Oct. 3, 1961 J. SKOPYK 3,002,344

JET PROPULSION APPARATUS FOR BOATS

Filed June 10, 1960 3 Sheets-Sheet 1

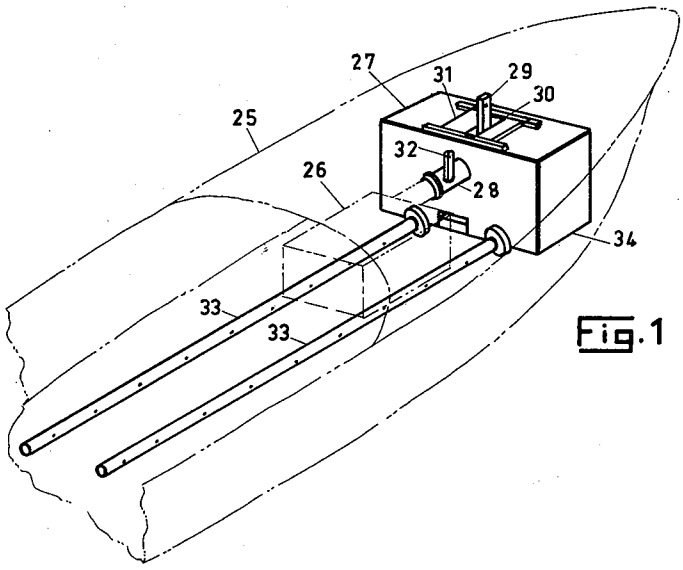


Fig.1

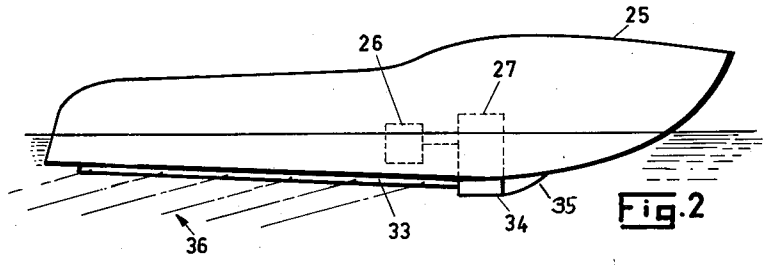


Fig.2

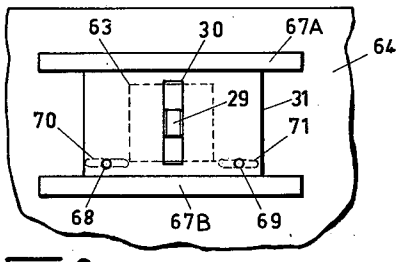


Fig.6

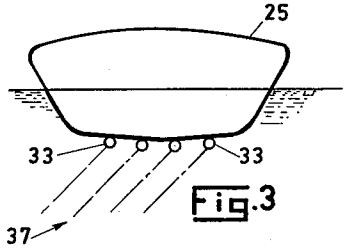


Fig.3

INVENTOR

Joseph Skopyk

Oct. 3, 1961 J. SKOPYK 3,002,344

JET PROPULSION APPARATUS FOR BOATS

Filed June 10, 1960 3 Sheets-Sheet 2

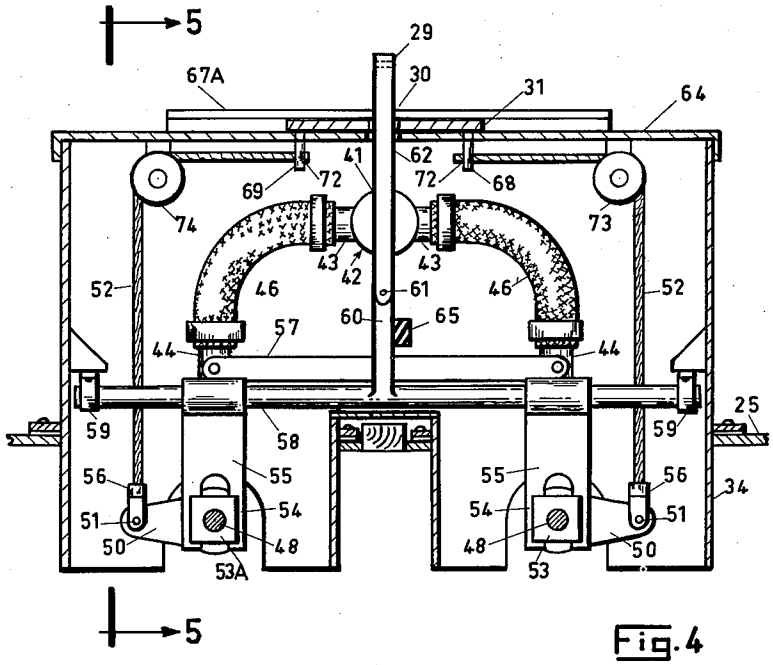


Fig. 4

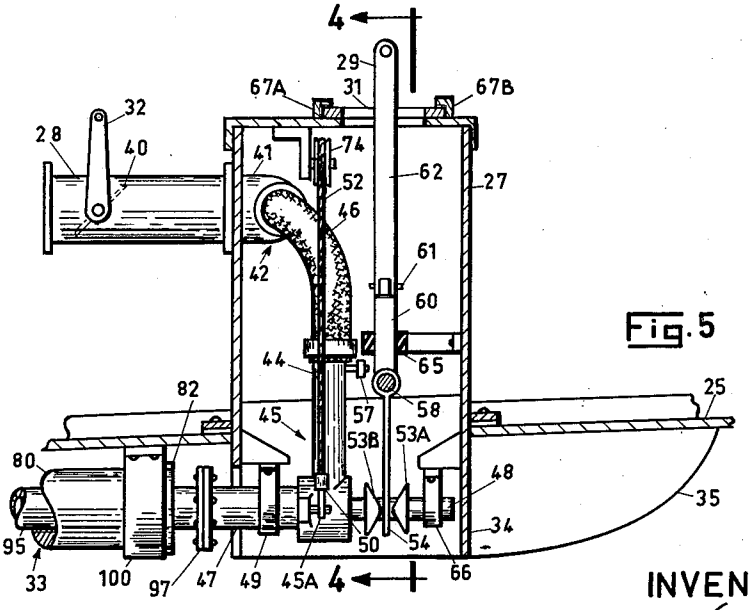


Fig. 5

INVENTOR

Joseph Skopyk

Oct. 3, 1961 J. SKOPYK 3,002,344

JET PROPULSION APPARATUS FOR BOATS

Filed June 10, 1960 3 Sheets-Sheet 3

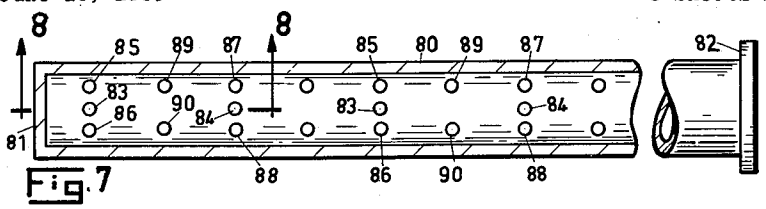


Fig. 7

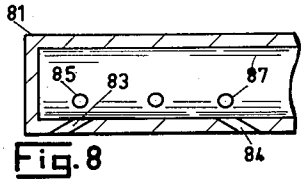


Fig. 8

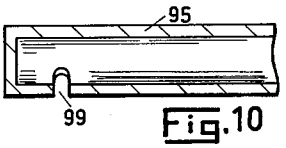


Fig. 10

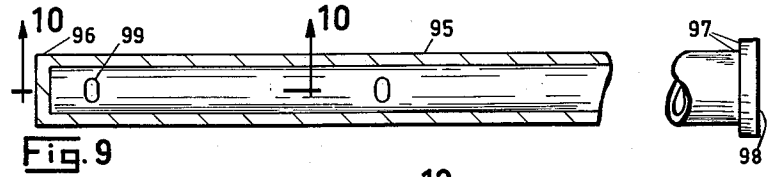


Fig. 9

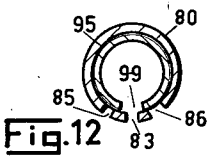


Fig. 12

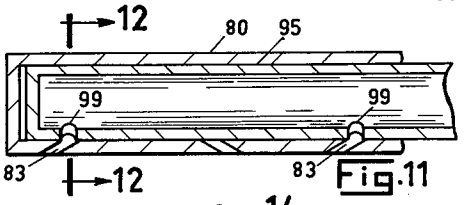


Fig. 11

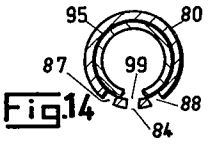


Fig. 14

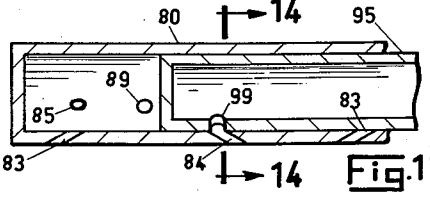


Fig. 13

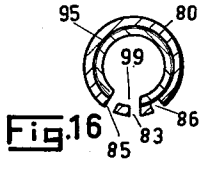


Fig. 16

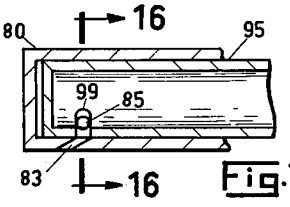


Fig. 15

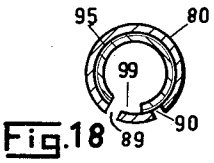


Fig. 18

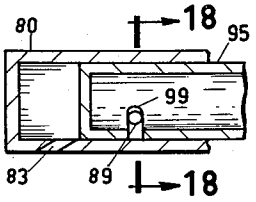


Fig. 17

INVENTOR

Joseph Skopyk

United States Patent Office 3,002,344 Patented Oct. 3, 1961

3,002,344

JET PROPULSION APPARATUS FOR BOATS

Joseph Skopyk, % Canadian Research & Development Foundation, 1434 Queen St. W., Toronto, Ontario, Canada

Filed June 10, 1960, Ser. No. 35,321
3 Claims. (Cl. 60—35.56)

This invention relates to improvements in boat propulsion apparatus and more particularly to improvements in propulsion apparatus utilizing jets of air or water to effect both propulsion and steering of a boat.

It is conventional practice to utilize propulsion systems for boats, consisting of a motor, a drive shaft and a propeller, such systems having the disadvantage, that the propeller must project substantially below the hull of the boat to be effective, this requiring retraction of the propeller upon the boat entering shallow water, to prevent the propeller from fouling the bottom, such retracted position