Fig. 5.
The present invention relates to jet propelled watercraft and more particularly to means for controlling the direction of such craft.

One form of water jet propelled boat incorporates an engine arranged to drive a pump located within a conduit through the boat. Water moves into the conduit through an intake opening at the bottom of the boat, is forced through the conduit by the pump and is exhausted in a stream from the rear of the boat whereby the boat moves through the water. In order to move the boat rearwardly, the stream of water may be deflected as it leaves the rear of the boat in such a manner as to cause the stream to flow forwardly beneath the boat. In some applications, it is desirable to close off or bottle up the stream whereby the water pressure produced by the pump can be used for fire fighting or for other purposes such as a chlorination spray or a plant spray.

Consequently, one object of the present invention is to provide a jet boat direction control which can be used to bottle up the jet stream to provide water pressure for fire fighting and other purposes.

Another object of the present invention is to provide a jet boat direction control which is relatively simple to operate and only requires one mechanism for steering and one mechanism for thrust direction.

Another object of the present invention is to provide the jet boat direction control which provides full steering at all reverse as well as forward speeds.

Still another object of the invention is to provide a jet boat direction control which can be conveniently operated to cause the boat to retain position while a portion of the output of the pump is being used to fight a fire on the like.

Certain presently available direction controls use the balanced flow concept of neutral. That is, the flow is balanced in such a manner that a portion of the jet flows forward and a portion flows rearward whereby the total front and rear thrust is zero. It has been found that such balanced flow direction controls do not balance the steering forces at the same setting at which front and rear thrust is balanced which results in an incomplete neutral. A further object of the invention is to provide a jet boat direction control which incorporates a neutral or "no thrust" position wherein steering forces are also balanced.

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

One embodiment of the present invention comprises a direction control system for watercraft comprising a conduit mounted on the craft and including a wall generally perpendicular to the conduit, said conduit having an upper exit opening and a downwardly spaced lower exit opening, both through said wall, means for pumping water through said conduit toward said lower exit opening, a gate received within said conduit, and means for moving said gate across said wall to positions wherein said gate covers both of said exit openings or covers only one of said openings, a tubular member pivotally mounted on said conduit with its forward end in alignment with said lower exit opening, said conduit further including a passage leading from said upper exit opening and dividing into two horizontally spaced passages each of which leads downwardly on opposite sides of said tubular conduit and opens downwardly at a lower jet discharge opening, a horizontal element, a plurality of parallel deflectors fixed to said element and curving downwardly then forwardly, said element and deflectors being fixed to said tubular conduit for pivoting therewith, said element being positioned within said lower jet discharge opening for controlling the water exiting therefrom.

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 system of the present invention.

FIG. 2 is an enlarged rear elevation of the direction control system of the jet boat of FIG. 1 with a portion of FIG. 2 in section taken along the line 2--2 of FIG. 3 in the direction of the arrows.

FIG. 3 is a top plan view of the jet boat direction control of FIG. 2 with a portion of FIG. 3 in section taken along the line 3--3 of FIG. 2 in the direction of the arrows.

FIG. 4 is a vertical section taken along the line 4--4 of FIG. 2 in the direction of the arrows.

FIG. 5 is a vertical section taken along the line 5--5 of FIG. 4 in the direction of the arrows.

Referring now more particularly to the drawings, there is illustrated a jet boat 10 having a hull 11, said hull being provided with an intake opening 12 communicating between the bottom of the boat and a pump 13. The pump 13 has a passage therethrough communicating between the intake opening 12 and a passage 15 defined by a lip 27 formed on casting 26. The pump 13 is driven by a conventional marine engine 17 through shaft 18 and functions to pump water from the intake 12 to and out of the rear of the boat. The water is formed into a jet stream by the converging surface 20 of an annular member 21 fixed within the passage 15.

The casting 26 is fixed to the transom 25 of the boat and is provided with a vertically extending interior 30, the passage 15 opening into the vertically extending interior. The casting has a further lip or collar 31 which receives a sleeve 32. Between the sleeve and the lip 31 is an O-ring 35 which is positioned within inwardly opening recess 36 in the lip 31. The O-ring prevents leakage of water out of the interior 30 of the casting into the boat.

