This invention relates to boats. More particularly, it has reference to a toy boat that is equipped with a water jet propulsion means.

It is the principal object of this invention to provide a boat in the nature of a toy or for uses otherwise, containing a water storage cylinder from which a water jet may be forcibly discharged into the body of water in which the boat is floated in such manner as to effect the propulsion of the boat.

It is also an object of this invention to provide a boat of the character above stated wherein power for expulsion of the propelling jet of water is supplied by atmospheric air pressure created incident to the drawing of a vacuum in a cylinder mounted in the boat as a companion of the water storage cylinder and which vacuum cylinder contains a piston through which the force of atmospheric air is transmitted to a power piston fitted in the water storage cylinder.

Yet another object of the present invention is to provide a power unit comprising a pair of coextensive cylinders, each fitted with a piston and wherein said pistons are operatively joined through the medlacy of their piston rods for reciprocal action in unison; one piston being operable in one direction to suck water into its cylinder and operable in the opposite direction to expel water from its cylinder as a propelling jet; the other piston being movable in opposite directions, first to draw a vacuum in its cylinder and then for powering the water jet piston.

Further objects and advantages of the invention include the greatly increased extent of travel or "limination" of the boat and in the provision of valves for the water cylinder to control flow in its intake and discharge passages, and in the character of and mode of operation of the valves and pistons as associated with the air and water cylinders.

Fig. 1 is a longitudinal section of a toy boat, equipped with a power unit embodied by and applied in accordance with the objects of the present invention.

In Fig. 2 is an enlarged, sectional view, taken on line 2—2 in Fig. 1, showing the relationship of the water and vacuum cylinders and the joined piston rods as connected with the two pistons.

In Fig. 3 is a forward end view of the power unit as applied in the boat in Fig. 1.

Figs. 4 and 5 are cross-sectional views taken, respectively, on lines 4—4 and 5—5 in Fig. 2.

In Fig. 6 is a cross-section taken on line 6—6 in Fig. 5.

Fig. 7 is a longitudinal section of a jet producing power unit of an alternative form of construction.

Fig. 8 is a cross-section taken on line 8—8 in Fig. 7.

Fig. 9 is a longitudinal section of a part of a boat containing a power unit of yet another form.

In Fig. 9 is a vertical cross-section, taken on line 10—10 in Fig. 9.

Referring more in detail to the drawings:

In Fig. 1, I have designated a typical form of toy boat by reference numeral 10 which boat is shown to be equipped with a power unit embodied by this invention and herein designated in its entirety by reference numeral 12. Preferably, the boat hull would be molded of a suitable plastic to simulate a cabin cruiser and the power unit 12 would be fixedly mounted therein in its central longitudinal line and preferably in the stern end portion thereof as therein shown.

It is also shown in Fig. 1 that the power unit 12 is supported in a forwardly and slightly upwardly inclined position, resting at its rear end on the boat bottom and at its forward end on a cross-rib 13 that is integrally cast with the boat hull. However, the relative dimensions of parts of both boat and power unit may be changed as required to meet requirements or desires, without departing from the spirit of the invention. Likewise the materials used in their making may be selected to best suit condition or desires.

The power unit 13, as shown in horizontal section in Fig. 2, comprises a pair of cylinders 15 and 16, here shown to have equal diameters and to be coextensive in length, they are joined across their rear ends and sealed by a cylinder head plate 17 and are open to their full diameters at their forward ends.

The cylinder 15 has a piston 18 reciprocally fitted therein and likewise the cylinder 16 has a piston 19 reciprocally fitted therein. These pistons are joined to a piston rod assembly which comprises a pair of rods 21 and 22, each cast in the form of a cross as shown in Figs. 3 and 4. These rods reciprocally fit in their respective cylinders and are joined at their inner ends to their respective or corresponding pistons 18 and 19 by suitable means, such as by the set screws, as shown at 23 in Fig. 2.

At their outer ends the two piston rods 21 and 22 are joined by an integral cross-member or head 25, formed as a mold point with a hole 26 to which a pull cord 27 is attached and which cord extends forwardly and from the hull through a hole 28 in the boat prow where it is fixed by a ring 29 to a small anchor 30 serving as a handle or pull member.

The pistons 18 and 19 are molded of plastic and are equipped peripherally with flexible sealing flanges 18' and 19' that automatically seal under the pressure of gas or liquid applied thereagainst. Cast integrally with the rear end of the power unit, as a part of the cylinder head plate 17 is a block or lug 32 that projects downwardly therefore from through the boat bottom in its center line. Formed in this lug, as best shown in Fig. 6 are downwardly and rearwardly directed channels 35 and 36, each of which opens at its inner or upper end through the cylinder head 17 into the cylinder 15 and at their lower ends open to the rear vertical edge of the lug. Channel 35 is somewhat greater in diameter than channel 36 and is used in the charging of the cylinder 15 with water. The channel 36 opens at its lower end into an enlargement 37 thereof and this is directed horizontally rearwardly through the lug.

To charge the cylinder 15 with water, and at the same time to create a condition of vacuum in cylinder 16 the two piston rods are pulled forwardly by the use of pull cord 27 and hand hold 33. As they are drawn forwardly, water is sucked into the cylinder 15 through channels 35 and 36 while vacuum is drawn in the closed end portion of cylinder 16. The greater the extent of forward travel of the pistons in their cylinders, the greater will be the volume of water drawn into the cylinder 15 but the vacuum when once created in cylinder 15 will remain constant during travel of its piston.

