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SINGLE VANE STEERING DEVICE

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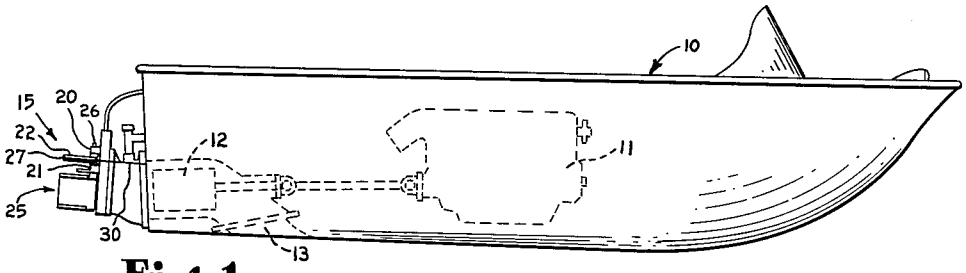


Fig. 1.

Fig. 2.

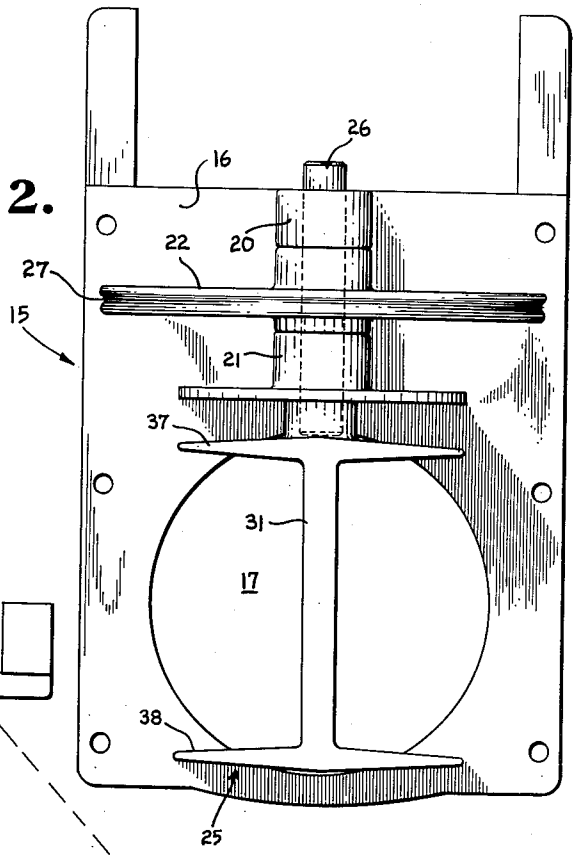
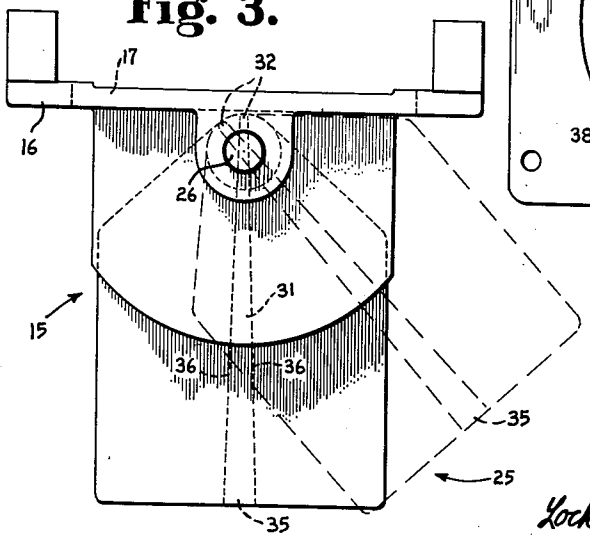


Fig. 3.



INVENTOR.
RICHARD L. COCHRAN

BY

Lockwood, Woodard, Smith & Weikart

ATTORNEYS

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SINGLE VANE STEERING DEVICE

Richard L. Cochran, Indianapolis, Ind., assignor to The Buehler Corporation, a corporation of Indiana

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The present invention relates to jet propelled water craft and more particularly to a device for steering such water craft.

At least one form of water jet propelled boat involves an engine arranged to drive a turbine which is located within a conduit passing through the boat. Water is drawn into the conduit through an intake opening at the bottom of the boat, is pumped through the conduit by the turbine 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 directly on a basic law of physics which provides that every action has an equal and opposite reaction. Thus, as water is ejected astern, the boat moves forward.

