April 9, 1963 J. B. PARSONS 3,084,509

CONTROL FOR JET PROPELLED MARINE CRAFT

Filed Aug. 22, 1960 2 Sheets-Sheet 1

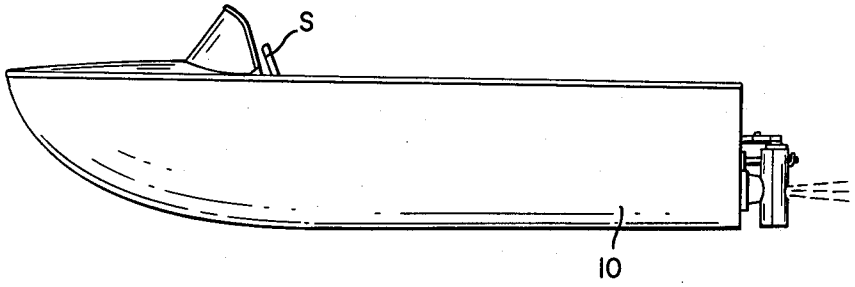


Fig. 1

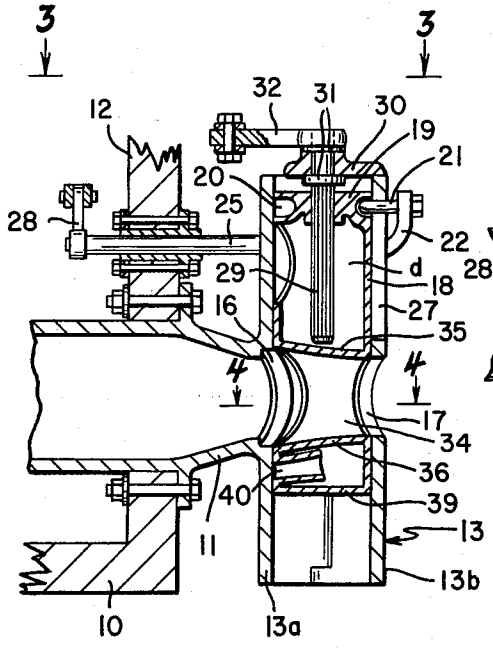


Fig. 2

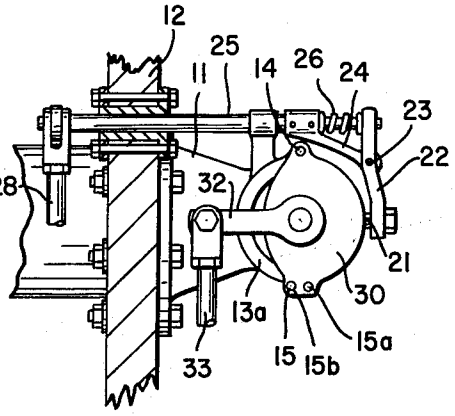


Fig. 3

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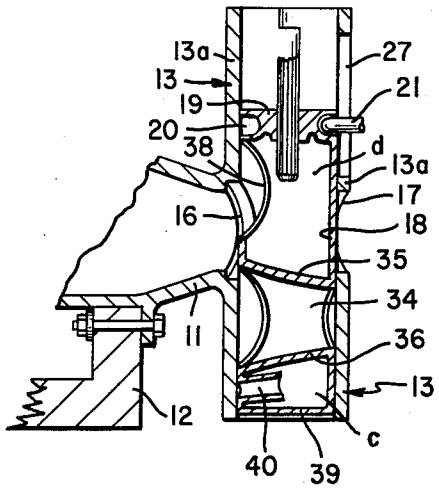


