Sept. 26, 1950 R. H. GODDARD 2,523,655

ROTATING COMBUSTION CHAMBER

Filed July 26, 1946

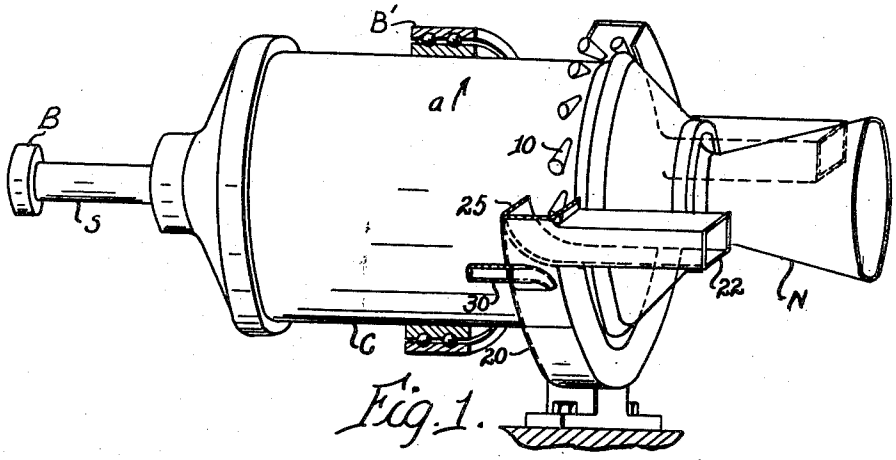

Fig. 1.

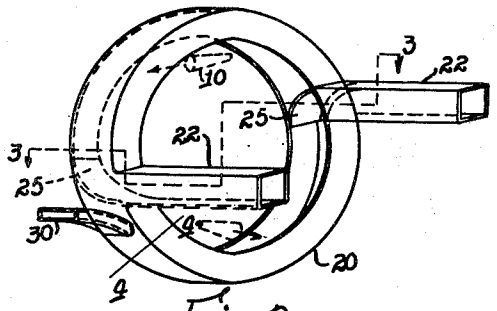

Fig. 2.

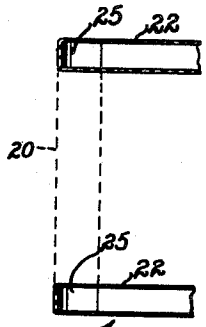

Fig. 3.

Fig. 4.

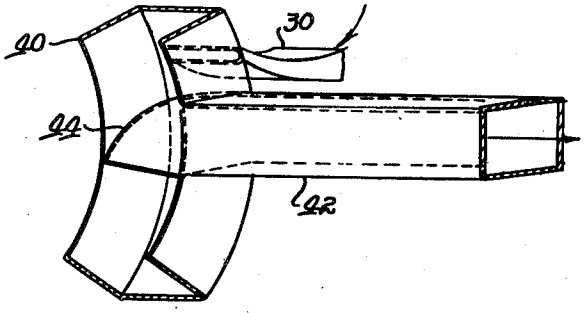

Fig. 5.

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ROTATING COMBUSTION CHAMBER

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Application July 26, 1946, Serial No. 686,387

9 Claims. (Cl. 60—35.6)

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This invention relates to a rotating combustion chamber adapted for use in the propulsion of rockets or rocket craft. The invention relates more specifically to the type of rotating combustion chamber in which a portion of the combustion gases are discharged through a series of small auxiliary nozzles arranged tangentially about the periphery of the combustion chamber and providing power to rotate said chamber. These gases as they leave the auxiliary nozzles are travelling very much faster than the peripheral speed of the combustion chamber and they possess a substantial amount of momentum.

It is the general object of the present invention to provide means to conserve the power in these rapidly moving gases by diverting and redirecting the gases so that they are discharged axially rearward and thus aid propulsion.

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 perspective view of a combustion chamber having this invention applied thereto;

Fig. 2 is a perspective view of the gas-diverting structure;

Fig. 3 is a sectional plan view, taken along the irregular section line 3—3 in Fig. 2;

Fig. 4 is a transverse sectional view, taken in the plane of the line 4—4 in Fig. 2; and

Fig. 5 is a partial perspective view of a modified construction.

Referring to the drawing, a combustion chamber C is provided with an axial discharge nozzle N and is mounted to rotate in bearings B and B' about the axis of a supporting shaft S.