rendering the propeller ineffective for propulsion in shallow water. Another disadvantage of this conventional system lies in the fact that the propeller, being fully exposed to the elements, is liable to become entangled in weed beds, fishing lines or the like and may badly injure any person who inadvertently comes into contact with it, such as, for instance, a swimmer or a person falling overboard from the boat. Another disadvantage derived from operation of the conventional motor-driven propeller is the phenomenon known as "cavitation" which reduces the efficiency of any propeller at higher speeds due to comminution of the medium such as water, on one side of the propeller, through inertia of the water, in which it operates.

Other methods have been utilized to propel boats and the like comprising suction systems or ejection systems adapted to act against the water and thereby propel the boat. Most of such systems utilize ejection nozzles adapted to be moveably located in various directions and thereby propel the boat in a selected direction. The disadvantages with regard to this system lie first in the difficulty of controlling direction of such nozzles, secondly, in requiring a comparatively complicated system of nozzles, adapted to be linked together in order to provide directional motion of the boat.

Other systems have utilized jet propulsion in various ways. All of these systems have however various disadvantages, in that they particularly rely on, for instance, oil, for reduction of friction between the hull of the boat and water, such systems normally requiring thorough cleaning of the hull at frequent intervals without contributing particularly to reduction of such friction, other disadvantages with regard to the conventional systems being, that methods of steering through directional control of various jets is extremely complicated and costly to produce.

It is an object of this invention to provide a jet propulsion apparatus for boats adapted to enable a boat to operate both in shallow water and in deep water.

