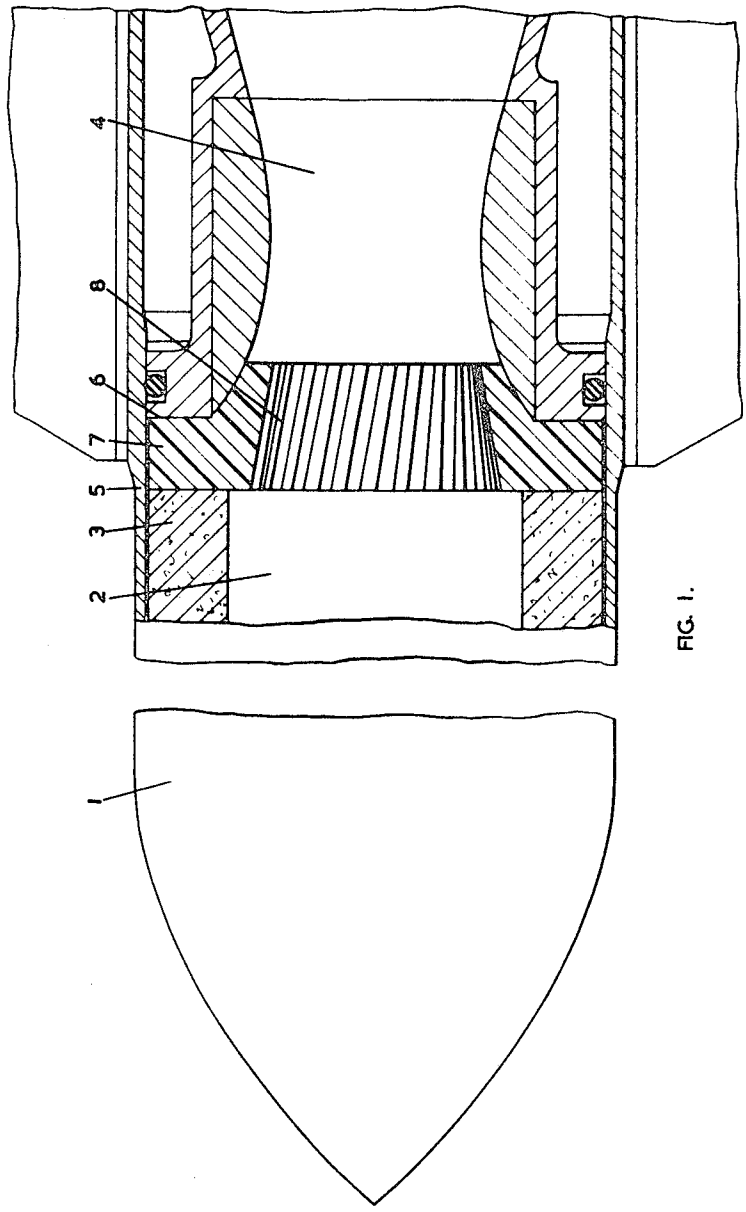

FIG. 1.

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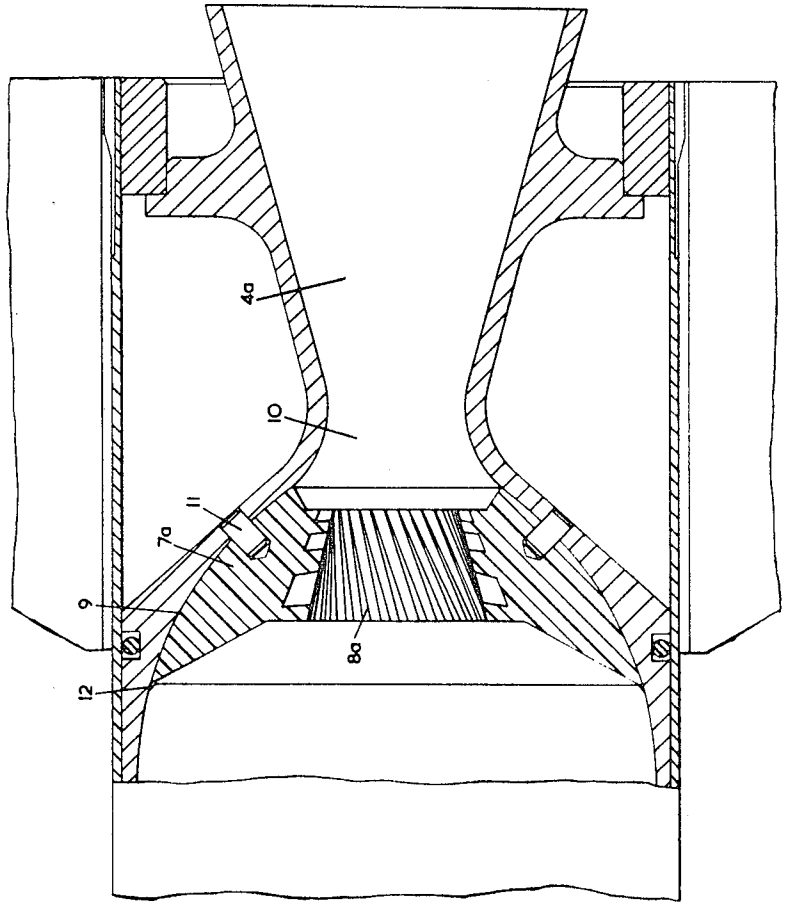

FIG. 2.

