June 12, 1956 T. KLATTE 2,749,874

PROPULSION AND STEERING APPARATUS FOR A MARINE VESSEL

Filed Oct. 7, 1952 3 Sheets-Sheet 1

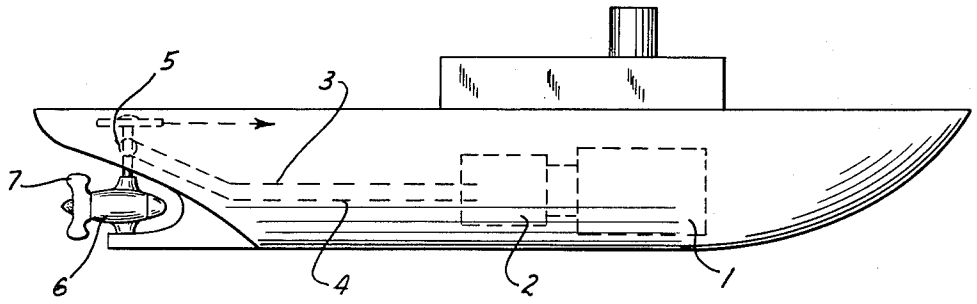


FIG. 1

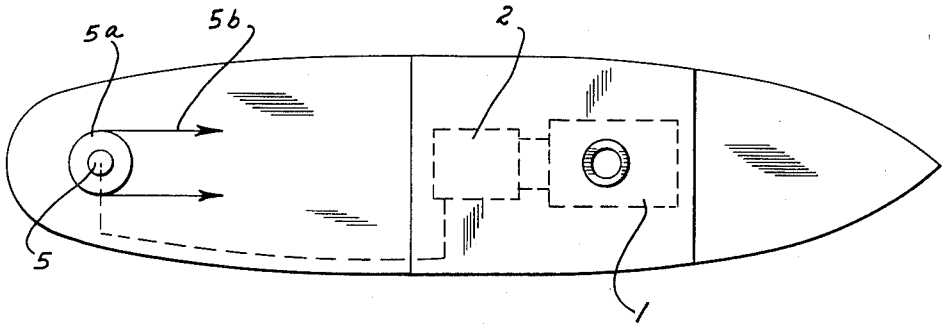


FIG. 2

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Filed Oct. 7, 1952 3 Sheets-Sheet 2

