REVERSE STEERING CASCADE FOR JET PROPELLED WATERCRAFT

Morley S. Smith, Indianapolis, Ind., assignor to The Buehler Corporation, Indianapolis, Ind., a corporation of Indiana

Filed Feb. 3, 1964, Ser. No. 341,986
4 Claims. (Cl. 60—35.54)

The present invention relates to jet propelled watercraft and more particularly to a means for controlling the direction of such craft.

One form of jet propelled boat incorporates an engine operatively connected to a pump located within a conduit extending through the boat from an intake opening at the bottom of the boat to an exhaust at the rear of the boat. Water is drawn into the conduit through the intake opening and is exhausted in a stream from the rear of the boat causing the boat to move forward. The direction of movement of the boat is controlled by deflecting the stream of water as it leaves the rear of the boat. For example, the stream could be deflected so as to cause the stream to flow beneath and forwardly of the boat causing the boat to move in reverse.

A primary object of the present invention is to provide in a jet boat improved means for controlling the direction of flow of the water as it leaves the boat and for controlling the direction of movement of the jet boat.

A further object of the invention is to provide in a jet boat improved direction control means which is more responsive and effective in controlling a watercraft particularly in reverse movement than either a conventional jet direction control or a conventional rudder.

Related objects and advantages will become apparent as the description proceeds.

One embodiment of the present invention might include a control system for a watercraft comprising a conduit mounted on the craft extending from an intake opening to the watercraft thereof, means for pumping water through said conduit to exhaust from said opening, said conduit having a further opening in the lower sidewall thereof, means for closing off said first opening to cause flow from said further opening, defendant means incorporating at least one vane leading downwardly and then forwardly, said means being positioned below said further opening and rotatably mounted relative to said conduit for rotation about a vertically extending axis, a vertical fin fixed to said means and positioned below said further opening, said fin normally lying in a fore-and-aft position and the vane of said means in a transversely extending position but said fin and vane being rotatable to guide water issuing from said further opening.

The full nature of the invention will be understood from the accompanying drawings and the following description and claims.

FIG. 1 is a side elevation of a jet boat incorporating the novel direction control of the present invention.

FIG. 2 is an enlarged vertical longitudinal section through the rearward portion of the watercraft of FIG. 1.

FIG. 3 is a fragmentary bottom plan view of a portion of the structure illustrated in FIG. 2.

FIG. 4 is an enlarged fragmentary rear elevation of the watercraft of FIG. 1.

Referring now more particularly to the drawings, there is illustrated a jet boat 10 having a hull 11 which is provided with an intake opening 12 at the bottom 13 of the craft. A conduit 15 is mounted within the craft and extends from the intake opening 12 to a housing 16 mounted on the transom 17 of the craft. The conduit 15 includes a discharge section 20 which opens into the housing 16 through a cylindrical aperture 21 in the forward wall 22 of the housing. A pump 25 is operatively received within the conduit 15 and is driven by a conventional marine engine 26 operatively connected to the pump 25 by a shaft 27. It can be appreciated that the pump 25 functions to pump water from the intake 12 into the housing 16. The water is constricted into a jet stream by the converging surface 28 of an annular member 27 fixed within the rearward end 30 of the discharge section 20 by a snap ring 29.

The housing 16 is provided with an outer decorative covering 31. It further includes an inner housing or an inner functional box-like enclosure 33. This enclosure includes a rearward wall 32, the major portion of which is flat and generally perpendicular to the axis of the discharge section 20. The inner enclosure or housing 33 further includes sidewalks 36 which are vertical and join the front wall 22 of the housing to the rearward wall 32.

A circular aperture 37 is formed in the rearward wall 32 in registry with the end 30 of the discharge section 20. When the gate 40 is in the illustrated upward position of FIG. 2, the water jet formed by the tapering surface 28 of the annular member 27 passes directly rearwardly through the aperture 37 without an appreciable portion of the water contacting any portion of the inner housing 33.

The gate 40 is movable downwardly to cover the aperture 37 to seal off flow of water therethrough. Downward movement of the gate 40 to such a position and to the illustrated upward position is accomplished by pivoting of a lever 41 fixed to the end 42 of a shaft 43 pivotally received within a bearing 44 mounted on the transom 17 and the housing 16 so as to extend through the transom and the forward wall of the housing. At the other end 50 of the shaft 43, there is fixed an arm 51, the radially outwardly projecting end 52 of which is pivoted to a further arm 53 which, in turn, is pivoted to the gate 40 at the axis 54 of the gate. Thus, it can be seen that the swinging of the lever 41 moves the gate upwardly and downwardly.

A pair of deflectors 55 are individually pivoted on shafts 56 which are received in suitable bearing portions 57. The deflectors 55 are positioned on opposite sides of the aperture 37 and are used to deflect the jet stream rightwardly or leftwardly (see FIG. 3) for steering the craft. The deflectors can be individually pivoted by means of a bifurcated member 58 fixedly mounted on the lower end of shaft 59. The shaft 59 is pivoted in bearings 59A integral with the inner housing 33. The shaft 59 and member 58 can be pivoted by a lever 59C extending into the craft. This steering apparatus is described in more detail in the copending application of James W. Reynolds and Robert L. Stevenson entitled Jet Boat Steering Deflectors, Serial No. 236,292, filed November 8, 1962, and assigned to the same assignee as the present application.

