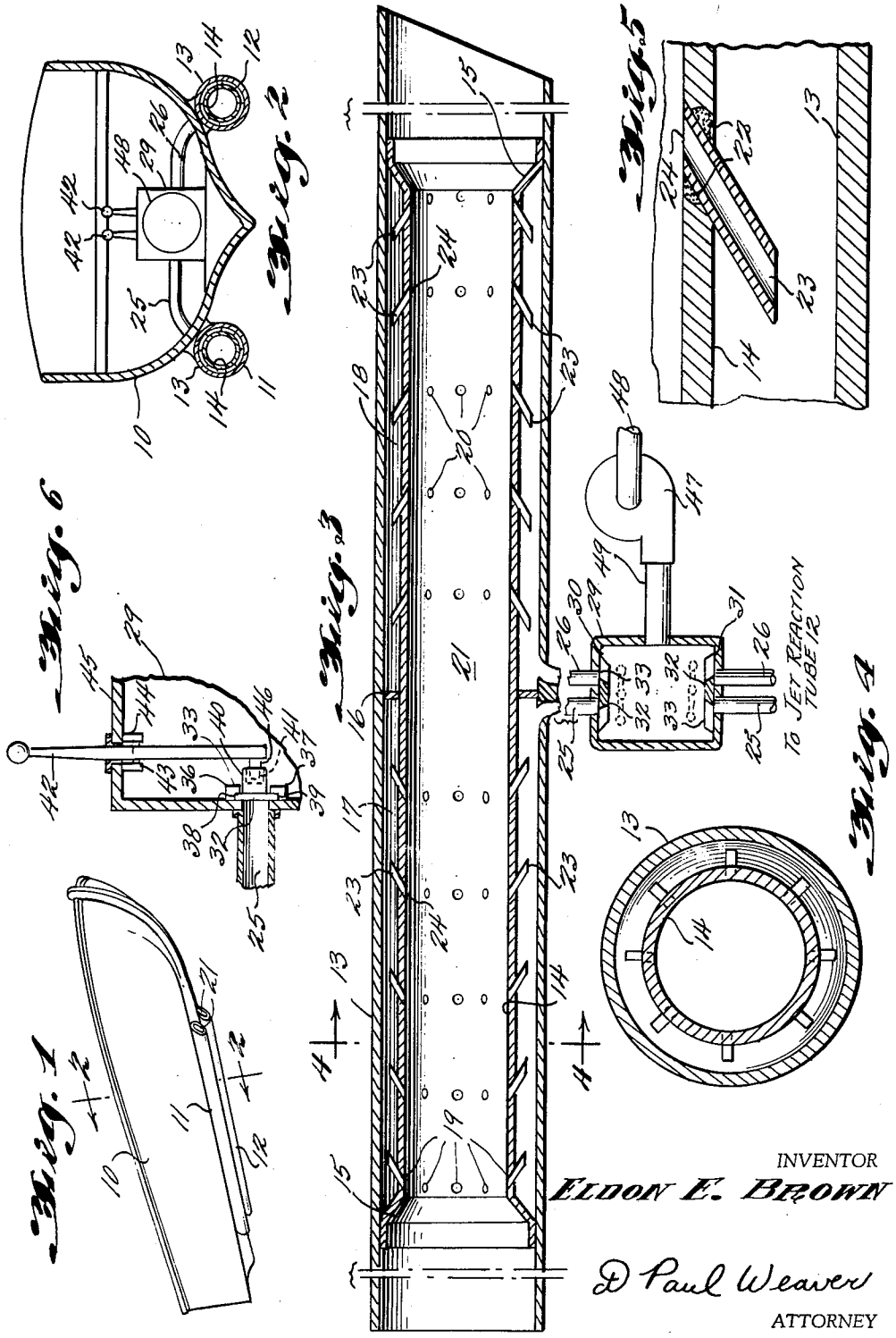
April 30, 1963 E. E. BROWN 3,087,302

JET PROPULSION APPARATUS FOR BOATS

Filed Dec. 22, 1960



INVENTOR
ELDON E. BROWN

D Paul Weaver
ATTORNEY

United States Patent Office

3,087,302

Patented Apr. 30, 1963

3,087,302

JET PROPULSION APPARATUS FOR BOATS

Eldon E. Brown, 184 Partridge Court,
Selfridge Air Force Base, Mich.