Fig. 8

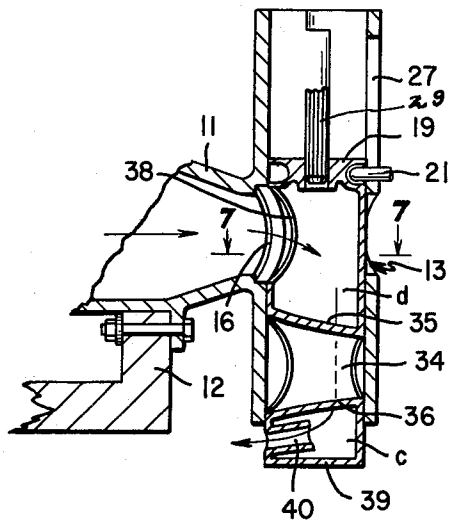


Fig. 6

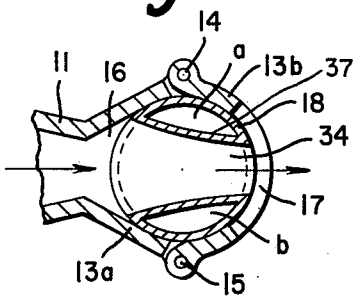


Fig. 4

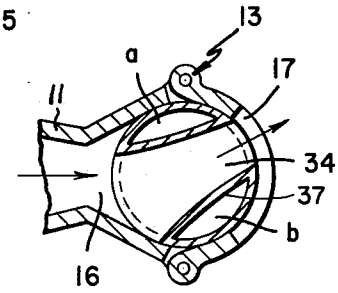


Fig. 5

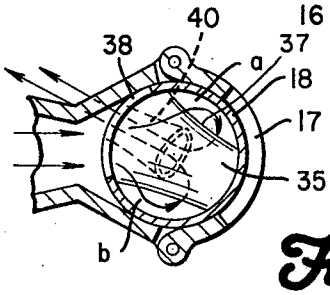


Fig. 7

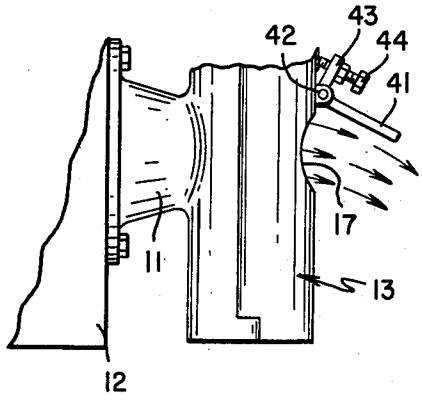


Fig. 9

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CONTROL FOR JET PROPELLED MARINE CRAFT

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1 Claim. (Cl. 60—35.55)

This invention relates to turbo jet propelled boats and other marine craft but more particularly to the control and steering thereof.

An object is to produce a new and improved steering mechanism for turbo jet propelled boats which enables steering to be effected during either the forward or rearward motion of the marine craft.

Another object is to produce a novel shiftable device for effecting forward and rearward drive for a unidirectional turbo jet marine engine as well as a neutral position at which no motion is imparted to the craft although the engine is operating.

A further object is to provide a turbo jet marine engine with a simple and efficient attachment through which the jet stream travels and which controls the forward, rearward drive as well as a neutral position and which has mechanism for directing the jet stream in one direction or another to effect steering during either the forward or reverse motion of the craft.

A still further object is to produce a new and improved tab for stabilizing a jet propelled craft and for maintaining the same approximately level while in motion and under power, and for militating against the rolling motion of the craft when the latter is equipped with multiple turbo jet engines.

Other objects and advantages of the invention will hereinafter appear and, for purposes of illustration but not of limitation, an embodiment of the invention is shown in the accompanying drawings in which:

FIGURE 1 is a side elevation of the power boat equipped with a turbo jet engine;

FIGURE 2 is an enlarged vertical sectional elevation of the steering mechanism connected to the turbo jet engine, a portion of the latter and the hull of the boat being shown in fragment;

FIGURE 3 is a top plan view of the mechanism shown in FIGURE 2, taken substantially on the line 3—3 of FIGURE 2;

FIGURE 4 is a fragmentary transverse sectional view taken substantially on the line 4—4 of FIGURE 2 and showing the steering mechanism adjusted to the position for driving the craft straight ahead;

FIGURE 5 is a sectional view similar to FIGURE 4 but showing the piston valve rocked to a position for causing the craft to turn in one direction;

FIGURE 6 is a vertical sectional view somewhat similar to that of FIGURE 2 with some of the parts removed but showing the piston valve shifted downwardly to the position for driving the craft in a reverse direction;

FIGURE 7 is a transverse sectional view substantially on the line 7—7 of FIGURE 6 and showing the piston valve rocked to a position for steering the craft in one direction during the reverse movement of the craft;

FIGURE 8 is a vertical sectional view similar of the steering mechanism but showing the piston valve disposed in its neutral position; and

FIGURE 9 is a fragmentary side elevation of the steering device equipped with an adjustable trim tab for stabilizing the craft.

The illustrated embodiment of the invention comprises a boat **10** which in this instance has the flat stern **12**, the boat being equipped with an inboard engine (not shown) for driving a turbo jet motor, the tapered outlet **11** thereof being shown extending through the hull. In this instance forming a part of the outlet tube **11** and disposed at substantially right angles thereto is an open ended vertical cylinder **13** which is connected at its center to the tapered outlet. In this instance the cylinder **13** is made up of two separable parts, a part **13***a* which is rigid with the tapered outlet pipe **11** and an outer section **13***b* which is hingedly connected to the section **13***a* by a hinge pin **14**. A removable pin **15** extending through a hole **15***a* in the cover **30** holds the other abutting ends of the sections together. This pin can be removed and then reinserted in a hole **15***a* in the cover **30** for the cylinder as will hereinafter appear, thereby to crack the parts of the cylinder to enable sand and other foreign matter to be washed from the device when that appears to be necessary.