The inner housing 33 is provided with only one further water outlet in addition to the aperture 37. This further water outlet is the passage 60 in the bottom of the housing. The rearward wall 32 of the housing is curved at 61 into a part-cylindrical shape which, along with the curved forward portion 62 of the housing, gradually changes the direction of the water moving out of the discharge section 20 so that the water is moving directly downwardly when it leaves the housing 16. Fixed and forming a part of the housing 16 is bottom member 65 which has a forwardly projecting portion 66 having a bearing member 67 fixed to the upper surface thereof. A deflector means 70 including three vanes 71, 72 and 73 is rotatably mounted within the bearing 67 by means of a post 75 having an enlarged head 76. The vanes 71, 72 and 73 each extend generally transversely of the boat when in the position of FIG. 2 and lead downwardly and
forwardly for deflecting water issuing from the passage 60 in a forward direction. A vertical fin 80 is fixed to the deflector means 70 and, when in the position of Fig. 2, extends from front-to-rear and also extends below the bottom 13 of the water craft. The deflector means 70 is coupled to the deflectors 55 by means of a coupling element 81 which has a gener-
erally T-shape as viewed in the bottom plan of Fig. 3. The coupling element 81 is pivotally secured to the in-
dividual deflectors by means of screws 82 and is secured to the deflector means by a shoulder bolt 85.

When the craft is moving forwardly under the action of the deflector means from the aperture 37, steering can be accomplished by the deflectors 55 and also by means of the vertical fin 80. Because the fin 80 projects beneath the bottom 13 into the water supporting the craft and be-
cause of the additional effect of the jet deflection, steering control of the craft in forward movement is more posi-
tive and effective than presently available conventional craft. When the gate 60 is lowered so as to cover the aperture 37, water is caused to flow downwardly through the passage 60 and is deflected beneath the craft by the vanes 71–73 producing rearward movement of the craft. As the craft moves rearwardly, the fin 80 operates in a high-

4. vertical fin extending below the bottom of said craft so as to be usable in the steering of said craft whether mov-

5. A control system for jet propelled watercraft com-
promising a conduit mounted on the craft extending and opening rearwardly thereof, means for pumping water through said conduit to exhaust from said opening, said conduit being constricted at the opening thereof for form-
ing the water into a jet, a housing secured to the conduit and covering the opening thereof, said housing having a forward wall and a rearward wall including a flat por-
tion generally perpendicular to said conduit and having flat vertical sidewalls, said flat vertical sidewalls having a pas-
ture therethrough positioned in registry with said con-
stricted conduit opening and jet, a gate received within said housing and moveable between a position covering and blocking flow through said rearward wall aperture and a position uncovering said rearward wall aperture, said housing having a further water outlet in addition to said aperture, said further water outlet being a passage which includes a portion extending downwardly between said vertical sidewalls, deflector means incorporating at least one vane leading downwardly and then forwardly, said means being positioned below said further water outlet and deflector means only is acted upon by the water supporting the craft but is also acted upon by the rapidly moving stream of water issuing from the passage 60.

5. A control system for jet propelled watercraft comprising a generally straight conduit mounted on the craft extending and opening rearwardly thereof, means for pumping water through said conduit to exhaust from said opening, said conduit being constricted at the opening thereof for forming the water into a jet, a housing se-
cured to the conduit and covering the opening thereof, said housing having a forward wall and a rearward wall including a flat portion generally perpendicular to said conduit and having flat vertical sidewalls, said rearward wall having an aperture therethrough positioned in registry with said constricted conduit opening and jet, a gate received within said housing and moveable between a position covering and blocking flow through said opening thereof, said housing having a forward wall and a rearward wall aperture, a pair of deflectors mounted on said craft for pivoting about spaced vertical axes on opposite sides of said craft, also means for pivoting said deflectors about said axes to deflect said water stream as it issues from said first exit, said housing having a further water outlet in addition to said aperture, said further water outlet being a passage which includes a portion extending rearwardly and downwardly between said vertical sidewalls, deflector means including a plurality of vanes leading downwardly and then forwardly, said means being positioned below said further water outlet and rotatably mounted on said housing for rotation about a vertically extending axis, a vertical fin fixed to said means and positioned below said further water outlet, said fin normally lying in a fore-and-aft position and the vane of said means in a transversely extending position but said fin and vane being rotatable to guide water issuing from said further opening, the lower end of said means terminating above the bottom of said craft, said vertical fin extending below the bottom of said craft so as to be usable in the steering of said craft whether moving forwardly or rearwardly.
4. A control system for a watercraft comprising a conduit mounted on the craft and opening downwardly there-of, means for pumping water through said conduit to exhaust from said opening, deflector means incorporating at least one vane leading downwardly and curving toward the horizontal, said means being positioned below said opening and rotatably mounted relative to said conduit for rotation about a vertically extending axis, a vertical fin fixed to said means and positioned below said opening, said fin normally extending in the same direction toward which said vane curves but said fin and vane being rotatable to guide water issuing from said opening, the lower end of said means terminating above the bottom of the craft, said fin extending below the bottom of the craft.

5

References Cited by the Examiner

UNITED STATES PATENTS

2,328,041  8/1943  Wollons  114-62
2,656,809  10/1953  Frasure  114-151
2,743,698  5/1956  Leonard et al.  115-16
3,097,623  7/1963  Hamilton  115-12
3,146,588  9/1964  Reynolds et al.  60-35.54

MARK NEWMAN, Primary Examiner.