June 10, 1969 T. GASKINS 3,448,710

PROPELLING AND STEERING DEVICE

Filed May 4, 1967 Sheet 1 of 3

Fig-1

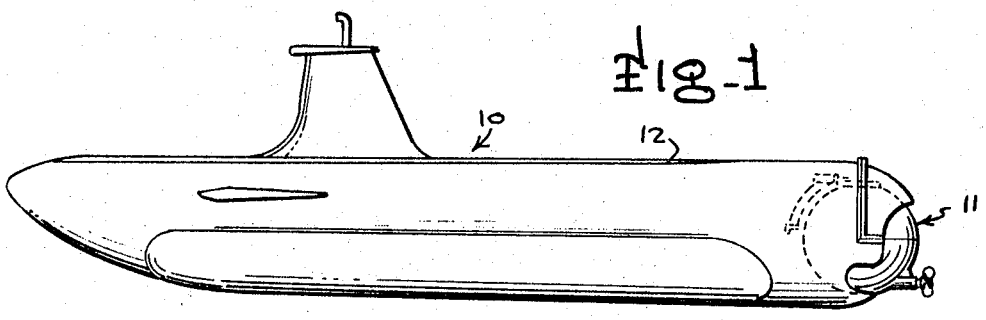
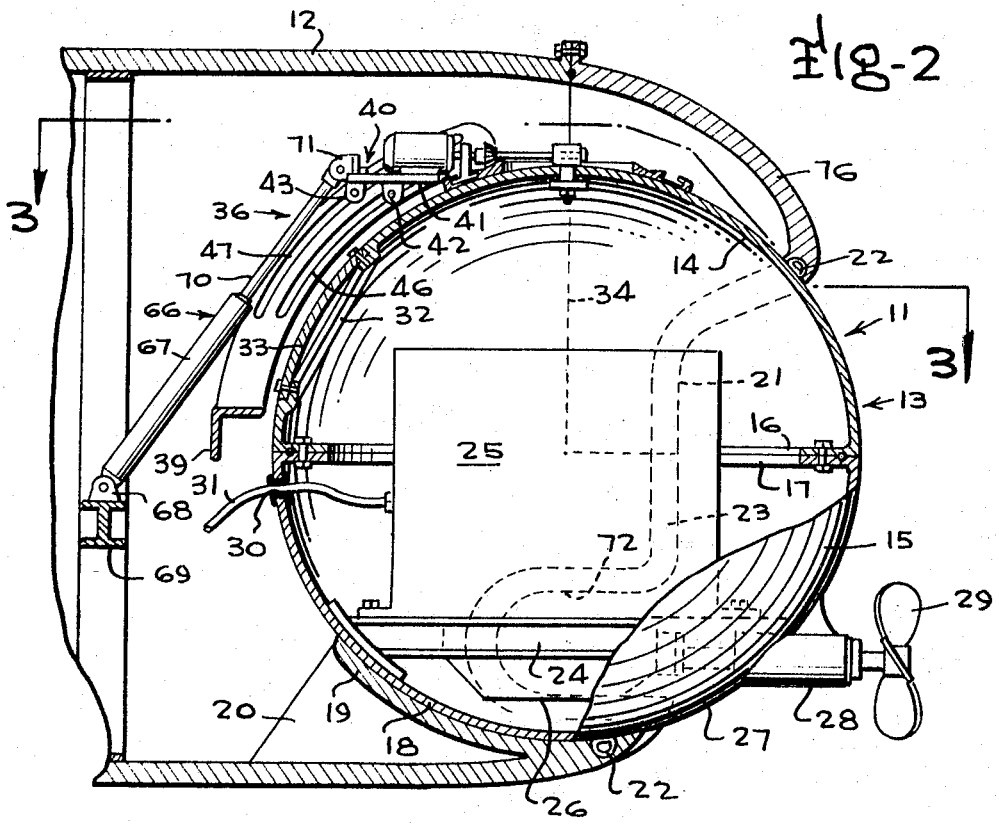