Filed Dec. 22, 1960, Ser. No. 77,691
4 Claims. (Cl. 60—35.54)

This invention relates to improved apparatus for propelling objects through a fluid, and more particularly it relates to improved jet propulsion apparatus for moving a boat through water.

Jet propulsion type engines have been previously suggested for propelling boats through water by using, for example, forced air mixed with water flowing through a tube mounted on the hull of a boat and in free communication with water. However, air mixed with water produces turbulence which may be undesirable in situations where quiet operation is desired. Moreover, the use of air is undesirable for submerged operations since air is at a premium in these circumstances. Other suggestions in the prior art have been to place the fluid pump in the reaction tube itself. However, this arrangement possesses the disadvantage of becoming easily fouled and of limiting the speed because the rate of fluid flow is limited due to the inherent resistance of the pump structure in the passing fluid.

A primary object of this invention is, therefore, to eliminate turbulence and noise in propulsion of surface and submerged craft .

A further object is to eliminate apparatus which impedes the rate of flow of a fluid reactive mass through a tube.

Another object of this invention is to eliminate the hazard of debris, flotsam or jetsam from fouling the propulsion apparatus.

A further object of the invention is to provide propulsion means which also serves to provide extremely rapid rudderless steering without causing excessive heeling of the craft or fouling of a rudder.

Still a further object of this invention is to provide a propulsion system which delivers maximum effective power with a minimum of volume and weight required by the propulsion apparatus.

Another object is to provide jet propulsion apparatus having no moving parts touching the fluid reaction mass.

Another object of this invention is to provide an auxiliary propulsion device which can be used as emergency or additional power in conjunction with existing equipment.

Yet another object of this invention is to provide safety in boating operations by eliminating the need of screws or propellors which often cause tragic accidents at sea by injuring living creatures that pass too close to the craft thus attracting dangerous scavengers such as sharks, which can consume a victim in seconds.

A further object of this invention is to accomplish control of speed and direction with the same levers by regulating the amount of fluid flow to the components of the jet propulsion apparatus thereby eliminating the need of rudder-type steering.

These and other objects of the invention will become manifest from a consideration of the accompanying drawings and the following description and appended claims.

In the drawings, FIGURE 1 illustrates in perspective a water craft having jet reaction tubes mounted on the hull thereof;

FIGURE 2 is a sectional view of FIG. 1 taken along lines 2—2, looking in the direction of the arrows;

FIGURE 3 is a diagrammatic view in longitudinal section of one of the jet reaction tubes, the pump, and valves;

FIGURE 4 is a cross-sectional view of the jet reaction tube taken along the line 4—4 of FIGURE 3 looking in the direction of the arrows;

FIGURE 5 is an enlarged fragmentary view of one of the jet nozzles; and

FIGURE 6 is an enlarged fragmentary view of one of the valve control levers.

Referring to FIGURES 1, 2, and 3, a boat is shown generally at **10** having a pair of identical jet reaction tubes **11** and **12** mounted on opposite sides of the hull thereof. The tubes **11** and **12** are each comprised of an elongated cylindrical outer casing **13** having a spaced inner wall **14** disposed concentrically therein as shown in FIGURE 4. The inner wall **14** has an outwardly flared or bell-like portion **15** at each end thereof which is disposed in abutting relation to the outer casing **13** and is fixedly secured thereto as by welding or other suitable means. A spacer or dividing ring **16** is disposed intermediate the ends of the casing **13** and the wall **14**, separating the space therebetween into two separate compartments **17** and **18**.

A plurality of circumferentially disposed longitudinally spaced sets of jet nozzles **19** and **20** are mounted on inner wall **14** and extend therethrough, providing communication between each of the compartments **17** and **18** and the interior space **21** of tubes **11** and **12**. The nozzles **19** and **20** are normally oriented at an angle of approximately 30° with respect to the longitudinal centerline of the reaction tubes **11** and **12**. Each of the jet nozzles **19** and **20** is fixedly secured to the inner wall **14** as by welding shown at **22**. The intake end **23** of each of the jet nozzles **19** and **20** extends outwardly into the compartment **17** and **18** respectively, and the discharge end **24** of each of the nozzles is flush with the interior face of the inner wall **14**. Jet nozzles **19** are canted in a direction opposite to that of jet nozzles **20** in order that fluid thrust may be developed in opposite directions. While jet nozzles **19** and **20** are depicted as being arranged in rings, other dispositions could be made without affecting the efficiency thereof.

