Jan. 7, 1964 E. L. BLAKE 3,116,598

ROTORTHRUST OUTBOARD MOTOR

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FIG. 1

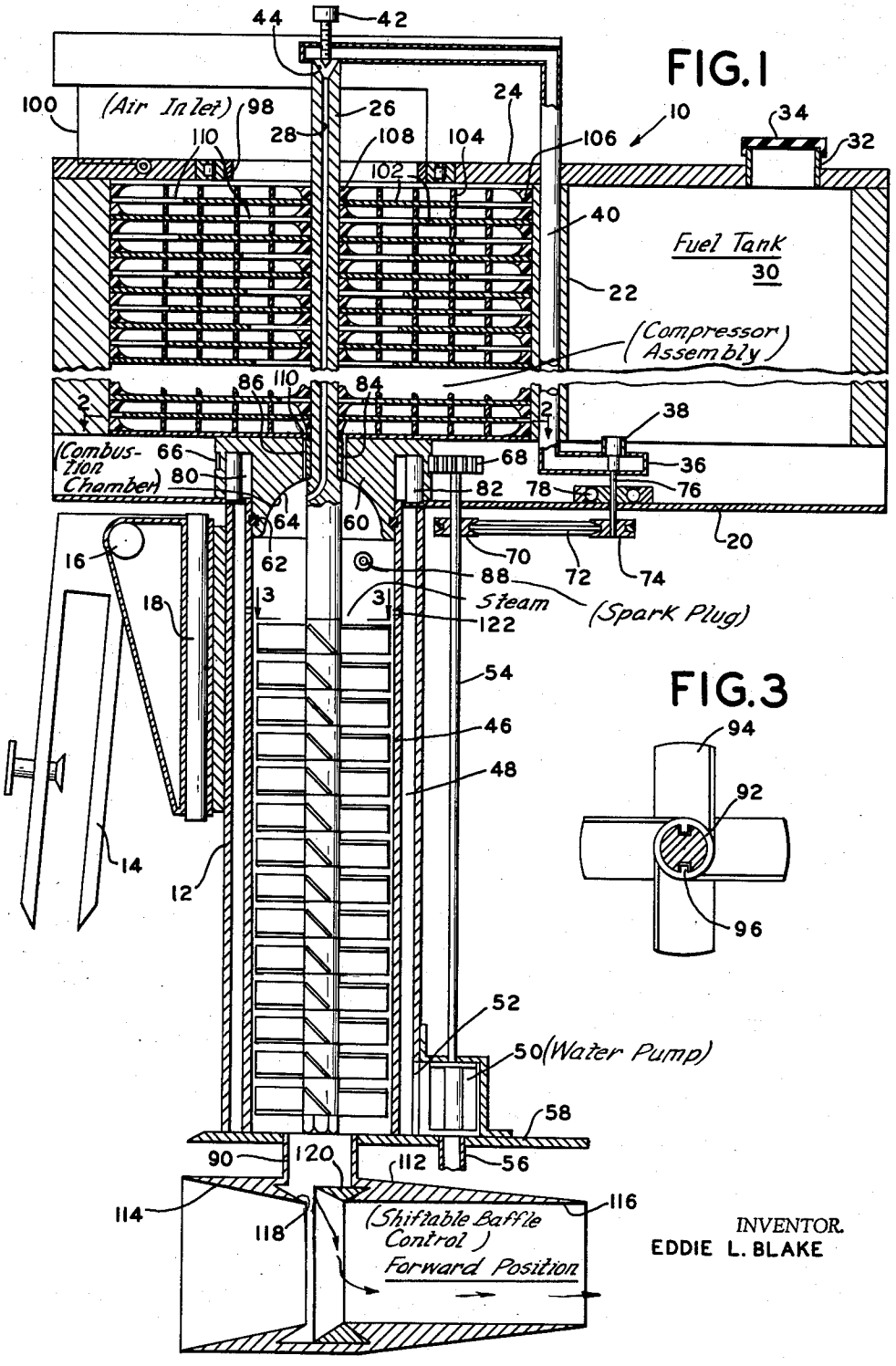


FIG. 3

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FIG. 2

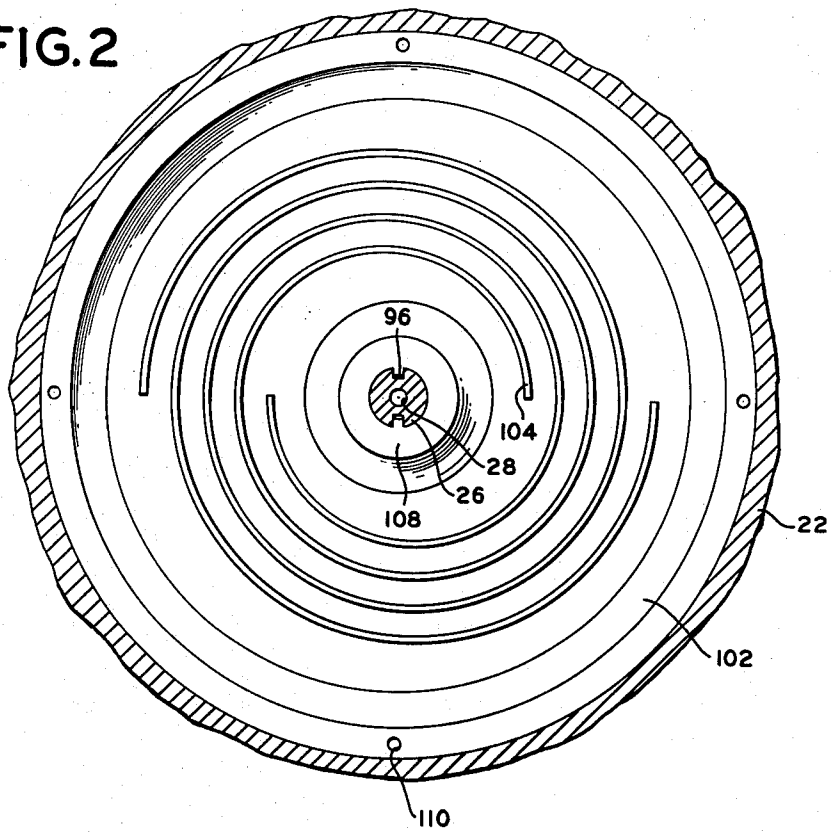


FIG. 4

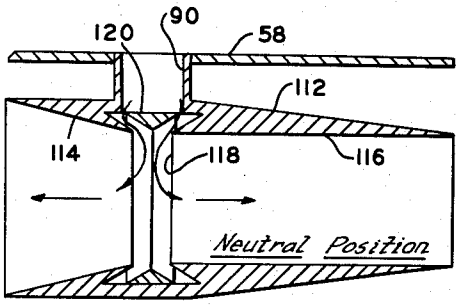
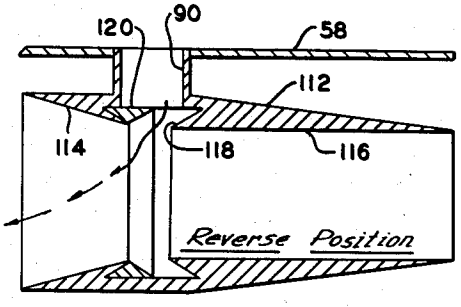


FIG. 5



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ROTORTHRUST OUTBOARD MOTOR

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4 Claims. (Cl. 60—35.6)

This is a continuation-in-part of my copending application filed August 29, 1960, Serial Number 52,731, now abandoned.

The present invention generally relates to propulsion for boats or the like and is intended as an outboard motor for boats incorporating a novel structure for producing a thrust for propelling the boat.

Conventionally, outboard motors have been provided with a piston type internal combustion engine driving a propeller through suitable gearing mechanism for rotating the propeller.

In distinction to this, the present invention has for its primary object the provision of an outboard motor of the type discharging an ignited and expanding volume of combustion products and in a predetermined direction in relation to the boat whereby the discharge of the combustion products will expand against the water thus producing a thrust to force the boat in the direction opposite to the direction of discharge of the combustion products.

Another object of the present invention is to provide an outboard motor having an air compressor driven from the expanding combustion products by virtue of an axial flow turbine which will provide power to drive the compressor and also drive other items such as a fuel pump, water pump and the like.

Another important object of the present invention is to provide an outboard motor having only rotary components in which simple controls are provided for controlling the fuel and air ratio, the ignition of the combustible charge and the direction of discharge of the expanding combustion products.

Other objects and advantages of the invention will become apparent from the following description taken in connection with the accompanying drawing in which:

FIGURE 1 is a vertical sectional view taken substantially through the center of the outboard motor illustrating the relationship of components of the motor with the nozzle mechanism oriented for forward movement of the boat.

FIGURE 2 is a transverse, plan, sectional view taken substantially upon a plane passing along section line 2—2 of FIGURE 1 illustrating the construction of the rotor blades;

FIGURE 3 is a transverse, sectional view taken substantially upon a plane passing along section line 3—3 of FIGURE 1 illustrating the construction of the turbine blades;

FIGURE 4 is a sectional view illustrating the discharge nozzle having the control mechanism therefor disposed in neutral position; and

FIGURE 5 is a sectional view similar to FIGURE 4 with the nozzle mechanism oriented for rearward movement of the boat.

