

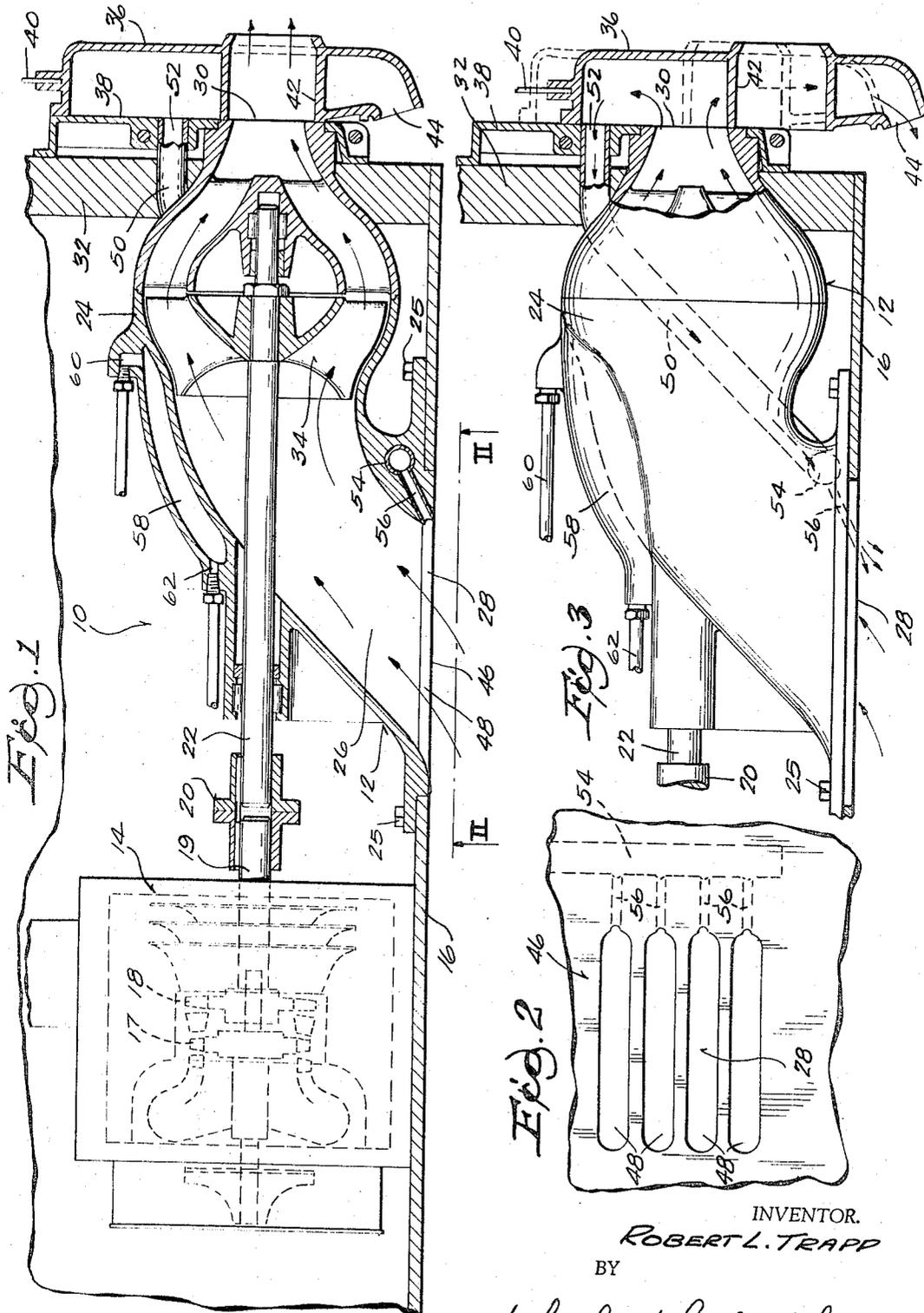
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REACTION JET MARINE ENGINE

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REACTION JET MARINE ENGINE

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This invention relates to marine propulsion systems and more particularly to marine reaction jet propulsion drives and to combinations of prime movers and reaction jet propulsion drives.

One object of the present invention is to provide a marine reaction jet drive in which means are provided for affording a scavenging flow of water at the inlet opening. Thus, in the disclosed construction, conduit means terminating at the trailing edge of the inlet opening is placed in communication with the discharge of the reaction jet housing outlet when the drive is operating under conditions other than in forward drive.

Another object of the present invention is to provide a marine propulsion system comprising a jet reaction drive and a driving turbine engine. The jet reaction drive maintains a working load on the turbine engine under all conditions, thereby avoiding overspeeding which could result in ultimate destruction of the turbine engine if a conventional propeller drive were coupled with the turbine and if disengagement of the drive occurred, or if the propeller were removed from the water.

