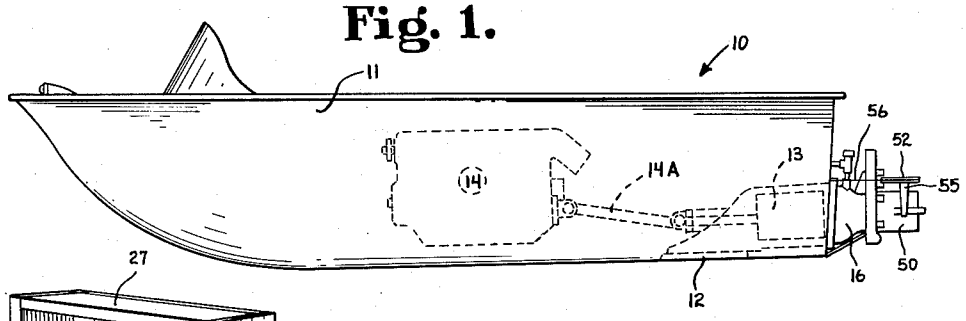
June 18, 1963 H. P. LERWICK 3,093,967

DIRECTION CONTROL DEVICE

Filed Dec. 4, 1961

Fig. 1.



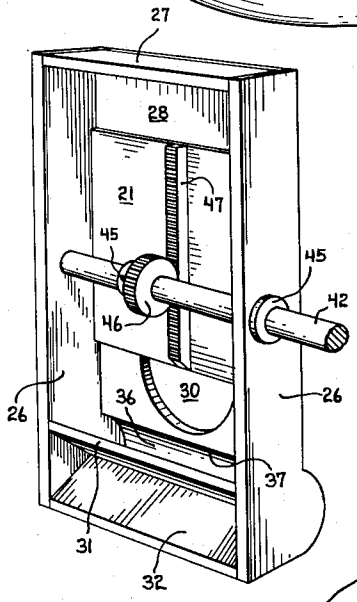


Fig. 3.

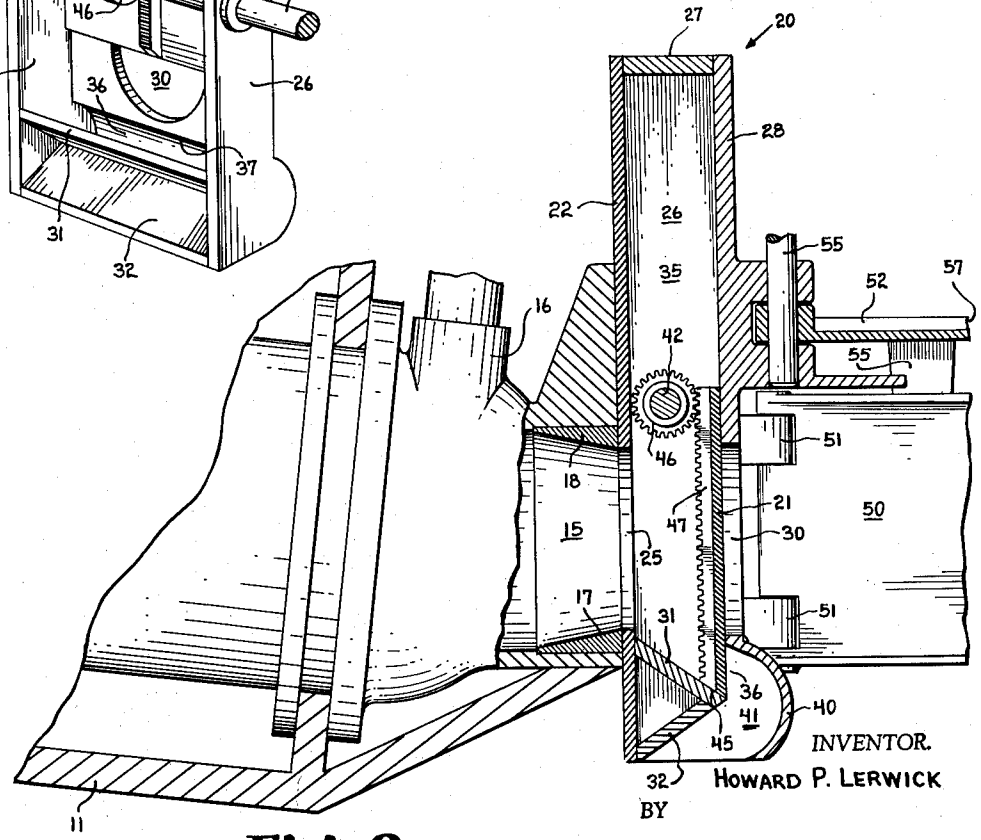


Fig. 2.