One means of steering such a jet propelled boat involves the deflecting of the stream of water causing the rear of the boat to move oppositely to such deflection and resulting in the turning of the boat. It is, of course, necessary to exert a certain amount of force upon suitable steering mechanism to accomplish such deflection. Accordingly, one object of the present invention is to provide a jet boat steering device which requires the exertion of a relatively small amount of force to deflect the jet stream exhausted from the boat whereby the steering of the boat is facilitated.

A further object of the present invention is to provide a jet boat steering device which includes means for controlling the spray from the jet stream and for preventing the spray from blowing onto the occupants of the boat or water skiers towed by the boat.

Still another object of the present invention is to provide a jet boat steering device constructed to provide a positive steering action when the boat is moving directly forwardly as well as when the boat is turning.

Further objects and advantages will appear as the description proceeds.

One embodiment of the present invention involves a steering device for a liquid jet propelled boat, the boat having means for propelling a stream of liquid therefrom. The device comprises a deflector mounted on the boat in the stream and control means for turning the deflector about a vertical axis in the stream to steer the craft. The deflector is provided with a wedge shape tapering from a forward upstream portion, upstream of the axis to a relatively thicker downstream portion. A pair of horizontal flat guide elements are fixed to the deflector above and below the stream for channeling the spray from the stream.

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 liquid jet propelled boat incorporating the present invention.

FIG. 2 is a rear view of a steering device forming a part of the boat of FIG. 1 and embodying the present invention.

FIG. 3 is a top plan view of the structure illustrated in FIG. 2 with the quadrant thereof removed for clarity.

Referring now more particularly to the drawings, there is illustrated a water jet propelled boat 10 having an engine 11 mounted therein and arranged to drive a schematically illustrated turbine 12 positioned within a passage 13 extending from the bottom of the boat to the

rear thereof. The engine 11 drives the turbine 12 causing it to pump water through the passage 13 and from the rear of the boat causing the boat to move.

Fixed to the rear of the boat is a steering device indicated generally by the numeral 15 and illustrated in detail in FIGS. 2 and 3. The steering device comprises a housing 16 and a cylindrical orifice 17 formed therein which is arranged in registry with the passage 13. When the boat is moving forwardly, water is pumped by the turbine 12 through the passage 13 and the passage 17 to be exhausted from the rear of the boat causing the forward motion of the boat.

Formed integrally with the housing 16 is a pair of rearwardly extending projections 20 and 21 which provide a pivotal mounting about a generally vertical axis for a steering quadrant 22 and a deflector indicator generally by the numeral 25. The quadrant 22 and the deflector 25 are fixedly mounted upon a shaft 26 which is pivoted within suitable bores in the projections 20 and 21. The quadrant is provided with a peripheral groove 27 adapted to receive a steering line 30 (FIG. 1) which is operatively associated with the steering wheel or similar steering means located in the boat. Because the steering quadrant 22 and the deflector 25 are both fixed with relation to the shaft 26, pivoting of the quadrant by the steering line will also cause the deflector 25 to be pivoted.

The deflector 25 is provided with a flat vertically extending wedge shaped portion 31 which tapers from its forward upstream portion 32 to a relatively thicker rearward downstream portion 35. This tapering configuration causes the stream of water from the orifice 17 to maintain contact with the wedge shaped portion 31 along its length even though the portion 31 is extending directly forwardly. It has been found that if the opposite sides 36 of the central portion of the deflector are in parallel relation, the stream of water will break away from those sides prior to reaching the rear of the deflector producing a "dead spot" in the steering when the boat is moved directly forwardly. Thus, the wedge shaped central portion 31 of the present invention eliminates any "dead spots" or lack of steering operation when the boat is moving directly forwardly.

Formed integrally with the deflector 25 at its upper and lower portions is a pair of flat, generally horizontal guide portions 37 and 38. It can be seen from FIG. 2 that these guide portions are located at the upper edge and the lower edge of the stream of water passing through the orifice 17. Since the splitting of the stream of water by the wedge shaped portion 31 tends to produce a spray which is inconvenient to both the occupants of the boat and to water skiers towed by the boat, the flat portions 37 and 38 channel this spray and return it to the stream of water.

It should be noted that the deflector and especially the wedge shaped portion 31 thereof extends somewhat forwardly or upstream of its pivotal axis. The forwardly extending portion 32 is so proportioned and arranged that when the steering quadrant 22 is operated to pivot the deflector into a position wherein the stream of water is deflected, the portion 32 is acted upon by the stream of water to aid in maintaining the deflector in that position. In other words, the portion 32 of the deflector will be on one side of the pivotal axis of the shaft 26 and thus will counteract the tendency of the stream of water to force against the rearward portion 35 of the deflector and to return the deflector to a directly forwardly extending position.

