Oct. 25, 1938. G. M. HOFFMAN 2,134,042

BOAT

Filed Sept. 26, 1935 2 Sheets-Sheet 1

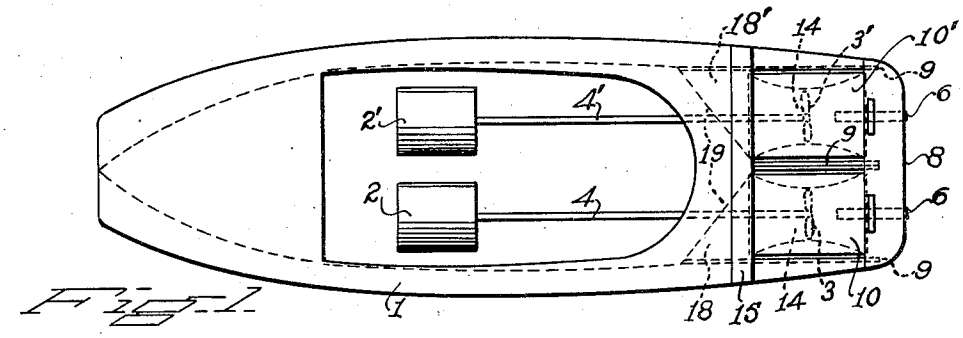


Fig. 1

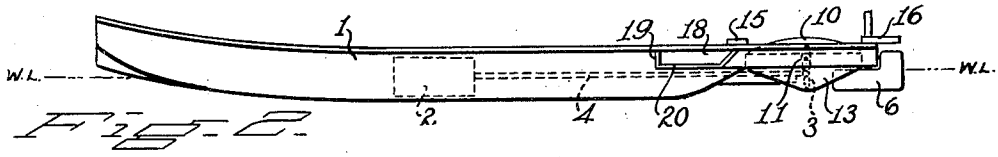


Fig. 2

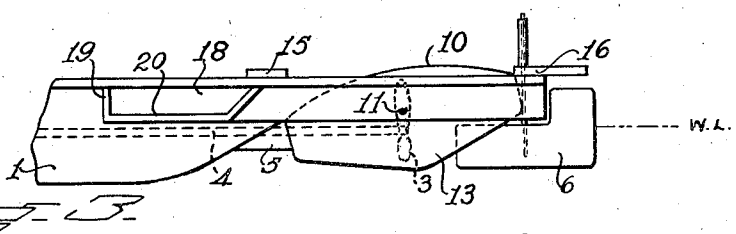


Fig. 3

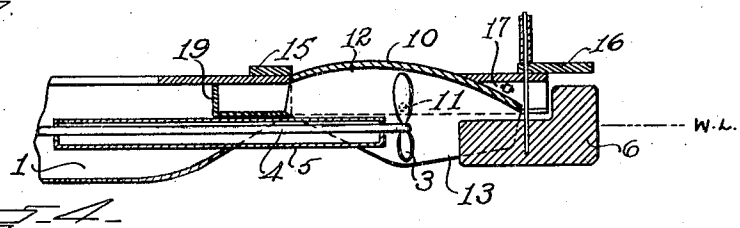


Fig. 4

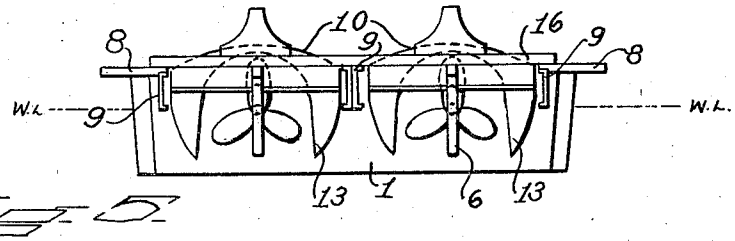


Fig. 5

George M. Hoffman, INVENTOR.