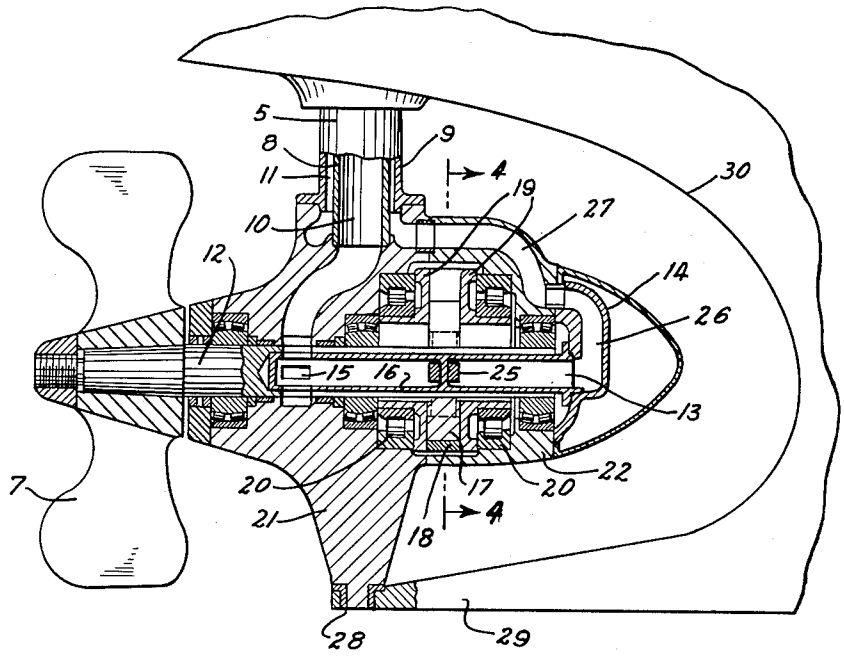


FIG. 3

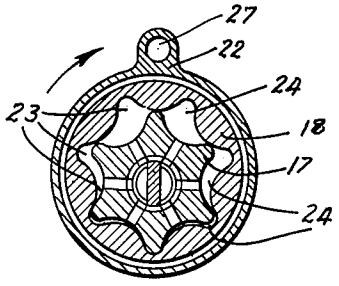


FIG. 4

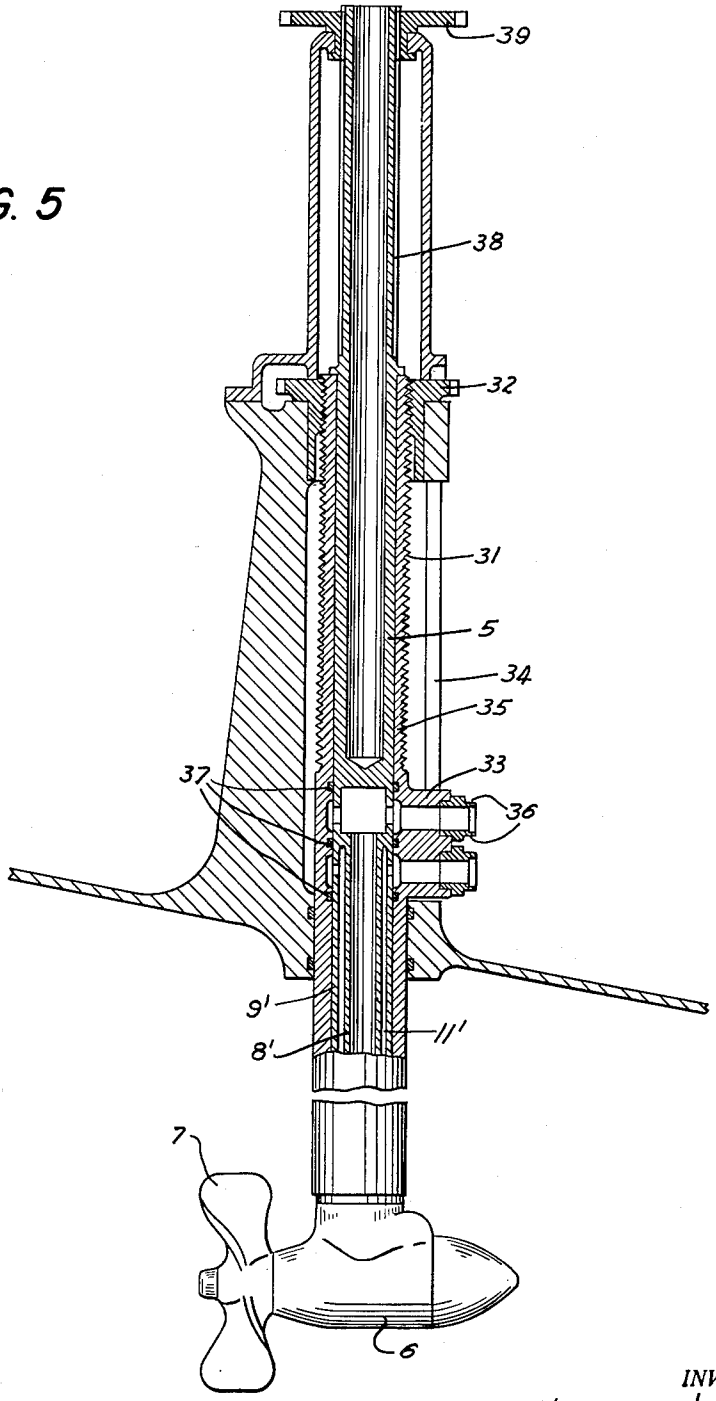
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Filed Oct. 7, 1952 3 Sheets-Sheet 3

