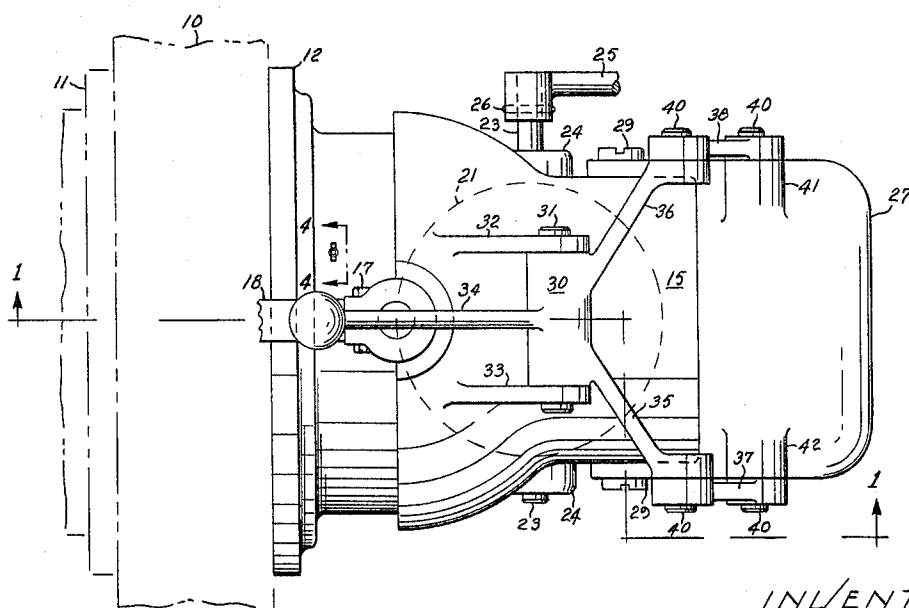


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2 Sheets-Sheet 1



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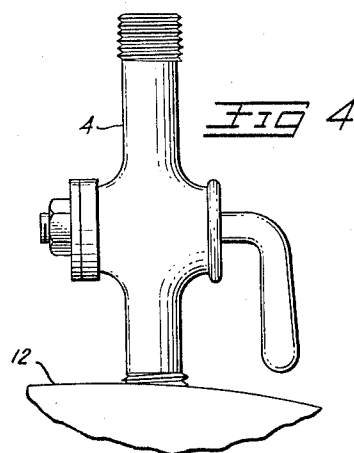
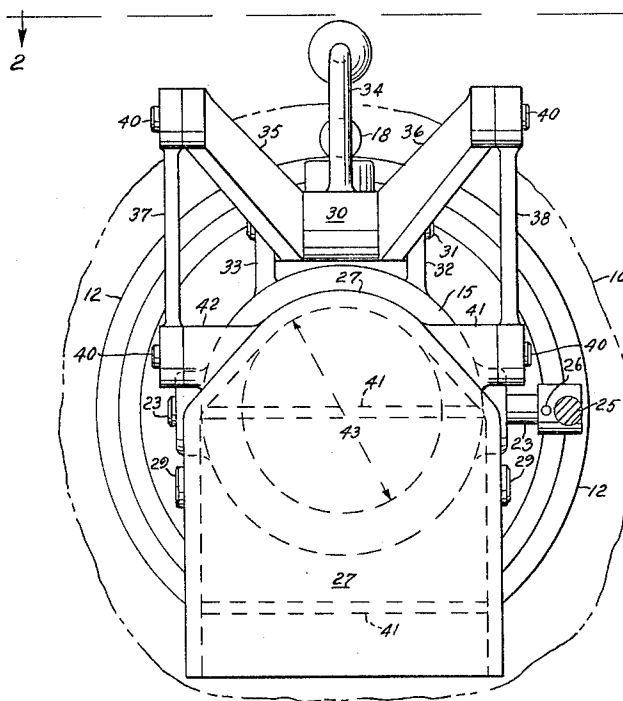
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HYDRAULIC BOAT PROPELLING, GUIDING AND REVERSING MEANS

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1 Claim. (Cl. 239—265.27)

This invention relates generally to a commercial boat of small displacement and relatively small draft, powered by an internal combustion engine driving an hydraulic reaction water jet means adapted to receive water as required from outside said boat, increase the kinetic energy of said water within said jet means and eject said water from said jet means in a direction opposite to the desired direction of motion of the boat.

Additionally this invention relates to means for laterally positioning the discharge end of said hydraulic reaction jet means to vary the angular reaction of said water jet means with respect to the center line of said jet means as installed in said boat, laterally to steer said boat.