Fig-2



INVENTOR

THOMAS GASKINS

BY Mason, Fenwick & Lawrence

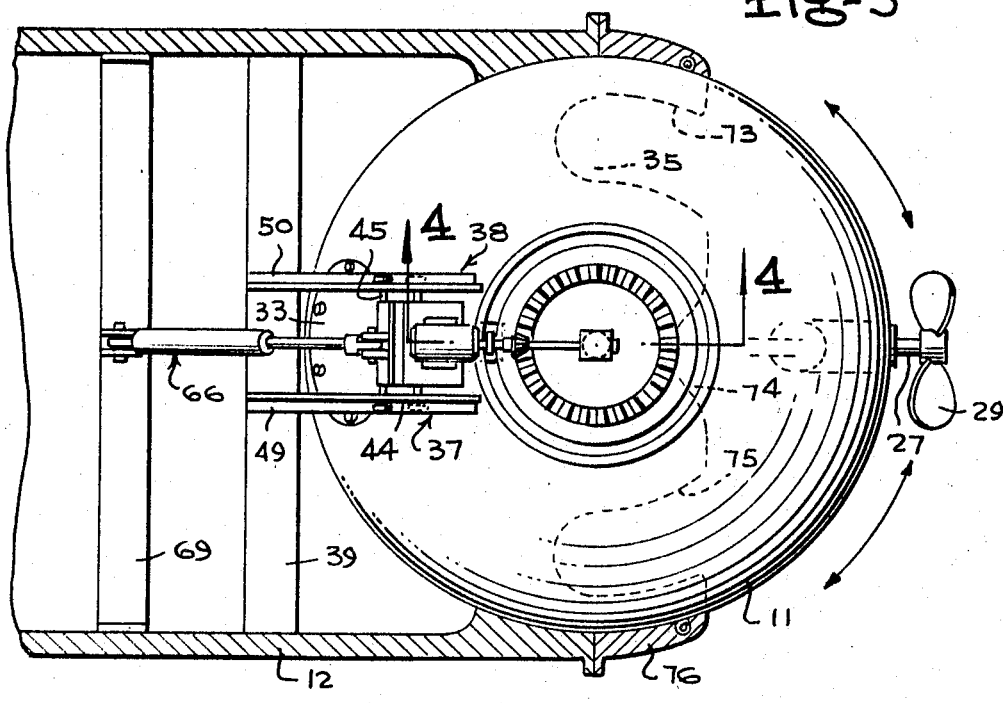
ATTORNEYS

June 10, 1969 T. GASKINS 3,448,710

PROPELLING AND STEERING DEVICE

Filed May 4, 1967 Sheet 2 of 3

Fig-3



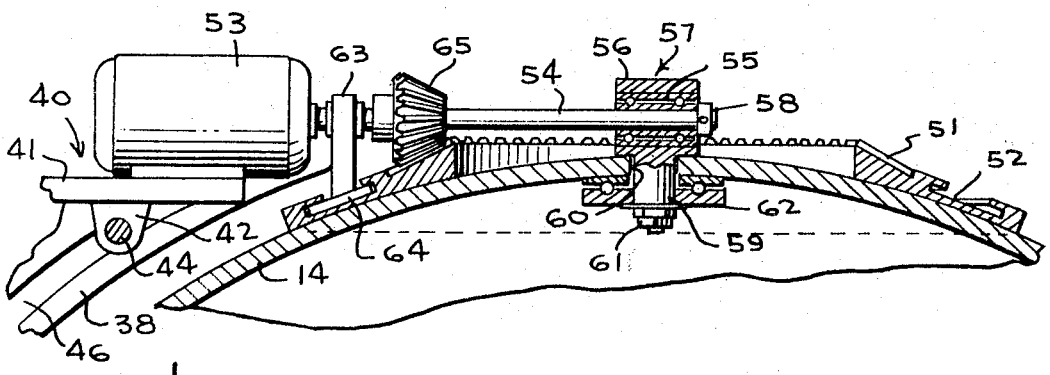


Fig-4

INVENTOR

THOMAS GASKINS

BY Mason, Fenwick & Lawrence
ATTORNEYS

June 10, 1969 T. GASKINS 3,448,710

PROPELLING AND STEERING DEVICE

Filed May 4, 1967 Sheet 3 of 3

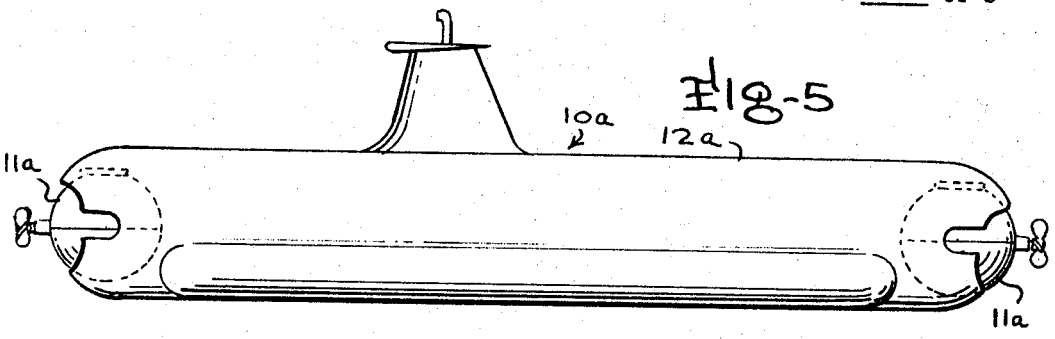


Fig-5

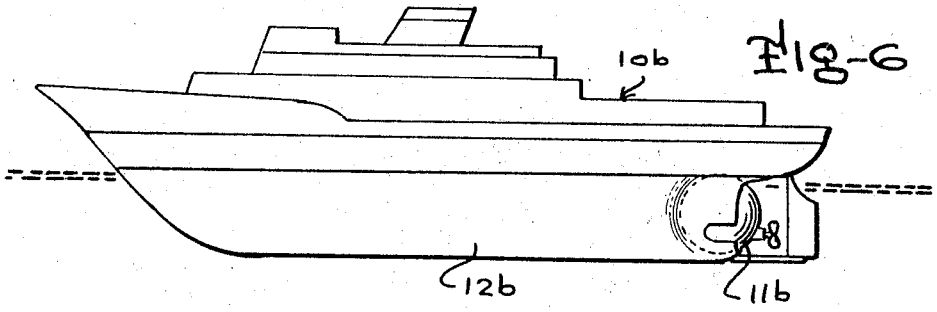


Fig-6

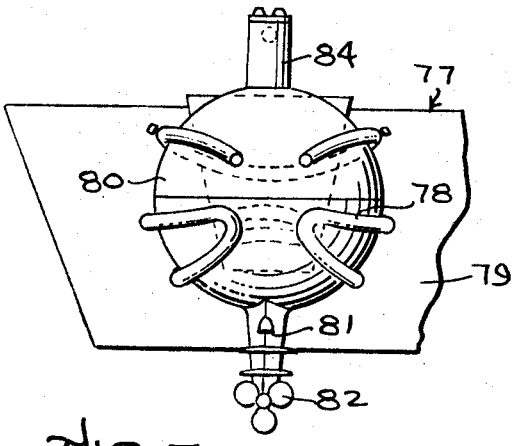


Fig-7

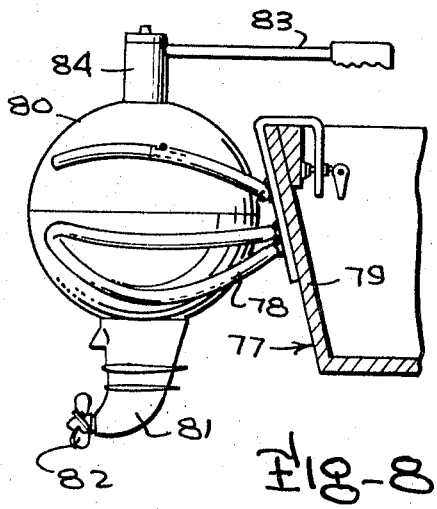


Fig-8

INVENTOR

THOMAS GASKINS

BY Mason, Fenwick & Lawrence

ATTORNEYS

United States Patent Office 3,448,710 Patented June 10, 1969

3,448,710

PROPELLING AND STEERING DEVICE

Thomas Gaskins, Palmdale, Fla. 33944

Filed May 4, 1967, Ser. No. 636,092
Int. Cl. B63h 25/42, 21/26; B63g 8/08
U.S. Cl. 114—16 7 Claims

ABSTRACT OF THE DISCLOSURE

A propelling and steering device for craft including a hull structure, wherein the entire propelling means is provided in a single unit mounted on a seat on the hull structure of the craft, which can be moved about at least one axis to steer the craft. A fluid cylinder moves the unit about one axis and a motor moves the unit about another axis normal to the first axis.

