March 22, 1966 J. W. REYNOLDS ETAL 3,241,770

JET BOAT STEERING DEFLECTORS

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Fig. 1.

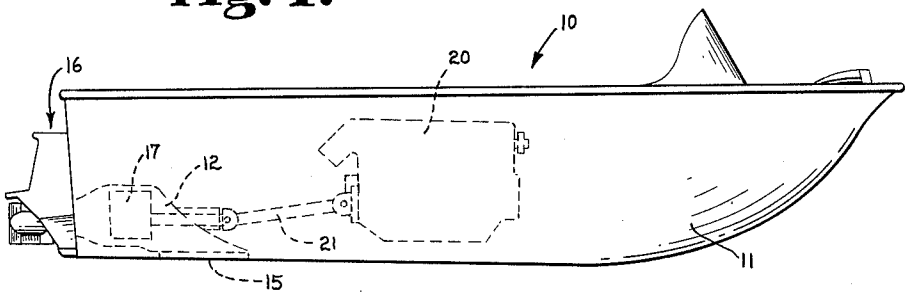


Fig. 2.

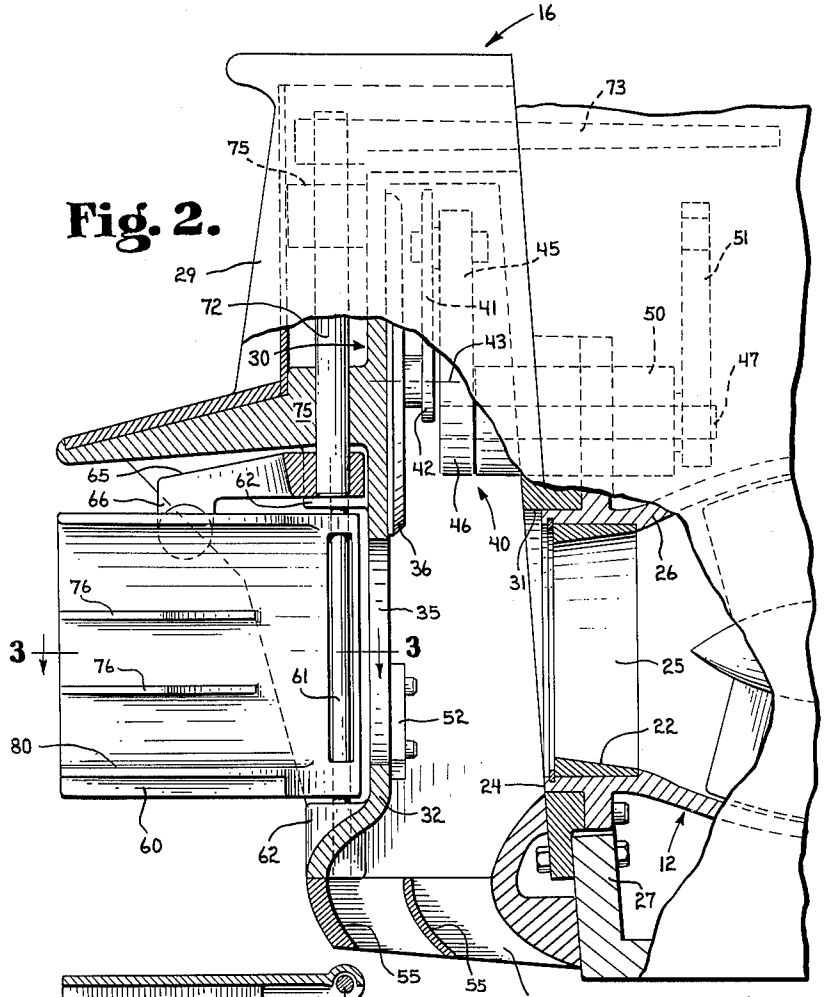
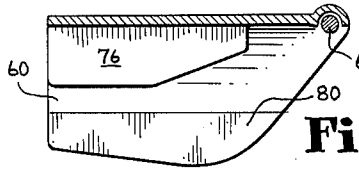


Fig. 3.



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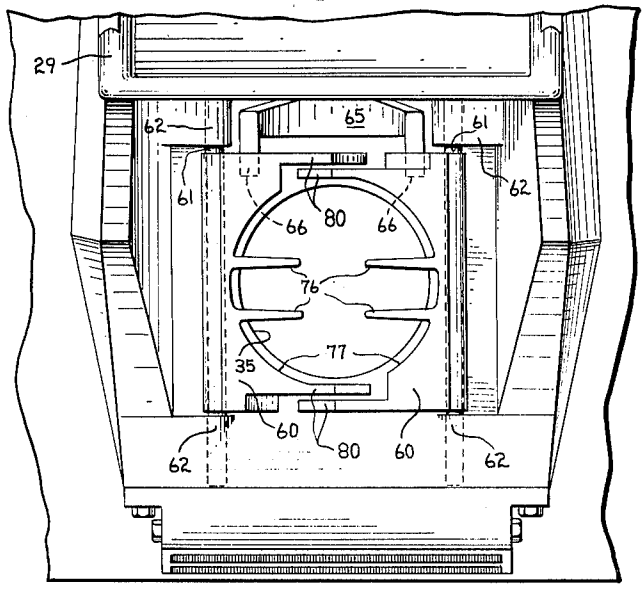
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Fig. 4.



