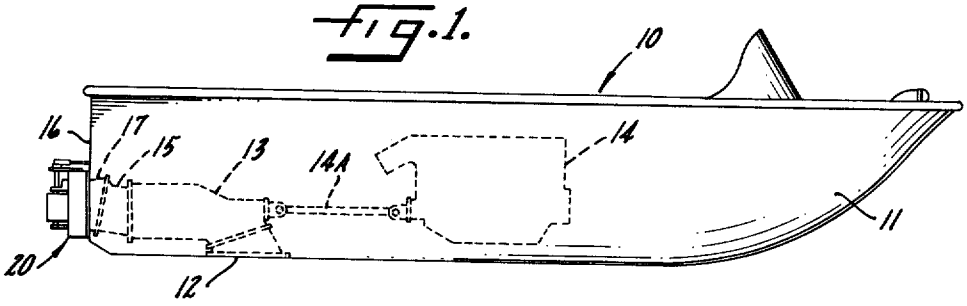
June 18, 1963 R. L. COCHRAN ETAL 3,093,965

DIRECTION CONTROL

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2 Sheets-Sheet 1

Fig. 1.



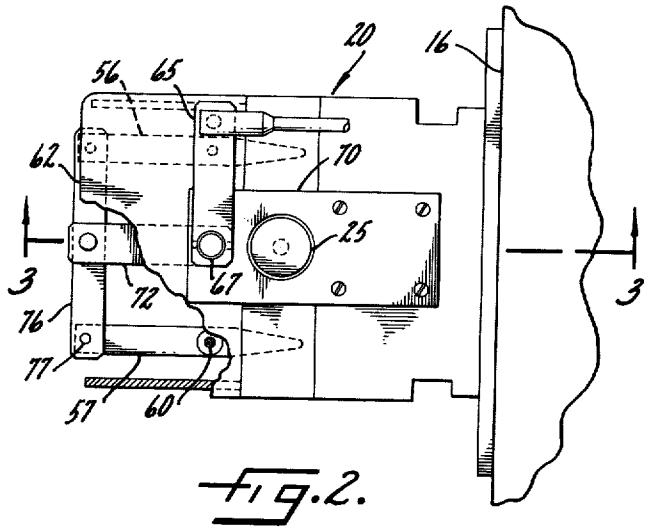


Fig. 2.

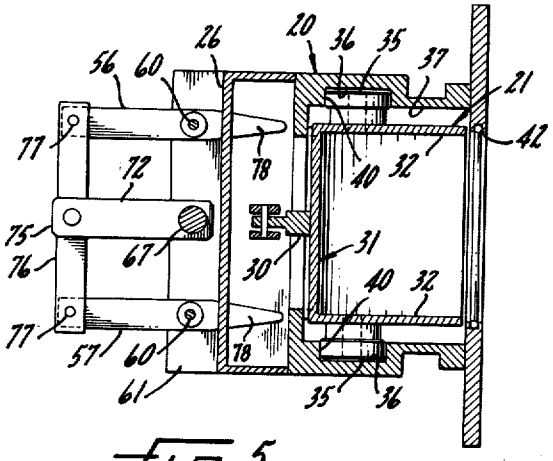


Fig. 5.