Background of the invention

In most conventional surface and under water craft, the propulsion of the craft commonly is provided by means of one or more stationary gas engines, diesel engines or steam or gas turbines mounted within the hull structure of the craft, having at least one drive shaft extending aft through the hull structure, which is provided with propeller blades. Steering and planing of such craft commonly has been provided by means of multiple propellers, vertical and horizontal vanes, or combinations thereof. Most often, such means have been found to be satisfactory for most craft requirements, but not entirely effective under circumstances requiring complex maneuvering of the craft and instant response to change in course or ascending or descending as in the case of under water craft.

Objects of the invention

The principal object of the present invention is to provide a novel propelling and steering device.

Another object of the present invention is to provide a novel propelling and steering device suitable for use with either surface or under water craft.

A further object of the present invention is to provide a novel propelling and steering device for a surface water craft which will provide maximum maneuverability of the craft.

A still further object of the present invention is to provide a novel propelling and steering device suitable for use with under water craft, which will provide maximum maneuverability in course change and in ascending and descending to different depths.

Another object of the present invention is to provide a novel propelling and steering device which eliminates the requirement of horizontal or vertical vanes and multiple propellers commonly employed for steering or ascending and descending in the case of under water craft.

A further object of the present invention is to provide a novel propelling and steering device which is readily adapted for installation and removal from the hull structure of either a surface or under water craft.

A still further object of the present invention is to provide an improved propelling and steering device which is responsive to instantaneous change in course or ascending or descending angle.

Another object of the present invention is to provide an improved propelling and steering device which is relatively simple in structure, relatively inexpensive to manufacture, and comparatively economical to maintain.

Other objects of the invention will become more apparent to those persons skilled in the art, from the following description of an embodiment thereof, when taken in conjunction with the accompanying drawings which form a part of this specification.

Brief description of the drawings

FIGURE 1 is a side elevational view of an embodiment of the invention.

FIGURE 2 is an enlarged vertical cross-sectional view of the embodiment illustrated in FIGURE 1.

FIGURE 3 is a cross-sectional view taken along line 3—3 in FIGURE 2.

FIGURE 4 is an enlarged cross-sectional view taken along line 4—4 in FIGURE 3.

FIGURE 5 illustrates an under water craft utilizing multiple installations of the embodiment illustrated in FIGURES 1 through 5.

FIGURE 6 illustrates a surface craft utilizing the embodiment of the invention shown in FIGURES 1 through 4.

FIGURE 7 is an elevational rear end view of another embodiment of the invention.

FIGURE 8 is an elevational side view of the embodiment illustrated in FIGURE 7.

Description of the preferred embodiment

Briefly described, the present invention relates to a propelling and steering device for a craft including a hull structure generally comprising a movable enclosure means mounted on seating means on the hull structure of the craft, prime mover means mounted within the enclosure means, the prime mover means having propelling means extending through the enclosure means to the exterior of the hull structure and means mounted on the hull structure and operatively connected to the enclosure means for moving the enclosure means with the propelling means about at least one reference means whereby thrust may be directed selectively to propel or steer the craft. Preferably, the seating means comprises socket means at least partially enclosing the enclosure means, the propeller means includes a drive shaft having propeller blades mounted thereon and the moving means is operative to move the enclosure means about two separate axes.