Referring now to the drawings, the numeral 10 generally designates the outboard motor of the present invention which includes a tubular housing or cylindrical member 12 stationarily attached to the transom of a boat by a suitable clamp 14 pivotally attached to the

housing 12 for movement about a horizontal axis 16 and a vertical axis 18 thus enabling tilting and swinging of the outboard motor in a conventional manner.

Disposed at the top of the tubular member 12 is a bottom plate 20 of a housing including a wall 22 and a top 24 for forming a stator for a compressor assembly.

The compressor assembly includes an elongated shaft 26 extending vertically through the housing with the shaft 26 having an elongated passageway 28 extending therethrough. Disposed to one side of the housing 22 is a fuel tank 30 having an opening or neck 32 thereon together with a cap 34. Disposed below the tank 30 is a fuel pump 36 having an inlet 38 communicating with the bottom area of the tank 30. The pump 36 connects with a tubular member 40 extending upwardly and connected with the shaft or axle 26. A needle valve 42 is provided in the tubular member 40 and is movable towards and away from the seat 44 in the upper end of the shaft or axle 26 whereby the quantity of fuel discharged into the tubular passageway 28 may be varied by varying the setting of the needle valve 42.

Disposed internally of the tubular housing 12 is a member which is in the form of a cylinder 46. The annular space 48 between the tubular member 12 and the cylinder 46 forms a water chamber in communication with a water pump 50 through an enlarged opening 52 at the bottom of the sleeve 12. The water pump 50 is driven from an elongated shaft 54 and has an intake 56 extending through a bottom plate 58 which also forms a bottom for the pump 50, a bottom for the annular space 48 and partially closes the interior of the cylinder 46. The shaft 26 extends completely down to a point adjacent the bottom end of the cylinder 46 and rigidly mounted thereon is a rotating cylinder head 60 which rotates in relation to the cylinder 46 and is sealingly connected thereto by seal member 62. The lower surface of the cylinder head 60 is provided with a semicircular concave surface forming a combustion chamber 64 and the periphery of the rotating cylinder head 60 is provided with teeth 66 for engagement with a gear 68 on the upper end of the shaft 54 thus driving the water pump 50. Also provided on the shaft 54 is a V-belt pulley 70 engaging a V-belt 72 that also engages a V-belt pulley 74 for driving the fuel pump 36. The shaft 76 for the fuel pump 36 is supported by a bearing assembly 78.

Spaced from the periphery of the cylinder head 60, there is provided an upwardly extending annular groove or recess 80 which receives a roller thrust bearing assembly 82 thus forming a support for the cylinder head 60 and the shaft 26 which is keyed to the cylinder head 60 at point 84.

The cylinder head 60 is provided with passageways 86 receiving compressed air from the compressor assembly and also the fuel passageway 28 communicates with the interior of the cylinder 46 adjacent the cylinder head 60 whereby the air and fuel are mixed together in the proper ratio and a spark plug 88 or an equivalent igniting device is employed for igniting the combustible mixture where upon the combustible mixture will then expand downwardly in an axial manner through the cylinder 46 for discharge through a discharge fitting 90 in the bottom plate 58. Rigidly affixed to the shaft 26 are a plurality of turbine blades 92 which are provided with

radially extending fins or blade members 94 which are inclined in relation to the longitudinal axis of the cylinder 46 so that upon passage of expanding combustion products over the surfaces of the fins 94, the blades 92 and the shaft 26 will be rotated due to the keying engagement of the blades 92 with the shaft 26 as indicated at 96.

As illustrated in FIGURE 1, the compressor assembly is provided with an enlarged central inlet 98 in the top wall 24 and this inlet is communicated with an air intake manifold 100 of any suitable construction and any suitable air cleaners or the like may be provided thereon. The compressor itself is provided with a plurality of rotors 102 having a pair of spiral blades 104 on the upper surface thereof. The blades 104 fill the area between adjacent plates and outer air deflectors 106 and inner air deflectors 108 serve to move the air in a radial direction. Each rotor 102 is provided with a purality of apertures 110, alternating in location adjacent the outer edge of the rotor, in the uppermost rotor and each alternate lower rotor, and the center of the rotor, in the rotor beneath the uppermost rotor and each alternate lower rotor. These apertures decrease in size progressively from the uppermost to the lowermost rotor in which the apertures are small pinholes in communication with the passageways 86 in the cylinder head 60, as is clearly shown in FIGURE 1 of the drawing. Thus, as the rotors spin with the shaft 26, the two blades 104 of the uppermost rotor force air from the central inlet 98 outwardly through the large apertures 110 adjacent to the outer edge thereof and into proximity with the blades 104 of the next lower rotor which force the air radially outwardly and downwardly through the slightly smaller holes 110 in such next lower rotor. This process is repeated in each lower rotor, whereby the air is continuously compressed and forced through increasingly smaller apertures until it is finally discharged into the combustion chamber 64 through the inner pinholes 110 formed in the lowermost rotor and through the communicating passageways 86 in the cylinder head.