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BOAT

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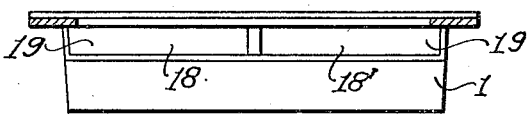


Fig. 6.

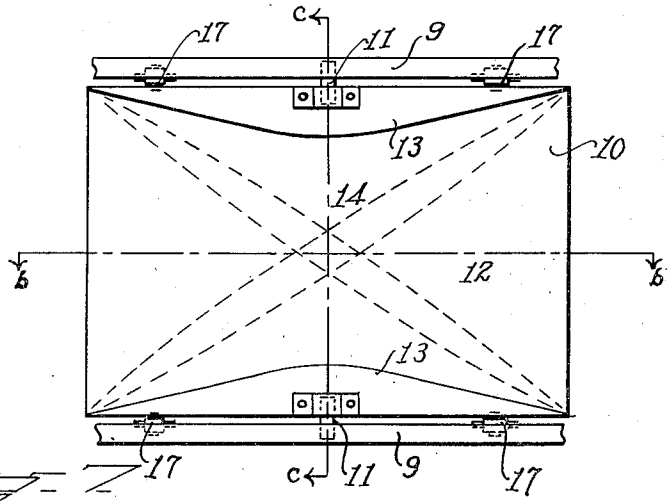


Fig. 7.

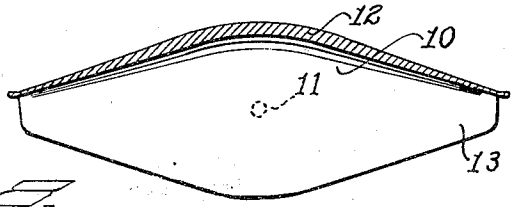


Fig. 8.

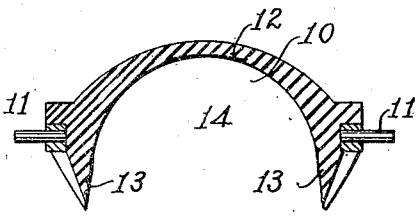


Fig. 9.

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Patented Oct. 25, 1938

2,134,042

UNITED STATES PATENT OFFICE

2,134,042

BOAT

George M. Hoffman, Upper Montclair, N. J.; Ruth T. Hoffman administratrix of said George M. Hoffman, deceased

Application September 26, 1935, Serial No. 42,255

11 Claims. (Cl. 115—39)

This invention relates to boats and more particularly to boats for inland navigation, such as shallow draft tow boats, for example, that are propeller driven.

The necessity of having shallow draft for tow boats has restricted the size of the propelling means resulting in low efficiency due to the fact that the propelling means was required to impart an uneconomical velocity to the water stream that was thrust astern in order to absorb the power of the engine or motor that was installed for driving the boat. The cross section of the stream of water that was thrust astern by prior boats of this sort was only about half of that of the immersed cross section of the boats, although it has been known for a long time that for economical propulsion a much larger cross section of the water stream thrust astern was needed.

Attempts have been made to increase the volume of water that could be thrust astern with propeller driven boats by immersing the propellers for about two thirds of their diameters and installing tunnels over the propellers whose sides and ends extended below the water-line so as to provide "solid" water for the propellers. The reaction of the stream of water against the after-end of such tunnels which had to extend below the water-line in order to enable the boats to be propelled backwards produced drag which interfered greatly with the efficiency during forward travel of such boats. Even providing a flap for the tunnel was not successful because of troubles with drift accumulations and also unsatisfactory maneuvering and backing ability of boats equipped with such tunnels.

By the present invention propeller-driven boats of shallow draft can be produced that have high efficiency, ease of manipulation and cause water streams of cross section comparable in size, or approximating the size of the immersed cross section of the boat to be thrust astern.

