April 11, 1950 W. B. POPE 2,503,684

JET-ADJUSTING MEANS

Filed Feb. 1, 1944

Fig. 1.

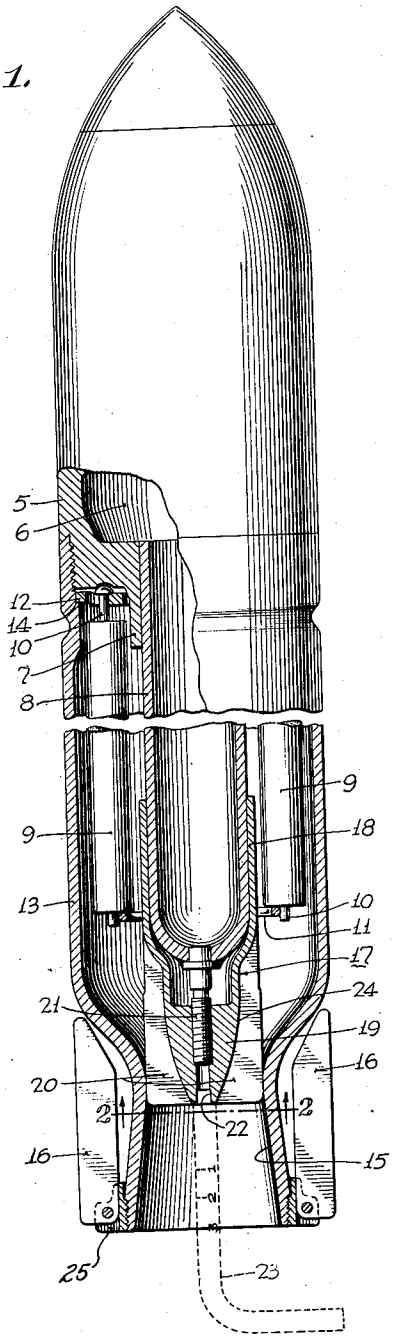
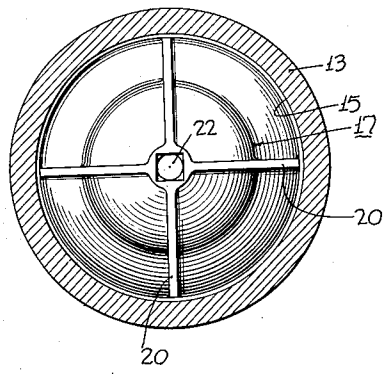


Fig. 2.



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Patented Apr. 11, 1950 2,503,684

UNITED STATES PATENT OFFICE

2,503,684

JET-ADJUSTING MEANS

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Application February 1, 1944, Serial No. 520,622

1 Claim. (Cl. 102—49)

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This invention relates to projectiles and other devices of the character adapted to be initiated in flight by a propelling charge of slow-burning powder or other suitable material.

In one form of the device, the tubular casing having an axially-opening venturi at its trailing end is secured to the rearward end of the projectile proper, and the slow-burning propelling charge is supported within this casing, the gases resulting from the burning of the propelling charge exhausting under pressure through the Venturi passage.

The object of the present invention is to provide a novel means for manually controlling or adjusting the area of the Venturi passage of a jet-propelled projectile whereby to control the propelling pressure developed within the casing thereof and thereby enable the range of the projectile to be predetermind.

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 side elevation of a jet or rocket device, partially in section, having the arrangement of the present invention incorporated therein; and

Figure 2 is an enlarged transverse section taken approximately on the line 2—2 of Figure 1.

Referring to the accompanying drawing, the projectile, shown for the purpose of illustration, embodies a main body 5 having a chamber 6 for the explosive charge (not shown) and a rearwardly extending apertured portion 7 which supports a coaxial burster tube 8. The propelling charge comprises a number of sticks 9 of slow-burning powder or other suitable material carried by a suitable cage in surrounding relation with respect to the burster tube 8. As here shown for the purpose of illustration, the cage comprises a number of rods 10 extending through the sticks 9, a rod-interconnecting ring 11 at one end and a supporting plate 12 at the opposite end.