A further object of this invention is to provide a marine propulsion system which can be shifted from forward drive to reverse drive or vice versa at full throttle without the necessity of utilizing an expensive transmission and a brake system which is necessary if a conventional propeller drive were used with a turbine engine.

A still further object is to provide a marine propulsion system having an oil sump which is located adjacent to the jet reaction drive housing and which serves as an oil cooler.

Other objects and advantages will become apparent from the following description and the drawings in which:

FIGURE 1 is a fragmentary view, partially in section, of a marine propulsion system in accordance with the invention;

FIGURE 2 is an enlarged, fragmentary view taken generally from along the line II-II of FIGURE 1; and

FIGURE 3 is a side elevational view, partially in section, of the marine propulsion system shown in FIGURE 1.

Referring now to the drawings, and more particularly to FIGURE 1, the marine propulsion system of the present invention is identified generally by the numeral 10, and comprises an inboard reaction jet drive 12 and a turbine engine 14 both mounted on a boat hull 16.

The turbine 14 has two stages 17 and 18. At least one stage, as for example, the stage 18 includes an output shaft 19 which, in turn, is connected through an appropriate gear reduction and coupling device 20 to the input shaft 22 of the jet drive 12.

The reaction jet drive 12 comprises, in addition to the shaft 22, a housing 24, means in the form of bolts 25 mounting the housing 24 in boat hull 16, and means in the housing 24 defining a waterflow passageway 26. The waterflow passageway 26 has an inlet opening 28 in the bottom of the boat hull 16 and an outlet opening 30 at the transom 32 of the boat hull 16. Water is displaced through the waterflow passageway 26 by a rotor 34 disposed therein and fixed to the shaft 22.

The direction of part or all of the flow of water discharged from the outlet opening 30 can be diverted or controlled by means in the form of a deflector 36 which

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is slideably mounted or carried on the boat hull 16 adjacent the outlet opening 30 by means in the form of a guideway 38 for affording movement of deflector 36 between neutral, forward drive and reverse drive positions. Means are provided for moving the deflector 36 between neutral, reverse drive and forward drive positions.

While various means can be employed, in the preferred embodiment of the present invention such means comprises a remotely operated linkage 40 connected to the upper portion of deflector 36. When the deflector 36 is in the forward drive position, as shown in FIGURE 1, the flow of water discharged from the outlet opening 30 passes rearwardly through a central duct 42 in the deflector 36 to propel the boat forwardly. When the deflector 36 is moved to the reverse drive position, shown by solid lines in FIGURE 3, the waterflow discharged from the outlet opening 30 is diverted by the deflector 36 for passage around the duct 42 and through a forwardly facing opening 44 to provide rearward propulsion. When the deflector 36 is moved to the neutral position, shown by broken lines in FIGURE 3, part of the flow of water discharged from the outlet opening 30 passes through the central duct 42 and part of the flow travels around the duct and out the opening 44. The effect is to provide simultaneous forward and rearward jets which balance each other and provide a neutral drive condition.

Debris and the like is prevented from entering passageway 26 by fabricating the inlet opening 28 in the form of a screen 46 having a series of spaced parallel slots 48, as shown in FIGURE 2. In order to prevent collection of debris at the trailing edges of slots 48, when the boat hull 16 is forwardly propelled, means are provided for scavenging or cleaning any such debris by flowing or discharging adjacent to the trailing edges of slots 48 a part of the discharge from the outlet opening 30 when the deflector is in either its neutral or rearward drive positions. While various means can be employed, in the preferred embodiment of the present invention, part of the flow of water diverted by deflector 36 is received in a conduit 50 and directed thereby to the trailing edges of the slots 48. The conduit 50 includes an end 52 disposed in the transom 32 in communication with the deflector 36. The other end 54 terminates in a series of branch pipes 56, each of which is disposed adjacent to and contiguous with the respective trailing edges of the slots 48. When the deflector 36 is displaced from the forward drive position, part of the waterflow travels through conduit 50 and is directed to the trailing edges of slots 48 by way of branch pipes 56 to provide a scavenging waterflow for the screen 46.

The deflector 36 of the jet drive 12 can be moved from the forward drive position to the reverse drive position or vice versa or, in fact, into and out of any position including neutral while the turbine engine is running at full speed without adversely affecting the operation of the turbine engine. This is possible because the change in drive condition is accomplished through diversion of waterflow. Utilization of a conventional propeller drive with a turbine engine would require an expensive transmission and brake system and would still require a throttling down of the engine to accomplish shifting from forward drive to reverse drive conditions, or vice versa.

