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R. H. GODDARD
JET DIRECTIVE DEVICE
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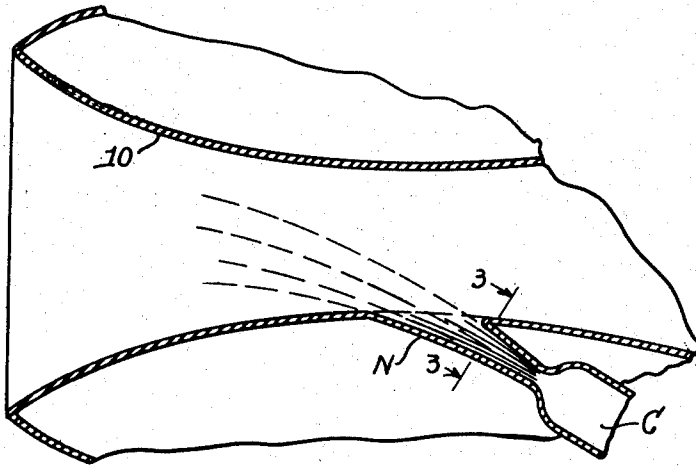


Fig. 1.

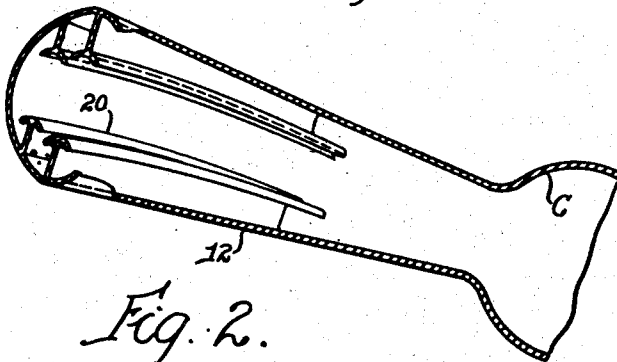


Fig. 2.

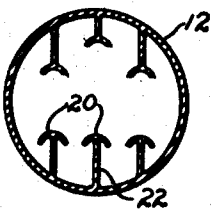


Fig. 3.

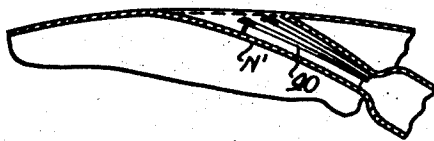


Fig. 4

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UNITED STATES PATENT OFFICE

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JET DIRECTIVE DEVICE

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4 Claims. (Cl. 60—35.6)

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This invention relates to devices for angularly diverting portions of a jet and for striating the jet to increase the entraining capacity thereof. The invention is particularly adapted for use in connection with air-entraining augments tubes in rocket propulsion apparatus. In such apparatus as used in jet propulsion, a small compact jet of combustion gases moving at very high speed has very low propulsive efficiency but this low efficiency may be greatly increased by entraining with the combustion gases a substantial quantity of air. The resulting mixture of gas and air has greatly increased mass and correspondingly decreased speed and is found much more efficient for propulsion purposes.

It is the general object of the invention to increase the entraining effectiveness of such jets by the provision of improved directive devices. A further object is to provide directive devices adapted for use in an augments where the jet-producing apparatus is disposed at a substantial angle to the axis of the augments tube.

The invention further relates to arrangements and combinations of parts which will be hereinafter described and more particularly pointed out in the appended claims.

Preferred forms of the invention are shown in the drawing, in which

Fig. 1 is a sectional side elevation of a portion of an augments tube, with the improved directive devices associated therewith;

Fig. 2 is a longitudinal sectional view of the directive devices, partly in perspective;

Fig. 3 is a transverse sectional view, taken along the line 3—3 in Fig. 1; and

Fig. 4 is a sectional view similar to Fig. 1 but showing a modified construction.

Referring to the drawing, an augments tube 10 is shown, through which a flow of air is induced by combustion gases developed in a combustion chamber C and delivered into the tube 10 through a nozzle N. It will be noted that the nozzle N opens into the side of the tube 10 and at a substantial angle to the axis of the tube.

