May 2, 1944.

E. V. LOVELL

2,347,785

SHIP PROPULSION

Filed Nov. 10, 1942

2 Sheets-Sheet 1

FIG. 1

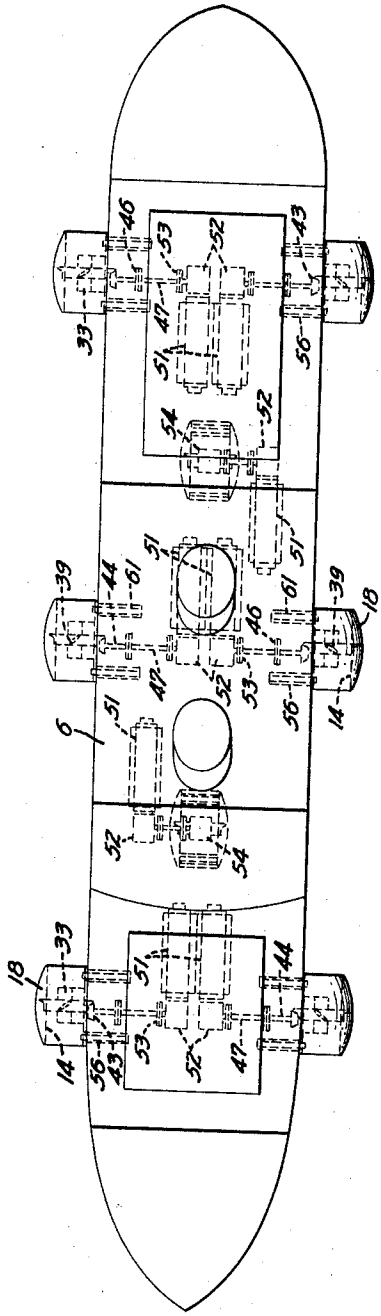
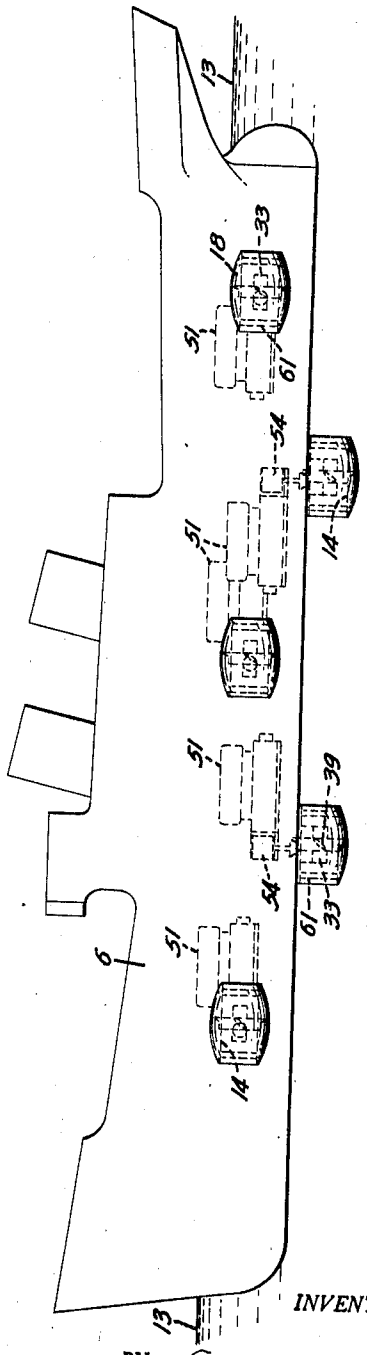