Referring to the drawings, FIGURES 1 through 4 illustrate an embodiment of the invention. FIGURE 1 specifically illustrates an under water craft **10** having a propelling and steering device **11**, embodying the present invention, mounted in the stern of the hull structure **12** of the craft. As best illustrated in FIGURES 2 and 3, the propelling and steering device **11** includes a spherical enclosure assembly **13** consisting of a pair of hemispherical shell sections **14** and **15**. The shell sections each are provided with annular, inwardly projecting flanges **16** and **17** which abut and are bolted together when the enclosure member is formed to provide a spherical member. The lower portion of the enclosure member **13** is seated on a spherical support surface **18** of a bottom wall member **19** secured to the hull structure and reinforced by a gusset **20**. The spherical support surface **18** is positioned within the stern end of the hull structure so that the rearward portion of the enclosure member **13** projects aft through an opening **21** in the stern of the hull structure. The side walls of opening **21** and the spherical support surface **18** lie in the same spherical plane including the outer surface of the spherical enclosure member **13** to permit movement of the enclosure member **13** about its geometric center. In addition, sealing means **22** of any suitable form is provided between the end wall **23** of opening **21** and the spherical enclosure member **13**.

Mounted within the spherical enclosure member **13** and longitudinally across the lower end of the lower shell section **15** is a support platform **24**. A prime mover means **25** which may consist of a gas engine, a diesel engine or a gas or steam driven turbine is mounted on the support

platform 24. Depending from the prime mover means is a transmission 26 operatively connected to the prime mover means, having a rearwardly projecting drive shaft 27 extending through the enclosure member 13 and journaled in suitable bearings mounted in a support shroud 28 connected to the shell section 15. A conventional type propeller 29 is provided on the free end of the drive shaft 27 for propelling the craft. The lower shell section 15 is provided with a suitable opening 30 adapted to receive a flexible service conduit 31 therethrough which is connected to the engine 25. The service conduit 31 is adapted to accommodate any fuel, air and exhaust lines for the engine, in addition to any mechanical, electrical or hydraulic control lines. The upper shell section 14 is provided with an access opening 32 provided with a cover plate 33 which can be removed to provide access to the interior of the enclosure member 13 and particularly the engine 25.

The spherical enclosure member 13 is adapted to be rotated about a first axis 34 and a perpendicular axis 35 by means of a drive mechanism 36. Included in the mechanism 36 is a pair of transversely spaced parallel guide rails 37 and 38 which are supported at their lower ends on a transversely disposed cross beam 39 rigidly secured to the hull structure 12 of the craft. The guide rails are arcuately shaped and are disposed adjacent the spherical enclosure member 13. Mounted for movement substantially along the length of the guide rails 37 and 38 is a carriage assembly 40. The carriage assembly includes a substantially horizontal platform 41 having depending brackets 42 and 43. Journaled within the depending brackets 42 and 43 are transversely disposed guide pins 44 and 45 which extend through and are adapted to move along parallel arcuate guideways 46 and 47 in the guide rails, which are disposed concentric with the spherical enclosure member 13. The ends of the guide pins 44 and 45 disposed outwardly of the guide rails 37 and 38 are provided with rollers 48 which are adapted to ride on outwardly projecting arcuate flanges 49 and 50 provided on the guide rails 37 and 38. The guideways 46 and 47 and the arcuate flanges 49 and 50 are formed so that as the guide pins 44 and 45 are guided along guideways 46 and 47, the platform 41 will remain substantially parallel to the longitudinal centerline of the craft.

Concentrically mounted on the upper shell section 14, relative to the axis of rotation 34, is an annular bevel gear 51 and an annular keeper slot 52 as best illustrated in FIGURE 4. A motor 53 is rigidly mounted on the support platform 41 having a drive shaft 54 extending across the upper shell section 14 substantially radially relative to the axis 34. The outer end of the drive shaft 54 is journaled in a bearing 55 mounted in a collar portion 56 of a support fixture 57. The drive shaft 54 is prevented from being removed from the fixture 57 by means of a collar element 58 locked to the outer end of the drive shaft. The fixture 57 also is provided with an integral depending cylindrical portion 59 extending through an opening 60 in the shell section 14, disposed axially relative to axis of rotation 34. A retainer plate 61 is provided on the lower end of the cylindrical portion 59 for retaining a thrust bearing 62 mounted on the cylindrical portion 59 of the fixture between the retainer plate 61 and the upper shell section 14.