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United States Patent Office 3,093,967 Patented June 18, 1963

3,093,967

DIRECTION CONTROL DEVICE

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Filed Dec. 4, 1961, Ser. No. 156,820
6 Claims. (Cl. 60—35.54)

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

At least one form of water jet propelled boat includes an engine operatively connected to a pump located within a conduit through the boat. Water passes into the conduit through an intake opening in the bottom of the boat, is moved through the conduit by the pump and is exhausted in a jet stream from the rear of the boat, the stream leaving the boat above the water within which the boat is floating or is supported.

One problem present in the construction and operation of such water jet propelled boats is that of controlling the direction of movement thereof whereby the boat moves forwardly, rearwardly or retains position. This control may be accomplished by deflecting the jet stream as it leaves the rear of the boat in such a manner as to cause the stream to flow forwardly of and beneath the boat. A primary object of the present invention is to provide improved means for controlling the direction of movement of a jet boat.

A further object of the present invention is to provide a jet boat direction control capable of not only balancing rearward and forward jet flow to cancel out forward and rearward thrust but also capable of completely cutting off jet flow.

Still another object of the present invention is to provide a jet boat direction control including means for reducing ingestion of foreign particles through the intake of the boat when the boat is a stationary or neutral operating condition, it being understood that frequently seaweed and other such particles are particularly prevalent adjacent docking facilities where the coat could be in a neutral operating position.

Another object of the present invention is to provide a jet boat direction control capable of eliminating the tendency of the boat to creep when in neutral position.

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

One embodiment of the present invention includes a direction control system for a watercraft including means for moving water in a jet from the craft. The craft has a container mounted thereon with an entrance for the jet, said container including a wall having a pair of exits therethrough. One of the exits is positioned for registry with the jet and the other is positioned out of registry with the jet. A deflector is fixed with relation to the craft in such a position as to deflect flow from the other exit in a direction opposite to the direction of the jet. A plate is mounted within the container for movement across the inside surface of the container wall to selectively cover the exits.

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 longitudinal vertical section of the rearward portion of the boat of FIG. 1 showing in detail the direction control of the present invention.

FIG. 3 is a perspective view of a gate and housing forming a part of the direction control of the present invention.

Referring now more particularly to the drawings, there is illustrated a jet boat **10** having a hull **11**, the 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** through a tail pipe **16** secured to the rear of the boat. The pump **13** is driven by a conventional marine engine **14** through shaft **14A** and functions to pump water from the intake **12** to and out of the rear of the boat. The water is formed into a stream by the converging surface **17** of an annular member **18** fixed within the passage **15**.

Fixed to the tailpipe **16** is a housing **20**, one function of which is to contain a gate or plate **21** which is movable within the housing to various positions. The housing **20** has a flat upright generally rectangular shape and includes a forward wall **22** having an opening **25** therethrough in registry with the opening through the annular member **18**. The housing further includes vertical elongated sidewalls **26** and a top wall **27** which have fixed thereto a rear wall **28**. The rear wall **28** has an exit **30** formed therein and positioned in registry with the opening **25** through the front wall, the exit **30** being circular in shape and slightly larger than the opening **25**.

At the bottom of the housing, there is mounted a pair of elongated members **31** and **32** which are each fixed to the sidewalls **26** and the front wall **22** in a fluid-tight manner. The member **31** forms the bottom of the chamber **35** within the housing **20** and also defines the bottom edge of a horizontally extending exit **36** which is further defined by the lower edge **37** of the rear wall and by the sidewalls **26**. Fixed to the rear wall and to and between the sidewalls **26** is a curved deflector **40** which curves first rearwardly and then downwardly and forwardly from the exit **36**.

It can be seen that the deflector **40** together with the sidewalls **26** and the member **32** define a closed passage **41** extending from the exit **36** and leading and opening in a forward direction whereby water being expelled through the passage **41** will cause rearward movement of the boat.