FIG. 2



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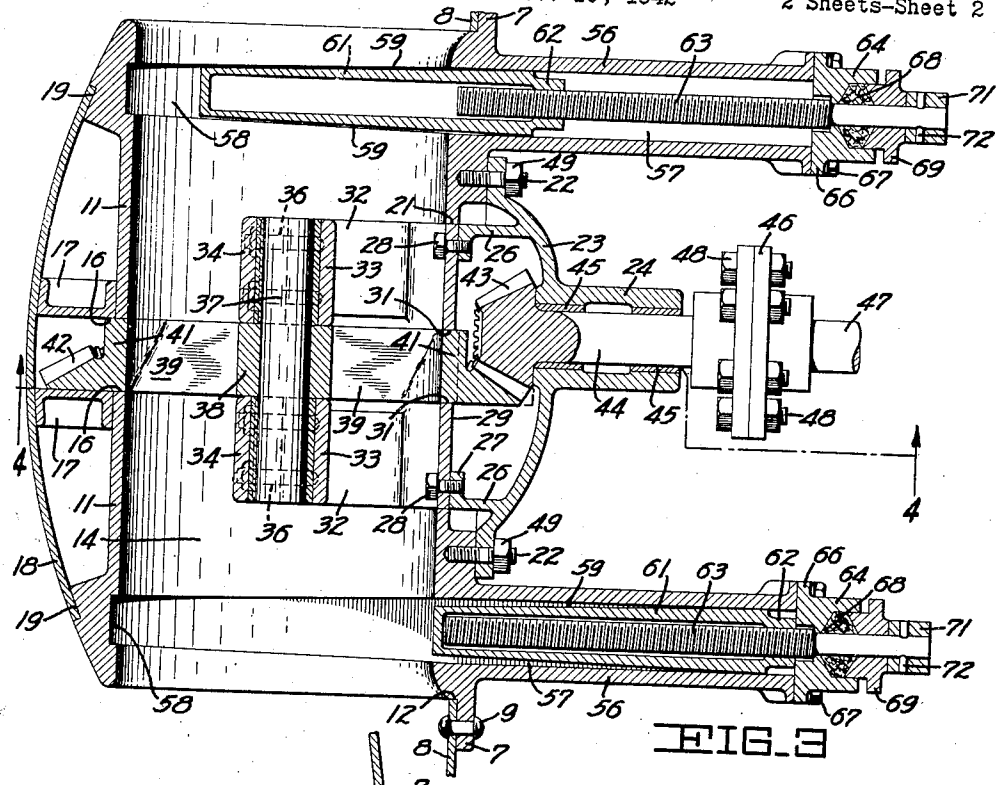
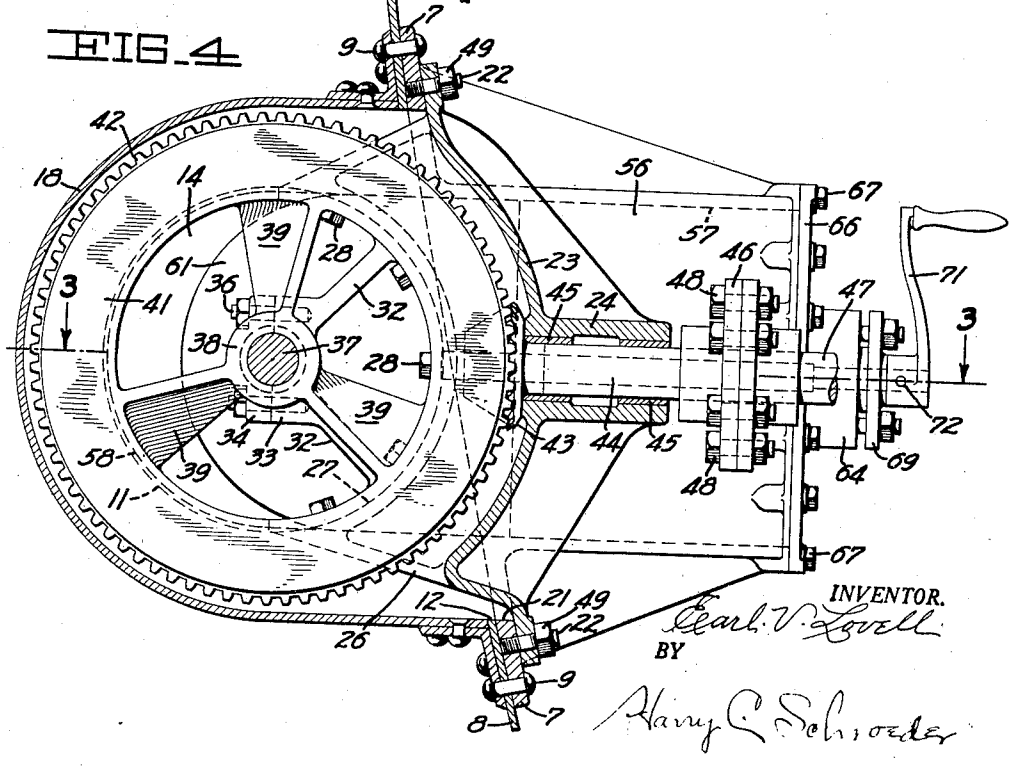


FIG. 3

FIG. 4



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UNITED STATES PATENT OFFICE

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SHIP PROPULSION

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Application November 10, 1942, Serial No. 465,130

5 Claims. (Cl. 115—42)

This invention relates to means for the propulsion of ships.