FIG. 5



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PROPULSION AND STEERING APPARATUS FOR A MARINE VESSEL

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Application October 7, 1952, Serial No. 313,537

Claims priority, application Germany October 16, 1951

8 Claims. (Cl. 115—35)

The present invention relates to an apparatus for propelling marine vessels and the like.

More particularly, the present invention relates to an apparatus for driving a propeller of a ship and for steering such a vessel.

One of the objects of the present invention is to provide a propeller driving means which will consume very little space in the interior of a ship or the like.

Another object of the present invention is to provide a rudderless means for steering a ship or the like.

A further object of the present invention is to provide a means for varying the depth at which a propeller is located.

An additional object of the present invention is to provide a propeller driving means, for a marine vessel, which is practically devoid of any gear transmission and which operates very quietly.

Yet another object of the present invention is to provide a very simple means for locating a drive propeller at any desired location on a marine vessel.

A still further object of the present invention is to provide a marine vessel with a propelling apparatus capable of accomplishing all of the above objects while at the same time being of an extremely simple construction.

A still additional object of the present invention is to mount a propelling apparatus in such a way that it is balanced and produces a minimum of strain on its supporting structure.

With the above objects in view, the present invention mainly consists of a marine vessel propelling apparatus which includes a driving means mounted in the vessel and a fluid pump connected to the driving means to be driven thereby. A fluid motor is located on the exterior of the vessel, and a propeller is connected to this fluid motor to be driven thereby, the propeller forming a unit with the fluid motor. A conduit means interconnects the pump with the motor for conveying fluid between the latter and the pump so as to operate the motor.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

Fig. 1 is a diagrammatic, side elevation view of an apparatus constructed in accordance with the present invention;

Fig. 2 is a plan view of the apparatus of Fig. 1;

Fig. 3 is a side, sectional view of the propeller-motor unit of the present invention;

Fig. 4 is a sectional view taken along line 4—4 of Fig. 3 in the direction of the arrows; and

Fig. 5 is a fragmentary side, partly sectional view of a different embodiment of an apparatus constructed in accordance with the present invention.

Referring now to the drawings, there is shown in Fig. 1

a marine vessel in which there is located a driving means in the form of a prime mover 1, which may, for example, be a steam engine or any internal combustion engine. An oil pump 2 is connected to the driving means 1 to be driven thereby, and fluid flows to and from the pump 2 along the lines 3 and 4 which extend from pump 2 to the shaft 5 which extends along the axis about which a conventional rudder would turn if the vessel of Fig. 1 were supplied with a rudder. This shaft 5, as will be more fully explained below, is hollow to provide passage ways for the fluid and is connected to the fluid motor 6 of the same basic construction as the pump 2. The propeller 7 is connected to the motor 6 to be turned thereby and forms a unit therewith.

As is apparent from Fig. 2, a pulley 5*a* is fixed to the shaft 5 and may be turned by cables 5*b* so as to turn the shaft 5 and the unit 6—7 therewith for steering the vessel. As may be seen from Fig. 2, the conduit means 3, 4 extends for the greatest part of its length along the hull of the vessel so that the interior of the vessel is substantially free. This is in sharp distinction to conventional constructions where a considerable part of the interior space of the vessel is occupied by a fairly long portion of the propeller shaft and by the gearing associated therewith for transmitting a drive to the propeller. Moreover, with the disclosed construction the necessity for a sealing gland, such as a stuffing box or the like, for the propeller shaft is entirely eliminated.