The inner end of the drive shaft 54 adjacent the motor 53 is journaled in an upstanding support bracket 63, which is provided with a lower block portion 64 disposed in the keeper slot 52 for sliding movement therein. Also mounted on the drive shaft 54 intermediate the upstanding bracket 63 and the fixture 57 is a bevel gear 65 which meshes with the bevel gear 51 rigidly mounted on the upper shell section 14. It will be appreciated that upon energization of the motor 53, drive will be transmitted through the drive shaft 54 and the meshing gears 65 and 51 to rotate the spherical enclosure member about the axis of rotation 34.

The carriage assembly 40 is moved along the guide rails 37 and 38 by means of a fluid cylinder assembly 66. This assembly includes a fluid cylinder 67 pivotally connected at its lower end to an upstanding bracket 68 rigidly secured to a transversely disposed cross beam member 69, and an extensible piston rod member 70 pivotally secured to a forwardly disposed bracket 71 rigidly secured to the support platform 41 of the carriage assembly 40. By controlling the supply of fluid under pressure to either side of the piston head of rod member 70 of the fluid cylinder assembly, it will be seen that the carriage assembly 40 can be caused to travel along the guideways 46 and 47 of the guide rails 37 and 38. Simultaneous with such movement of the carriage assembly, the spherical enclosure member 13 will be caused to rotate about the axis of rotation 35 by virtue of the connection of the drive shaft 54 with the upper shell section 14 through the fixture 57. It further will be appreciated that when the carriage assembly 40 is moved along the guideways 46 and 47 to rotate the spherical enclosure member about the axis of rotation 35, the support bracket 63 and the thrust bearings 62 will serve to eliminate any excessive load from being applied to the bearings 55 and the meshed gears 51 and 65.

In the operation of the propelling and steering device as described, whenever it is desired to change the course of the craft 10, the motor 53 is energized to drive the drive shaft 54 and meshed gears 65 and 51, thus rotating the spherical enclosure member about the axis of rotation 34. Upon rotation of the spherical enclosure member, the axis of the drive shaft 27 for the propeller 29 will move correspondingly to cause the craft to change course. It is contemplated that the motor 53 will be adapted to operate in forward and reverse directions to permit the spherical enclosure member to be rotated in either direction about the axis of rotation 34. In addition, it is intended that suitable electrical or fluid controls be provided for the motor 53, to permit instantaneous and intricate response to command signals from the control station of the craft. The arcuate span of movement of the drive shaft 27 will depend upon the size and shape of the opening 21 in the hull structure through which the spherical enclosure member 13 projects. As illustrated in FIGURE 2, the opening 21 in the hull structure can be provided with deep side recesses 72 which would permit the propeller drive shaft 27 to be trained within an arc of approximately 180° when the propeller drive shaft 27 is disposed in the position as illustrated in FIGURE 2 relative to the hull structure of the craft. Suitable cutout circuits can be provided in the control circuitry for the motor 53, to prevent the propeller drive shaft 27 from being trained beyond its travel limits.

When it is desired to descend or ascend, the fluid cylinder assembly is either extended or retracted to move the carriage assembly along the arcuate guideways 46 and 47 of the guide rails 37 and 38. Upon such movement of the carriage assembly, the spherical enclosure member will be caused to rotate about the axis of rotation 35. Simultaneous with the rotation of the spherical enclosure member about the axis of rotation 35, the angle of the axis of propeller shaft 27 will be adjusted, thus causing the craft to ascend or descend. The angular deviation of the axis of propeller shaft 27 is limited by the size and shape of the opening 21 in the hull structure and the cutout circuitry provided in the control system for the fluid cylinder assembly 66. As illustrated in FIGURE 3, various recesses 73, 74 and 75 may be provided in the opening 21 to increase the angular span of travel of the propeller shaft 27 upon actuation of the fluid cylinder assembly 66.

It will be noted that the motor 53 and the fluid cylinder assembly 66 can be operated simultaneously to permit maximum maneuverability of the craft. In addition, the propelling and steering device 11 can be used in conjunction with other conventional craft maneuvering means such as rudders, vanes and the like, to provide an under

water craft with maximum maneuverability. As illustrated in FIGURE 5, propelling and steering devices **11** can be mounted both in the bow and stern of an under water craft, to increase even further its maneuvering capability. The arrangement as illustrated in FIGURE 5 provides maximum craft versatility in that the angle, the direction and the speed of each propeller shaft can be varied to produce various maneuvers.