The cylinder **13** has an inlet opening to enable the jet stream from the tapered inlet **16** to enter the cylinder. Diametrically opposed to the inlet **16** is an outlet opening **17** in the cylinder and from which the propelling jet stream is discharged.

Having a relatively free sliding fit within the cylinder **13** is a hollow piston-like valve **18** which is closed at its top by a wall **19**. In the end wall **19** is an external annular groove **20** into which extends the end portion of a pin **21** in screw threaded engagement with an arm **22**. The arm **22** has a pivotal mounting **23** intermediate its ends in the outer end of a bracket **24** which is fixed at its inner end to a rock shaft **25**. The rock shaft **25** is rotatably mounted in a suitable bearing in the stern **12** of the boat, and has a suitable actuating rod **28** disposed on the inside of the boat. The operating rod **28** is mounted in any suitable manner for selectively shifting the valve **18** to the desired position in order to drive the craft forwardly or rearwardly or to dispose the valve in neutral position so that no propelling power is made available.

It will be observed that the inner end of the pivoted arm **22** is slidably mounted on a reduced end portion of the rock shaft **25** and a coil spring **26** normally urges the arm so that the pin **21** is disposed in the annular groove **20** in the piston valve. This arrangement enables the arm to be rocked in a counter clockwise direction (FIGURE 3), against the force of the coil spring **26** sufficiently so that the piston valve **18** is freed from the pin **21** and can be slid from the cylinder **13** for cleaning or repair.

Formed in the cylinder **13** is a vertical slot **27** through which the pin **21** extends. The slot **27** is somewhat arcuate to enable proper actuation of the pin and is of sufficient length to enable proper shifting of the piston valve to effect the desired controls as will hereinafter appear.

The closed upper end wall **19** of the piston valve **18** is provided with a central straight spline way to receive a vertically disposed straight splined rod **29** which extends through the cover plate **30** at the upper end of the cylinder **13**, a pair of spaced discs **31** on the upper end of the rod **29** holding the rod from axial movement. It will be understood that the cover **30** is retained in place by the pins **14** and **15** which hold the cylinder sections **13***a* and

13*b* together. The cover 30 only partially covers the cylinder to permit the passage of any water that may find its way above the piston valve and also afford free movement to the valve.

Suitably fixed to the upper end of the splined rod 29 is an operating arm 32 having suitable connections with the steering wheel S of the boat so that upon turning of the steering wheel the arm 32 may be turned in one direction or the other for effecting steering of the boat as will hereinafter appear. As shown a link 33 extends from the opposite end of the arm 32 but it will be understood that any suitable means for effecting rocking movement of the arm 32 may be employed.

Extending through the piston valve 18 is a cylindrical passage 34 in the form of a venturi, the inlet end being considerably wider than the outlet end and being disposed to receive the jet stream from the tapered outlet 11 from the turbo jet motor. It will be observed that adequate space is provided to enable the passage 34 to be rocked from one side to the other and still have the full benefit of the jet stream. The cylindrical passage 34 is formed with an upper wall 35, a bottom wall 36 and side walls 37, the latter spaced from the sides of the piston valve particularly as shown in FIGURES 4, 5, and 7, thereby to provide passages *a* and *b* on the outer sides of the cylindrical passage 34. The vertically disposed passages *a* and *b* communicate with a chamber *c* at the bottom of the piston valve and with a chamber *d* above the transverse passage 34. The chamber *d* has a lateral opening 38 on the inner side of the piston valve, which can be brought into registry with the cylinder opening 16 to receive the jet stream when the piston valve is lowered to the position shown in FIGURE 6.

The chamber *c* is closed at the bottom by an end wall 39 of the piston valve and has a rearwardly extending opening in which a relatively short downwardly inclined verturi tube 40 is secured which enables the jet stream from the chamber *c* to be discharged in a forward direction as indicated by the arrow in FIGURE 6 for imparting backup or reverse movement to the craft.