The burster tube 8 and the propelling charge are surrounded by a tubular casing 13 threaded at one end to the rearward end of the main body 5 and having a shoulder 14 at this end for supporting the plate 12. The rearward end of the casing 13 is shaped to provide an axially-opening

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Venturi passage 15. Suitable stabilizing vanes 16 are pivoted to a ring 25 which is secured to the trailing end of the casing 13, as shown in the drawing.

The present invention is directed to a new and novel arrangement whereby the cross sectional area of the Venturi passage 13 can be so adjusted and predetermined that the projectile can be projected through flight of a given range. To this end, an adjustable element 17 is provided in coaxial association with the Venturi passage 15. The element 17, while it may be formed in any number of different manners, is shown in the drawing to be in the form of a cast or machined member of annular formation at one end 18 which is adapted to surround the rearward end of the burster tube 8 in slidable and rotatable engagement therewith, and having a closed tapering end portion 19 extending rearwardly therefrom coaxially into the Venturi passage 15. In order to prevent any substantial lateral deflection of the element 17, the rearward end thereof is provided with a number of vanes 20 which rotatably engage with the wall of the Venturi passage 15. The vanes 20, however, may be omitted if desired.

In order to afford axial adjustment of the element 17, a threaded rod element 21 is rigidly and coaxially secured to the closed end of the burster tube 8. This threaded rod element has axially-threaded engagement with the closed end 19 of the element 17, the rearward end of the element 17 being provided with a squared opening 22 for the reception of a correspondingly shaped end of a removable wrench element 23 shown in broken outline in Figure 1. The shank of the wrench element may be provided with suitable adjustment markings, such as for example, the spaced numerals 1, 2 and 3 shown thereon.

It is to be noted that the Venturi passage is defined by the tapering surface 24 of the end portion 19 of the adjusting element 17 and the flaring surrounding wall surface 15 of the casing 13. It is obvious that by rotating the element 17 by the wrench device 23 axially rearwardly through the Venturi passage, the area of the Venturi passage will be decreased by reason of the increasing diameter of the end portion 19. In other words, if the wrench element 23 is rotated from the position shown in Figure 1 wherein the marking 3 is aligned with the end of the casing, to a position wherein the marking 2 is aligned with the end of the casing, the area of the Venturi passage will be decreased, with the result that greater pressures will be developed within

the casing by the burning of the propelling charge 19. Preliminary studies of the device will, of course, for predetermined charge sticks 9 provide data as to the pressure that will be developed within the casing 13 for various areas of the Venturi passage. Such studies will also afford information as to the pressures necessary to project the device through a given range. The markings 1, 2 and 3 can be made to thus correspond with desired ranges. The indicia 3, for example, may indicate that the projectile will have a range of 2500 yards, and by the same token, when the element 17 is rotated to align the indicia 2 with the end of the casing 13 and decrease the area of the Venturi passage, the indicia 2, for example, may indicate a range of 3500 yards, and the indicia 1 may indicate a range of 4000 yards. In other words, by decreasing the size of the Venturi passage the range can be increased inasmuch as the propelling pressure is greater.

There is thus provided a means which will enable the person responsible for firing the projectile to manually adjust the same for projection over a given range.

Obviously, the shank of the wrench element 23 can be calibrated as desired to indicate various firing ranges of the projectile, each calibration corresponding to a Venturi passage area which will provide for a predetermined pressure within the casing 13.

While the arrangement of the present invention has been described in connection with rocket-type projectile, it has to be understood that the same is applicable to any device wherein it is desired to control or adjust the area of a Venturi passage.

Obviously, 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 claim.

What is claimed is:

In a jet propulsion device having an annular casing terminating at one end in an axially-opening Venturi passage and within which propelling pressures are to be developed, and a cylindrical member concentrically disposed within said casing and having an end terminating within said casing and spaced from said Venturi passage, a shank portion carried by said last-mentioned end in coaxial alignment with said Venturi passage and an adjusting element threadably mounted on said shank portion, said adjusting element having an end portion of gradually increasing diameter in the direction of said cylindrical member disposed within said Venturi passage, and an opposite annular end portion surrounding the said end of said cylindrical member and having rotatable and slidable engagement therewith, relative threading movement of said adjusting element and shank portion being effective to axially move said element relative to said passage to vary the area thereof.

WINSLOW B. POPE.

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The following references are of record in the file of this patent:

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