The invention will be understood from the description in connection with the accompanying drawings in which Fig. 1 is a plan view of an illustrative embodiment of the invention; Fig. 2 is a side view of the same; Fig. 3 is a side view on an enlarged scale showing a tunnel in the forward moving position of the boat; Fig. 4 is a similar view in longitudinal section showing the tunnel in a backward moving direction; Fig. 5 is an end view of Fig. 1 on an enlarged scale; Fig. 6 is an end view similar to Fig. 5 on an enlarged scale with parts removed; Fig. 7 is a plan view of the lower side of one of the tunnels on an enlarged scale; Fig. 8 is a section along the line *b*—*b* of Fig. 7 and Fig. 9 is a section along the line *c*—*c* of Fig. 7.

In the drawings reference character 1 indicates a tow boat having a flat bottom and small draft. Driving means 2, 2' are somewhat diagrammatically indicated for driving the propellers 3, 3' through shafts 4, 4'. Although only two propellers and driving motors are indicated in the drawings, it is understood that a different number may be used if desired. The portions of the shafts 4, 4' extending to the rear of the hull of the boat are supported by cantilevers 5 which are rigidly connected to the hull of the boat or may be made integral therewith when the hull is made of steel. The cantilevers 5 carry bearings for the shafts 4, 4' and these shafts are preferably installed at or near the water line so that the propellers 3, 3' are about half submerged.

The boat may be provided with rudders 6 of the conventional sort, but since these rudders and the operating mechanism therefor constitute no part of this invention they are not described in detail.

An after-deck 8 is installed above the propellers 3, 3' upon cantilever supports 9 which may extend from side and center trusses of the boat 1.

Tilting tunnels 10, 10' are installed above the propellers 3 and 3' in such positions that "solid" water will be provided for the propellers as water is lifted and thrust astern by the propellers. Journals 11 are provided for the tunnels athwartship so that the ends thereof tilt up and down. The upper wall 12 of each tunnel is concave on its lower side or extends downwardly from its middle to its opposite ends, and the side walls 13 thereof extend below the water line and terminate in thin edges, the ends of the tunnels being left open.

The inside walls of each tunnel converge toward the middle to provide a Venturi section 14 where the propeller is located when the tunnel is in place.

Cross bars or straps 15, 16 are provided on the after-deck to limit the extent of tilting of the tunnels as the ends of the tunnels strike the under-sides of these cross bars in the extreme positions of the tunnel. It has been found satisfactory to pivot the tunnels and provide stops in such positions that the tunnels can tilt through an angle of about 13° fore and aft from its horizontal position. Rollers 17 are provided along the sides of the openings in the afterdeck 8 in which the tunnels are located so as to guide the tunnels and make it easy for the same to be turned. A tow line (not shown) may be attached to the afterdeck 8, or other portion of the boat in any convenient way.

Sluiceways 18 and 18' are provided in the stern of the boat on opposite sides thereof located in positions to receive the discharge of water from the propellers 3 and 3', respectively, when the propellers are driven backwards. The end walls 19 of the sluiceways 18 and 18' extend diagonally from near the center line of the

boat to opposite edges thereof, and the bottom walls or floors **20** of these sluiceways are at or above the water-line of the boat. When only one propeller is used one sluiceway may be provided, with the propeller located along the center line of the boat the sluiceway extending diagonally from one side of the center line of the boat to the edge so that water from the propeller will be discharged into it, or two diagonal sluiceways may be provided leading from each side of the center line with a movable plate pivoted on the center line so as to divert the water into either sluiceway or part into one and part into the other.