Typically the boat referred to here may be provided with an internal combustion engine of, say, three hundred horsepower, have an overall length of, say, thirty feet and be useful for commercial transportation over some of the relatively shallow, swift-water streams of the Pacific Northwest.

Again in a typical case the hydraulic reaction jet means may comprise a series of, say, three water screws, or impellers spaced along a stiff metal shaft to form the impeller shaft of the reaction jet means of a boat as here described. The multiple screw or impeller shaft will be supported at its forward end by adequate bearing means sealed in the forward end of a water manifold adapted to receive water near its forward end through a water passageway through the hull of the boat. From its inlet near its forward end the manifold will be generally continuous to a supporting flange opening through the rear end of the boat. How the motor is attached to the inlet end of the water screw shaft will depend on the type of motor used. The small high speed outboard type of motor adaptable to this purpose can be used but generally the more rugged type of high speed inboard marine engine is desired. Many makes of engines adapted to this purpose are now available on the U. S. market.

The outboard parts of the boat propulsion, reversing and guiding means of this invention begin at the outside of the hull with a substantially circular internally axially tapered nozzle support collar secured through the hull to the supporting flange terminating the water manifold enclosing the multiple screw or impeller shaft within the boat. These essentially novel and useful parts of this invention are here illustrated and described, as follows. In the drawing,

FIG. 1 is a side elevation view in partial section of the assembly of the novel elements of this invention as seen from the plane 1—1 of FIG. 2.

FIG. 2 is a top plan view of the assembly of the novel elements of this invention as seen from the plane 2—2 of FIG. 3.

FIG. 3 is a view in front elevation of the assembly of the novel elements of this invention as seen from the plane 3—3 of FIG. 1.

FIGURE 4 is a view in front elevation of the hose cock as seen from the plane 4—4 of FIGURE 2.

Like reference numerals refer to like parts in the several figures of the drawing.

Referring now to the drawing, in each of the figures a broken away section of the rear end of the boat 10 is shown as secured by bolts 13, not shown, between the rear end 11 of the supporting flange of the water manifold within the boat and the steering nozzle support col-

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lar 12 on which the parts of the present invention are assembled outside of the boat.

Stub shafts 14 are freely rotatably supported, as shown, in collar 12 rotatably to support steering nozzle 15 thereon.

Keys 16 prevent shafts 14 from turning in nozzle 15 and clamp bolts 17 limit the relative endwise movement of parts 14 and 15. Tiller arm 18 keyed to shaft 14 and to steering nozzle 15 by keys 16 is capable of moving steering nozzle 15 to 15° either side of center.

A relatively hard flexible rubber seal ring 19 is seen in FIG. 1 to be positioned on circular tongue 20 of nozzle support collar 12 to seal the gap between collar 12 and nozzle 15 as tiller arm 18 is used to move nozzle 15 laterally to steer the boat laterally by the reaction of water ejected from nozzle 15.

It should be noted in FIG. 1 that the inside diameter of collar 12 and nozzle 15 are progressively reduced in the outlet direction of the water jet through nozzle 15.

Also it is a feature of my present invention to provide at the entrance to the final section of nozzle 15 a symmetrically balanced stainless steel butterfly valve 21 pinned by a hollow, stainless, spring-steel, roll-drive, pin 22 to stainless steel shaft 23 journaled in aluminum bearings 24 formed in nozzle 15.

The unique purpose of butterfly valve 21 positionable by its arm 25 secured to its shaft 23 by non-rusting roll pin 26 is to increase the pressure built up progressively in the manifold or screw shaft housing inboard of the butterfly valve 21. For instance, in the more isolated regions it has been found desirable to have an immediate source of water under a considerable pressure but without additional machinery and expense. With the pressure available behind the closed butterfly valve 21 one or more hose cocks tapped into the wall of the manifold housing the impeller shaft will provide service water up to the pressure limits made available.

Another purpose of the present invention is to provide an improved thrust reverser 27 to be positioned back of the boat as required to intercept more or less of the water jetted from the steering nozzle 15 and reverse its direction in reverser 27 to reverse the reaction force on the boat of the water jetted from nozzle 15.

Note that as shown in the three figures of the drawing, the helmet shaped aluminum thrust reverser 27 overlaps the discharge end of steering nozzle 15 and has side faces 28 pivoted for up and down movement on nozzle 15 by horizontally aligned axle screws 29.

Bell crank 30 hinged by axle pin 31 to arms 32 and 33 has handle arm 34 at one end and bifurcated clevis arm 35, 36 at the other. Pivot screws 40 hold links 37, 38 operatively connected with ears 41, 42, respectively of reverser 27.