It is a further object of this invention to provide a jet propulsion apparatus, adapted to have the main portion thereof housed within the boat, a streamlined ejection portion thereof being adapted to be mounted substantially flush with the underside of the boat's hull, adding very little to the draught of the boat.

It is another object of this invention to provide a jet propulsion apparatus having no moving parts located on the outside of the hull of the boat.

It is a further object of this invention to provide a jet propulsion apparatus for boats having the advantage of retaining its efficiency at high speeds.

It is further an object of this invention to provide a

jet propulsion apparatus that will enable the operator to manoeuvre the boat quickly and easily at will.

It is still another object of this invention to provide a jet propulsion apparatus that will facilitate boat manoeuvring by allowing the operator to selectively motivate the boat to move fully sideways, with no simultaneous forward or backward travel.

It is another object of this invention to provide a jet propulsion apparatus adapted to provide a substantial air cushion between the hull of the boat and water to cut down friction losses therebetween.

It is another object of this invention to provide a jet propulsion apparatus utilizing one single control handle, adapted to selectively control motivation of boat in forward direction, reverse direction, turn to the right and turn to the left.

It is a further object of this invention to provide a jet propulsion apparatus adapted to provide braking means, by selectively motivating the above mentioned control handle to exert jet power in opposite direction to any present direction of movement.

These and other objects and features of this invention will become apparent when taken in conjunction with the accompanying drawings in which:

FIG. 1 is a perspective view of a jet propulsion apparatus for boats embodying this invention, showing, in phantom, the boat in which it is installed.

FIG. 2 is a diagrammatic side elevation of a boat embodying this invention.

FIG. 3 is an end elevation of the boat shown in FIG. 2.

FIG. 4 is a transverse section of the control unit embodied in this invention taken on the line 4—4 of FIG. 5.

FIG. 5 is a longitudinal section of the control unit shown in FIG. 4, taken on the line 5—5.