The details of the motor-propeller unit 6, 7 are illustrated in Fig. 3 where it is seen that the stern part 30 of the vessel is provided with a lower arm 29 having a bearing 28 for turnably supporting the housing part 21 of the motor 6 for turning movement about the axis of shaft 5. A housing part 22 is fixed to the housing part 21 to form therewith a housing of the motor 6.

The shaft 5 is constructed from two rigid concentric tubes 8 and 9 which form the annular space 11. In the particular example illustrated, one of the tubes 3 and 4 is connected to the tube 8 for supplying fluid to the motor 6 along the passageway 10 while the other of the tubes 3 and 4 is connected to the tube 9 to receive fluid from the motor 6 and deliver it to the pump 2, the tube 9 communicating with the passage 26, 27 forming the outlet of motor 6. The tube 9 is fixed at its lower end to the housing 21, 22 so that upon turning of the pulley 5*a* the tube 9 together with the motor-propeller unit 6, 7 turn about the axis of shaft 5.

The propeller 7 is fixed to the outer end of the propeller shaft 12 which extends through the pump 6 and is hollow within the pump 6. The passage 10 extends through the housing 21 and communicates with the interior of the shaft 12 through the slots 15 formed therein, these slots being opposite similar slots formed in a tubular member 13 having a substantially S-shaped partition extending through the same. On the left side of this partition, as viewed in Fig. 3, the member 13 and shaft 12 are formed with slots 16 to admit fluid to the interior of the pump, and on the right side of the partition the shaft 12 and member 13 are formed with slots 25 for carrying fluid away from the pump to the tube 14 which forms the passageway 26 communicating with the passageway 27 and the annular space 11.

As may be seen from Fig. 4, the motor 6 includes an inner ring 17 formed with outer teeth and an outer ring 18 formed with inner teeth which are greater by one than the number of teeth on the inner ring 17. The outer ring 18 is fixed at its opposite sides to plates 19 which are turnably mounted on roller bearings 20. The plates 17 and 18 turn in the direction of the arrow shown in Fig. 4, and the ring 17 is fixed to the shaft 12 to turn the same. As is apparent from Fig. 4, the rings 17 and 18 are not concentric with each other, and the ring 17 is formed

with a plurality of radial passages communicating with the slots **16** and **25** for bringing oil into and out of the pump. As may be seen from Fig. 4, the rings **17** and **18** form, on the inlet side of the motor, the chambers **23** and, on the outlet side of the motor, the chambers **24**. As the oil flows into the chambers **23** and out of the chambers **24** the rings **17** and **18** turn with respect to each other while simultaneously turning in the direction of the arrow of Fig. 4 to change the volume of the several chambers **23** and **24**. As was mentioned above, the pump **2** is of the same construction as the motor **6**. Pumps or motors of this general type are disclosed in U. S. Patents 2,434,135 and 2,445,967.

The motor-propeller unit **6**, **7**, shown in Fig. 3, is so designed that the axis of shaft **12** and the turning axis of the unit, coinciding with the axis of shaft **5**, intersect at the center of gravity of the entire unit so that the latter is very easy to turn in order to steer the vessel and provides no strain on the shaft **5**. The vessel is provided with a suitable bearing and sealing gland cooperating with the tube **9** of shaft **5**.

Fig. 5 of the drawings illustrates a further embodiment of the invention which includes a motor-propeller unit **6**, **7** of the same construction as that described above. In the embodiment of Fig. 5, however, the motor-propeller unit **6**, **7** simply extends from the bottom of the vessel. The turning axis of propeller **7** and the axis of shaft **5** intersect at the center of gravity of the unit **6**, **7**, and the shaft **5**, in the embodiment of Fig. 5, is turnably mounted within a hollow tube **35**. The motor **6** may turn with respect to the tube **35** and cooperates with the shaft **5** in the same way as was described above, this shaft **5** having inner and outer concentric tubes **8'** and **9'** connected to the motor **6** in the same way as the tubes **8** and **9** of Fig. 3.