It is an object of the invention to provide more efficient propelling means for a vessel than is provided by the ordinary screw propeller located at the stern of the vessel.

Another object of the invention is to provide propulsion means for a vessel which renders the latter more maneuverable.

Still another object of the invention is to provide, for driving a vessel through the water, a plurality of separate and independent propulsion units whereby the progress or steering of the vessel are not seriously affected in the event that a small number of the propulsion units becomes inoperative.

Yet another object of the invention is to provide propulsion means for a vessel which may function to regulate the speed of the vessel without reducing the speed of the driving engines.

A further object of the invention is to provide, in ship propulsion means employing outboard propellers, means for permitting inspection or repair of the propellers and their associated apparatus from within the hull of the ship

It is another object of the invention to provide, in a vessel, propulsion means comprising a group of relatively small separate units which permits greater ease in handling of the parts during repair operations and also permits such operations to be performed with a smaller repair crew.

It is a further object of the invention to provide propulsion means for a vessel comprising a large group of dispersed individually driven propellers which renders the vessel less likely to be rendered helpless in wartime in the event that a portion of the group of propellers should become destroyed or damaged by torpedo or shell hits.

The invention possesses other objects and features of advantage which, together with the foregoing, will be specifically pointed out in the detailed description of the invention hereunto annexed. It is to be understood that the invention is not to be limited to the specific form thereof herein shown and described, as various other forms thereof may be employed within the scope of the appended claims.

Referring to the drawings:

Figure 1 is a top plan view of a ship showing the improved propelling means of my invention in place thereon.

Figure 2 is a side elevational view of the structure shown in Figure 1.

Figure 3 is a horizontal sectional view of one of the propelling units. The plane in which the view is taken is indicated by the line 3—3 of Figure 4.

Figure 4 is a vertical sectional view of the propelling unit taken in the plane indicated by the line 4—4 of Figure 3.

In Figures 1 and 2 I have shown a ship 6 on which several of my propulsion units are mounted, the latter being arranged in opposed pairs along the opposite sides of the ship, and, if desired, along the keel thereof. The function of each propulsion unit is to take in a stream of water from the direction of the bow of the ship and forcibly eject the stream toward the stern, thereby forcing the ship to move in a forward direction at a speed depending on the velocity of discharge of the water streams. Of course, the streams are also capable of being directed toward the bow of the ship when it is desired to move the latter in a reverse direction. In addition, variations in the operational speeds of the various propulsion units may be employed to steer the ship or to render the latter more rapidly maneuverable than one provided with the conventional stern rudder. Since each of the propulsion units are identical, with the exception of variations in their drive connections, it will suffice to describe but one of them in detail.

In Figures 3 and 4, I have detailed one of the propulsion units which comprises a flange 7 secured to the interior surface of the hull 8 of the vessel, by rivets 9 or otherwise, which carries an integral cylindrical casing 11 which projects exteriorly of the vessel through a suitable opening 12, provided in the hull 8 thereof and positioned below the water line 13. The casing 11 is provided with a central cylindrical passage 14, extending therethrough and in a direction fore and aft of the vessel, and is also provided, medially of its ends, with a peripheral slot 16. Approximately U-shaped channel bars 17 secured to the casing 11, adjacent the sides of the slot 16, are attached to a curved cover plate 18 whose side edges are welded, or otherwise secured, to steps 19 formed at the ends of the casing. This forms a truss structure stiffening the casing at the slot 16 and also produces a more or less streamlined exterior on the propulsion unit so that the latter may pass through the water with as little frictional resistance as possible. The casing flange 7 is provided with a central opening 21 over which is secured, by studs 22, a cover plate 23 having a hub 24 extending within the exterior of the vessel. Integral arms 26, of the cover plate 24, extend toward the passage 14 and are