Mounted on the outer wall **13** of tubes **11** and **12** are conduits **25** and **26** which provide separate passages for the flow of fluid into the compartments **17** and **18** of tube **11**. The discharge ends of the conduits **25** and **26** are angled into the compartments **17** and **18** to insure a smooth flow of fluid into the compartments with a minimum of turbulence.

A valve chamber **29** is located centrally of the interior of the boat **10** and has the intake ends of conduits **26** and **26** connected to walls **30** and **31** of valve chamber **29** as by welding or other means so that fluid may flow from the valve into the conduits **25** and **26**. By this arrangement, fluid is free to flow from valve chamber **29** to compartments **17** and **18** of tubes **11** and **12** via conduits **25** and **26**.

Movable gate members **32** are slidably mounted on guides **33** located on the inner side of valve wall **30** and **31** and are positionable in guide **33** to block the passage of fluid from valve chamber **29** into either of the conduits **25** or **26**. Movable gate members **32** are of such a size and shape in relation to the size and shape of the intake ends of the conduits that they cannot be positioned to block the passage of fluid from the valve chamber **29** to both of the conduits **25** and **26** at the same time.

Referring to FIGURE 6, the guide member **33** is seen to be comprised of an upper channel member **36** and a lower channel member **37** having grooves **38** and **39** respectively formed therein. The upper and lower edges of the movable gate members **32** are normally disposed in grooves **38** and **39** for reciprocable movement therein. Movable member **32** is provided with an integral backing plate or block **40** having a recess **41** therein. A manually

operable control lever 42 is movable about a pivot 43 journalled between support members 44 depending from the top wall 45 of valve 29. A protruding boss 46 is fixedly secured to control lever 42 adjacent the lower end thereof, the boss 46 extending into the recess 41. Boss 46 is free to move up and down in recess 41, but is substantially restrained from moving sideways therein. Boss 46 is preferably of a hard but slippery material such as that shown under the trade name of "Teflon." A seal (not shown), consisting of a resilient material such as rubber or plastic, is disposed intermediate the lever 42 and valve 29 adjacent pivot 43 in order to prevent escape of fluid from the valve.

A pump 47 is mounted on the interior of boat 10 and is connected on its intake side by conduit 48 to a suitable source of fluid supply such as sea water. The conduit 49 connects the discharge side of pump 47 to valve chamber 29.

With the gate members 32 arranged so that fluid is admitted into compartment 17 the fluid will pass out through jets 23 toward the stern of the boat, and will cause suction of water through the open forward end of tubes 11 and 12. The combined mass of the fluid pumped through the jet nozzles and the sea water drawn through the reaction tubes 11 and 12 will be the total reaction mass which is thrust through the discharge ends of the tubes to drive the boat forwardly through the water. The reverse of the above would be true with the gate member 32 being positioned to admit fluid into compartment 18.

In operation, fluid from the source of fluid supply is drawn through conduit 48 by pump 47 and is pumped into valve chamber 29 through conduit 49. The operator of the boat, through manipulation of control levers 42, regulates the amount of fluid flow into the conduits 25 and 26 of both tubes 11 and 12.

For the operator of the boat to move the boat forward through the water in a constant heading he would move control levers 42 in such a direction as to cause gate members 32 to close conduits 26 and permit fluid flow into compartment 17 of tubes 11 and 12 respectively. In operation, the control levers 42 turn about their pivots 44 causing bosses 46 to push against a side of recesses 41. The gate members 32 are forced in the same direction in the guides, and as they move, boss 46 travels up the recess 41 because the movement of the boss will be curvilinear. For causing the boat to travel through the water in a backward or reverse direction the operator would move control lever 42 so as to cause gate members 32 to close conduits 25 and permit fluid flow into comparment 18 of tubes 11 and 12.

If the operator of the boat holds both control levers 42 at a central position, whereby gate members 32 are disposed centrally with regard to conduits 25 and 26, the fluid flow will be divided equally into conduits 25 and 26, and ultimately into chambers 17 and 18 of tubes 11 and 12. Since the fluid flow is divided equally, the thrust from the jet nozzles of compartment 17 will tend to counterbalance the thrust from the jet nozzles of compartment 18. This will result in fluid being ejected from both ends of tubes 11 and 12, and the boat will not be propelled through the water.