FIG. 6 is a fractional plan view of a steering selector embodied in this invention.

FIG. 7 is a fractional part sectional plan view of an outer guide tube embodied in this invention, showing the location of the guide hole for jet efflux.

FIG. 8 is a fractional longitudinal mid-vertical section of the outer guide tube shown in FIG. 7 taken on the line 8—8.

FIG. 9 is a fractional part sectional plan view of an inner control tube embodied in this invention showing the relative position of slots utilized for air distributon.

FIG. 10 is a fractional longitudinal, mid-vertical section of the inner control tube shown in FIG. 9 taken on the line 10—10.

FIG. 11 is a fractional, longitudinal, mid-vertical section of a propulsion tube assembly combining an outer guide tube, illustrated in FIG. 7, and an inner control tube, illustrated in FIG. 9, the assembly being shown in the operating position utilized to effect forward travel of the boat.

FIG. 12 is a transverse section of the propulsion tube assembly shown in FIG. 11 taken on the line 12—12.

FIG. 13 is a fractional, longitudinal, mid-vertical section of the propulsion tube assembly illustrated in FIG. 11 showing the inner control tube located in the operating position utilized to effect rearward travel of the boat.

FIG. 14 is a transverse section of the propulsion tube assembly shown in FIG. 13 taken on the line 14—14.

FIG. 15 is a fractional, longitudinal, mid-vertical section of the propulsion tube assembly illustrated in FIG. 11 showing the inner control tube located in the operating position utilized to turn the boat in a side direction while travelling in a forward direction.

FIG. 16 is a transverse section of the propulsion tube assembly shown in FIG. 15 taken on the line 16—16.

FIG. 17 is a fractional, longitudinal mid-vertical section of the propulsion tube assembly illustrated in FIG.

11 showing the inner control tube located in the operating position utilized to effect sideways travel of the boat.

FIG. 18 is a transverse section of the propulsion tube assembly shown in FIG. 17 taken on the line 18—18.

Referring to FIG. 1 a boat 25 is shown in phantom, a conventional compressor unit 26 being located therewithin.

A control unit 27 is located toward the bow of boat 25, control unit 27 containing a compressed air distribution mechanism, an inlet port of the compressed air distribution mechanism being connected to outlet port of compressor 26 by means of a duct 28. A control handle 29 projects through a slotted opening 30 in a slide plate 31, control handle 29 being adapted to be moved forward or aft in order to control forward and reverse motivation of boat 25, side movement of handle 29 and slide plate 31 being adapted to motivate the bow of boat 25 in direction of side movement of handle 29 in forward motion, stand still and reverse motion respectively.

A throttle lever 32, adapted to control the volume of air entering the compressed air distribution mechanism, is situated on duct 28, movement of lever 32 to one or other side allowing more or less air to enter the compressed air distribution mechanism.

At least one propulsion tube assembly 33 is mounted on the undersurface of the boat 25, situated parallel with the longitudinal centre line thereof and equally disposed on each side thereof, the forward end of propulsion tube assembly 33 being in close proximity to a portion 34 sealably extending through the bottom of boat 25.

Referring to FIG. 2, an arcuate fitting 35, adapted to streamline the extending portion 34 of control unit 27, is fitted to the underside of the hull of boat 25 immediately forward of the extending portion 34, thereby reducing drag and eddy currents which would otherwise be engendered upon extending portion 34 being allowed to present a flat surface area at substantially right angles to the water flow. Lines 36 extending from propulsion tube assemblies 33 indicate the direction of air ejected from the apparatus upon boat 25 being motivated in a forward direction.

Referring to FIG. 3, a plurality of propulsion tube assemblies 33 are shown in spaced relationship, equally disposed about the longitudinal centre line of boat 25 and in close proximity to the outer surface of the hull thereof. Lines 37 extending from propulsion tube assemblies 33 indicate the direction of air ejected from the apparatus upon boat 25 being motivated in a starboard direction.

Referring to FIGS. 4, 5 and 6, the mechanisms within control unit 27 are shown, illustrating firstly the means of supplying, and controlling the supply of, compressed air from the compressor 26 (FIGS. 1 and 2) to the propulsion tube assemblies 33, secondly the means for controlling the motivation of boat 25 in a forward, backwards, or central position, thirdly the means for controlling the motivation of boat 25 to port or starboard as follows:

In the following description, the terms "forward," "backward," "front," "rear," "aft," "port," "starboard" are stated in relation to the boat 25 in which the invention is shown installed.

Compressed air from compressor 26 enters duct 28, its volume of flow being controlled inside duct 28 by a conventional type valve 40, the spindle of which extends through the wall of duct 28 and is attached to throttle lever 32, which, in this instance, upon rearward movement of lever 32, results in cutting down the airflow through duct 28, whereas forward movement of lever 32 will permit an increased amount of air to flow through duct 28.