provided with arcuate flanges 27, concentric with the axis of the passage 14, to which are secured, by screws or bolts 28, mounting plates 29 spaced apart longitudinally of the passage 14 to provide a gap 31 registering with the slot 16 and fitted with struts 32 which carry bearings 33 provided with caps 34 secured in position by studs 36. The bearings 33—36 are concentrically alined with the axis of the passage 14. Journaled in the bearings is a shaft 37 on which is mounted a rotor comprising a hub 38 having a plurality of vanes 39 extending radially therefrom and terminating in an integral cage ring 41 carrying a bevel gear 42 which meshes with a bevel pinion 43 carried by a stud shaft 44 journaled in bearings 45 provided in the hub 24. The rotor, it will be seen, occupies the slot 16 and gap 31 of the casing 11 and between the mounting plates 29 respectively, the bore 46 of the cage ring 41 registering with and forming a part of the passage 14. A drive shaft 47 is detachably connected to the stub shaft 44 by a coupling 48 whose sections are secured together by bolts 48.

It will be seen that when the drive shaft 47 is revolved, the resulting rotation of the bevel pinion 43 will cause rotation of the bevel gear 42 and the cage ring 41 thus moving the vanes 39 about the axis of the shaft 37. The vanes 39 are angularly positioned with respect to the longitudinal axis of the passage 14, in the manner of a conventional propeller, so that, during movements of the vanes, water will be drawn in from one end of the passage 14 and be caused to flow through the passage and be discharged from the other end thereof. Thus the vessel will be propelled either forward or backward, depending upon the direction of flow of the stream of water through the passage 14. The construction is such that by removing the bolts 48, detaching the drive shaft 47 from the stub shaft 46 and removing the nuts 49 of the studs 22, the rotor may be drawn inwardly into the vessel through the opening 21 without the necessity of dismantling any of the bearing or drive parts associated with the rotor.

In Figures 1 and 2, I have shown individual motors 51 connected through gear boxes 52 and couplings 53 with the drive shafts 47 of the various propulsion units; the units which are situated on the bottom of the vessel being provided with additional gear boxes 54 to take care of the vertical placement of the stub shaft 44 and to eliminate overhead structure so as to facilitate easy removal of the rotors from these particular propulsion units. Although separate drive motors have been shown, it is within the scope of the invention to provide one or more larger motors capable of serving all or separate groups of the propulsion units, the latter of course being then provided with change gear boxes and clutches by means of which the various propulsion units may be operated at different speeds or cut out altogether if desired. It will be seen that by speeding up the units on one side of the vessel while stopping, or maintaining at a reduced speed, the units on the other side of the vessel, very rapid steering maneuvers of the vessel may be had.

Means is provided for regulating the flow of water through the passage 14, so that the effective thrust of the propulsion unit may be varied without changing the speed of the rotor, or for completely closing the passage at both ends to permit removal of the rotor for repairs or for any other reason. Provided at opposite ends of the casing 11, and extending within the vessel, are housings 56, each having a rectangular chamber 57 therein which opens into the passage 14, the passage being provided with a peripheral seating groove 58 which is formed as an extension of the upper and lower wall surfaces of the chamber 57. The opposite side surfaces of the seating grooves are angularly related, in a direction transaxially of the passage 14, to correspond with the sloping sides 59 of a valve 61 mounted for slidable movement in the chamber 57. The valve 61 carries a hub 62 bored and threaded to receive a screw 63 which is journaled at one end in a hub 64 provided on the cover plate 66, which closes the inner end of the housing 56 and is secured thereon by screws 67. A stuffing box 68 closed by a gland follower 69 is provided for sealing against leakage of sea water from the passage 14 through the chamber 57 and into the vessel and a crank 71 secured by means of a pin 72 to the screw 63 provides means for manually rotating the screw so as to move the valve 61 between its extreme positions.

It will be seen in Figure 3 that when the valves are in their fully retracted positions, as shown in the lower portion of the view, the passage 14 will be fully open to allow free passage of water therethrough and that, when the valves are in any intermediate position, as indicated in the upper portion of the view, the passage will be more or less constricted, thus materially reducing the amount of water which may flow therethrough. Thus it is possible, while maintaining a constant speed of rotation of the rotor or impeller, to vary the speed of the vessel through the water. It will also be seen that when the valves 61 are moved as far as they will go toward the left, as viewed in Figure 3, and seated in the grooves 58, the opposite ends of the passage will be closed against the entrance of sea water thereinto, thus permitting the rotor to be removed, as was explained above, for inspection or repair. When the valves 61 are fully closed, a quantity of water will be trapped in the passage 14 between the valves. However, this water may be pumped out of the passage through a suction duct which may be provided to open into the passage, or the water may be allowed to drain into the vessel's bilge when the rotor unit is being removed.

