Oct. 17, 1950 R. H. GODDARD 2,526,224

ROTATING COMBUSTION CHAMBER
WITH FIXED JACKET CASING
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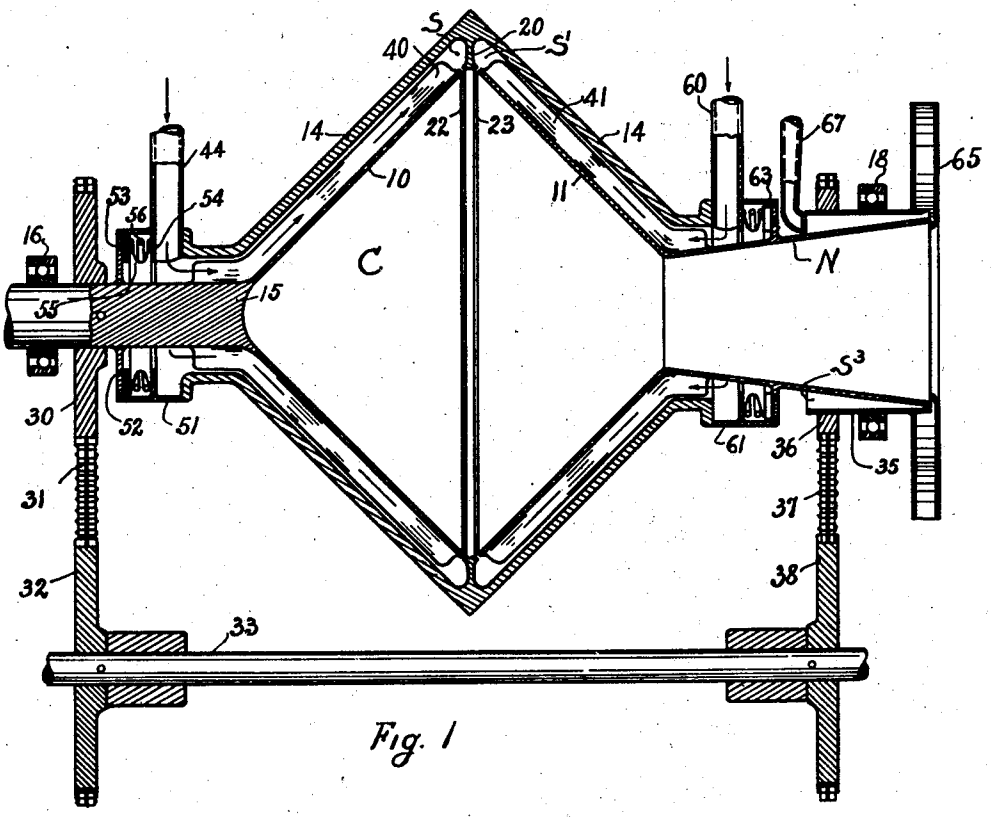

Fig. 1

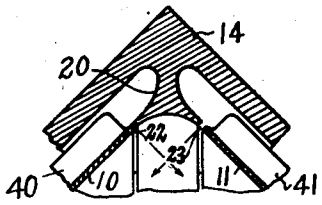

Fig. 2

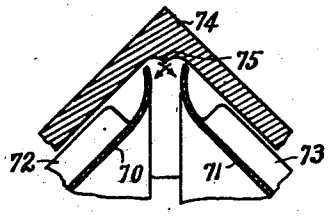

Fig. 3

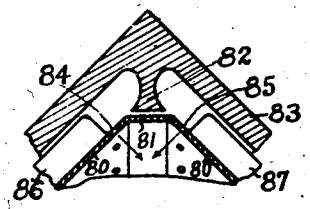

Fig. 4

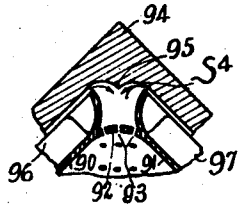

Fig. 5

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ROTATING COMBUSTION CHAMBER WITH FIXED JACKET CASING

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5 Claims. (Cl. 60—44)

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This invention relates to rotating combustion chambers to which a liquid fuel and a liquid oxidizer are supplied, and from which combustion gases are discharged through an outwardly expanding nozzle. Substantial pressures are developed in such combustion chambers by expansion of the hot combustion gases formed therein.