It should be noted that other variations of this particular arrangement are possible to suit varying installations of the invention, and the method heretofore described should in no way limit the scope of the invention.

The compressed air, having been metered by valve 40, passes into control unit 27 through the inlet port 41 of an air distribution manifold 42 having a number of outlet branches 43 equal to the number of propulsion tube assemblies 33.

The following description relates to the embodiment of the invention in a boat 25 adapted to have installed therein two propulsion tube assemblies 33, but, as previously stated, the invention may utilize any number of propulsion tube assemblies 33 as required.

In this invention, manifold 42 comprises the inlet port 41 and two outlet branches 43. Each outlet branch 43 is connected to a flexible hose 46 which in turn is connected to a vertical stem 44 of an elbow 45. A horizontal tube 47 of elbow 45 is in axial alignment with and flangeably attached to propulsion tube assembly 33. A circular shaft 48 extends forwardly from the lower end 45A of elbow 45 in axial, concentric alignment with the horizontal tube 47. A bearing 49, allowing both rotary and axial movement of tube 47, supports horizontal tube 47, while a similar bearing 66, located at the forward end of control unit 27, supports the free end of shaft 48. An arm 50 extending horizontally outward from the lower portion 45A of elbow 45 at its extremity, supplied with a hole 51 adapted for receiving an end fitting 56 attached to a control cable 52.

Two conical collars 53A and 53B are rigidly attached to shaft 48 in inverted relation to each other and in spaced relationship to form a divergent annular groove, adapted to receive the prong ends 54 of an actuating fork 55 which is adapted to selectively move shaft 48 forwardly or rearwardly.

A link arm 57 connects upper ends of stems 44 to provide synchronous leverage on plurality of tubes 47 for simultaneous rotation thereof.

Actuating forks 55 extend upwardly from shafts 48 and are rigidly attached to a transverse shaft 58, each end of which is rotatably mounted in bearings 59 located on sides of control unit 27. A bar 60, perpendicular to and integral with transverse shaft 58, extends upwardly from the centre of transverse shaft 58, the extremity of bar 60 forming the lower component of a hinge joint 61, the upper component of hinge joint 61, being the lower end of the control handle 29. Hinge joint 61 permits independent, arcuate movement of control handle 29 in a plane containing transverse shaft 58. Fore or aft movement of control handle 29 is transmitted through hinge 61 to bar 60 causing transverse shaft 58 to rotate, imparting an arcuate movement to actuating forks 55, which in turn, through fork ends 54 and collars 53A or 53B is translated into fore or aft travel of shaft 48 in an opposite direction to control handle 29.

A friction retaining clamp 65 is attached to the rear face of the front wall of control unit 27 in longitudinal alignment with bar 60 and extends aft to frictionally and slideably embrace bar 60, permitting control handle 29 to remain in any selected position upon being disconnected from any fore and aft motivating force.

Control handle 29 extends upwardly from hinge 61 through a substantially rectangular hole 63 located centrally in the upper cover 64 of control unit 27 and through the longitudinal slot 30 formed centrally in the substantially rectangular slide plate 31 located on the upper surface of cover 64. Slide plate 31 is slideably located in, and restrained from fore and aft movement by, two parallel guide rails 67A and 67B which are attached transversely of longitudinal axis of boat 25 to upper cover 64. Two lugs 68 and 69 attached to opposite rear corners of slide plate 31 project downwardly through two transverse slots 70 and 71 respectively, formed in cover 64 of control unit 27. The lower extremities of lugs 68 and 69 are each adapted to be connected to an end fitting 72 of control cables 52.

Two pullies 73 and 74 are oppositely located and attached to the undersurface of cover 64, each being sub-

stantially vertically above one of the arm 50, and each supporting at its perimeter a control cable 52. Transverse movement in one direction of control handle 29 causes slide plate 31 to move in the same direction. This movement is transmitted through lugs 68 and 69 to control cables 52, causing one cable 52 to be in tension and its particular arm 50 to be raised arcuately. Arcuate movement of arm 50 is transmitted through elbow 45 and stem 44 to link arm 57, the opposite end of which is attached to stem 44 of the second elbow 45, causing the second elbow 45 to rotate in the same direction with the same angular movement as the first elbow 45.