The shaft 37 is rotatable within bearings 40. Fixed to the end of the shaft 37 is a radially extending arm 41 which is rotatably secured to an arm 42 by a pin 43. The arm 42 is rotatably secured about the axis 45 to a circular disc gate 46. Rotation of the shaft 37 causes the gate 46 to be raised and lowered within the interior 30, the gate being guided by the vertically extending inwardly facing walls 47 of the interior 30.

The interior 30 has two outlets or exits, an upper exit 50 which is generally half-moon in shape and a lower circular exit 51. The upper exit 50 leads into a passage 52 which divides into two passages 53. The two passages 53 are horizontally spaced and extend outwardly and downwardly around a tubular conduit 55. The two passages 53 terminate into the tubular conduit 55 and within a part-circular jet discharge opening 56 defined by a depending circular lip 57.

Positioned within the discharge opening 56 is a part circular or C-shaped member or element 60 having horizontally extending deflectors 61 formed integrally therewith. The deflectors 61 curve downwardly and then forwardly. The member 60 and the deflectors 61 form a cascade control 62 which deflects the water exiting from the outlet 56 forwardly beneath the bottom 65 of the boat. The cascade control 62 is formed integrally.
3 with a vertically extending shaft 66 which projects into and is fixed to the tubular conduit 55. The shaft 66 is received within a bearing 67 secured to the casting 56. Thus, the shaft 66 provides a lower pivotal mounting for the tubular conduit 55 as well as a means for pivoting the cascade control 62.

The outlet 51 of the interior 30 has a tubular lip 70 therearound. The lip 70 projects rearwardly and is flush with the rear wall 73 of the casting 26 at the rear thereof 71 and 72. The upper portion of the tubular conduit 55 is fixed to a shaft 75 which projects upwardly through a bearing 76 to a further bearing 77. The tubular conduit 55 is pivoted by means of the shaft 75 which is controlled by suitable steering means within the boat.

A rubber ring 80 is received about the tubular conduit 55 within a suitable recess 81. The purpose of the rubber ring is to prevent leakage of water past the tubular conduit 55. It will be noted from FIGS. 2 and 3 that the inner surfaces 82 of the casting are formed in a generally cylindrical shape so that the ring 80 rides thereon as the tubular conduit 55 is pivoted about the axis of the shaft 66 and 75.

When the disc gate 46 is in the uppermost position of FIGS. 4 and 5, the water from the pump flows directly through the interior 30 through the opening 51 so that it can be controlled by the tubular conduit 55. Such control is, of course, achieved by pivoting of the shaft 75 whereby steering of the boat is accomplished by deflecting of the jet stream to the right or the left.

If the disc gate 46 is lowered so as to cover the openings 50 and 51, the jet stream is bottled up and water under pressure fills the interior 30 of the casing. When the device is in this condition, the water pressure can be used for fire fighting and similar purposes. When the disc gate 46 is in its lowest position covering the opening 51 and uncovering the opening 50, water flows through the passage 52 outwardly and downwardly through the passages 53, then through the jet discharge opening 56 where it is deflected by the cascade control 62. It can be appreciated that the boat can be steered by means of the water passing through the cascade control and with exactly the same controls as are used to control the tubular conduit 55.

From the above description, it will be evident that the present invention provides an improved jet boat direction control which can be used to bottle up the jet stream to provide water pressure for fire fighting and other purposes. It will also be evident that the present invention provides an improved control which is operationally simple and only requires one mechanism for steering and one for thrust direction. Because of the fact that the present control can be operated to completely close off both the forward opening and the reverse opening, a no-thrust position can be provided which is a complete neutral and does not rely upon a balancing of flow to produce a zero thrust.

While the invention has been illustrated and described in detail in the drawings and foregoing description, the same is to be considered as illustrative and not restrictive in character, it being understood that only the preferred embodiment has been shown and described and that all changes and modifications that come within the spirit of the invention and the scope of the claims are also desired to be protected.

The invention claimed is:

1. A direction control system for watercraft comprising a conduit mounted on the craft and including a generally perpendicular wall, said conduit having an upper exit opening and a downwardly spaced lower exit opening both through said wall, means for pumping water through said conduit toward said lower exit opening, a gate received within said conduit, and means for moving said gate across said wall to positions wherein said gate covers both of said exit openings or covers only one of said openings, a tubular member having its forward end in alignment with said lower exit opening, said conduit further including a further portion having a passage leading from said upper exit opening and dividing into two horizontally spaced passages each of which leads downwardly on opposite sides of said tubular member and opens downwardly at a part circular lower jet discharge opening, a pair of shafts each pinned to said tubular member, said shafts projecting from said tubular member one upwardly and one downwardly, said shafts being pivotally mounted in said conduit, a plurality of parallel deflectors fixed to said element and curving downwardly then forwardly, said element and deflectors being fixed to said downwardly projecting shaft for pivoting therewith, said element being positioned within said lower jet discharge opening for controlling the water exiting therefrom.