For example, FIG. 3 shows (in dotted lines) the deflector pivoted to a position wherein the stream of water is deflected rightwardly. As the stream of water acts upon

the rearward central portion 35 of the deflector, it will tend to return the deflector to the solid line position of FIG. 3; however, a certain portion of the stream will act upon the forwardly extending portion 32 of the deflector producing a moment which aids in maintaining the deflector in the dotted line position.

From the above description, it can be seen that the present invention provides an improved jet boat steering device which requires the exertion of a relatively small amount of force to deflect the jet stream exhausted from the boat whereby the steering of the boat is facilitated. It can also be seen that the present invention provides an improved jet boat steering device which has no "dead spot" or portion of the steering travel within which there is no steering action. Furthermore, the present invention provides a jet boat steering device incorporating means for preventing the formation of spray as a result of the operation of the steering device.

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 liquid jet propelled water craft comprising a hull, means carried by the hull for propelling a stream of liquid through the air above the surface of the water sustaining said craft, a deflector mounted on said hull in said stream, and control means for turning said deflector in said stream to steer said craft, said deflector having a wedge shape pointing upstream of said stream.

2. A liquid jet propelled water craft comprising a hull, means carried by the hull for propelling a stream of liquid through the air above the surface of the water sustaining said craft, a vertically extending deflector vane mounted on said hull in said stream, control means for turning said deflector in said stream to steer said craft, said deflector being mounted on said hull so as to remain continuously in said stream of liquid even though the deflector is turned to a position wherein the stream is not deflected, a pair of flat guide elements extending horizontally and carried by said deflector above and below said stream of liquid, said guide elements extending horizontally from both transverse sides of said deflector at the upper and lower terminations thereof.

3. A liquid jet propelled water craft comprising a hull, means carried by the hull for propelling a stream of water through the air above the surface of the water sustaining said craft, a deflector mounted on said hull in said stream, said deflector having a wedge shape pointing upstream of said stream, control means for turning said deflector in said stream to steer said craft, and a pair of guide elements carried by said deflector above and below said stream of liquid.

4. A liquid jet propelled water craft comprising a hull, means carried by the hull for propelling a stream of water through the air above the surface of the water sustaining said craft, a deflector mounted on said hull in said stream, control means for turning said deflector in said stream to steer said craft, said deflector having a wedge shape tapering from its forward upstream portion to a relatively thicker rearward downstream portion, and a pair of horizontal flat guide elements fixed to said deflector above and below said stream for channeling the spray from said stream.

5. A liquid jet propelled water craft comprising a hull, means carried by the hull for propelling a stream of water through the air above the surface of the water sustaining said craft, a vertically extending deflector mounted on said hull in said stream, and control means for turning said deflector about a vertical axis in said stream to steer said craft, said deflector having a wedge shape tapering from a forward upstream portion upstream of said axis to a relatively thicker rearward downstream portion, and a pair of horizontal flat guide elements fixed to said deflector above and below said stream for channeling the spray from said stream.

6. A device for steering a liquid jet propelled water craft comprising a conduit carried by said craft, means for forcing a stream of liquid through said conduit to cause a liquid jet to be expelled from said conduit, said conduit being so positioned that said jet is propelled through the air above the surface of the water sustaining said craft, a deflector vane pivotally mounted on said craft about a generally vertical axis, said deflector being mounted on said craft so as to remain continuously in said stream of liquid even though the deflector is pivoted to a position wherein the stream is not deflected, a first portion of said deflector extending away from said axis upstream of said liquid stream and a second portion of said deflector extending away from said axis downstream of said liquid stream whereby, when said deflector is pivoted to deflect said liquid stream, a moment is created on said first portion aiding in the pivoting of said reflector.

7. Control means for a jet propelled water craft, said craft arranged to propel the jet out of the craft above the surface of the water sustaining the craft, said control means comprising a deflector mounted on the craft in the jet, means for pivoting the deflector about an axis transverse of the jet, said deflector having a wedge shape pointing upstream of the jet.

8. Control means for a jet propelled water craft, said craft arranged to propel the jet out of the craft above the surface of the water sustaining the craft, said control means comprising a deflector mounted on the craft in the jet, means for pivoting the deflector about a vertical axis for steering the craft, said deflector having a wedge shape pointing upstream of the jet.

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