April 7, 1953 R. H. GODDARD 2,633,700

COMBUSTION CHAMBER FOR PROPULSION APPARATUS AND HAVING MULTIPLE DISCHARGE NOZZLES

Original Filed April 12, 1946

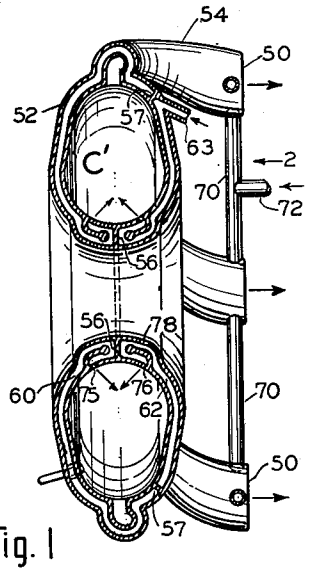

Fig. 1

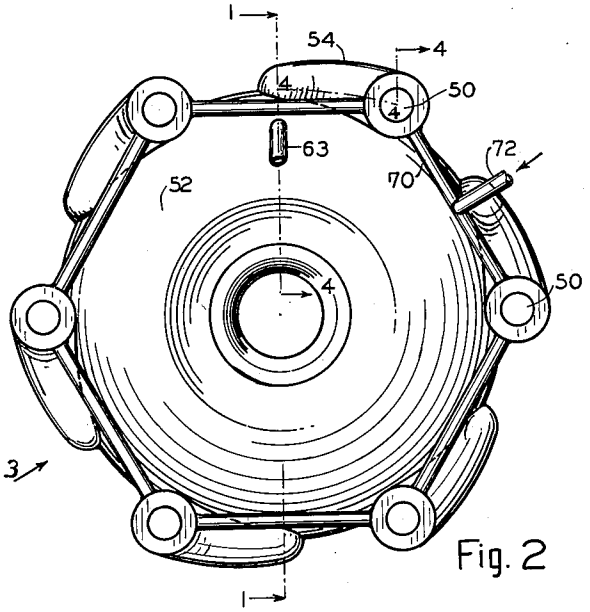

Fig. 2

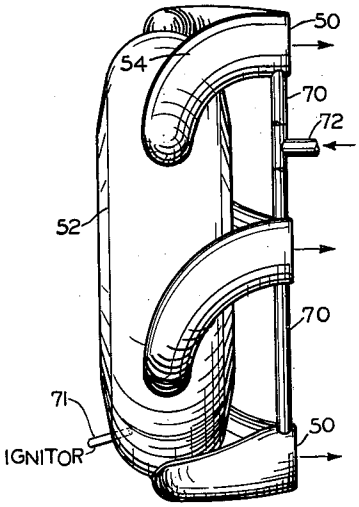

Fig. 3

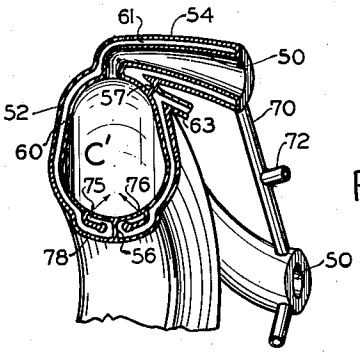

Fig. 4

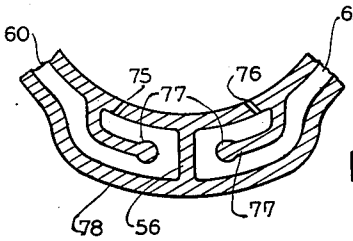

Fig. 5

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COMBUSTION CHAMBER FOR PROPULSION APPARATUS AND HAVING MULTIPLE DISCHARGE NOZZLES

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Original application April 12, 1946, Serial No. 661,825, now Patent No. 2,563,023, dated August 7, 1951. Divided and this application February 1, 1951, Serial No. 208,931

5 Claims. (Cl. 60—35.6)

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This application is a devision of prior application Serial No. 661,825, filed April 12, 1946, now Patent No. 2,563,023.

This invention relates to combustion chambers for propulsion apparatus and having multiple discharge nozzles, and more particularly to combustion chambers where it is desired to have a very short travel of the combustion gases between the point where the combustion fluids mix and ignite and the point where the combustion gases enter the discharge nozzles. Such short travel is especially desirable in the case of very active fluids with high energy content, such as ozone or methane.

It is the general object of the invention to provide a single combustion chamber of large diameter and relatively short axial length, and to provide a plurality of discharge nozzles for said single combustion chamber. In the form herein shown, the combustion chamber is in the form of a toroidal ring with a plurality of nozzles spaced about the periphery.