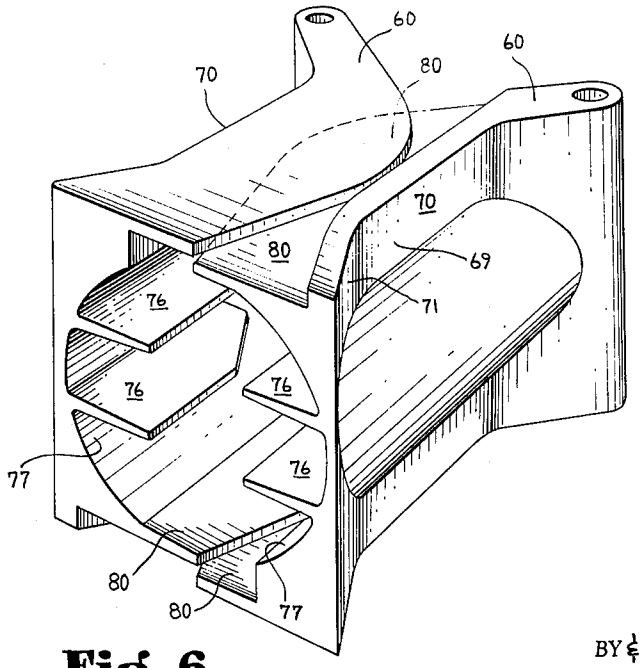
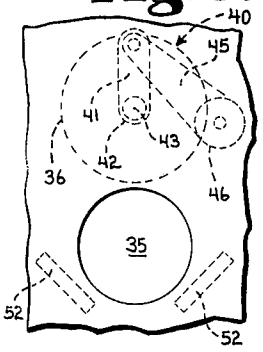


Fig. 6.

Fig. 5.



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JET BOAT STEERING DEFLECTORS

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1 Claim. (Cl. 239—265.19)

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

One type of water jet propelled boat includes a conduit having an intake opening at the bottom of the boat and an exhaust opening at the rear of the boat. Water is pumped through the conduit by an engine arranged to drive a pump located within the conduit. One problem present in the construction and operation of such water jet propelled boats is that of controlling the steering of the boat. This control may be accomplished by deflecting the stream of water as the water leaves the rear of the boat.

It is an inherent function of the rolling disc type of gate described and claimed in the copending application of Howard P. Lerwick et al., filed January 5, 1962, Serial No. 164,481, now Patent No. 3,191,319, entitled Rolling Disc Gate and assigned to the same assignee as the present application that in many circumstances the water jet has an upward angle as it leaves the exhaust opening at the rear of the boat. More particularly, the gate when in partially closed condition covers the upper portion of the exhaust aperture and permits flow through the lower portion of the exhaust aperture, this situation resulting in the jet flow exiting at a sharp upward angle. Of course, the flow of the jet in a given direction produces thrust on the boat in an opposite direction. It can be appreciated that any thrust component which is exerted verticaly is wasted since it results in no movement of the craft across the horizontal surface of the water.

Upward flow of the jet also results from the water surrounding and supporting the boat. This water is at a level or has its water line at the exhaust opening and acts to redirect the jet upwardly. As a result of the above factors, there is a problem of spray which can affect water skiers towed by the jet boat and can affect occupants of boats in the area surrounding the jet boat.

Consequently, one object of the present invention is to provide jet boat steering apparatus which incorporates spray reducing means.

Still another object of the present invention is to provide an improved direction control for a jet boat.

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 means for moving water in a jet stream from the craft and a pair of deflectors pivotally mounted on the craft on opposite sides of the jet stream, the deflectors having spaced, flat, horizontal, rearwardly extending, guide elements fixed thereto and projecting into the jet stream.

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

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

FIG. 2 is an enlarged longitudinal vertical section of the rearward portion of FIG. 1 showing in detail the steering and control means of the present invention.

FIG. 3 is a horizontal section taken along line 3—3 of FIG. 2 in the direction of the arrows and showing a representative one of the deflectors of FIG. 2.

FIG. 4 is a fragmentary rear elevation of the structure shown in FIG. 3.

FIG. 5 is a reduced view similar to FIG. 4 but with various parts removed to show the internal housing structure and the means for raising and lowering the gate of the present arrangement.

FIG. 6 is an enlarged perspective view of the steering deflectors of the present invention.

Referring now more particularly to the drawings, there is illustrated a jet boat **10** having a hull **11** within which is mounted a conduit **12**. The conduit leads from an intake opening **15** at the bottom of the boat to a housing **16** mounted on the the rear of the boat. Received within the conduit **12** is a pump **17** which is driven by a conventional marine engine **20** through a shaft **21**. The pump **17** functions to pump water from the intake **15** to and out of the rear of the boat. The water is formed into a jet stream by the converging surface **11** of an annular member **25** fixed within the rearward end **24** of a tail pipe **26** forming a part of the conduit **12**.

