Nov. 1, 1949 J. S. SHARPE 2,486,990

JET PROPULSION MOTOR

Filed Jan. 4, 1945

FIG. 1.

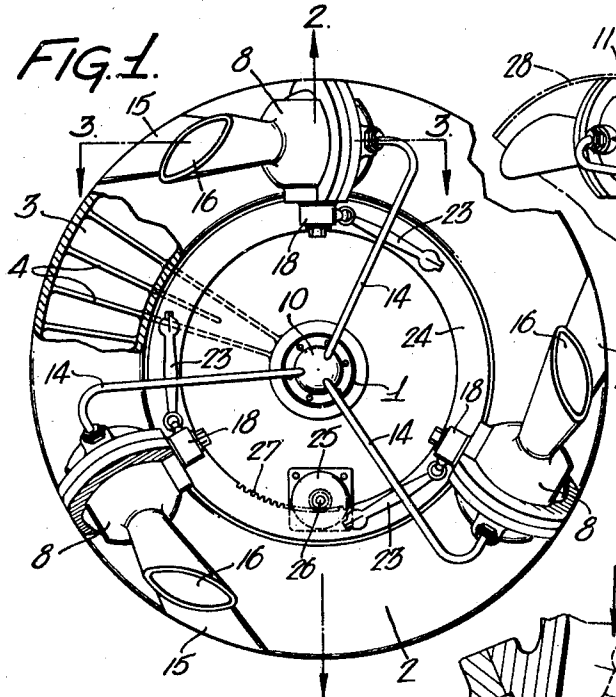


FIG. 2.

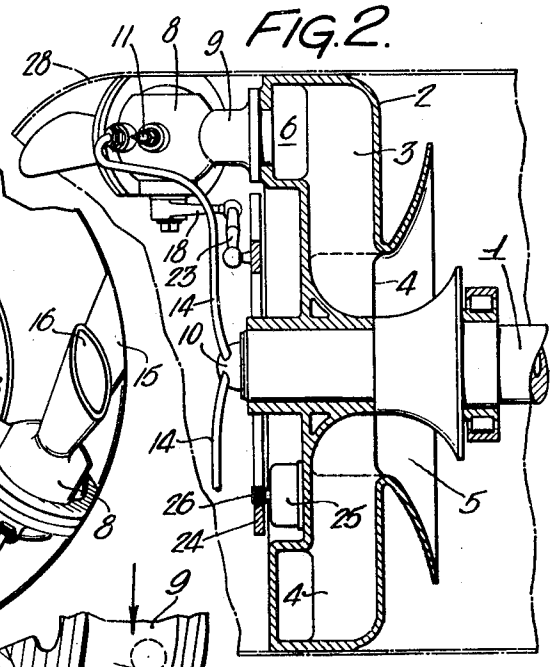


FIG. 3.

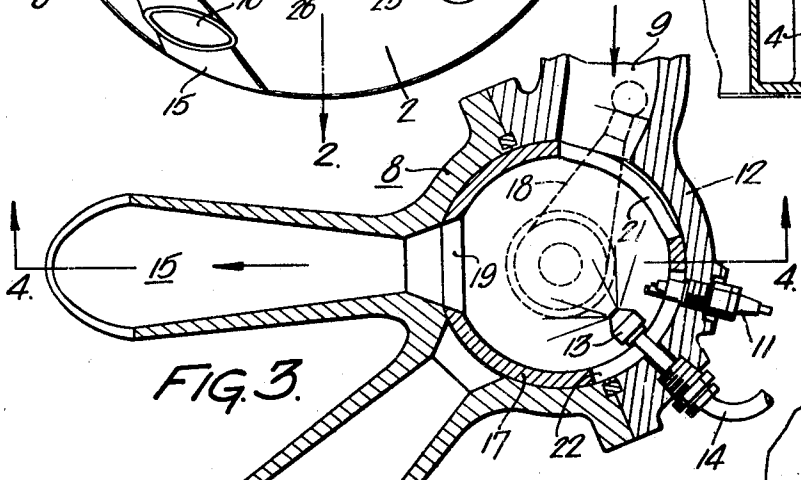


FIG. 4.