2. A direction control system for watercraft comprising a conduit mounted on the craft and including a generally perpendicular wall, said conduit having an upper exit opening and a downwardly spaced lower exit opening both through said wall, means for pumping water through said conduit toward said lower exit opening, a gate received within said conduit, and means for moving said gate across said wall to positions wherein said gate covers both of said exit openings or covers only one of said openings, a tubular member having its forward end in alignment with said lower exit opening, said conduit further including a further portion having a passage leading from said upper exit opening and dividing into two horizontally spaced passages each of which leads downwardly on opposite sides of said tubular member and opens downwardly at a part circular lower jet discharge opening, a pair of shafts each pinned to said tubular member, said shafts projecting from said tubular member one upwardly and one downwardly, said shafts being pivotally mounted in said conduit, a horizontal C-shaped element, a plurality of parallel deflectors fixed to said element and curving downwardly then forwardly, said element and deflectors being fixed to said downwardly projecting shaft for pivoting therewith, said element being positioned within said lower jet discharge opening for controlling the water exiting therefrom.

3. A direction control system for watercraft comprising a conduit mounted on the craft and including a generally perpendicular wall, said conduit having an upper exit opening and a downwardly spaced lower exit opening both through said wall, means for pumping water through said conduit toward said lower exit opening, a gate received within said conduit, and means for moving said gate across said wall to positions wherein said gate covers both of said exit openings or covers only one of said openings, a tubular member having its forward end in alignment with said lower exit opening, said conduit further including a passage leading from said upper exit opening and dividing into two horizontally spaced passages each of which leads downwardly on opposite sides of said tubular member and opens downwardly at a part circular lower jet discharge opening, a horizontal C-shaped element, a plurality of parallel deflectors fixed to said element and curving downwardly then forwardly, said element and deflectors being fixed to said downwardly projecting shaft for pivoting therewith, said element being positioned within said lower jet discharge opening for controlling the water exiting therefrom.

4. A direction control system for watercraft comprising a conduit mounted on the craft and including a generally perpendicular wall, said conduit having an upper exit opening and a downwardly spaced lower exit opening both through said wall, means for pumping water through said conduit toward said lower exit opening, a gate received within said conduit, and means for moving said gate across said wall to positions wherein said gate covers both of said exit openings or covers only one of said openings, a tubular member having its forward end in alignment with said lower exit opening, said conduit further including a further portion having a passage leading from said upper exit opening and dividing into two horizontally spaced passages each of which leads downwardly on opposite sides of said tubular member and opens downwardly at a part circular lower jet discharge opening, a pair of shafts each pinned to said tubular member, said shafts projecting from said tubular member one upwardly and one downwardly, said shafts being pivotally mounted in said conduit, a horizontal C-shaped element, a plurality of parallel deflectors fixed to said element and curving downwardly then forwardly, said element and deflectors being fixed to said downwardly projecting shaft for pivoting therewith, said element being positioned within said lower jet discharge opening for controlling the water exiting therefrom.
housing defining a passage means leading from said conduit and dividing into two horizontally spaced passages each of which leads downwardly on opposite sides of said tubular member and opens downwardly at a part circular lower jet discharge opening, means for diverting the water from said exit opening into said passage means, a horizontal C-shaped element, a plurality of parallel deflectors fixed to said element and curving downwardly then forwardly, said element and deflectors being fixed to said tubular member for pivoting therewith, said element being positioned within said lower jet discharge opening for controlling the water exiting therefrom.

5. A direction control system for watercraft comprising a conduit mounted on the craft and having an exit opening, means for pumping water through said conduit, a tubular member pivotally mounted on said conduit with its forward end in alignment with said exit opening, a housing defining a passage means leading from said conduit and dividing into two horizontally spaced passages each of which leads downwardly on opposite sides of said tubular member and opens downwardly at a lower jet discharge opening, a set of downwardly and forwardly curving deflectors positioned within said lower jet discharge opening and fixed to said tubular member for pivoting therewith.

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