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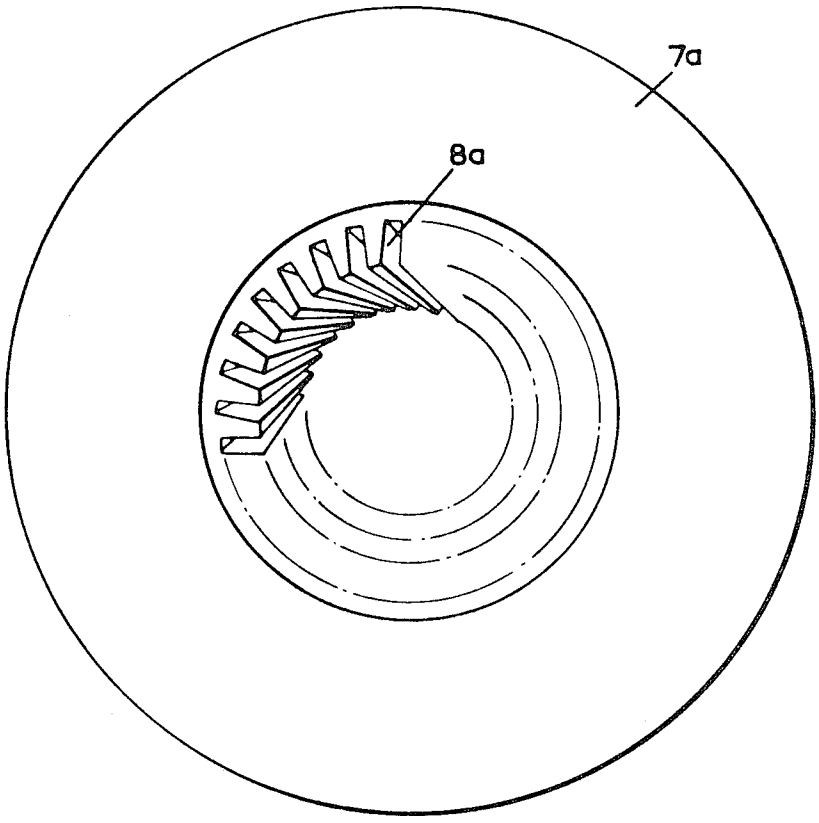

FIG. 3.

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ROCKET PROJECTILES

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U.S. Cl. 60—201 10 Claims

ABSTRACT OF THE DISCLOSURE

A rocket projectile having a group of inclined vanes symmetrically disposed in the propellant gas stream just upstream of the venturi for imparting spin to the rocket. The vanes are made of a consumable material, so that spin is imparted during the early stages of propulsion before the vanes are consumed, and may consist of helical ribs on the bore surface of an annular body fitted into the rocket body just forward of the venturi throat.

This invention relates to rocket projectiles and is concerned with means for imparting to such projectiles, a limited amount of spin to improve flight accuracy by reducing the effects of thrust malalignment.

There exists as optimum rate of spin for counteracting these effects and, in order to obtain the full advantage from this spin, it is clearly desirable that it should be effective during the early stages of flight when the disturbing effects of thrust malalignment are most severe. Preferably the optimum spin is attained on the launcher, being therefore, effective during the earliest stages of free flight. Spin imparted by inclined jets derived from the main propulsion motor or by aerodynamic means such as inclined fins continues to develop well into the free flight period and either attains its optimum value later in flight or, if the optimum is reached early, will continue to develop beyond the optimum which is undesirable.

This invention therefore comprises, in a rocket projectile, a group of inclined vanes symmetrically disposed in the path of the propellant gas stream for imparting spin to the projectile, the said vanes being made of a consumable material whereby the whole of the imparted spin is developed during the early stages of propulsion, before the vanes have been consumed. Preferably the vanes are consumed before, or soon after, the rocket has left the launcher.

Although the desired spin may be obtained from vanes located at or downstream of the throat of the venturi, this arrangement may introduce disturbances by interfering with the gas flow at a critical position. It is therefore preferred to locate the vanes near but upstream of the throat. The vanes may be of any convenient form and may be composed of any consumable material which will last long enough and has sufficient strength to impart the desired spin. The amount of spin imparted can be controlled by varying the inclination of the vanes and/or influencing the consumption time through such factors as selection of material or variation of vane thickness. These vanes may be consumed by burning or melting or a combination of both.