Referring to FIGS. 7 and 8, a cylindrical outer guide tube 80 is closed at one end by a disc-like end wall 81, the opposite end being completely open and supplied with a circular flange 82. The end of guide tube 80 carrying end wall 81 is ductionally located towards the aft end of the boat 25, the end of guide tube 40, incorporating flange 82 being located toward the front of the boat 25. A plurality of holes 83 in equally-spaced longitudinal relationship, having their axes in the mid-vertical plane, perforate the bottom portion of the wall of tube 80. Holes 83 slope inwardly toward centre of tube 80 and forwardly toward front end of boat 25 at an angle providing that the forward edge of the hole formed in the exterior wall of tube 80 is situated vertically behind the rear edge of the hole formed in the interior wall of tube 80. The rearmost hole 83 is adjacent end wall 81. A plurality of holes 84 are located alternately one on each side of holes 83 and are in equally spaced longitudinal alignment with holes 83. Holes 84 slope inwardly toward the centre of tube 80 and rearwardly towards the stem of boat 25 at an angle providing that the rearmost edge of the hole formed in the exterior wall of tube 80 is vertically in front of the foremost edge of the hole formed in the interior wall of tube 80. Each hole 83 is flanked by a radially drilled hole 85 on the one side and a similar hole 86 equidistantly spaced on the opposite side. The centres of holes 85 and 86 and the centre of hole 83 at the point where it emerges through the inner wall of guide tube 80 are in circumferential alignment, holes 85 and 86 being contained within the lower half of guide tube 80. In a similar manner each hole 84 is equidistantly flanked by a radial hole 87 and radial hole 88, the centres of holes 87, 88 and 84 at the point where it emerges through the inner wall of guide tube 80 being in the same transverse plane. All holes 85 and 87 are in longitudinal alignment in a line parallel with the line through the centres of holes 83 and 84. All holes 86 and 88 are similarly aligned. A hole 89 is drilled radially through guide tube 80 in axial alignment with each set of holes 85 and 87 and equally spaced between them. A radial hole 90 is similarly positioned between each set of holes 86 and 88.

Referring to FIGS. 9 and 10, a cylindrical inner control tube 95 is closed at one end by a disc-like end wall 96, the opposite end being completely open and carrying a circular flange 97. The external diameter of control tube 95 is substantially equal to the internal diameter of outer guide tube 90, control tube 95 being a sliding fit within guide tube 80 when assembled. Control tube 95 is substantially longer than guide tube 80. A plurality of axially aligned, circumferential slots 99 in equally spaced relationship are located in the lower half of control tube 95 in such a position that upon control tube 95 being inserted in guide tube 80 to its fullest extent, slots 99 are in radial alignment with holes 83. Slots 99 have a width equal to the diameter of hole 83 and a length equal to the circumferential distance between the outer edges of holes 83 and 85.

Referring to FIGS. 7 and 9, the circumferential distance between holes 83 and 85 and holes 83 and 86 is such that, upon being assembled with slots 99 of control tube 95 centrally aligned over holes 83 of guide tube 80, the outer edges of slots 99 do not overlap either holes 85 or 86.

In FIGS. 11 and 12, inner control tube 95 is shown assembled within outer guide tube 80, end wall 96 of control tube 95 being in working contact with end wall 81 of guide tube 80, and slots 99 in control tube 95 are centrally aligned over holes 83 in outer guide tube 80.

In FIGS. 13 and 14, inner control tube 95 is shown in its most forwardly operating position with slots 99 centrally aligned over holes 84.

FIGS. 15 and 16 illustrate the position of inner control tube 95 at its rearward travel, as in FIG. 11, having been rotated about its longitudinal axis a sufficient distance to enable slots 99 to uncover holes 83 and 85 simultaneously or, by an equal and opposite rotation, holes 83 and 86 may be uncovered in a similar manner.

In FIGS. 17 and 18, inner control tube 95 is positioned substantially midway between its rearmost position as illustrated in FIG. 11 and its foremost position as shown in FIG. 13, slots 99 being so arranged that holes 89 in outer guide tube 80 are in unrestricted communication with the interior of control tube 95, the outer edges of slots 99 and holes 89 being in radial alignment.

Referring to FIG. 5, a propulsion tube assembly as heretofore described is assembled to a boat 25 which is adapted to be fitted with the invention in the following manner:

With handle 29 centralized and in its fully forward position, horizontal tube 47 is fully aft and in the mid-position of its arcuate travel limts. Inner control tube 95 is assembled to its full limit within outer guide tube 80, slots 99 being centralized over holes 83. With holes 83 and 84 being centralized in the mid-vertical plane of assembly 33, the flange 97 of inner control tube 95 and the flange located at the rear of horizontal tube 47 are fixedly assembled in sealable contact. A plurality of clamps 100 rigidly secure outer guide tube 80 to the bottom of the hull of boat 25 in parallel alignment with the centre line thereof. The front face of the foremost clamp 100 abutting the rear face of flange 82 thereby positionally locating guide tube 80 in relation to boat 25.