The improved directive devices comprise a plurality of deflectors 20 mounted in the nozzle N and extending lengthwise thereof. The devices 20 are curved longitudinally as shown in Fig. 2 and are also somewhat sharply curved transversely as shown in Fig. 3. It will be noted that all of the devices 20 are concave toward the long side of said nozzle as shown in the drawings. Each device 20 is mounted on a supporting web 22

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extending outward to the more closely adjacent wall 12 of the nozzle N.

The devices 20 and webs 22 may be formed of a heat-resistant metal or of any other suitable material of substantial strength and high heat resistance.

The longitudinal curvature of the devices 20 tends to divert the combustion gases from the chamber C away from the axis of the nozzle N and toward the axis of the augments tube 10. The transverse curvature of the devices 20 tends to restrain the gases from sliding off and thus lateral escaping from the directive devices.

In the modification shown in Fig. 4, the axis of the nozzle N' is curved longitudinally, and the deflectors 40 are somewhat more sharply curved longitudinally than is the case with the straight conical construction of the nozzle N as shown in Figs. 1 and 2.

In both cases, the distribution of the deflectors 20 or 40 is preferably as shown in Fig. 3, and this distribution is well adapted to produce a substantially uniform distribution of the combustion gases over the cross sectional area of the augments tube.

By the provision of such directive devices, the combustion gases are gradually displaced into alignment with the axis of the augments tube and this displacement occurs without shock or substantial change in velocity, thus conserving the entraining power of the jet.

Having thus described the invention and the advantages thereof, it will be understood that the invention is not to be limited to the details herein disclosed, otherwise than as set forth in the claims, but that what is claimed is:

1. In a jet directive device an augments tube, a combustion chamber, a conical discharge nozzle for said chamber mounted in one side wall of said tube and having its axis substantially inclined to the axis of said tube, and a plurality of jet deflectors mounted in said nozzle and extending longitudinally thereof, all of said deflectors being curved longitudinally and in the same direction with respect to the axis of said nozzle and being effective to deflect the combustion gases away from said axis and all in the same direction, and all of said deflectors being curved transversely and presenting deflecting surfaces which are concave toward that side of the nozzle toward which the gases are deflected.

2. In a jet directive device, an augments tube, a combustion chamber, a conical discharge nozzle for said chamber mounted in one side wall of

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said tube and having its axis substantially inclined to the axis of said tube, and a plurality of jet deflectors mounted in said nozzle and extending longitudinally thereof, all of said deflectors being curved longitudinally and in the same direction with respect to the axis of said nozzle and being effective to deflect the combustion gases away from the axis of said nozzle and all in the same direction, all of said deflectors being curved transversely and presenting deflecting surfaces which are concave toward that side of the nozzle toward which the gases are deflected, and each deflector having a web by which it is supported on the nozzle wall but in spaced relation thereto.

3. In a jet directive device, an augments tube, a combustion chamber, a discharge nozzle mounted in one side wall of said augments tube and substantially inclined relative to the axis thereof, and a plurality of deflectors mounted in said nozzle, said deflectors being arched longitudinally toward the short side of the nozzle and being curved transversely to present deflecting surfaces which are concave toward the long side of the nozzle, and said deflectors being effective to divert combustion gases from the axis of said nozzle toward the axis of said augments tube.

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4. In a jet directive device, an augments tube, a combustion chamber, a discharge nozzle mounted at one side wall of said augments tube and substantially inclined relative to the axis thereof, and a plurality of deflectors mounted in said nozzle, said deflectors being arched longitudinally toward the short side of the nozzle and being curved transversely to present deflecting surfaces which are concave toward the long side of the nozzle, said deflectors being effective to divert combustion gases from the axis of said nozzle toward the axis of said augments tube, and said deflectors being relatively spaced and positioned to distribute the combustion gases substantially uniformly over the cross sectional area of the augments tube.

ESTHER C. GODDARD,
Executrix of the Last Will and Testament of
Robert H. Goddard, Deceased.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
2,348,518	Birkigt	May 9, 1944