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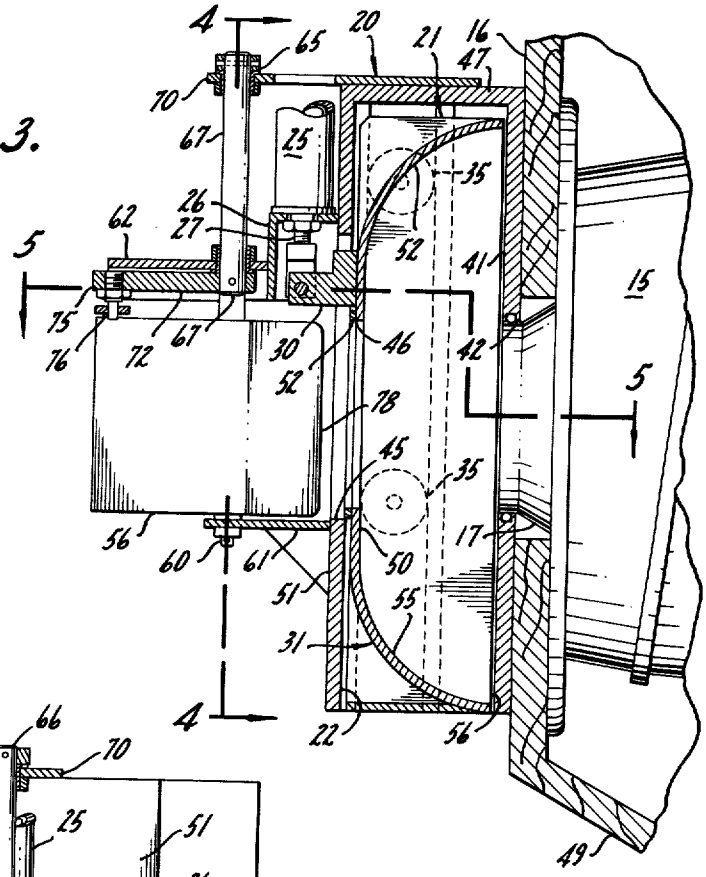
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DIRECTION CONTROL

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Fig. 3.



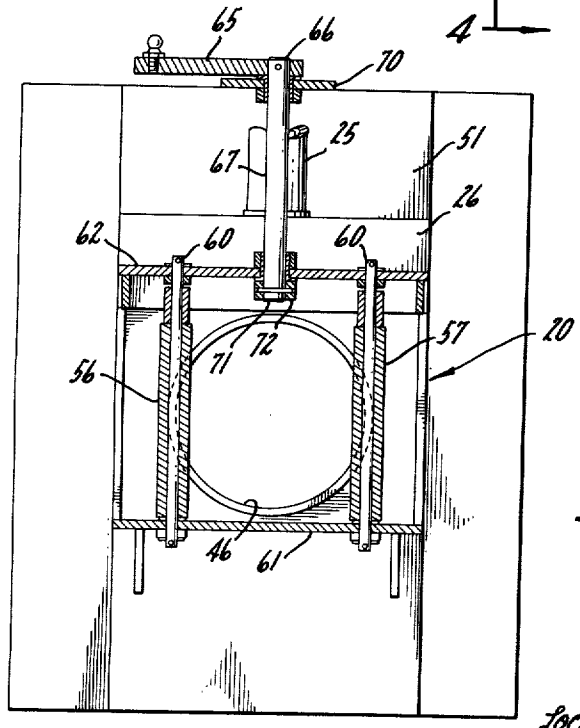


Fig. 4.

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DIRECTION CONTROL

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2 Claims. (Cl. 60—35.54)

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

At least one form of water jet-propelled boat involves an engine arranged to drive a pump which is located within a conduit through the boat. Water is drawn 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, the stream leaving the boat above the water within which the boat is floating or is supported. The propulsion principle depends upon the physical law providing that every action has an equal and opposite reaction. Thus, as water is ejected astern, the boat moves forward.

One problem present in the construction and operation of such water jet-propelled boats is that of controlling the direction of movement of the boat whereby the boat moves forwardly, rearwardly or retains position. This control may be accomplished by deflecting the stream of water 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 permitting steering of the boat while the boat is moving rearwardly.

Another object of the invention is to provide a jet boat direction control which is relatively compact and does not require lengthy travel distances of the moving parts thereof.

Still a further object of the invention is to provide a jet boat direction control which is of simple and inexpensive construction, yet is durable and efficient in operation.

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

One embodiment of the present invention comprises a direction control system for water craft including means for moving water in a jet from an aperture in the rear of said craft, a downwardly opening housing secured to the rear of said craft and positioned to that the aperture opens into said housing, said housing having a rearward opening in registry with the aperture in the rear of said craft, a gate having a concave forward surface and a passage leading horizontally from said forward surface through said gate, said gate being vertically movable in said housing between a first position wherein said passage is in registry with said aperture and opening and said gate is completely within said housing and a second position wherein said gate is blocking said opening and is extending below said housing.

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 fragmentary top plan view of the direction control of FIG. 1.

FIG. 3 is a longitudinal vertical section taken along the line 3—3 of FIG. 2 in the direction of the arrows.