The method of utilizing a jet propulsion apparatus for boats embodying this invention is as follows:

Air under pressure from compressor 26 passes through duct 28 past throttle valve 40 into manifold 42 where it is distributed according to the number of propulsion tubes 33 which are to be served. The air is then ducted through an appropriate number of flexible hoses 42 into the elbow fittings 45, thence through horizontal tubes 47 into the interior of inner control tubes 95, where the selective positioning of slots 99 determines the direction of travel of boat 25.

The selective positioning of slots 99 originate at control handle 29. With control handle 29 centralized both in slot 30 (in slide plate 31) and in rectangular hole 63 (in cover 64) as shown in FIG. 6, all cables 52 are at rest and arms 50 are substantially horizontal as illustrated in FIG. 4. At the same time, bar 60 is in the vertical position as shown in FIG. 1 and, through transverse shaft 58, actuating forks 55 are also vertical, their pronged ends 54, through conical collars 53A and 55B, locating shaft 48 in a mid way position between its limits of longitudinal axial travel.

In this position slots 99 of inner control tubes 95 are situated centrally between holes 89 and 90 in the outer guide tubes 80, there is no outlet for the compressed air contained within the assembly and boat 25 remains static.

Upon moving handle 29 in slot 30 toward the front of boat 25, while remaining in the same vertical plane, it may be seen from FIG. 5 that hinge 61 remains rigid causing bar 60 to move in alignment with handle 29, overcome the resistance of friction clamp 65, and, through transverse bar 58, impart an arcuate motion to actuating forks 55. This arcuate movement is transmitted as pressure upon the rear conical collars 53B through pronged ends 54. Conical collars 53B being fixed to shafts 48, and shafts 48 being integral with elbows 45, pressure

on collars 53B causes the whole elbow assemblies to move aft, supported by bearings 49 and 66. Flexible hoses 46 bend sufficiently (without undue distortion) to allow for this movement and link arm 57 ensures that all elbows 45 move in synchronization. Inner control tubes 95, being securely attached to horizontal tubes 47, also move aft to their rearmost position, and, as illustrated in FIGS. 11 and 12, slots 99 allow the compressed air to escape downwardly and rearwardly through holes 83, resulting in a reactive force being applied to outer guide tubes 80 and, through clamps 100, transmitted to the hull of boat 25.

Upon control handle 29 being moved to its rearmost position, the hinge 61 transmits the movement through bar 60 to transverse shaft 58, causing actuating forks 55 to swing arcuately forward. Prong ends 54 apply a forward pressure to conical collars 53A which in turn transmit the pressure to shafts 48, causing them to move forward. Elbows 45 move forward in synchronization causing a slight bending in flexible hoses 46, and, through horizontal tubes 47, inner control tubes 95 are moved to their fully forward positions.

Referring to FIGS. 12 and 14 it may be seen that in this position, compressed air is directed through slots 99 to be ejected downwardly and forwardly through holes 84, resulting in a rearward thrust being applied to outer guide tubes 80 and, through clamps 100, this thrust is transmitted to the hull of boat 25.

Friction clamp 65 ensures that bar 60, and therefore control handle 29, remains in its selected position in the horizontal, vertical plane of the boat 25.

It will also be noted that control handle 29 provides instinctive control inasmuch as the operator must move handle 29 forward to have the boat 25 move ahead and backwards for reverse.

With boat 25 moving ahead as previously described, control handle 29 is fully forward and in line with the centre line of the boat 25. Upon handle 29 being moved to starboard, pivoting on hinge 61, a pressure is exerted on the port edge of slot 30 causing slide plate 31 to move in rails 67A and 67B, and, in this instance, lug 68 creates a tension in its particular cable 52, which, through end fitting 56, causes arm 50 to move upwardly. Arm 50 being integral with elbow 45, stem 44 and horizontal tube 47 are caused to rotate in bearings 49 and 66. Stem 44 moving through an arc exerts a pressure on link arm 47, causing the inter linked stem 44 to move to the same degree, rotating its own particular elbow assembly 45, its arm 50 moving downwardly, and, through end fitting 56, applying a tension in its own cable 52 to lug 69, assisting to move slide plate 31 in the previously selected direction. Flexible hoses 46 allow for movement of stems 44 without any undue distortion. The arcuate travel of arms 50 and the resultant rotation of horizontal tubes 47 cause inner control tubes 95 to move in a clockwise direction as viewed from the rear, and, as shown in FIGS. 15 and 16, slots 99 uncover both holes 83 and 85. Air from holes 83 continues to provide forward thrust, while air ejected from holes 85, which are, on the port side of guide tubes 80, impart a sideways thrust through outer guide tubes 80 and clamps 100 to the hull of boat 25, causing boat 25 to move both forwardly and to starboard.