From the above description it will be understood that the piston valve 18 is in the position shown in FIGURE 2 for driving the boat forwardly. In this instance the stream from the turbo jet engine passes through the venturi passage 34 to the outside through the opening 17 in the cylinder 13. Both the outlet opening 17 and the inlet 16 in the cylinder are sufficiently wide to enable the valve 18 to be rocked by the splined shaft 29, arm 32 and other connections in one direction or the other thereby to effect steering of the boat in a forward direction. FIGURE 5 shows the valve rocked in one direction for effecting steering of the boat in one direction and manifestly by rocking the valve 18 in the opposite direction the force of the jet stream will cause the boat to turn in the opposite direction.

By a slightly downward movement of the valve 18 through the operation of the arm 22, rock shaft 25 and associated parts to the position shown in FIGURE 8, the parts are in neutral position where neither forward nor rearward propelling movement is imparted to the craft. In this position the outlet 17 and the cylinder is closed by a solid wall of the valve 18 and the venturi tube 40 is also closed by an imperforate portion of the wall of the cylinder. In this case the jet stream can merely churn within the valve and cylinder without effecting any driving force in one direction or the other.

The piston may be shifted downwardly to the position shown in FIGURE 6 in which the venturi tube 40 is uncovered from the cylinder 13, enabling the jet stream to be impelled forwardly toward the hull, thereby to cause a reverse movement of the craft. In this instance the jet stream from the turbo jet motor enters the chamber *d* through the piston opening 38, passes downwardly through the vertical passages *a* and *b* into the chamber *c*, and thence outwardly in a forward direction through the short venturi tube 40. The reverse or backup motion of the

boat can be steered by turning the valve 18 in one direction or the other by rocking the splined shaft 29 through connections above described. This can be accomplished readily and conveniently and either a sharp turn or a gradual turn can be effected depending upon the amount of turning movement imparted to the valve.

FIGURE 9 somewhat diagrammatically illustrates a stabilizer for the boat to effect leveling of the boat fore and aft while running forwardly. In the form shown a plate or tab 41 is disposed above the outlet opening 17 of the cylinder 13 so that the force of the jet stream will impinge upon it and elevate the stern of the boat to a degree dependent upon the amount by which the jet stream is intercepted. In this instance the plate 41 has an integral arm 43 at right angles thereto and an adjusting screw 44 is provided for manually rocking the plate 41 to a desired position. Manifestly the rocking of the trim tab or plate 41 can be operated by suitable mechanism disposed inside of the boat, such as by suitable linkage or the like. Furthermore it will be understood that another tab or plate 41 may be disposed in a position below the opening 17 which would tend to effect a reverse action, i.e. that of lowering the stern of the boat to a predetermined degree.

In this connection it is contemplated that on boats provided with twin jet streams, pairs of trim tabs 41 therefor of the above description, one pair being disposed above the jet stream and the other pair below the jet stream, may be employed in connection with a gyro or other control well known in the art for the stabilization of marine craft, thereby to control the roll about a fore and aft axis without adding appreciably to the drag as is presently experienced in the use of certain stabilizers, such as retractable fins which operate beneath the surface of the water. Thus pairs of plates or tabs 41 may be automatically rocked by suitable means responsive to the rolling action of the boat and consequently causing the boat to maintain a substantially level condition.

Numerous changes in details of construction, arrangement and operation may be effected without departing from the spirit of the invention especially as defined in the appended claim. Although mention has heretofore been made of "venturi-like" passages, it is to be understood that other shaped passages are satisfactory, such as straight walls, concave, convex and other shapes.

What I claim is:

In combination with a jet propelled watercraft having a jet nozzle extending through the transom thereof, a thrust reversing and steering control device comprising:

(*a*) a cylindrical chamber mounted upon the boat rearwardly of the transom and nozzle in the path of the jet stream, with its longitudinal axis disposed substantially vertically,

(*b*) said cylindrical chamber having opposed inlet and discharge openings on the annular wall of said chamber, the inlet opening being aligned with the jet nozzle exit;

(*c*) a cylindrical piston mounted in said chamber for reciprocating and rotatable sliding movement with respect to said chamber,

(*d*) said piston having vertically stacked, upper, forward inlet openings, each comprising a greater arc than said chamber inlet opening; an intermediate discharge opening opposing the lower one of said inlet openings; and a lower, forward, discharge opening;

(*e*) the chamber and piston being dimensioned so that the lower piston inlet opening is aligned with the nozzle exit opening and the piston intermediate discharge opening is aligned with the chamber discharge opening, the other piston openings being blocked by the chamber wall, in an upper position of the piston; and so that the upper piston inlet opening is aligned with the nozzle exit opening and the lower piston discharge opening is exposed, the other piston openings being blocked by the chamber wall, in a lower position of said piston;

(*f*) first actuating means for reciprocating the piston between said upper and lower positions; and

(*g*) second actuating means for rotating said piston while it is in either of said upper or lower positions.

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