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ROTATABLE DISCHARGE NOZZLE FOR  
FIXED COMBUSTION CHAMBERS  
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2,510,570

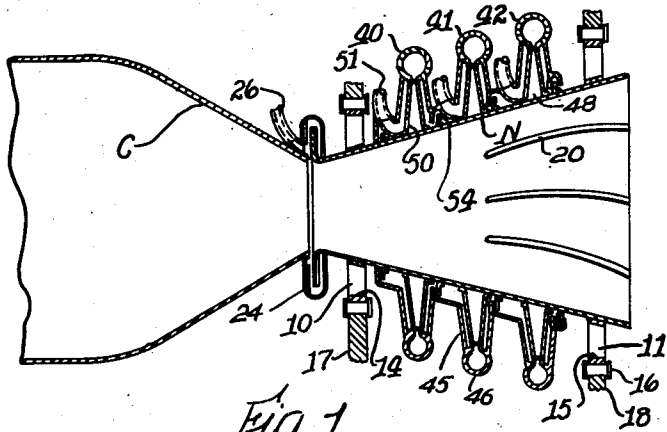


Fig. 1.

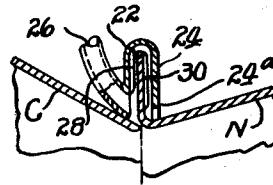


Fig. 3.

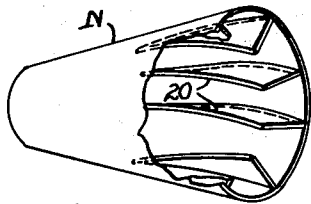


Fig. 2.

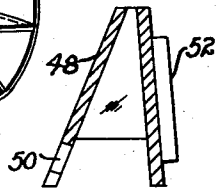


Fig. 7.

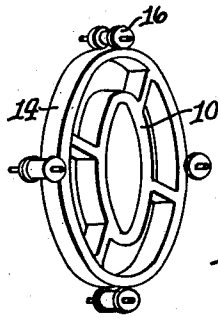


Fig. 4.

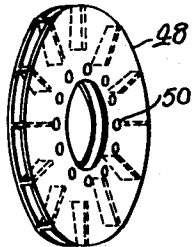


Fig. 5.

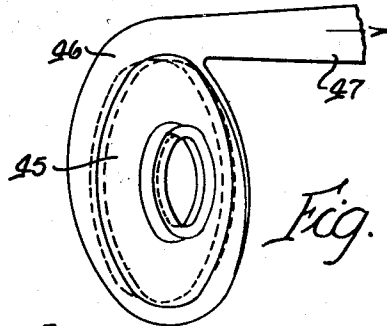


Fig. 6.

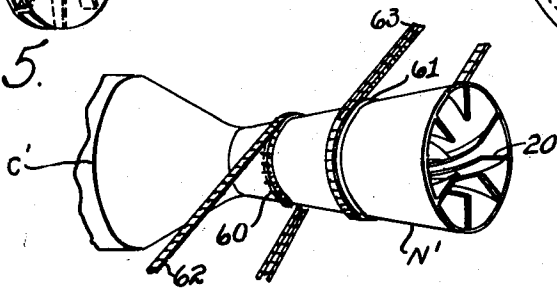


Fig. 8.

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# UNITED STATES PATENT OFFICE

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## ROTATABLE DISCHARGE NOZZLE FOR FIXED COMBUSTION CHAMBERS

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1 Claim. (Cl. 60—35.6)

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This invention relates to the discharge nozzles of combustion chambers as commonly used in rocket and aircraft operation.

It is the general object of the invention to provide a fixed combustion chamber with a rotatably mounted discharge nozzle and also to provide effective means for rotating the nozzle.

A further object is to provide improved means for utilizing said rotating discharge nozzle as a convenient source of power.

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

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

Fig. 1 is a sectional side elevation of combustion apparatus embodying the invention;

Fig. 2 is a perspective view of the rotatable nozzle;

Fig. 3 is an enlarged sectional detail of certain parts shown in Fig. 1;

Fig. 4 is a perspective view of a nozzle support or bearing;

Fig. 5 is a reverse perspective view of a pump impeller;

Fig. 6 is a perspective view of a pump casing;

Fig. 7 is a partial radial section of the impeller; and

Fig. 8 is a perspective view showing modified means for taking off power from the rotating nozzle.