At this point it should be noted that gate members 32 are not relatively large enough to completely block off the flow of liquids through conduits 25 and 26 at the same time. This makes it impossible to develop a buildup of back pressure that might burst the valve or cause undue strain on the pump. Moreover, this design, which permits fluid flow at all times, enables the operator to operate the pump at full power at all times. As an example of the relative dimensions of the gate members to the conduits, if the diameters of the openings of the conduits 25 and 26 are each considered to be D and they are separated by a distance equal to D, their total spread would amount to 3D. The gate member 32 would then have to have a length somewhat greater than D and somewhat less than 3D, with its length being preferably in the neighborhood of 2D.

When the operator desires to turn the boat to one side or the other, he moves the control levers 42 out of unison with respect to each other, the degree of relative movement of the levers, and thence the differential in the amount of fluid flowing to tubes 11 and 12, determining the rate of turn. More specifically, turning movement would be achieved by causing the gate members 32 to close conduit 25 on one side of the valve housing 29, while opening up valve 25 on the other side (or, conversely, closing conduit 26 on one side while opening conduit 26 on the other side).

With the foregoing turning arrangement, it is possible to turn a boat almost within its own length. Additionally, the ride afforded by the boat will be a more stable and level ride. This will be so because the tendency of the boat to heel to the side away from a turn will be offset by the development of a greater fluid thrust on that side.

It will be appreciated that the foregoing arrangement permits both speed and steering control with the same levers and that control of speed and steering are both accomplished without the aid of propellers, rudder or other conventional equipment.

Further it should be appreciated that the elimination of moving parts from the interior of the jet reaction tubes 11 and 12 overcomes the disadvantage of having to overcome the resistance of such moving parts to the flow of fluid through the tube. Moreover, since there are no moving parts, it is extremely unlikely that the tubes will become fouled with flotsam. Such debris will simply be passed through the tubes along with the sea water.

While I have illustrated and described the preferred embodiment of my invention, it is to be understood that I do not limit myself to the precise construction herein disclosed, and the right is reserved to all changes and modifications coming within the scope of the invention as defined in the appended claims.

Having thus described my invention, what I claim as new, and desire to secure by United States Letters Patent is:

1. Hydraulic propulsion apparatus for a boat comprising a hollow reaction tube having an outer elongated cylindrical tubular casing open at both ends and fixedly secured lengthwise to the bottom of said boat, a second cylindrical tube arranged concentrically within said outer casing and having a longitudinal wall disposed in spaced relation with respect to the longitudinal wall of the outer casing, said second tube having a length less than the length of the outer casing and having its opposite ends connected to the longitudinal wall of the outer casing to thereby provide an elongated tubular chamber therebetween, the opposite ends of said second tube being open and in communication with the interior of the outer casing whereby fluid entering either end of the outer casing flows lengthwise through said second tube, means within the chamber between the outer casing and the second tube and arranged intermediate the length of said second tube to divide the chamber into a front compartment and into a rear compartment, means for conducting fluid in a predetermined direction from the front compartment toward the interior of said second tube, means for conducting fluid from the rear compartment toward the interior of said second tube in an opposite direction to the direction in which fluid is conducted from the first compartment, a fluid distribution means arranged to contain fluid under pressure, means for connecting said fluid distribution means with said front compartment, separate means for connecting said fluid distribution means with said rear compartment, and means for controlling the flow of fluid from said fluid distribution means to said front compartment and to said rear compartment.

2. A device as set forth in claim 10 wherein said means for conducting fluid from said front compartment to the

interior of said second tube comprises a plurality of circumferentially disposed longitudinally spaced sets of jet nozzles, said jet nozzles being canted so as to discharge fluid therefrom in a forward direction for effecting reverse movement of said boat, and said means for conducting fluid from said rear compartment to the interior of said second tube comprises a plurality of circumferentially disposed longitudinally spaced sets of jet nozzles, said second sets of nozzles being canted so as to discharge fluid therefrom in a rearward direction for effecting forward movement of said boat.

3. A device as set forth in claim 1 wherein said fluid distribution means comprises a valve chamber for reception of fluid under pressure, and a pump for supplying fluid to said valve chamber.

4. A device as set forth in claim 1 wherein said means

for controlling the flow of fluid from said fluid distribution means comprises a valve positioned between said first named connecting means and said second named connecting means, said valve being adapted to be moved to selectively block either said first named connecting means or said second named connecting means, or to partially block both said first named connecting means and said second named connecting means.

References Cited in the file of this patent

UNITED STATES PATENTS

1,259,753	Lassell	Mar. 19, 1918
2,303,729	East	Dec. 1, 1942

FOREIGN PATENTS

287,510	Great Britain	Oct. 22, 1928