The chamber C is provided with a plurality of small auxiliary nozzles 10 rotating therewith. The nozzles 10 are mounted about the periphery of the chamber C near the discharge end thereof and are inclined with respect to the periphery to produce rotation of the combustion chamber in the direction of the arrow *a*. Such rotation may be utilized to drive fuel feed pumps for the combustion chamber or other devices associated with the rotating shaft S. The rotation of the combustion chamber also acts to cool the cylindrical chamber wall which is necessarily made very thin to save weight when used in rocket craft.

As has been previously stated, the rate of travel of the portion of combustion gases discharged through the auxiliary nozzles N is very much

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greater than the peripheral speed of rotation of the chamber C, and the substantial momentum of these discharged gases would be lost if no provision were made for changing the direction of travel of these gases.

For the purpose of producing such changes in direction, an annular casing 20 is mounted in fixed position concentric with the rotating combustion chamber C and loosely surrounding the chamber. The member 20 is of U-shaped cross section with an open inner side, as shown in Fig. 1, and is positioned to provide clearance for the nozzles 10, which discharge into the member 20 and in a substantially tangential direction opposite to the direction of rotation of the chamber.

Rearwardly directed discharge tubes 22 are mounted on the member 20 at diametrically opposite points and at each side of the discharge nozzle N. A curved deflecting vane 25 extends inward from one side face of each tube 22 and has its curved end portion abutting and secured to the opposite side of the member 20. The vanes 25 have fairly close clearance with respect to the nozzles 10 but the nozzles move at a smaller radius which avoids interference of the nozzles with the vanes.

As the combustion chamber C is rotated and the combustion gases are discharged from the nozzles 10, they enter the U-shaped annular member 20 and travel around the annular passage within said member until they are deflected by the vanes 25 which cause them to be diverted and discharged axially rearward through the associated tubes 22. The momentum of the gases is thus conserved and acts with the gases discharged through the main nozzle N to increase the propulsive effect. Water may be injected through supply nozzles 30 for cooling the annular member 20.

In the construction shown in Fig. 5, the annular member 40 and discharge tubes 42 are as previously described, but each deflecting vane 44 is given a warped surface and is curved in two directions, so that the gases are given a combined outward and rearward deflection into the tubes 42. This construction tends to reduce any tendency of the gases to escape through the annular openings between the inner edges of the annular member 40 and the outer surface of the rotating chamber C.

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 what is claimed is:

1. In aerial propulsion apparatus, a rotating combustion chamber having a main axial discharge nozzle, a plurality of auxiliary nozzles mounted adjacent the discharge end of said chamber and discharging substantially tangentially from the periphery thereof to rotate said chamber, and stationary means to divert the gases tangentially-discharged from said auxiliary nozzles rearward to aid propulsion.

2. In aerial propulsion apparatus, a rotating combustion chamber having a main axial discharge nozzle, a plurality of auxiliary nozzles mounted adjacent the discharge end of said chamber and discharging substantially tangentially from the periphery thereof to rotate said chamber, a fixed annular casing enclosing said auxiliary nozzles, and rearwardly directed discharge tubes mounted on and secured to said annular casing.

3. The combination in aerial propulsion apparatus as set forth in claim 2, in which the annular casing is of U-shaped cross section and has an open inner side to clear said rotating nozzles.

4. The combination in aerial propulsion apparatus as set forth in claim 2, in which the annular casing is of U-shaped cross section and has an open inner side to clear said rotating nozzles, and in which a deflecting vane is provided in said annular casing adjacent each discharge tube.

5. The combination in aerial propulsion apparatus as set forth in claim 2, in which the annular casing is of U-shaped cross section and has an open inner side to clear said rotating nozzles, and in which a deflecting vane having a warped surface twisted outward and sideways is provided in said annular casing adjacent each discharge tube.

6. The combination in aerial propulsion apparatus as set forth in claim 2, in which means is provided to cool said annular casing.

7. The combination in aerial propulsion apparatus as set forth in claim 2, in which fixed nozzles deliver a cooling liquid at spaced points into said annular casing.

8. In aerial propulsion apparatus, a rotating combustion chamber having a main axial discharge nozzle, means to discharge a portion of the combustion gases from said chamber tangentially to produce rotation of said chamber, and means to deflect said portion of gases rearwardly to aid propulsion, said latter means being fixed in said apparatus and including a gas-collecting member and rearwardly directed discharge tubes mounted on and secured to said member.

9. The combination in aerial propulsion apparatus as set forth in claim 8, in which two discharge tubes are mounted in a balanced pair.

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

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

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