FIG. 4 is a transverse vertical section taken along the line 4—4 of FIG. 3.

FIG. 5 is a horizontal section taken along the line 5—5 of FIG. 3 in the direction of the arrows.

For the purposes of promoting an understanding of the principles of the invention, reference will now be made to the embodiment illustrated in the drawing and specific language will be used to describe the same. It will nevertheless be understood that no limitation of the scope of the invention is thereby intended, such alterations and further modifications in the illustrated device, and such further applications of the principles of the invention as illustrated therein being contemplated as would normally occur to one skilled in the art to which the invention relates.

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 duct **15** leading through the transom **16** 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 jet stream by the converging portion **17** of the duct **15**.

Fixed to the transom **16** is a housing **20**, a primary function of which is to contain a gate **21** which is movable within the housing and through the opening **22** at the bottom of the housing to various positions. There is provided a hydraulic cylinder **25** fixedly mounted upon an extension **26** from the housing for vertically moving the gate **21** within the housing, said cylinder having its piston rod **27** secured to an extension **30** fixed to the rear plate **31** of the gate.

The gate **21** comprises a pair of parallel, generally rectangular, vertically extending side plates **32** which have the rear plate **31** fixed therebetween. Rotatably mounted upon the outside surfaces of the side plates **32** are two pairs of rollers **35** which are received within vertically extending indentations **36** in the inside lateral faces **37** of the housing **20**. As the gate **21** is moved upwardly and downwardly within the housing **20**, the rollers **35** roll along the surfaces **40** of the indentations **36** insuring relatively free movement of the gate.

The forward plate **41** of the housing **20** has an aperture **42** therein which is circular in shape and receives duct **15**. The housing **20** is formed with an opening **45** of generally the same size as the exit end of the duct **15** and in alignment with the duct **15** so that the water jet being exhausted from the duct may pass directly rearwardly through a passage **46** in the rear plate **31** of the gate directly rearwardly of the boat.

It will be noted that the gate **21** as illustrated in FIG. 3 is just about at the upward limit of its travel almost in contact with the top plate **47** of the housing **20**. When in this position, the gate **21** is completely received within the housing and does not project therebelow through the opening **22** in the bottom of the housing. Since the housing **20** does not project below the bottom **49** of the boat, the forward movement of the boat is not impeded by the housing or by the gate **21** when it is in the illustrated position of FIG. 3. It should also be mentioned that the housing **20** is completely sealed except for openings **46** and **22** and a suitable slot permitting movement of extension **30**.

When it is desired to cause the boat to move rearwardly or to retain its position, the gate is moved downwardly by means of the hydraulic cylinder **25**. The rear plate **31** of the gate is fixed to the side plates adjacent their rearward edges and thus, the intermediate portion **50** of the rear plate through which the passage **46** extends is always positioned just adjacent the rear plate **51**

of the housing. An annular collar **52** is fixed to the housing so as to bear against the rear plate **51**. Thus, when the gate is moved downwardly to such a position that the passage **46** is below the opening **45** in the housing, the annular collar engages the rear plate **51** of the housing to seal off any movement of water through the passage **46**.

The rear plate **31** has upper and lower end portions **52** and **55**, respectively, which curve smoothly forwardly from the intermediate portion **50** of the rear plate and which terminate at the forward edges **56** of the side plates **32**. It can be appreciated that, when the gate is moved downwardly to a position wherein the passage **46** is blocked by the rear **51** of the housing, the upper endward portion **52** of the rear plate will be positioned directly rearwardly of the aperture **42** whereby water flowing into the housing will be guided downwardly through a closed passage formed by the gate and the front plate **41** of the housing. This water will be maintained under pressure because of the closed nature of the passage and will be deflected forwardly beneath the bottom **49** of the boat by means of the forwardly curving endward portion **55** of the gate. When the gate is in such a position, the forward movement of the water stream beneath the boat causes rearward movement of the boat.

If it is desired to cause the boat to retain position or to move slowly forwardly or slowly rearwardly, the gate **21** may be positioned between the above mentioned two positions so that a portion of the water is deflected forwardly by the rear plate **31** and a further portion of the water is permitted to move through the passage **46** and opening **45**. As long as a certain portion of the water passes through the opening **45**, the boat may be steered by deflectors **56** and **57**.