Further objects of the invention are to provide improved means for cooling such a combustion chamber and for cooling the discharge nozzles, and also to provide improved means for feeding the combustion fluids to the combustion chamber and intermingling them therein.

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

A desirable form of the invention is shown in the drawing, in which

Fig. 1 is an enlarged sectional side elevation of a combustion chamber embodying this invention;

Fig. 2 is a front elevation thereof, looking in the direction of the arrow 2 in Fig. 1;

Fig. 3 is a side elevation thereof, looking substantially in the direction of the arrow 3 in Fig. 2;

Fig. 4 is a sectional side elevation, taken along the irregular line 4—4 in Fig. 2; and

Fig. 5 is an enlarged sectional view of certain parts appearing in Figs. 1 and 4.

Referring to the drawing, the combustion chamber C' is in the shape of a toroidal ring having a plurality of nozzles 50 mounted about the periphery thereof. Each of the nozzles 50 is curved in plan view as shown in Fig. 3, so that all of the nozzles discharge substantially axially of the ring.

The chamber C' is surrounded by a jacket casing 52, and each nozzle 50 is surrounded by a jacket casing 54 connecting into the casing 52.

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The jacket-enclosure between the chamber C' and the casing 52 is divided by partitions 56 and 57 to form a larger jacket space 60 to which the nozzle jacket spaces 61 (Fig. 4) are connected, and a smaller jacket space 62 to which a fuel supply pipe 63 is connected.

The jacket spaces 61 in adjacent nozzles 50 are preferably connected by tubes 70 to insure circulation of a cooling and oxidizing liquid through all of the nozzle jacket spaces 61 and thence into the main jacket space 60. The cooling liquid may be supplied through a feed pipe 72.

Separate annular series of perforations 75 and 76 (Figs. 1, 4 and 5) are provided at each side of the partition 56, and deflector plates 77 are provided in enlarged end portions 78 of the jacket spaces 60 and 62, as clearly shown in Fig. 5. The extreme edge portion of each deflector 77 is preferably enlarged and rounded as also shown in Fig. 5.

With a construction as described, liquid fuel, as methane, may be provided through the supply pipe 63 and through the smaller jacket space 62 to the feed openings 76, and a liquid-oxidizing agent, as ozone, may be provided through the supply pipe 72, nozzle jacket spaces 61 and larger jacket space 60 to the feed openings 75.

Both of these liquids are supplied under substantial pressure, and sprays of the two more or less vaporized liquids are ejected through the openings 75 and 76 in intersecting directions, so that the sprays cross and are effectively intermingled. Combustion then takes place and the combustion gases enter the several nozzles 50 in radially outward directions. These gases then have their directions changed by the curved contours of the nozzles, so that they are discharged substantially parallel to the axis of the chamber C' as indicated by the arrows in Fig. 3.

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. A combustion chamber enclosed by surfaces of revolution and of substantially greater outside diameter than axial length, means to feed two different combustion liquids to said chamber, and a plurality of discharge nozzles connected into the outer periphery of said chamber and extending radially outward therefrom and having their outer portions curved to discharge the combustion gases along paths substantially parallel to each other and substantially parallel to the axis of said chamber.

2. The combination in a combustion chamber as set forth in claim 1, in which the two combustion liquids are discharged outwardly from an inner surface thereof and along intersecting paths.

3. The combination in a combustion chamber as set forth in claim 1, in which the said combustion is in the general form of a toroidal ring.

4. In combination, a combustion chamber enclosed by surfaces of revolution and of substantially greater outside diameter than axial length, and a plurality of discharge nozzles connected into the periphery of said chamber and extending radially outward therefrom and having their outer portions curved to discharge the combustion gases along paths substantially parallel to each other and substantially parallel to the axis of said chamber, and said combustion chamber being in the general form of a toroidal ring and having provision for spraying two different combustion elements from the inner face of said ring toward the outer portion thereof and along lines intersecting within said chamber and relatively close to said inner face.

5. A combustion chamber enclosed by surfaces of revolution and of substantially greater outside diameter than axial length, a plurality of discharge nozzles connected into said chamber and discharging the combustion gases therefrom along paths substantially parallel to each other and substantially parallel to the axis of said

chamber, cooling jacket structures surrounding said combustion chamber and said separate nozzles and enclosing jacket spaces, and partitions which divide the chamber-cooling jacket space into separated portions which receive two different combustion liquids and deliver said liquids under pressure to said combustion chamber in unmixed condition and along paths which intersect in said chamber relatively close to their points of injection, and the jacket spaces of all of the separate nozzles being connected to each other and to the same portion of the chamber-cooling jacket space.

ESTHER C. GODDARD,
Executrix of the last will and testament of Robert H. Goddard, deceased.

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