The gate or plate **21** has a rectangular shape which approaches in width the width of the rear plate **28**. The vertical dimension, however, of the plate **21** is substantially less than the vertical dimension of the chamber **35** whereby the plate may be positioned upwardly uncovering the exits **30** and **36** so that the jet stream being exhausted through the opening **25** can pass freely and without interference through the chamber **35** and the exit **30**. The gate **21** is movable downwardly from such position to the position of FIG. 3 and even further downwardly to the position of FIG. 2 and to various other positions. This movement may be accomplished by rotation of a horizontal shaft **42** rotatably mounted within bearings **45** fixed to the sidewalls **26** of the housing.

The shaft **42** has fixedly mounted thereon by means of setscrew **45** a spur gear **46** which meshes with a vertically extending rack **47** fixed to or integral with the forward face of the plate **21**. The rotation of the shaft to move the plate between the above mentioned positions may be accomplished by any suitable control device located within the boat.

An important feature of the present invention is the fact that it has two types of neutral position, the "neutral position" being such that the thrust produced by the movement of water away from the boat is eliminated so that no force is present for moving the boat through the water. One such neutral position is illustrated in FIG. 2 wherein the plate **21** has been moved downwardly to its lowermost position wherein the lower edge **45** of the plate engages the member **31** and completely covers the exits **30** and **36** so that the water that normally moves

through the opening 25 and the exit 30 is bottled up within the housing. It should be mentioned that the housing is essentially fluid-tight except for the opening 25 and the exits 30 and 36. Since the pump is unable to move water out the rear of the boat, little or no water will be taken in through the intake opening and the ingestion of foreign particles through the intake opening will be reduced or eliminated. Also, the boat will have no tendency to creep either forwardly or rearwardly because all jet flow has been cut off.

Referring to FIG. 3, the other neutral position of the boat or at least a position approaching the other neutral position is illustrated. In the position of FIG. 3, the gate or plate 21 partially covers the exit 30 so that a portion of the water normally flowing through the exit 30 is diverted and caused to flow through the exit 36 and passage 41. This diverted water tends to provide a rearward thrust to the boat while the water passing through the exit 30 provides a forward thrust to the boat. It will be clear that by slight vertical adjustment of the plate 21, these thrust forces can be balanced to neutralize or cancel out the forward or rearward thrust. If, however, it is desired to eliminate any tendency of the boat to creep or any tendency of the pump to draw in foreign particles while the gate is in the position of FIG. 3, the gate may be dropped completely to the position of FIG. 2 whereby these tendencies are eliminated.

The housing 20 and particularly the rear plate 28 also function to provide a pivotal mounting for a pair of deflector plates 50 (only one of which is shown in FIG. 2) which are used for deflecting the stream of water moving through the exit 30 for steering the boat. The plates 50 are each pivotal about a vertical axis provided by suitable shafts extending through projections 51, the plates 50 being positioned on opposite sides of the stream of water. In order to turn the boat in one direction, one of the plates 50 is pivoted into the stream by means of a steering quadrant 52 pivotally mounted on the housing 20 by means of a shaft 55 positioned directly between the pivotal mountings of the deflector plates. The quadrant 52 has a pair of depending elements 55 (only one shown in FIG. 2) located outside of the deflector plates and arranged to pivot one or the other of the plates inwardly when the quadrant 52 is pivoted. The quadrant may be pivoted by suitable steering mechanism within the boat, said mechanism being operatively associated with a steering line 56 received within groove 57 in the quadrant.

It should be mentioned that the gate 21 can be lowered from the position of FIG. 3 to permit a slow rearward movement of the boat. Unless the gate is lowered to the extent that no water passes through the exit 30, the deflectors 50 may be used to steer the boat by deflection of the portion of the stream of water which passes through the exit 30. Thus, if it is desired to steer the boat while moving rearwardly, all that is necessary is to position the gate so that a certain portion of the water passes through the exits 30.

From the above description, it can be appreciated that the present invention provides an improved means for controlling the direction of movement of a jet boat, It can also be appreciated that the present invention provides a jet boat direction control capable of balanced flow to cancel out forward and rearward thrust but also capable of complete bottling up of the jet exhaust to eliminate creeping while in neutral and to eliminate ingestion of foreign particles also while in neutral.

It should also be pointed out that the closing off or "bottling up" of the jet exhaust makes possible the use of the pump 13 to supply water under pressure for such applications as fire fighting or for supplying water for irrigation or any purpose. In such applications, a duct would be provided for tapping off the water, said duct being located somewhere between the pump and the exit of the tailpipe or possible even on the housing 20.

