April 7, 1953 R. H. GODDARD 2,633,699

PROPULSION APPARATUS ACTUATED BY SUCCESSIVE CHARGES OF DETONATING MATERIALS

Original Filed May 21, 1945

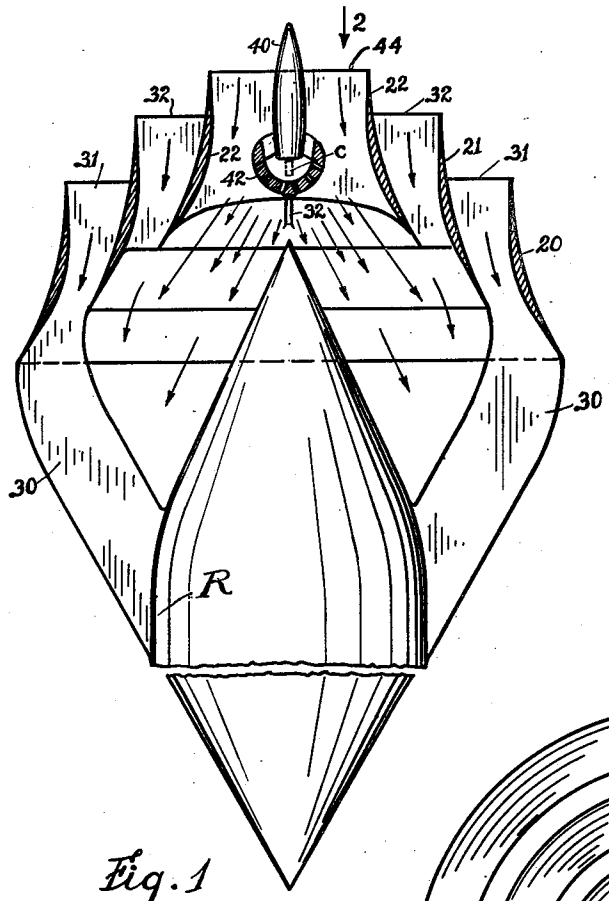


Fig. 1

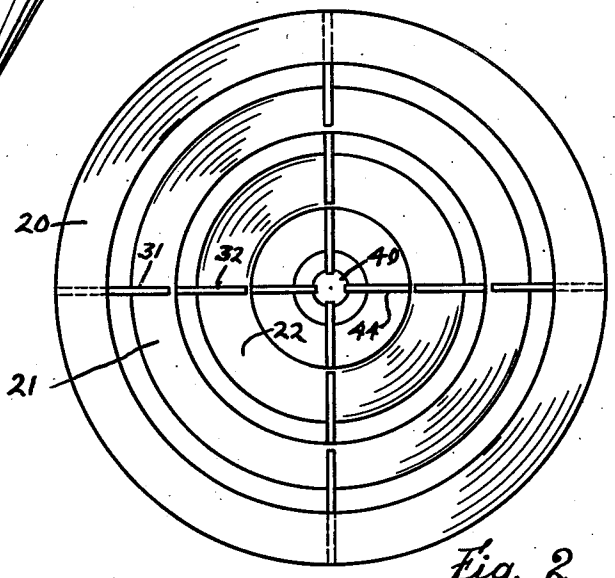


Fig. 2

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2,633,699

PROPULSION APPARATUS ACTUATED BY SUCCESSIVE CHARGES OF DETONATING MATERIALS

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Original application May 21, 1945, Serial No. 594,846, now Patent No. 2,515,643, dated July 18, 1950. Divided and this application February 6, 1950, Serial No. 142,672

1 Claim. (Cl. 60—35.6)

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This invention relates to apparatus in which propulsion is obtained by free detonations of successive unconfined charges of explosive material within a surrounding deflecting structure, and is a division of the prior Goddard application Serial No. 594,846, filed May 21, 1945, now Patent No. 2,515,643.

Free detonations are here defined as those occurring at a sufficient distance from relatively fixed deflecting surfaces so that they will produce no seriously disruptive effect on said surfaces, as contrasted with confined explosions taking place in closely enclosing containers.