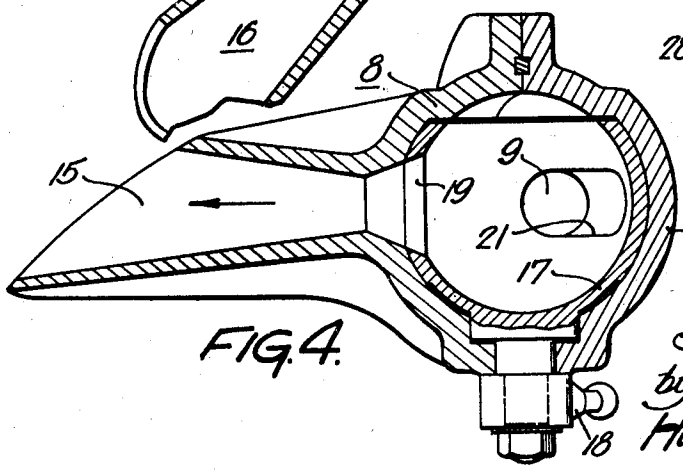
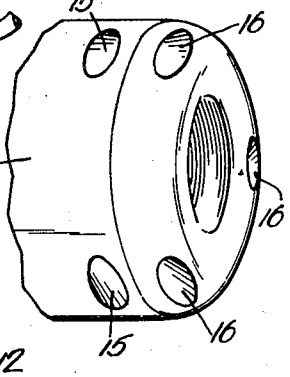


FIG. 5.



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UNITED STATES PATENT OFFICE

2,486,990

JET PROPULSION MOTOR

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1 Claim. (Cl. 60—35.6)

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This invention relates to improvements in jet propulsion devices, and a principal object of the invention is to provide means for avoiding certain limitations inherent in prior applications of the jet propulsion principle and to thereby provide a device capable of taking advantage in fuller degree of the potentalities of said principle.

The foregoing, and other incidental objects of the invention hereinafter appearing, may be attained by means of the devices illustrated in the attached drawing, wherein:

Figure 1 is a front elevational and partial sectional view of a jet propulsion motor made in accordance with my invention;

Figure 2 is a section on the line 2—2, Figure 1;

Figure 3 is a section on the line 3—3, Figure 1;

Figure 4 is a section on the line 4—4, Figure 3; and

Figure 5 is a fragmentary view in perspective of the motor unit illustrating a detail of construction.

With reference to the drawing, the engine comprises a hollow shaft 1 upon which is mounted a housing structure 2 which contains the jet generating elements. The housing 2 comprises a centrifugal pump or compressor section designated generally by the reference numeral 3 and consisting of a plurality of radially disposed blades 4 which terminate at their inner ends in a laterally disposed annular intake port 5 and at their outer ends in a laterally disposed annular compression manifold 6. Air is admitted to this compressor section through the port 5 and is compressed by centrifugal action into the manifold 6.

Suitably attached to the housing 2 is a plurality of combustion chambers 8, these chambers being three in number in the present instance and being uniformly distributed about the shaft axis as shown in Figure 1. Each of these chambers communicates with the manifold 6 through a port 9. Each of the chambers is also provided with a spark plug 11, which may be of conventional form, and which is secured in the wall 12 of the chamber in conventional manner. Each chamber is also provided with a fuel nozzle 13 which is connected through a duct 14 with a distributor head 10 on the terminal end of the shaft 1. Through this distributor the ducts are connected with the hollow interior of said shaft, which in turn is connected to a suitable fuel source. Each of the chambers, therefore, is connected with a source of fuel supply, a source of compressed air, and means for igniting the said fuel.

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Each of the chambers 8 is provided with two discharge nozzles designated respectively by the reference numerals 15 and 16. Each of these nozzles, in the present instance, is generally of funnel formation, increasing slightly in diameter towards its outer end as best illustrated in Figure 3. The longitudinal axis of the nozzle 15 lies preferably in a plane which parallels the plane of rotation of the housing 2; while the axis of the nozzle 16 extends at an angle of approximately 45 degrees to the axis of the nozzle 15 in the direction of the axis of rotation of said housing. Discharge of gases from the nozzle 15 will thereby exert a reaction force in a tangential direction tending to rotate the housing 2 about its axis in the shaft 1; while the force exerted by gases discharging at high velocity through the nozzle 16 will have components tending respectively to rotate the housing about its axis and to displace the housing in the axial direction.