Similarly upon control handle 29 being moved to port, the jet efflux will issue from holes 83 to provide forward thrust, and from holes 86 in the starboard side of outer guide tubes 80 to give a reaction to port.

It should again be noted that turning control is instinctive, the operator moving handle 29 to port in order to make a port turn and to starboard to make a starboard turn.

The action of turning while reversing is similar in all respects to that previously described for turning while moving forward. Upon control handle 29 being moved to the fully aft limit of its travel and to starboard, slots 99 of inner control tubes 95 uncover holes 84 and 87 in the outer guide tubes 80. Holes 84 impart a rearward thrust to boat 25, as previously described, while the efflux through holes 87 on the port side of outer guide tubes 80 simultaneously impart a side thrust to starboard.

As previously described, upon handle 29 being centralized in rectangular hole 63, slot 99 is blanked-off by a plain portion of the lower wall of outer guide tube 80 and boat 25 is at rest. FIGS. 17 and 18, however, illustrate the action upon handle 29 being moved to starboard with no further fore and aft movement within slot 30. Holes 89 are uncovered by slots 99, and, being on the port side of outer guide tubes 80, impart a thrust to starboard. With no travel ahead or astern, boat 25 is caused to move fully sideways to starboard. Similarly, upon handle 29 being moved to port, slots 99 uncover holes 90, the resulting jet effect causing boat 25 to move to port. It will again be noted that this incorporates the principles of instinctive control.

From the foregoing description it may be understood that control handle 29 is fully universal within the confines of rectangular hole 63, this being especially important in an emergency it being possible to move say, from full ahead starboard to full astern port in one direct movement, with no time consuming selection through various "gates."

The embodiments of the invention in which I claim exclusive priority and privilege are defined as follows:

1. In a water vessel, jet propulsion apparatus comprising a source of compressed gas, at least one stationary tube located longitudinally of and directly subjacent said water vessel, a secondary tube located, rotatably and axially movable, within said stationary tube, the wall of said secondary tube being concentric with, and in close proximity, of said stationary tube, said stationary tube having a forward end and a stern end, said stern end being closed by closure means, said stationary tube being rigidly attached subjacent said water vessel, said secondary tube projecting from said forward end of said stationary tube into bearing means, carried subjacent said water vessel, said projecting end of said secondary tube being rigidly connected to hollow elbow means, conduits connecting said source of compressed gas to said hollow elbow means, a portion of said conduit means being flexible, axle means extending axially and concentrically from said protruding end of said secondary tube, said axle means having two truncated collars rigidly attached thereto, said truncated collars having their apex facing each other, control handle means pivotably attached in said water vessel, said handle means having its lower end formed as a double pronged fork, said double pronged fork extending below pivot point of said handle, said double pronged fork stradling said axle means at a location between said two truncated collars, said apex of said two truncated collars being directly adjacent to each side of said prongs, lever means extending perpendicular to said secondary tube, actuating means connecting said lever means with manually operable control means, a plurality of holes located in axial alignment along the lowest portion of said stationary tube, said holes being located substantially perpendicular to transverse axis of said water vessel, said holes being alternately directed in a direction extending from internal side of said stationary tube towards the stern end of said water vessel and the forward end of said water vessel respectively, a plurality of corresponding holes located in wall of said secondary tube, said corresponding holes being adapted to selectively communicate with said stern directed holes and said forward directed holes in said stationary tube respectively upon said secondary tube being axially motivated to full stern location and full forward location within said stationary tube respectively, and a plurality of side holes located on each side of said plurality of holes located in said stationary tube,

said plurality of side holes being located partly in a transverse plane containing each of said stern and forward directed holes in said stationary tube and partly substantially midway between said transverse planes, said secondary tube being adapted to be selectively rotatably and axially motivated to permit communication of said corresponding holes in said secondary tube with said forward directed holes, said stern directed holes, said side holes located in said transverse planes in said port side of said stationary tube, said side holes located between said transverse planes in said starboard side of said stationary tube and said side holes located between said transverse planes in said port side of said stationary tube, respectively.

2. In a water vessel, jet propulsion apparatus as claimed in claim 1 in which each of said plurality of holes in said secondary tube is of elongate form elongated in direction transversely of longitudinal axis of

said secondary tube, said elongate form being sufficiently elongate to permit each of said elongate holes to selectively communicate with said forward directed holes in said stationary tube and one of said side holes in said stationary tubes simultaneously, conversely with said stern directed holes in said stationary tube and one of said side holes in said stationary tube simultaneously, respectively.

3. In a water vessel, jet propulsion apparatus as claimed in claim 1 in which said conduit, connecting said source of compressed gas with said elbow, is supplied with metering valve means.

References Cited in the file of this patent

FOREIGN PATENTS

723,160 Great Britain ---------- Feb. 2, 1955