The propulsive force of the combustion gases from such free detonations is best utilized by deflecting the gases rearward of the craft to be propelled. It is the general object of the present invention to avoid interference of such combustion gases with each other when thus deflected, and also to attain maximum effectiveness.

More specifically, it is the general object of the invention to provide a system of deflectors which will cause non-interfering deflected directions, and which will minimize the reaction of the mechanical forces on any deflecting surface, while maintaining the momentum produced by said mechanical forces.

In the construction shown, the deflecting surfaces are mounted forward of the aircraft to be propelled, and said surfaces progressively increase in diameter rearward with respect to said craft. Furthermore, the deflecting surfaces are all positioned at the same deflecting angle with respect to the axis of said craft.

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

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

Fig. 1 is a sectional side elevation of the improved propulsion apparatus; and

Fig. 2 is a plan view, looking in the direction of the arrow 2 in Fig. 1.

Referring to the drawing, propulsive apparatus is shown for an aircraft indicated generally at R, and said apparatus comprises a series of deflectors 20, 21 and 22 mounted adjacent the forward end of the aircraft R. Each deflector is convex in section and as to its inner and rearward surface. The deflector 20 may be supported from the craft R by radial ribs 30 and the deflectors 21 and 22 may be similarly supported by radial ribs 31 and 32.

A device for intermittently feeding a liquid

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detonating mixture to the apparatus is indicated diagrammatically at 40 and may be of the general construction shown and described in prior Goddard Patent No. 2,465,525, issued March 29, 1949.

The injected charge is indicated at C, and the combustion gases resulting from detonation are ejected through a deflecting casing 42 into the annular air passage between the casing 42 and the annular deflector 22. The feeding device 40 and casing 42 are supported by ribs 44.

The combustion gases are thus intermingled with a mass of entrained air which flows rearward and outward around the tapering front end of the craft R. The forward end of the feeding device 40 and the forward end of the casing 42 are both preferably streamlined to reduce air resistance.

Sufficient air cannot usually be admitted through the relatively narrow annular passage around the casing 42, and hence additional annular passages between the deflectors 22 and 21, and between the deflectors 21 and 20 are provided.

It will be noted that the inner faces of all of the deflectors 20, 21 and 22 are set at the same angle with the axis of the craft. The deflectors are also arranged in an outward and rearward progression, so that the outwardly expending gases encounter only surfaces which are at the same angle with the axis.

As the propulsion apparatus is forward of the craft R, the deflectors are preferably of relatively large diameter, so that when air is drawn in by suction after each detonation, the resistance due to air compression by the forward end of the craft R will be largely avoided.

The gases leave the deflectors 20, 21 and 22 in somewhat divergent and outwardly inclined directions, being outwardly displaced and directed by the body of the aircraft R. Such divergence is desirable in air of appreciable density, where as much air as possible should be entrained by the expanding and deflected gases and should be given a high rearward velocity. The ejected gases should also mix rapidly with the entrained air and should rapidly impart heat thereto.

The apparatus herein shown is exceptionally adapted to attain the desired results.

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 claim, but what is claimed is:

Propulsion apparatus positioned forward of a pointed and streamlined aircraft and comprising an inner, annular air-entraining deflector, a

detonating chamber defined thereby, means to present and detonate an explosive charge within said chamber and at a locus substantially spaced inward from the inner surface of said deflector, and a plurality of additional concentric annular spaced air-entraining deflectors surrounding said first deflector and said detonating chamber, each of said deflectors forming approximately a frustum of a hollow cone, all of said deflectors having small relative axial displacement so that a single diametral plane will section all of said deflectors, all of said deflectors having convex inner surfaces which increase in diameter rearward and with the rearward portions of all of said inner surfaces at substantially equal oblique angles to the common axis of said annular deflectors and being substantially equally spaced from each other, and all of said deflectors having concave and rearwardly expanding outer surfaces and having thin and sharp forward and rearward edge portions, whereby the entrance of air to said deflectors is substantially unobstructed, and

the rearward flow of the entrained air is facilitated, and whereby the stream of entrained air is outwardly expanded with respect to said aircraft.

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

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