When the cylinder 15 has been charged to a desired extent, the boat is placed properly in the water of a lake, tank, or pool and released for operation. The vacuum pull against piston 19 or what is the pressure of atmospheric air against its forward end, will force the piston rearwardly and through the connected piston rods this will
cause piston 18 to move and force water from cylinder 15 through 36 thus to create the boat propelling jet. Water is restrained from discharge through channel 35 by a plastic flapper valve member 46 applied to the inner face of the piston head over the end of said channel. The jet channel 36, in this instance is quite small, yet the jet therefrom will effectively and adequately propel the boat for an extended period of time.

It is to be understood that the particular cross section shape of the piston rods gives them strength and rigidity and will guide the rods in their travel in their respective cylinders.

In FIG. 7, I have shown an alternative form of power unit wherein a single cylinder 50 is divided medially of its ends by a head 51 fixed therein thus to define axially aligned cylindrical chambers 52 and 53 in its forward and rearward ends, respectively. In this device a piston rod 54 is reciprocally slideable through the head 51 in a joint sealing bearing 54' and is equipped at its opposite ends with pistons 55 and 56 that move in unison from end to end of their respective cylinders. A pull rod 57 is attached to the rear end of rod 54 and extended through the transom wall of the boat to which the device is applied and is there equipped with a pull ring 58.

Formed along the bottom of cylinder 50, at a medial location, is a keel-like flange 60 that extends through and below the boat bottom. This is provided with a channel 61 that leads upwardly into the head 51 and there turns rearwardly into the forward end of cylinder 53. Likewise, there is a jet channel 62 that leads from the forward end of cylinder 53 downwardly into the flange 60 and then turns rearwardly and opens through its rear edge to discharge water as a jet therefrom. The top end of channel 61 is covered by a plastic flapper valve member 65 that opens under suction in the cylinder. In this device the channel 61 is the filling channel for cylinder 53 and the channel 62 is the channel from which water is discharged under force of vacuum and provides the propelling jet.

To charge this form of device, the user grasps the pull ring 58 and pulls both pistons rearwardly. As this takes place, water is drawn into cylinder 53 through channel 61 and a vacuum is drawn in cylinder 52 forwardly of piston 55. The boat is then placed in the water and released. As the piston rod 54 is drawn forwardly by that force resulting from the vacuum in cylinder 52, water is discharged under pressure of piston 56 from cylinder 53 through channel 63 thus creating a boat propelling jet.

It is shown in FIG. 7 that the forward and rear ends of this cylinder 50 are closed and sealed by heads 68—69 and that the head 68 is equipped with a port 69 containing a ball check valve 70 which sustains vacuum but which may be forced open by piston action for expulsion of water in the event any should seep into the cylinder. Also, a port 71 is formed in the cylinder wall adjacent bulk head 51 for expulsion of seepage into cylinder 52.

Yet another form of power unit is shown in FIGS. 9 and 10. This unit is substantially like that of FIG. 7 in principle and operation and to these views, like reference numerals have been applied to designate corresponding parts. However in the FIG. 9 device, a hand pump mechanism 75 is operable by a pivoted handle 76 to forcibly charge the cylinder with water drawn through channel 76 rearwardly of the piston therein, and to thereby effect the drawing of a vacuum in the space between the bulk head 51 and the vacuum holding piston 55. Water is adapted to be discharged from the water cylinder through a jet channel 77 controlled by a hand valve to effect boat propulsion. This type of propulsion is especially desirable for small fishing boats and is not necessarily confined to use for propulsion of toy boats.

The most notable advantages in the use of a boat that is powered by jet propulsion resides in the increased length of travel over similar boats as provided by spring operated propellers and in the absence of propeller entanglement; this being especially desirable when using the boat for fishing purposes. Furthermore, a boat so powered avoids propeller entanglement with water vegetation.

What I claim as new is:

1. A boat propulsion means comprising a cylindrical tube closed at its opposite ends and fixed in the boat lengthwise thereof, a bulhead in said tube between its ends to define a vacuum cylinder at its forward end and a water pressure cylinder at its rearward end, an air inlet in said vacuum cylinder, a longitudinal fin formed on the tube along its lower side and projecting downwardly therefrom through the boat bottom, a piston fitted reciprocally in each of said cylinders, a rod projecting through said bulhead and joining said pistons for their reciprocal movement in unison, a water inlet passage opening into one end of said water cylinder, a water discharge passage leading from said water cylinder to the rear end edge of the fin, manual means attached to said rod for moving the pistons in the tube to cause a vacuum to be drawn in the vacuum cylinder and to effect the filling of the water cylinder by suction.

2. A boat propulsion means according to claim 1 wherein the water inlet passage is equipped with a check valve to prevent outflow therethrough and the vacuum cylinder is formed with said air inlet adjacent the bulhead.

3. In a boat or the like; a jet propulsion means comprising a cylindrical tube, closed at its ends and divided medially of its ends by a bulhead defining a vacuum cylinder at one end of the tube and a water cylinder at its other end, and air inlet into said vacuum cylinder, pistons reciprocally fitted in said cylinders, a piston rod joining said pistons through the bulhead, for their reciprocal movement in unison, a passage for the flow of water into the water cylinder incident to the movement of the pistons, means for moving said pistons, a water discharge passage leading from the water cylinder for the discharge of a boat propelling jet from said cylinder and means for controlling outflow through said discharge passage.

References Cited in the file of this patent

UNITED STATES PATENTS

2,661,571 Ramsay ---------------- Dec. 8, 1953