It is the general object of this invention to provide an improved and simplified structure in which a combustion chamber is rotated within a fixed jacket casing, and in which the combustion liquids are supplied to the combustion chamber through the jacket spaces thus provided between the chamber and the fixed casing.

Another object is to provide a rotating combustion chamber in which the chamber is formed in two axially separated portions, and in which the combustion liquids are supplied to the chamber in the form of thin intersecting sheets at the adjacent outer edges of said two chamber portions.

A further object is to provide centrifugal means to develop liquid pressure in the jacket spaces and to thus offset the outward pressure of the combustion gases on the combustion chamber walls.

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 longitudinal sectional view of a rotating combustion chamber embodying this invention;

Fig. 2 is an enlarged detail sectional view of certain parts shown in Fig. 1; and

Figs. 3, 4 and 5 are detail sectional views similar to Fig. 2 but showing modified constructions.

Referring to Figs. 1 and 2, a combustion chamber C is shown which comprises opposed but aligned conical walls 10 and 11 which are rotatable in spaced relation within a fixed outer jacket casing 14. The chamber wall 10 may be supported on a shaft 15 rotatable in one or more bearings 16, and the chamber wall 11 is preferably formed integral with an open discharge nozzle N and is rotatable in one or more suitable bearings 18.

The jacket casing 14 has an inwardly projecting annular portion or ring 20, and the inner edges of this ring are spaced from the outer edges of the chamber walls 10 and 11 to provide feeding slots 22 and 23.

The shaft 15 is shown as provided with a

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sprocket 30 connected by a chain 31 to a second sprocket 32 on a countershaft 33. The nozzle N has a spaced cylindrical sleeve 35 supporting the bearing 18 and also provided with a sprocket 36 connected by a chain 37 to a sprocket 38 on the shaft 33. The pairs of sprockets 30—32 and 36—38 are of proportionate size, so that the wall portions 10 and 11 of the chamber C are rotated at the same speed.

A plurality of outwardly extending vanes 40 are mounted on the wall 10 and rotate in the jacket space S between the wall 10 and the fixed jacket casing 14. Similar vanes 41 are mounted on the wall 11 and rotate in the jacket space S' between the wall 11 and the jacket casing 14. The vanes 40 and 41 rotate with slight clearance with respect to the fixed casing 14.

Liquid fuel, as gasoline, may be supplied through a pipe 44 to a fixed annular casing 51 concentric with the shaft 15 and open on one side to the space S.

A flange 52 on the shaft 15 rotates at the outer edge of the casing 51 and is engaged on its inner face by a non-rotating sealing ring 53 which may be of carbon or carbon-impregnated material and which is connected to an inner flange 54 of the casing 51 by a bellows member 55. A coil spring 56 forces the carbon sealing ring 53 yieldingly against the rotating flange 52, and the pressure of the ring against the flange is increased by the pressure of the liquid fuel supplied to the space S through the casing 51.

This fuel is engaged by the vanes 40 and is forced outward through the space S by centrifugal force, and is then fed into the chamber C as a thin annular sheet through the slot 22 by the pressure thus developed.

A suitable liquid oxidizer is similarly fed through a pipe 60 to a stationary casing 61 from which it enters the space S' and is thrown outward centrifugally by the vanes 41, after which it enters the chamber C through the slot 23. The sealing device 63 which is provided for the casing 61 is identical in construction with the sealing device previously described.

A turbine 65 is mounted on the outer end of the nozzle N and sleeve 35, and the blades of the turbine project inside of the nozzle for engagement by the peripheral portion of the stream of discharging combustion gases. The engaged portion of the gases passes outward through the turbine 65 and continuously rotates the nozzle N and the associated chamber wall 11, and also rotates the associated chamber wall 10 through the coun-

tershaft 33 and the driving connections previously described.

Compressed air may be supplied through a nozzle 67 for starting purposes. This air is delivered to the turbine 65 through the space S3 between the nozzle N and the sleeve 35.

Reference to Fig. 2 will show that the two sheets of combustion liquids intersect each other a short distance inside of the jacket ring 20, so that they are effectually intermingled. Additional turbulence of the liquid arises from the fact that the slots 22 and 23 each have a moving wall at one side and a fixed wall at the other side.