The tube **35** is threaded along its outer surface at **31**, and a nut **32** is turnably mounted on the vessel and cooperates with the threads of the tube **35** to move the latter along the axis of shaft **5** when the nut **32** is turned by any suitable control means, the nut **32**, shown in Fig. 5, having gear teeth by which it may be connected to a suitable controlling mechanism. As is shown in Fig. 5, the shaft **5** rests on the tube **35** with an outer annular shoulder of shaft **5** so that the latter and the motor **6** connected thereto move in translation with the shaft **35** while being free to turn with respect to the same. The supporting structure for the apparatus illustrated in Fig. 5 is formed with a slot **34** in which bored extensions of tube **35** are slidably located so as to prevent turning of the tube **35**. Couplings **36** are respectively connected to the bored extensions **33** to join flexible tubes, or the like, of lines **3** and **4** to the same for carrying fluid along a circuit between the motor **6** and pump **2**. As may be seen from Fig. 5, fluid may flow through the upper extension **33** to the interior of tube **8'** through suitable bores formed in the shaft **5**, and fluid from the motor **6** flows along the annular space **11'**, between tubes **8** and **9**, through suitable bores in tube **9** to the lower extension **33**, as viewed in Fig. 5. Suitable sealing rings **37** are mounted in grooves of tube **35** and engage the shaft **5** to seal the inflowing fluid from the outflowing fluid, and similar sealing rings are located about the tube **35** adjacent to the outer surface of the vessel.

The top portion of shaft **5** is hollow and formed with outer splines **38** which cooperate with mating splines in the hub of the turnably mounted gear **39** which may be turned through a suitable transmission for turning the shaft **5**, motor **6**, and propeller **7** with respect to the tube **35**. Thus, the shaft **5** is free to move in translation along its axis with respect to gear **39** but is constrained to rotate therewith.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of marine vessel propelling apparatus differing from the types described above.

While the invention has been illustrated and described as embodied in a rudderless marine vessel propelling apparatus, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. In a marine vessel, apparatus for propelling the vessel, comprising, in combination, driving means mounted in the vessel; a fluid pump operatively connected to said driving means to be driven thereby; a fluid motor located on the exterior of the vessel; a propeller connected to said fluid motor to be driven thereby and forming a unit therewith, said propeller being mounted on said fluid motor for rotation about a first axis; conduit means interconnecting said pump with said motor for conveying fluid between said pump and motor to operate the latter, said conduit means comprising a pair of concentric straight tubes spaced from each other, communicating with said motor, and located along a second axis extending from the vessel across said first axis, the inner one of said pair of said tubes conveying fluid in one direction with respect to said motor and the outer one of said pair of tubes cooperating with the said inner tube to form an elongated annular space for conveying fluid in an opposite direction with respect to said motor, and one of said tubes being fixedly connected to said motor; and support means mounting said one tube on the vessel for turning movement about said second axis so that when said tube turns about said second axis the direction in which said propeller drives the vessel changes.

2. In a marine vessel, apparatus for propelling the vessel comprising, in combination, driving means mounted in the vessel; a fluid pump operatively connected to said driving means to be driven thereby; a fluid motor located on the exterior of the vessel and having a drive shaft; a propeller connected to said shaft to rotate therewith and forming a unit with said fluid motor; conduit means interconnecting said pump with said motor for conveying fluid between said pump and motor to operate the latter, said conduit means including a pair of concentric straight tubes spaced from each other, communicating with said motor, and being fixed thereto, the inner one of said pair of said tubes conveying fluid in one direction with respect to said motor and the outer one of said pair of tubes cooperating with the said inner tube to form an elongated annular space for conveying fluid in an opposite direction with respect to said motor support means mounting said tubes on the vessel for turning movement about the axis of said tubes, at least one of said tubes having a potrion terminating within the vessel, turnning means operatively connected to said portion of said tube for turning the tube and motor thereby steering the vessel.