The connection of nozzles 15 and 16 with the interior of the chamber 8 is controlled by a rotary valve element 17 which may be moved through a lever arm 18 to open or close the nozzles selectively, the arrangement being such that either of the nozzles may be opened to the exclusion of the other, or both opened in part and in variable relative degrees to permit escape of gases from the combustion chamber 8.

It will be noted by reference to Figure 3 that the valve 17 is provided with a port 19 for registration with the nozzles 15 and 16, and with a port 21 which registers with the air intake port 9 regardless of the position of the valve. The valve element also comprises a slot 22 through which the spark plug 11 and the nozzle 13 project and which provides for movement of the valve element without regard to said plug and nozzle. It will be noted by reference to Figures 1 and 2 that the arms 18 of the respective valves are connected by links 23 with an adjusting ring 24 which is suitably mounted for rotational adjustment on the housing and which may be operatively connected with a servo-motor 25 through the medium of a pinion 26 on the motor shaft, and a cooperating rack 27 at the inner periphery of the said ring. The motor 25 is mounted on the housing 2 and affords a means for adjusting the ring 24 from a remote point.

It is proposed to provide the housing 2 with a suitable streamlining cowl 28 which may be shaped generally as illustrated in Figures 2 and 5. Since the nozzles 15 and 16 terminate in this cowl as shown in Figure 5, the ends of the said

ports are shaped to conform to the contour of the cowl at the points of intersection.

In operation, the compressor 3 continuously discharges compressed air into the chambers 8 and fuel is continuously admitted through the nozzles 13. Combustion is initiated by means of the spark plugs 11 but after ignition has once taken place, the combustion also is continuous. The heat of combustion acts to greatly expand the compressed air in the combustion chambers and the highly compressed gases issue from the chambers through one or both of the nozzles 15 and 16 in the form of high velocity jets which by reaction, in known manner, exert a propulsive force upon the housing 2. When the jets are discharged through the nozzles 15 this propulsive force will be exerted in a plane normal to the rotary axis of the housing structure and in a direction in each case substantially at right angles to a line in said plane radial to said axis, so that substantially the entire force is utilized to effect rotation of the structure. When, on the other hand, the jets issue from the nozzles 16, the direction of discharge of each individual jet is such as to create a component tending to displace the structure in the axial direction, a second component tending to rotate the structure about the axis as aforesaid.

The device as illustrated is applicable, for example, to an airplane propeller drive wherein the propeller is fixed to the housing structure 2 to rotate with this structure. When the nozzles 15 are employed as described above to the exclusion of the nozzles 16, the entire reaction force of the discharge jets is utilized to rotate the propeller in the normal manner. Under the circumstances where jet propulsion is desirable the discharge may be shifted to the nozzles 16, whereupon the jets function to propel the airplane, the component of the jet which maintains rotation of the structure being primarily for the purpose of driving the compressor which is required for operation of the jet device as described above.

Since the interior walls of the chambers 8 and valve 17 may be lined with a ceramic or other material capable of withstanding high temperatures for extended periods of time, the device avoids the limitations imposed on prior jet propulsion devices arising from the inability of driven parts of the mechanism, such as turbine blades, to withstand the excessive temperatures developed in the combustion chamber for any extended period of time.

It will be understood that the device is subject to material modification without departure from the invention. It is not essential, for example, that the air compressor which is associated with the rotary housing structure 2 be of the centrifugal type herein illustrated as it may take other forms well known in the art.

I claim:

In a jet propulsion motor, a rotary structure having an annular manifold, a centrifugal impeller in said structure operative by rotation of the latter to supply compressed air to said manifold, a plurality of combustion chambers each connected to said manifold, means for continuous supply of fuel to said combustion chambers, and means for continuously discharging compressed gas from the combustion chambers in a direction to effect reactive rotation of said structure.

JOHN S. SHARPE.

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