At the lower end of the tubular member 12 and below the plate 58, the discharge member 90 is attached to an elongated nozzle 112 having an outwardly flared end 114 and a cylindrical end 116. Annular grooves 118 are formed on the interior surface of the discharge nozzle 112 and the passage formed thereby is in communication with the tube 90. A shiftable baffle control 120 is provided which has a configuration similar to the configuration of the grooves 118 and controls the direction of discharge of the combustion products as they enter the nozzle 112. As illustrated, the grooves 118 are triangular in configuration and the annular baffle control 120 is also provided with triangular surfaces for close fitting engagement therewith.

In the position illustrated in FIGURE 1, the products of combustion will be directed through the groove 118 and adjacent baffle control 120, and discharged rearwardly through the nozzle 112 as indicated by the arrow in FIGURE 1 thus causing a thrust to be produced for urging the boat in a forward manner. FIGURE 4 illustrates the central position of the baffle control ring or valve 120 where the thrust produced will be neutralized since a portion thereof will extend in each direction. FIGURE 5 illustrates the baffle control ring in the forward position thus discharging the products of combustion forwardly thus causing the boat to move rearwardly.

Adjacent the upper end of the tubular member 12 and at what may be considered the bottom of the combustion area, the cylinder 46 is provided with aperture 122 for purposes of communicating the combustion chamber with the annular space thus introducing water into the combustion products for discharge of the combustion products together with steam which is formed when a small amount of water was introduced into the combustion chamber by virtue of the small apertures 122 thus producing an additional thrust to the engine.

In operation, the compressor supplies combustion supporting air to the combustion chamber 64 and a suitable control valve such as a butterfly valve or the like may be employed for controlling the quantity of air. This apparatus could be initially started in several ways, none of which are intended to form a part of the present invention. For example, the starting could be done by an electric motor mounted upon the apparatus and geared to the drive shaft 26 to supply the initial rotation for operating the fuel pump, allowing the discharge of air into the combustion chamber, and causing ignition of the mixture. This operation could also be performed by hand, such as with a draw cable and a sheave applied to the top of the rotor shaft, as in the starting of other types of combustion engines. Fuel is admitted through the bored shaft 26, the fuel pump 36 supplying fuel under pressure and the needle valve adjusting the quantity of fuel. As the fuel and air are mixed in the combustion chamber 64, the mixture will be ignited by the spark plug 88 or other suitable igniter timed in a proper manner and the igniter may be connected to any ignition device such as a magneto or the like. Suitable lubrication means may be provided as needed and means may be provided for controlling the position of the annular ring 120 thus determining the direction of thrust produced. Water passing into the combustion chamber will be promptly converted into steam and as this mixture is discharged, it will turn the turbine rotors 92 and then be discharged from the nozzle 112.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily ocur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. In an outboard motor for the propulsion of a boat comprising, in combination, a cylindrical member, means on said member for mounting it on the transom of a boat with the lower end of the member disposed below the surface of the water, a nozzle communicating with the lower end of the member and having open ends, a housing mounted on the upper end of the member and communicating therewith, an elongated shaft extending through said housing and member, compressor means mounted on said shaft in said housing, said housing including air inlet means for the compressor means adjacent the top of said housing and air outlet means communicating the compressor means with the member for discharging air into said member, said shaft having a longitudinal bore communicating at opposite ends with the top of said housing and with the interior of said member, fuel supply means connected with one end of the bore for supplying fuel to the interior of said member below the housing for mixture with air from said compressor means, ignition taking place in said member, said shaft including a plurality of turbine blades mounted thereon within said member whereby axial flow of combustion products will cause rotaiton of the shaft thus driving the compressor, and means in said nozzle controlling the direction of expanding combustion products for producing a thrust, said member having a water jacket in spaced enclosing relation thereto defining a water chamber, a water pump for circulating water in the water chamber, and said member including small openings adjacent the upper end thereof for inlet of water into the combustion chamber for conversion to steam for discharge with the combustion products.

2. The structure as defined in claim 1 wherein said shaft is provided with a cylinder head rotatable with the shaft, seal means between the head and member for main-

taining a seal for preventing flow of combustion products therethrough, and gear means on the head for driving the water pump, said fuel supply including a pump driven by said gear means.

3. The structure as defined in claim 2 wherein a needle control valve is provided in the bore in the shaft to control input of fuel.

4. The structure as defined in claim 3 wherein said nozzle is in the form of a venturi, said means for controlling discharge including a movable annular ring of

triangular cross sectional configuration at the point of least diameter of the nozzle thereby deflecting the combustion products in a selective direction for controlling the direction of thrust produced by the nozzle.

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