One form of rocket projectile in accordance with the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

FIG. 1 is a partly sectioned, side elevation of a rocket projectile;

FIG. 2 is a sectional detail showing an alternative construction; and

FIG. 3 is a view looking on the forward face of a ring member as shown at 7*a* of FIG. 2.

The body **1** FIG. 1 may have any of the usual known forms terminating at the rear end in a motor comprising a combustion chamber **2** containing a propellant charge **3** and closed at its rear end by a block incorporating a single axial venturi **4**. The motor casing **5** is generally cylindrical in shape and the forward end of the venturi block is so formed as to provide an internal shoulder **6** at the rear end of the combustion chamber **2**. Fixed into the rear end of the combustion chamber **2**, forward of and in contact with the shoulder **6**, is a ring shaped member **7** having a conical (as shown) or cylindrical bore surface in which is formed a plurality of grooves **8** extending obliquely from the forward to the rearward face of the ring member **7**. The side faces of the ribs separating these grooves **8** act in the manner of turbine blades when impinged upon by the effluent propellant gases whereby spin is imparted to the projectile. The ring member **7** is made of a consumable material which, when subjected to the action of the hot propellant gases, either burns or melts so that the turbine action ceases after a short time, when the grooves **8** cease to exist.

The alternative form of ring member **7***a*, shown in FIGS. 2 and 3, has similar grooves **8***a* formed in its inner surface but has a curved outer surface **9** in the form of a frustum of an ogive which fits snugly onto a similarly shaped seating formed just forward of the throat **10** of the venturi **4***a*. It is located and fixed in position by means of dowels **11** and a fillet of cement around the forward edge **12**. The material of the ring **7**, **7***a* may be a plastics material which may burn or melt; a propellant which will burn; a metal, such as aluminium, which will melt or any other suitable material. Metals are less desirable than the other materials since molten metal tends to increase nozzle erosion. A ring member of propellant could, of course, be made integral with the charge. One suitable material, which has the advantage of lightness, is polyethylene.

It will be clear that a great many variations in detail may be made without departing from the scope of the invention. For example the motor may operate through multiple venturis instead of a single axial one. Spin may be sustained during flight, if desired, by employing a known means such as inclined fins in addition to the device of the invention.

I claim:

1. A rocket projectile having a body, a propellant motor incorporated at the rear end of the body, venturi means for the efflux of propellant gases to drive the projectile, and a group of inclined vanes, located just upstream of the said venturi means and symmetrically disposed in the path of the propellant gas stream, for imparting spin to the projectile; the said vanes being made of a consumable material whereby the whole of the imparted spin is developed during the early stages of propulsion, before the vanes have been consumed.

2. A rocket projectile as claimed in claim **1** wherein the dimensions and material of the vanes are such that the vanes are substantially completely consumed before the projectile leaves its launcher.

3. A rocket projectile having a body, a propellant motor incorporated at the rear end of the body, an axial venturi for the efflux of propellant gases to drive the projectile, and a group of inclined vanes located just upstream of the throat of said axial venturi, and symmetrically disposed in the path of the propellant gas stream, for imparting spin to the projectile; the said vanes being made of a consumable material whereby the whole of the imparted spin is developed during the early stages of propulsion, before the vanes have been consumed.

4. A rocket projectile as claimed in claim **1** incorporat-

ing a ring shaped member of consumable material coaxial with the rocket in the bore surface of which ring is formed a plurality of grooves; and a plurality of ribs separating the grooves which ribs constitute the aforesaid vanes.

5. A rocket projectile as claimed in claim 4 wherein the said bore surface is generally conical in form, tapering toward the rear.

6. A rocket projectile as claimed in claim 1 wherein the vanes are made of a fusible metal.

7. A rocket projectile as claimed in claim 1 wherein the vanes are made of a plastics material.

8. A rocket projectile as claimed in claim 1 wherein the vanes are made of a solid propellant material.

9. A rocket projectile as claimed in claim 1 wherein the vanes are made of polyethylene.

10. A rocket projectile comprising a body; a propellant motor incorporated at the rear of the body, a single axial venturi at the rear end of the motor for driving the projectile; a ring shaped member coaxial with the projectile and located in a seating just upstream of the throat of the

venturi, in the bore surface of which ring shaped member is formed a plurality of oblique grooves; and a plurality of ribs separating the said grooves and constituting a group of vanes for imparting spin to the projectile; said ring shaped member being made of a consumable material whereby the whole of the imparted spin is developed during the early stages of propulsion, before the vanes have been consumed.

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60—230; 89—1.808; 102—34.3; 239—265.15