It will be seen by those skilled in the art, from the foregoing description of my invention, that I have provided means, for propelling vessels through the water, which will more efficiently propel the vessel than will the conventional screw positioned at the stern of the vessel; that a vessel equipped with the propulsion units of my invention is more maneuverable than a vessel equipped with the conventional propeller; that the vessel may proceed on her course even though one or a few of the propulsion units should become disabled; that the speed of the vessel may be regulated even though the driving engines are being operated at a constant speed; and that the construction permits repairs to be made at sea and without interruption of the progress of the vessel.

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

1. In a ship having an aperture in a submerged portion of the hull thereof and intermediate the bow and stern of said hull and extending exteriorly thereof through said aperture, said casing having therein a cylindrical passage, extending longitudinally of the hull, and an aperture axially intersecting said passage and through which the passage and the interior of the hull may communicate, a cover plate removably secured to said casing, closing said aperture,

having an arcuate portion thereof forming a part of the wall of said passage and provided with struts carrying bearings concentrically positioned with respect to said passage, a shaft journaled in said bearings, a rotor carried by said shaft having impeller vanes for engaging and forcing sea water through said passage, a bevel gear carried by said rotor, a bevel pinion meshing with said bevel gear and carried by a drive shaft journaled in said cover plate, and means within said hull and connected with said drive shaft for revolving said rotor.

2. In a ship having an aperture in a submerged portion of the hull thereof and intermediate the bow and stern of said hull and extending exteriorly thereof through said aperture, said casing having therein a cylindrical passage, extending longitudinally of the hull, and an aperture axially intersecting said passage and through which the passage and the interior of the hull may communicate, a cover plate removably secured to said casing, closing said aperture, having an arcuate portion thereof forming a part of the wall of said passage and provided with struts carrying bearings concentrically positioned with respect to said passage, a shaft journaled in said bearings, a rotor carried by said shaft having impeller vanes for engaging and forcing sea water through said passage, a bevel gear carried by said rotor, a bevel pinion meshing with said bevel gear and carried by a drive shaft journaled in said cover plate, means within said hull and connected with said drive shaft for revolving said rotor, chambered housings on said casing at the respective ends thereof, each having a chamber therein and extending radially from the casing into the interior of said hull, valves slidably mounted in said chambers and movable transaxially of said passage so as to partially or totally close said passage, screws journaled in said housings and threadedly engaged with said valves, and cranks secured to said screws, at the end thereof within the hull, by means of which said screws may be rotated so as to move said valves across said passage.

3. In a ship having an aperture in a submerged portion of the hull thereof, a cover plate secured to said hull at a position to extend over said aperture, a casing supported by said cover plate and also extending over said opening, said casing having a cylindrical passage therethrough extending in a direction fore and aft of the ship, said passage having a slot in the wall thereof at a position medially between the ends of the passage, a rotor rotatively supported by said cover plate at a position within said passage, said rotor having a toothed periphery extending through said slot, a drive shaft also supported by said cover plate, and a pinion mounted on said drive shaft and engaging the teeth of said rotor.

4. In a ship having an aperture in a submerged portion of the hull thereof, a cover plate secured to said hull at a position to extend over said aperture, a casing supported by said cover plate and also extending over said opening, said casing having a cylindrical passage therethrough extending in a direction fore and aft of the ship, said passage having a slot in the wall thereof at a position medially between the ends of the passage, bearings carried by said cover plate and extended into said passage, a shaft axially disposed within said passageway and rotatively supported by said bearings, a rotor mounted on and rotatable with said shaft, said rotor having a toothed peripheral portion extended through said slot, a drive shaft also supported by said cover plate, and a pinion mounted on said drive shaft and engaging the toothed periphery of said rotor.

5. In a ship having an aperture in a submerged portion of the hull thereof, a cover plate secured to said hull at a position to extend over said aperture, a casing supported by said cover plate and also extending over said aperture, said casing having a cylindrical passage therethrough extending in a direction fore and aft of the ship, said passage having a slot in the wall thereof at a position medially between the ends of the passage, an approximately U-shaped brace for said casing positioned opposite to said cover plate and in alignment with said slot, a rotor rotatively mounted within said passage with its peripheral portion extended through said slot, and driving means located outside of the casing and engaging the periphery of said rotor.

EARL V. LOVELL.