Referring to the drawing, a fixed combustion chamber C is shown having a nozzle N rotatably mounted rearward thereof and adjacent thereto. The nozzle N is provided with bearing supports or spiders 10 and 11, mounted adjacent the opposite ends thereof and provided with circular tracks 14 and 15 which are rotatable in a plurality of spaced guide-rolls 16, mounted in fixed frame members 17 and 18. The nozzle N is thus supported for free rotation about the axis of the chamber C.

The nozzle is provided with a plurality of internal curved vanes 20 which project into the stream of combustion gases discharged through the nozzle, and such engagement with the discharge gases causes the nozzle to be rapidly rotated.

The small end of the nozzle is outwardly flanged as indicated at 22 (Fig. 3), and is loosely rotatable in an annular casing member 24 of U-shaped cross section which is fixed to the discharge end of the casing of the combustion cham-

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ber C. A sealing liquid as water may be supplied to the annular casing 24 through a pipe 26.

A series of radial vanes 28 are mounted on the entrance face of the fixed annular casing 24 as shown in Fig. 3, and a similar series of radial vanes 30 are mounted on that face of the rotating flange 22 which is more remote from the combustion chamber C.

With this construction, such portions of the sealing liquid as pass outward around the outside edge of the radial vanes 30 will be retained by centrifugal force, and very slight if any leakage will occur between the open edge 24a of the annular casing 24 and the outer surface of the nozzle N.

Any leakage which may occur between the rear end of the combustion chamber C and the adjacent outwardly curved surface of the nozzle N would be unobjectionable, as addition of water to the combustion gases at this point will help to cool the gases and also to increase the volume thereof by the formation of steam.

Provision is thus made for supporting and rotating the nozzle N adjacent the discharge end of the combustion chamber C and for sealing the connection between the fixed and rotating parts. This connection is in a low pressure area where the stream of combustion gases changes direction and begins to expand.

Any convenient means may be provided for taking off power from the rotating nozzle. In Fig. 1, three centrifugal pumps 40, 41 and 42 are shown mounted on the nozzle N. These pumps may be utilized to supply two different combustion liquids under pressure to the chamber C and a sealing liquid to the pipe 26. These pumps may be of any usual centrifugal type, and each comprises a casing 45 (Fig. 6) surrounded by a volute 46 connected to a discharge pipe 47. An impeller 48 is mounted within each pump casing 45 and is provided with a series of holes 50 through which the liquid to be pumped may enter the impeller. This liquid is supplied through a pipe 51 and is discharged through the pipe 47 previously mentioned.

Each impeller may be provided with radial vanes 52 (Fig. 7) on the face opposite to the holes 50, and a sealing flange 54 is mounted on the nozzle N adjacent each pump.

The three pumps will thus be rotated at high speed whenever the chamber C is in operation and the pumps may be utilized as previously stated or for any other desired purpose.

In Fig. 8 a modified construction is shown in which a nozzle N' rotatably mounted adjacent a

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combustion chamber C' is provided with annular sprockets 60 and 61 by which chains 62 and 63 may be driven. These chains may extend to sprockets on adjacent shafts or may otherwise be utilized for power purposes.

The utility and advantages of the constructions herein described will be readily apparent. The invention is not to be limited to the details herein disclosed, otherwise than as set forth in the claim, but what is claimed is:

In combustion apparatus, a fixed combustion chamber, an outwardly expanding conical discharge nozzle for said chamber, bearing means for said nozzle which is substantially spaced outward therefrom, a plurality of curved vanes 15 mounted within said nozzle and projecting into the outer and cooler portion only of the stream of discharge gases in said nozzle, said vanes being operative to rotate said nozzle, a pump impeller 20 mounted directly on said nozzle and rotatable

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therewith, a fixed pump casing for said impeller supported coaxial therewith, and means to supply to said impeller a liquid to be pumped.

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5 *Executrix of the Last Will and Testament of Robert H. Goddard, Deceased.*

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