The flat gate or plate 21 is also easy to shift through its various operating positions because the pressure of the water within the housing acts normal to the direction of movement of the gate and does not act in such a direction as to resist movement of the gate. Because there are no hydraulic forces tending to move the gate vertically and because the gate is held against the rear plate 28 by hydraulic pressure, there is no need to provide locking means to hold the gate in its various operating positions.

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 means for moving water in a jet from said craft, said craft having a container mounted thereon with an entrance for said jet, said container including a wall having a pair of exits therethrough, one of said exits being positioned in registry with said jet, the other of said exits being positioned out of registry with said jet, a deflector fixed with relation to said craft and positioned and arranged to deflect flow from said other exit in a direction opposite to the direction of said jet, a plate mounted within said container for movement across the surface of said wall to selectively cover said exits.

2. A direction control system for watercraft comprising means for moving water in a jet rearwardly of said craft, said craft having a container mounted thereon with an entrance for said jet, said container including a rearward wall, said rearward wall having a pair of exits therethrough, one of said exits being positioned in registry with said jet, the other of said exits being positioned out of registry with said jet, a deflector fixed with relation to said craft and positioned and arranged to deflect flow from said other exit in a direction generally forwardly of the craft, a plate mounted within said container for movement across the inside surface of said rearward wall, means for moving said plate to positions completely covering, uncovering and partly covering said one exit and to a position covering both of said exits.

3. A direction control system for watercraft comprising means for moving water in a jet rearwardly of said craft, said craft having a container mounted thereon with an entrance for said jet, said container including a vertical rearward wall, said rearward wall having a pair of exits therethrough, one of said exits being positioned in registry with said jet, the other of siad exits being positioned out of registry with said jet, said container being completely closed off except for said jet entrance and said exits, a deflector fixed with relation to said craft and positioned and arranged to deflect flow from said other exit in a direction generally forwardly of the craft, a flat plate mounted within said container for movement across the inside surface of said rearward wall, means for moving said plate to a position uncovering both of said exits, to a position covering both of said exits, to a position partly covering said one exit and uncovering said other exit and to a position covering said one exit and uncovering said other exit.

4. A direction control system for watercraft comprising means for moving water in a jet rearwardly of said craft, said craft having a rectangular upright container mounted thereon, said container having a vertical forward wall with an opening therethrough in registry with said jet, said container having a bottom wall which slopes downwardly and rearwardly and a vertical rearward wall, said rearward wall having a pair of exits therethrough, one of said exits being positioned in registry with said jet, the other of said exits being below said first exit and defined in part by said bottom wall, said container being completely closed off except for said jet opening and said

exits, said container being formed with a passage which extends rearwardly, then downwardly and forwardly from said other exit to open in a forward direction, a flat plate mounted within said container for movement across the inside surface of said rearward wall, means for moving said plate to positions completely covering, uncovering and partly covering said one exit and to a position covering both of said exits.

5. A direction control system for watercraft comprising means for moving water in a jet rearwardly of said craft, said craft having a container mounted thereon with an entrance for said jet, said container including a vertical rearward wall, said rearward wall having a pair of exits therethrough, one of said exits being positioned in registry with said jet, the other of said exits being positioned below said first exit out of registry with said jet, said container being completely closed off except for said jet entrance and said exits, a reflector fixed to said container and positioned and arranged to deflect flow from said other exit in a direction generally forwardly of the craft, a flat plate mounted within said container for vertical movement across the inside surface of said rearward wall, said container having vertically extending sidewalls forming guides for said plate, a vertically extending rack on the forward face of said plate, a horizontal shaft extending tranversely through and rotatably mounted on said

container, a spur gear fixedly mounted on said shaft and in meshing engagement with said rack, means for rotating said shaft to lower said plate from a position wherein said exits are uncovered through positions partially covering said one exit and completely covering said one exit to a position completely covering both exits and to raise said plate back through said position.

6. A direction control system for 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 secured to said conduit and covering the opening thereof, said housing having an aperture in the rearward wall thereof positioned in registry with said jet, said housing having only one further water outlet in addition to said aperture, said further water outlet being spaced from said aperture and also being in the rearward wall of said housing, a flat plate movable within said housing to positions completely covering, uncovering and partly covering said aperture and to a position covering both said aperture and said outlet, said housing having a passage leading first rearwardly, then downwardly and then forwardly from said outlet and opening beneath said craft.

No references cited.