These deflectors are pivoted about shafts **60** mounted on rearward extensions **61** and **62** fixedly secured with relation to the housing **20**. The deflectors are controlled by a lever **65** fixed to the upper end **66** of a shaft **67** pivoted upon the extension **62** and a further extension **70** extending from the housing **20**. The lower end **71** of the shaft **67** is fixed to a rearwardly extending member **72** pivoted at its distal end **75** to a link **76** pivoted at opposite ends **77** to the rearward portions of the deflectors **56** and **57**.

When the lever **65** is swung about the axis of the shaft **67**, the deflectors **56** and **57** are both pivoted about the axes of shafts **60**. It will be noted that the forward ends **78** of the deflectors project forwardly of the axes **60**. Therefore, when the deflectors are so swung, water exhausting from the opening **45** will strike one or the other forward portions producing a moment tending to cause the particular deflector to be pivoted even further into the jet stream. Thus, the forwardly extending portions **78** of the deflectors aid the steering of the boat by decreasing the force necessary to turn the boat. Of course, when the forward portion of one of the deflectors **56** or **57** is in the jet stream, the rearward portion of the other deflector will also be in and deflecting the jet stream because the mechanical link **76** causes the deflectors to move together.

From the above description, it will be evident that the present invention provides an improved means for controlling the direction of movement of a jet boat. It can also be seen that the present direction control is relatively compact and does not require an extreme amount of travel of the gate **21** between its various operating positions. It should also be clear that the direction control of the present invention is simple and inexpensive in construction and yet is durable and efficient in operation.

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 water craft comprising means for moving water in a jet from an aperture in the rear of said craft, a housing secured to the rear of said craft and covering the aperture, said housing having an open bottom and a rearward opening located in alignment with said conduit, a gate having an intermediate portion which extends vertically and is located in the rear of the housing, said intermediate portion having a passage therethrough of approximately the same size as said aperture and opening, said passage opening into the interior of the gate, said gate having upper and lower end portions which curve forwardly from said intermediate portion, said gate being vertically movable between an upper position wherein said passage is in alignment with said opening and aperture and said gate is completely within said housing and a lower position wherein said housing blocks passage of water through said passage and the rear plate guides the water of said jet downwardly and forwardly of the craft, and deflector means mounted on said craft and operable to deflect horizontally water issuing from the rearward opening of said housing.

2. A direction control system for water craft comprising means for moving water in a jet from an aperture in the rear of said craft, said means including a generally straight conduit extending rearwardly and terminating with said aperture, a housing secured to the rear of said craft and covering the aperture, said housing having an open bottom and a rearward opening located in alignment with said conduit, a gate comprising a pair of parallel generally rectangular side plates and a rear plate connecting said side plates, said rear plate having an intermediate portion which extends vertically and is located adjacent the rearward edges of said side plates, said intermediate portion having a passage therethrough of approximately the same size as said aperture and opening, said passage opening into the interior of the gate, said rear plate having upper and lower end portions which curve forwardly from said intermediate portion, rollers rotatably mounted on the side plates, said housing having vertically extending recesses receiving said rollers whereby said gate is vertically movable in said housing, said gate being vertically movable between an upper position wherein said passage is in alignment with said opening and aperture and said gate is completely within said housing and a lower position wherein said housing blocks passage of water through said passage and the rear plate guides the water of said jet downwardly and forwardly of the craft, said craft being formed to allow the unimpeded passage of the water in a direction generally forwardly of the craft and therebeneath, and a pair of deflectors pivotally mounted on said craft on opposite sides of said aperture, said deflectors being swingable horizontally to deflect the water in said jet after it leaves said rearward opening.

References Cited in the file of this patent

UNITED STATES PATENTS

3,007,305	Hamilton	Nov. 7, 1961
3,030,909	Barnes et al.	Apr. 24, 1962

FOREIGN PATENTS

63,447	Denmark	Apr. 30, 1945
188,683	Germany	Aug. 5, 1907
118,815	New Zealand	Feb. 26, 1959

(patent abstract)

OTHER REFERENCES

Robberson: "Wet Jet Propulsion," Yachting Magazine, vol. 106, No. 5, pages 70–71, Nov. 1959.