In order to economically provide an arrangement for cooling the oil employed in the turbine, there is provided means in the form of an oil sump 58 which extends in saddle-like disposition around the top and sides of the housing 24 and which can be formed as an integral part of the housing 24. Oil from the turbine engine is received in the sump 58 through an inlet opening 60 and is returned to the turbine engine through an outlet opening 62. Thus, the water flowing through the waterflow passage-

way serves to cool the oil circulating through the sump 58 as the oil contacts the wall between the sump 58 and the passageway 26.

The stage 18, in order to prevent over-speeding, should be under a load at all times. The jet drive 12 effectively maintains a working load on the turbine under all conditions, for even if the intake became clogged, the trapped water effectively serves to control over-speeding. In a conventional propeller drive, any disengagement of the gear train, or removal of the propeller from the water would result in over-speeding of the turbine engine.

Various of the features of the present invention are set forth in the following claims.

What is claimed is:

1. The combination of a reaction jet housing having a waterflow passageway including an inlet opening and an outlet opening, a rotor in said passageway intermediate said inlet and outlet openings, and conduit means separate from said passageway affording communication between said outlet opening and said inlet opening to provide a scavenging flow of water from said outlet opening to said inlet opening.

2. The combination of a reaction jet housing having a waterflow passageway including an inlet opening and an outlet opening, a rotor in said passageway intermediate said inlet and outlet openings, means adjacent said outlet opening for controlling the direction of water discharged from said outlet opening, means mounting said discharge direction control means for movement relative to a forward drive position, and conduit means separate from said passageway affording communication between said outlet opening and said inlet opening to provide a scavenging flow of water from said outlet opening to said inlet opening whenever said means for controlling the direction of water discharge is moved from said forward drive position.

3. The combination of a reaction jet housing having a waterflow passageway including an outlet opening and an inlet opening having a trailing edge, a rotor in said passageway intermediate said inlet and outlet openings, means adjacent said outlet opening for controlling the direction of water discharged from said outlet opening, means mounting said discharge direction control means for movement relative to a forward drive position, and conduit means separate from said passageway affording communication between said outlet opening and said trailing edge of said inlet opening to provide a scavenging flow of water from said outlet opening to said trailing edge whenever said means for controlling the direction of water discharge is moved from said forward drive position.

4. The combination of a reaction jet housing having a waterflow passageway including an outlet opening and an inlet opening including a series of elongated slots each having a trailing edge, a rotor in said passageway intermediate said inlet and outlet openings, means adjacent said outlet opening for controlling the direction of water discharged from said outlet opening, means mounting said discharge direction control means for movement relative to a forward drive position, and conduit means separate from said passageway affording communication between said outlet opening and said trailing edge of said inlet opening slots to provide a scavenging flow of water from said outlet opening to said trailing edge whenever said means for controlling the direction of water discharge is moved from said forward drive position.

5. A marine propulsion drive comprising a reaction jet housing having a water flow passageway including an outlet opening and an inlet opening including a screen having a series of elongated, spaced slots, a rotor disposed in said waterflow passageway for displacing water there-through, a deflector adjacent said outlet opening and movable between neutral, forward drive, and reverse drive positions for diverting the flow of part or all of the water discharged from said outlet when said deflector is displaced from said forward drive position, and a conduit

for receiving part of the water diverted by said deflector and directing it to the trailing ends of said slots, said conduit having one end communicating with said deflector and the other end terminating in a series of branch pipes, said branch pipes being disposed adjacent to and contiguous with the respective trailing ends of said slots to provide a scavenging water flow for said screen when said deflector is displaced from said forward drive position.

6. A marine propulsion drive comprising, in combination with a prime mover and a boat hull, a reaction jet housing mounted on said boat hull and having a waterflow passageway including an outlet opening in the transom of said boat hull and an inlet opening in the bottom of said boat hull including a screen, a rotor operatively connected to said prime mover and disposed in said waterflow passageway for displacing water therethrough, a deflector adjacent said outlet opening for diverting the flow of water discharged from said passageway, means mounting said deflector to said boat hull to afford displacement of said deflector between neutral, forward drive, and reverse drive positions, and means for communicating part of the water diverted by said deflector with said screen when said deflector is displaced from the forward drive position to provide a scavenging waterflow for said screen when said deflector is displaced from said forward drive position.

7. A marine propulsion drive comprising a boat hull, a prime mover, a reaction jet housing mounted on said boat hull and having a waterflow passageway including an outlet opening in the transom of said boat hull and an inlet opening in the bottom of said boat hull including a screen, a rotor operatively connected to said prime mover and disposed in said waterflow passageway for displacing water therethrough, a deflector disposed on said boat hull adjacent said outlet opening and movable between neutral, forward drive, and reverse drive positions for diverting the flow of part or all of the water discharged from said outlet when said deflector is displaced from said forward drive position, and means for communicating part of the water diverted by said deflector with the trailing edge of said screen to provide a scavenging waterflow for said screen when said deflector is displaced from said forward drive position.