Effectual feeding and mixing of two combustion liquids is thus accomplished, and the pressures of the liquids developed by centrifugal force in the jacket spaces S and S' offset the outward pressures of the combustion gases in the chamber C and thus prevent distortion of the relatively thin chamber walls. The jacket wall 14, being stationary, may be of any thickness required to withstand the outward pressure.

In the modified construction shown in Fig. 3, the chamber walls 70 and 71 are extended outward beyond the ends of the vanes 72 and 73, and the feeding slots are formed between the edges of the walls 70 and 71 and the surface of the fixed jacket or casing 74, which may have a small inner ridge or projection 75 which directs the converging liquid sheets inward to the combustion chamber.

The construction shown in Fig. 4 is similar to that shown in Fig. 2, except that the wall 80 of the rotating combustion chamber is continuous instead of in two separate portions. The outer annular portion 81 of the chamber wall rotates with slight clearance adjacent an inwardly projecting fixed ring 82 on the jacket casing 83. The combustion liquids are fed to the combustion chamber through holes 84 and 85 beyond the ends of the rotating vanes 86 and 87.

This construction has the advantage of being somewhat simplified, and avoids the necessity of separately rotating spaced chamber wall portions. It is necessary, however, that the parts 81 and 82 have relatively small clearance to prevent passage of any appreciable amount of one liquid to the jacket space containing the other liquid.

The construction shown in Fig. 5 is similar to that shown in Fig. 3 except that the opposite wall portions 90 and 91 of the rotating combustion chamber are connected by a rotating peripheral portion 92 having holes 93. The chamber rotates in a fixed casing 94 having a peripheral ridge 95. Oppositely-travelling sheets of combustion liquids thus enter a common mixing space S4, from which the mixed liquids are fed to the combustion chamber through the holes 93. The rotating vanes 96 and 97 build up liquid-feeding pressure as in Fig. 3.

With all forms of the invention, the combustion chamber rotates freely within a fixed casing and centrifugal force builds up liquid pressures in the jacket spaces which feed the liquids and which also effectively offset the gas pressure in the combustion chamber.

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 combustion apparatus, a rotating combustion chamber comprising reversed conical rotating chamber portions, means to rotate said chamber portions, a spaced fixed outer casing enclosing a separate jacket space about each chamber portion, which jacket space has a fixed outer wall and a rotating inner wall, means to feed combustion liquids to said jacket spaces at their smaller and more remote ends, and means to feed said liquids to said combustion chamber from said jacket spaces at their larger and adjacent ends.

2. In combustion apparatus, a rotating combustion chamber comprising reversed conical rotating chamber portions, a spaced fixed outer casing enclosing a separate jacket space about each chamber portion, which jacket space has a fixed outer wall and a rotating inner wall, means to feed combustion liquids to said jacket spaces at their smaller and more remote ends, and means to feed said liquids to said combustion chamber from said jacket spaces at their larger and adjacent ends, and means to rotate said chamber portions simultaneously and at the same speed.

3. In combustion apparatus, a rotating combustion chamber comprising reversed conical rotating chamber portions, means to rotate said chamber portions, a spaced fixed outer casing enclosing a separate jacket space about each chamber portion, which jacket space has a fixed outer wall and a rotating inner wall, means to feed combustion liquids to said jacket spaces at their smaller and more remote ends, means to feed said liquids to said combustion chamber from said jacket spaces at their larger and adjacent ends, and means to rotate said liquids in said jacket spaces to produce centrifugal pressure between said rotating chamber and said fixed outer casing.

4. In combustion apparatus, a rotating combustion chamber, a spaced fixed outer casing enclosing a jacket space, which jacket space has a fixed outer wall and a rotating inner wall, and centrifugal means to develop hydraulic pressure in said jacket space by rotation of said combustion chamber.

5. In combustion apparatus, a rotating combustion chamber, a spaced fixed outer casing enclosing jacket spaces for said chamber, means to feed combustion liquids to said jacket spaces, and means to feed said liquids from said spaces and to mix said liquids at that locus in said chamber which has the greatest diameter.

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
1,541,946	Harrison	June 16, 1925
2,397,834	Bowman	Apr. 2, 1946
2,479,829	Goddard	Aug. 23, 1949