3. In a marine vessel, apparatus for propelling the vessel comprising, in combination, driving means mounted in the vessel; a fluid pump operatively connected to said driving means to be driven thereby; a fluid motor located on the exterior of the vessel and having a drive shaft fixed within said motor, to a first ring having teeth on the outer periphery thereof, said motor having located about said first ring a second annular ring having inner teeth which exceed by one the number of teeth on said first ring and which cooperate therewith to drive said shaft, the latter being hollow within said motor and being formed at the hollow portion thereof with slots for conveying fluid to

said motor; a propeller connected to said shaft to rotate therewith and forming a unit with said fluid motor; conduit means interconnecting said pump with said motor for conveying fluid between said pump and motor to operate the latter, said conduit means comprising a pair of concentric tubes spaced from each other, communicating with said motor, and being fixed thereto, the inner one of said pair of said tubes conveying fluid in one direction with respect to said motor and the outer one of said pair of tubes cooperating with the said inner tube to form an elongated annular space for conveying fluid in an opposite direction with respect to said motor, said inner tube communicating with the interior of said shaft through said slots thereof and said outer tube communicating with said valve to receive fluid from said motor; and support means mounting said tubes on the vessel for turning movement about the axis of said tubes so that said unit turns with said tubes to steer the vessel.

4. In a marine vessel, apparatus for propelling the vessel comprising, in combination, driving means mounted in the vessel; a fluid pump operatively connected to said driving means to be driven thereby; a fluid motor located on the exterior of the vessel; a propeller connected to said fluid motor to be driven thereby and forming a unit therewith, said propeller being mounted on said fluid motor for rotation about a first axis; support means supporting said unit on the exterior of the vessel for turning movement about a second axis intercepting said first axis, said support means comprising a first, hollow shaft extending along said second axis and being mounted on the vessel only for movement along said second axis, and a second hollow shaft connected to said motor, joined to said first shaft for movement therewith along said second axis and being turnably mounted within said first shaft for movement about said second axis; and conduit means interconnecting said pump with said motor for conveying fluid between said pump and motor to operate the latter, said conduit means being formed in part by said second shaft.

5. In a marine vessel, apparatus for propelling the vessel comprising, in combination, driving means mounted in the vessel; a fluid pump operatively connected to said driving means to be driven thereby; a fluid motor located on the exterior of the vessel; a propeller connected to said fluid motor to be driven thereby and forming a unit therewith, said propeller being mounted on said fluid motor for rotation about a first axis; support means supporting said unit on the exterior of the vessel for turning movement about a second axis intercepting said first axis, said support means comprising a first, hollow shaft extending along said second axis and being mounted on the vessel only for movement along said second axis, said first shaft being threaded at an outer part thereof, and a second hollow shaft connected to said motor, joined to said first shaft for movement therewith along said second axis and being turnably mounted within said first shaft for movement about said second axis, said second shaft extending beyond said first shaft and being formed on the outer surface thereof beyond said first shaft with a plurality of splines, a nut turnably mounted on said vessel and threadedly engaging said threaded part of said first shaft to move the same along said second axis, and a gear turnably mounted on said vessel and having a splined hub in mating engagement with said splines of said second shaft so that the latter may move along said second axis with respect to said gear while being constrained to rotate with the latter about said second axis for steering the vessel; and conduit means interconnecting said pump with said motor for conveying fluid between said pump and motor to operate the latter, said conduit means being formed in part by second shaft.