As seen in FIG. 1 when operating handle arm 34 of bellcrank 30 is rotated to its left hand limit position all of the water ejected from nozzle 15 will be reversed in thrust reverser 27 to cause the boat to run in its reverse direction. But when handle arm 34 is rotated in the right hand direction bell crank arms 35 and 36 will move links 37, 38, downward taking thrust reverser 27 therewith to leave a clear path for water from nozzle 15 to operate as a reaction jet to drive the boat forward.

To repeat:

Water freely flowing from outside the boat into the water inlet manifold within the boat will be ejected at high pressure by a multi-stage ejector out through steering nozzle 15 and the ejected water will operate normally to drive the boat straight ahead.

But if crank 18 is operated in either lateral direction to direct the ejected water at a lateral angle from the boat the side pressure of the jet will be effective to turn the boat toward its side from which the water is ejected.

And if the arm 34 of bellcrank 30 is pressed downwardly towards the boat, reverser 27 will cause the water from nozzle 15 to be reversed in reverser 27 and cause the boat to back up.

A particular feature of this invention is the form and construction of the thrust equalizer 41 in relation to the parts adjacent thereto. Thus in FIG. 3 the internal diameter of the outlet of steering nozzle 15 is shown as 43, and when thrust reverser 27 is in the relation to nozzle 15 shown in FIG. 1 and FIG. 3, the thrust equalizer 41 has the form of a curved surface of horizontal elements extending across the interior of reverser 27 beginning near the horizontal diameter of nozzle 15 and progressing as shown in FIG. 1 to meet vertical faces 28 of reverser 27 at 28' as shown.

It will be remembered that butterfly valve 21 is principally used to substantially block the water flow through nozzle 15 to build up pressure ahead of nozzle 15 for fire pump or similar use and when butterfly valve 21 is not used for this main use it will lie horizontally across the nozzle 15 to smooth the flow of water from nozzle 14 into thrust reverser 27 below and above thrust equalizer 41. Thus the combination of butterfly valve 21 and thrust equalizer 41 not only adds greatly to the propulsion effectiveness of the mechanism of this invention but also adds greatly to the reversing effectiveness when reverse operation of the boat is required.

Having noted some of the advantageous purposes to which this invention is adapted, illustrated and described a preferred form in which the invention may be produced, and explained its operation, I claim:

A hydraulic propelling, reversing and guiding means for a boat powered by a marine type gasoline engine positioned therein, said propelling, reversing and guiding means including an inlet water manifold positioned longitudinally in said boat below the waterline thereof, a jet water inlet opening sealed through the underside of said boat into said manifold, a reaction water jet outlet collar means sealed through the rearward end, or transom, of said boat on the horizontal centerline of said manifold, a reaction jet water nozzle means formed with a bell shaped entrance to receive water thereinto from said outlet collar means and a relatively hard rubber seal ring sealing the outlet end of said outlet collar means into said bell shaped entrance section of said nozzle means, said propelling reversing and guiding means including a pair of cylindrical hinge pins extending in opposite radial alignment inwardly through the cylindrical inward end of said nozzle means to near the conical inner surface of said outlet collar means, said propelling, reversing and guiding means including a tiller arm with the outer end of one of said

hinge pins extending outwardly therethrough and keyed thereto and each of said hinge pins including a key securing said nozzle means thereto whereby when said tiller arm is rotated about said hinge pin means up to 15 degrees in either direction about the centerplane of said outlet collar means the water ejected by said nozzle will control the lateral direction of the boat as required, said manifold having at least one internally threaded hole formed through an upper surface wall thereof together with a hose cock having its externally threaded entrance end screwed tightly into said hole, said boat propelling, reversing and guiding means including a stainless steel butterfly valve rotatably positioned on a horizontal axle perpendicular to the vertical centerplane of said nozzle near the outlet of its bell end, said butterfly valve including lever means secured to the axle thereof outside said nozzle body to move said valve selectively between a vertical or fully closed position and a horizontal or fully open position, said butterfly valve in its fully open position permitting the free flow of water from said manifold and the free ejection of water from said nozzle and said valve in its fully closed position substantially preventing the emission of water from said manifold to said nozzle and thereby to develop in said manifold an increasing pressure of water for release as needed from said manifold through said hose cock, said hydraulic propelling, reversing and guiding means including a cast metal helmet shaped thrust reverser with a thrust equalizer cast thereon and an operating arm supported on the body casting of said nozzle on an axle parallel to said axle of said butterfly valve, said thrust equalizer being formed as a curved horizontal barrier radially spaced between said axle of said thrust reverser and its outer shell at a position such that the leading edge thereof is aligned with said butterfly valve when said reverser is in its reversing position and said butterfly valve is in its open position.

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