In operation when the boat is being driven forward the streams of water from the propellers **3** and **3'** striking the rear portions of the upper walls of the tunnels **10** tilt the same into the position shown in Fig. 3 with the front portion of the upper wall of the tunnels forming a smooth passage for flow of water from the bottom sloping rear portion of the boat to the propellers. The raised rear ends of the tunnels or the tilting upwardly of the discharge ends of these tunnels permit free discharge of water without interposing a drag reaction that occurs with fixed tunnels, thus eliminating losses due to interference with free flow. At the same time the edges of the sides of the tunnels extending below the water-line and the forward straight edges of the tunnel which conform with the rear portion of the hull and fits against it, together with the seal of water from the stern wave provide sealed closures so that the suction is not broken and solid water is secured for the propellers. When the propellers are reversed the tunnels automatically tilt in the opposite direction to the position shown in Fig. 4 so that there is a smooth flow of water toward the boat and a portion of this water is discharged into diverging sluiceways **18** without causing great drag reaction or resistance to backward travel of the boat. Besides, the weight of water discharged into sluiceways **18** aid in causing the rear end of the boat to squat and keep the rear ends of the tunnels **10** below the water line. The side thrust of the streams of water entering the tunnels balance each other and the water is discharged from these streams above the water line.

By running one of the propellers in one direction and the other in the other direction the boat can be turned as sharply as desired and can even be made to pivot, and by running only one propeller backwards the reaction produced by the stream in one sluiceway very effectively turns the boat, thus facilitating manuevering of the boat.

I claim:

1. A boat having a propeller that is located partially above the water line and means forming a tilting tunnel over said propeller having edges extending below the water line, said means narrowing from its ends towards its middle portion and having its narrowest portion near its center.

2. A boat having a propeller and a sluiceway in said boat into which water of the slip stream from said propeller may be discharged said sluiceway having one side open.

3. A boat having a propeller and a sluiceway in said boat located above the water line into which water of the slip stream from said propeller may be discharged said sluiceway having one side open.

4. A boat having a propeller and a sluiceway in said boat into which water from said propeller may be discharged, and means for guiding water of the slip stream from said propeller into said sluiceway said sluiceway having one side open.

5. A boat having a propeller and a sluiceway in said boat into which water from said propeller may be discharged, and means for guiding water from said propeller into said sluiceway, said means comprising a tilting tunnel located over said propeller.

6. A boat having a propeller and a sluiceway in said boat into which water from said propeller may be discharged, and means for guiding water from said propeller into said sluiceway, said means comprising a tilting tunnel journalled athwartship over said propeller.

7. A boat having a propeller and a sluiceway in said boat into which water from said propeller may be discharged, means for guiding water from said propeller into said sluiceway, said means comprising a tilting tunnel located over said propeller, and means to limit the extent to which said tunnel tilts.

8. A boat having propellers located on opposite sides of the center line of said boat partially above the water line, and tilting tunnels above said propellers, and means to cause the rear end of said tunnels to extend below the water line when said propellers are running backwards and above the water line when said propellers are running forwards.

9. A boat having propellers located on opposite sides of the center line of said boat partially above the water line, and tilting tunnels above said propellers, said boat having sluiceways along its sides to receive water from said propellers.

10. A propulsion mechanism for a boat having a propeller that is normally located partially above the water line, comprising a structure U-shaped in cross-section pivotally mounted on said boat substantially mid-way of the length of said structure and overlying said propeller and its shaft and the side edges extending below the water line on both sides of the pivotal axis, said pivotal axis being substantially at a right angle to said propeller shaft, said U-shaped structure defining a tunnel with its surfaces so constructed and shaped that it will automatically pivot on the pivotal mounting whereby the propulsive thrust will not adversely affect propulsion of the boat upon reversal of the direction of rotation of said propeller.

11. A propulsion mechanism for a boat having a propeller that is normally located partially above the water line, comprising a structure U-shaped in cross-section pivotally mounted on said boat substantially mid-way of the length of said structure and overlying said propeller and its shaft and the side edges extending below the water line on both sides of the pivotal axis, said pivotal axis being substantially at a right angle to said propeller shaft, said U-shaped structure defining a tunnel with its surfaces so constructed and shaped that it will automatically pivot on the pivotal mounting whereby the propulsive thrust will not adversely affect propulsion of the boat upon reversal of the direction of rotation of said propeller, the rear end of said U-shaped structure extending below the water line when said propeller is running backwards.

GEORGE M. HOFFMAN.