The tail pipe **26** is secured to and opens through a transom **27** of the watercraft and opens into the housing secured to the transom. It will be noted that the housing includes an outer decorative cover portion **29** as well as an inner enclosure portion **30**. The housing **30** has an aperture **31** receiving the tail pipe and includes a rearward wall **32** formed with a further aperture **35** in registry with the aperture **31**. The aperture **35** is circular in shape and slightly larger than the size of the jet stream which may be caused to issue from the tail pipe by operation of the pump **17**. A circular disc gate **36** is vertically movable in the housing **30** across the rearward wall **32** and can be moved between the illustrated position of FIGS. 2 and 5 and a position wherein the gate covers and blocks flow through the aperture **35**. Such a gate is described and claimed in detail in the copending above mentioned application of Howard P. Lerwick et al.

The disc gate **36** may be moved downwardly into proper covering relation over the aperture **35** by means of a linkage **40**. The linkage **40** includes a first arm **41** which is rotatably secured at its end **42** to the gate **36** at the axis **43** thereof. The other end of the arm **41** is rotatably connected to a further arm **45** which has its end **46** secured to a shaft **47**. The shaft **47** is rotatably received within a bearing **50** fixedly mounted upon the watercraft. The gate **36** may be raised and lowered by operation of a lever **51** fixed to the shaft **47**. When the disc gate **36** is lowered, it is guided into covering relation over the aperture **35** by guide elements **52** which taper inwardly toward one another below the aperture **35**.

When the aperture **35** is closed by the gate **36**, water is caused to flow downwardly through the open bottom **52** of the housing enclosure **30**. At this open bottom, there are provided a pair of guide surfaces **55** which cause the water to be deflected forwardly and to move beneath the craft producing rearward movement thereof.

A pair of steering deflectors **60** (best shown in FIG. 6) are pivoted to the housing **30** by means of shafts **61** received in suitable projecting portions **62** formed on the rearward surface of the housing **30**. The steering deflectors **60** can be pivoted inwardly by means of steering member **65** which has downwardly projecting portions **66** positioned on the outside of the deflectors **60** and arranged to engage the outer surfaces **70** of the deflectors **60**. It will be noted that the outer surfaces **70** flare outwardly at their rearward ends **71**. The member **65** is fixed to a shaft **72** which is pivotally received in projecting portions **75** integral with and extending rearwardly from the housing **30**. The shaft **72** may be pivoted by suitable steering

means within the craft and connected to lever **73** fixed to the upper end of the shaft **72**. It will be noted that the non-linear surfaces **70** and **71** of the deflectors will cause a different amount of pivoting for a given movement of the shaft **72** and member **65** depending upon whether the surface portion **69** or **71** is engaged by the member **65**.

Referring more particularly to the details of the deflectors **60**, it can be seen that each deflector has a pair of inwardly projecting, horizontal, rearwardly extending flat guide elements **76**. Except for the guide elements **76**, the inward surface **77** of each deflector **60** is part-cylindrical and forms or defines together with the opposite such surface **77** a generally cylindrical configuration when the deflectors are in the position of FIGS. 4 and 6. This cylindrical configuration corresponds to the shape of the jet stream issuing from the tail pipe **12**.

The guide elements **76** function to maintain the flow of the jet stream in a rearward direction even though the disc gate **36** partially covers the aperture **35** and causes a portion of the jet stream to be interrupted.

Each of the deflectors **60** is provided with a pair of further guide elements **80** which project inwardly from the upper and lower terminations of the deflectors. The guide elements **80** overlap and function to prevent or reduce spray from moving away from the main body of the jet stream. It will be appreciated that the gate elements **80** maintain their overlapping relationship even though the deflectors are pivoted either rightwardly or leftwardly as viewed in FIG. 4 by the member **65**. It should also be pointed out that the deflectors **60** are interchangeable and that the leftward deflector can be used to replace the rightward deflector merely by turning it over.

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 claim are also desired to be protected.

The invention claimed is:

A control system for a watercraft comprising a conduit mounted on the craft and having a circular exit disposed above the water line and toward which the conduit extends, means for pumping water through said conduit toward said circular exit, a pair of deflectors each pivotally mounted on said craft on an opposite side of said exit, said deflectors each having flat, horizontal, rearwardly extending guide elements formed integrally thereon and spaced vertically on said deflectors, said deflectors having mutually facing inward faces which together define, when the deflectors are extending rearwardly, a cylindrical configuration interrupted by said guide elements, each of said deflectors having a pair of flat horizontal, rearwardly extending further guide elements which extend inwardly from the upper and lower terminations of said deflectors, said further guide elements of one deflector overlapping the guide elements of the other deflector when the deflectors are extending rearwardly.

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