6. In a marine vessel, apparatus for propelling the vessel comprising, in combination, driving means mounted in the vessel; a fluid pump operatively connected to said driving means to be driven thereby; a fluid motor located on the exterior of the vessel; a propeller connected to said fluid motor to be driven thereby and forming a unit therewith, said propeller being mounted on said fluid motor for rotation about a first axis; support means supporting said unit on the exterior of the vessel for turning movement about a second axis intercepting said first axis, said support means comprising a first, hollow shaft extending along said second axis and being mounted on the vessel only for movement along said second axis, said first shaft being threaded at an outer part thereof and being formed with a pair of bores passing therethrough, a second shaft fixed to said motor, joined to said first shaft for movement therewith along said second axis and being turnably mounted within said first shaft for movement about said second axis, said second shaft extending beyond said first shaft and being formed on the outer surface thereof beyond said first shaft with a plurality of splines and said second shaft being formed on the interior thereof with a pair of chambers respectively communicating with said motor for conducting fluid to and from the same and respectively communicating with said bores of said first shaft, a nut turnably mounted on said vessel and threadedly engaging said threaded part of said first shaft to move the same along said second axis, and a gear turnably mounted on said vessel and having a splined hub in mating engagement with said splines of said second shaft so that the latter may move along said second axis with respect to said gear while being constrained to rotate with the latter about said second axis for steering the vessel; and conduit means interconnecting said pump with said bores for conveying fluid between said pump and motor to operate the latter.

7. In a marine vessel, apparatus for propelling the vessel, comprising, in combination, driving means mounted in the vessel; a fluid pump operatively connected to said driving means to be driven thereby; a fluid motor located on the exterior of the vessel; a propeller connected to said fluid motor to be driven thereby and forming a unit therewith, said propeller being mounted on said fluid motor for rotation about a first axis; support means supporting said unit on the exterior of the vessel for turning movement about a second axis intercepting said first axis, said support means comprising a first, hollow shaft extending along said second axis and being mounted on the vessel only for movement along said second axis, said first shaft being threaded at an outer part thereof and being formed with a pair of bores passing therethrough, a second shaft fixed to said motor, joined to said first shaft for movement therewith along said second axis and being turnably mounted within said first shaft for movement about said second axis, said second shaft extending beyond said first shaft and being formed on the outer surface thereof beyond said first shaft with a plurality of splines and said second shaft being formed on the interior thereof with a pair of chambers respectively communicating with said motor for conducting fluid to and from the same and respectively communicating with said bores of said first shaft, a nut turnably mounted on said vessel and threadedly engaging said threaded part of said first shaft to move the same along said second axis, and a gear turnably mounted on said vessel and having a splined hub in mating engagement with said splines of said second shaft so that the latter may move along said second axis with respect to said gear while being constrained to rotate with the latter about said second axis for steering the vessel; and conduit means interconnecting said pump with said bores for conveying fluid between said pump and motor to operate the latter, said conduit means including a pair of flexible tubes respectively connected to said bores of said first shaft.

8. In a marine vessel, apparatus for propelling the vessel comprising, in combination, driving means mounted in the vessel; a fluid pump operatively connected to said driving means to be driven thereby; a fluid motor located on the exterior of the vessel; a propeller connected to said fluid motor to be driven thereby and forming a unit there-

with, said propeller being mounted on said fluid motor for rotation about a first axis, support means supporting said unit on the exterior of the vessel for turning movement about a second axis intercepting said first axis, said support means comprising a first, hollow shaft extending along said second axis and being mounted on the vessel only for movement along said second axis, said first shaft being threaded at an outer part thereof, and a second hollow shaft joined to said first shaft for movement therewith along said second axis and being turnably mounted within said first shaft for movement about said second axis, said second shaft extending beyond said first shaft and being formed on the outer surface thereof beyond said first shaft with a plurality of splines, a nut turnably mounted on said vessel and threadedly engaging said threaded part of said first shaft to move the same along said second axis, and a gear turnably mounted on said vessel and having a splined hub in mating engagement

with said splines of said second shaft so that the latter may move along said second axis with respect to said gear while being constrained to rotate with the latter about said second axis for steering the vessel; and conduit means interconnecting said pump with said motor for conveying fluid between said pump and motor to operate the latter, said conduit means being formed in part by said second shaft.

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