8. A marine propulsion drive comprising a boat hull, a prime mover, a reaction jet housing mounted on said boat hull and having a waterflow passageway including an outlet opening in the transom of said boat hull and an inlet opening in the bottom of said boat hull including a screen having a series of elongated, spaced slots, a rotor operatively connected to said prime mover and disposed in said waterflow passageway for displacing water therethrough, a deflector disposed on said boat hull adjacent said outlet opening and movable between neutral, forward drive, and reverse drive positions for diverting the flow of part or all of the water discharged from said outlet opening when said deflector is displaced from said forward drive position, and a conduit having one end disposed in the transom of said boat hull in communication with said deflector for receiving part of the water discharged from said outlet when said deflector is displaced from said forward drive position and the other end disposed in the bottom of said boat hull in communication with the trailing ends of said slots to provide a scavenging waterflow for said screen when said deflector is displaced from said forward drive position.

9. The combination of a gas turbine engine, a jet reaction drive including a housing defining a waterflow passageway including an inlet opening and an outlet opening, an oil sump surrounding the top and sides of said housing, said oil sump having an inlet opening for receiving oil from said turbine engine and an outlet opening for returning oil to said turbine engine, a rotor operatively connected to said turbine engine and disposed in said waterflow passageway for displacing water there-through, and a conduit separate from said passageway

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communicating between said outlet opening and said inlet opening to provide a scavenging flow of water from said outlet opening to said inlet opening.

10. A marine propulsion system comprising, a gas turbine engine including an output shaft, an inboard jet reaction drive including means for mounting said drive to a boat hull, a housing having a waterflow passageway therein including an inlet opening and an outlet opening, an input shaft rotatively carried by said housing, a rotor connected to said input shaft and disposed in said waterflow passageway for displacing water therethrough, a conduit separate from said passageway communicating between said outlet opening and said inlet opening to provide a scavenging flow of water from said outlet opening to said inlet opening, and a coupling connecting said output shaft and said input shaft.

11. A marine propulsion system comprising a boat hull, a gas turbine engine carried by said boat hull and including an output shaft, a jet reaction drive carried by said hull and comprising a housing having a waterflow passageway including an outlet opening and an inlet opening, an input shaft rotatively carried by said housing, and a rotor connected to said input shaft and disposed in said waterflow passageway for displacing water therethrough, a coupling connecting said output shaft and said input shaft, a deflector adjacent said outlet opening for diverting the flow of water discharged from said passageway, means mounting said deflector to said boat hull to afford displacement of said deflector between neutral, forward drive, and reverse drive positions, and a conduit separate from said passageway affording communication between said outlet opening and said inlet opening to provide a scavenging flow of water from said outlet opening to said inlet opening whenever said deflector is moved from forward drive position.

12. A marine propulsion system comprising, a boat hull, a gas turbine engine carried by said boat hull and including a first and second stage and an output shaft operatively connected to one of said stages, a jet reaction drive carried by said boat hull and comprising a housing having a waterflow passageway including an outlet and an inlet opening including a screen, an input shaft rotatively carried by said housing, and a rotor connected to said input shaft and disposed in said waterflow passageway for displacing water therethrough, a coupling connecting said output shaft and said input shaft,

a deflector adjacent said outlet opening for diverting the flow of water discharged from said passageway, means mounting said deflector to said boat hull to afford displacement of said deflector between neutral, forward drive, and reverse drive positions, and means for communicating part of the water diverted by said deflector with said screen when said deflector is displaced from the forward drive position to provide a scavenging waterflow for said screen when said deflector is displaced from said forward drive position.

13. A marine propulsion system comprising, a boat hull, a gas turbine engine carried by said boat hull and including a first and second stage, a reaction jet housing mounted on said boat hull and having a waterflow passageway including an outlet opening in the transom of the said boat hull and an inlet opening in the bottom of said boat hull including a screen having a series of elongated, spaced slots, a rotor operatively connected to one of said stages of said turbine engine and disposed in said waterflow passageway for displacing water therethrough, a deflector disposed on said boat hull adjacent said outlet opening and movable between neutral, forward drive and reverse drive positions for diverting the flow of part or all of the water discharged from said outlet opening when said deflector is displaced from said forward drive position, and a conduit having one end disposed in the transom of said boat hull in communication with said deflector for receiving part of the water discharged from said outlet when said deflector is displaced from said forward drive position and the other end disposed in the bottom of said boat hull in communication with the trailing ends of said slots to provide a scavenging waterflow for said screen whenever said deflector is displaced from said forward drive position.

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