The propelling and steering device as described, being an integral and compact unit, can be readily installed and removed from the hull structure of a craft. At best illustrated in FIGURES 1 through 3, the device **11** can be removed from the hull structure of the craft, simply by removing the detachable cover section **76** of the hull structure, detaching the drive mechanism **36** from the enclosure member, and hoisting the enclosure member out of the hull structure. The device can be installed in the hull structure substantially by reversing the same procedure. It will be appreciated that with the use of the present invention, power plants for surface and under water craft can be readily removed and replaced, thus greatly reducing the amount of time required for the craft to be assigned to a shipyard facility for power plant overhaul and repair.

FIGURE 6 of the invention illustrates a surface craft provided with a propelling and steering device **11***b* which is similar in construction and operation to the device **11** disclosed in the embodiment illustrated in FIGURES 1 through 4.

FIGURES 7 and 8 illustrate a modification of the embodiment illustrated in FIGURES 1 through 4. This modification is intended for use with a small surface craft **77** and is provided with a support frame structure **78** adapted to be detachably secured to the transom **79** of the craft. Mounted in the support frame structure **78** is a spherical enclosure member **80** which is substantially similar to the spherical enclosure member **13** described in connection with the embodiment of the invention illustrated in FIGURES 1 through 4. The enclosure member **80** is provided with a depending vane section **81** housing the drive train of the engine mounted within the enclosure member, and a propeller **82** mounted on the end of the drive train. The steering of the craft is provided by a manually operated tiller arm **83** which is rigidly secured to a housing **84** mounted on the upper end of the enclosure member **80**. The enclosure member **80** can be easily removed by disassembling portions of the support frame structure **78**. In addition, a flexible service conduit can be provided to accommodate all necessary air, fuel and exhaust lines, in addition to any mechanical, fluid or electrical control lines.

From the foregoing detailed description it will be evident that there are a number of changes, adaptations and modifications of the present invention which come within the province of those skilled in the art. However, it is intended that all such variations not departing from the spirit of the invention be considered.

I claim:

1. A propelling and steering device for a craft including a hull structude comprising an enclosure means mounted on seating means on the hull structure of the craft, prime mover means mounted in said enclosure means, said prime mover means having propelling means extending through said enclosure means to the exterior of said hull structure, a pair of spaced, arcuate guideways mounted on said hull structure, a carriage member mounted on said guideways for movement along an arcuate path about a first axis, said carriage member being operatively connected to said enclosure member for movement therewith about said first axis and relative rotational movement therewith about a second axis, means for moving said carriage member along said guideways to move said carriage member and enclosure means about said first axis and means mounted on said carriage member and operatively connected to said enclosure means for rotating said enclosure means relative to said carriage member about said second axis.

2. A propelling and steering device according to claim **1**, wherein said means mounted on said carriage member and operatively connected to said enclosure means for rotating said enclosure means relative to said carriage member comprises a motor mounted on said carriage member having a drive shaft provided with a drive gear meshing with a gear rigidly mounted on said enclosure means.

3. A propelling and steering device according to claim **1**, wherein said means for moving said carriage member along said guideways about said first axis includes a fluid cylinder assembly operatively interconnecting said hull structure and said carriage member.

4. A propelling and steering device according to claim **1**, wherein said means mounted on said carriage member and operatively connected to said enclosure means for rotating said enclosure means relative to said carriage member comprises a motor mounted on said carriage member having a drive shaft provided with a drive gear meshing with a gear rigidly mounted on said enclosure means, and said means for moving said carriage member and said enclosure means about said first axis includes a fluid cylinder assembly operatively interconnecting said hull structure and said carriage member.

5. A propelling and steering device according to claim **1**, wherein said enclosure means is spherical and is seated on partially spherical surfaces in said hull structure.

6. A propelling and steering device according to claim **5**, including sealing means disposed between said hull structure and said enclosure means.

7. A propelling and steering device according to claim **1**, wherein said axes are disposed normal to each other.

References Cited

UNITED STATES PATENTS

190,312	5/1877	Gray et al.	115—35
2,755,766	7/1956	Wanzer	115—35
3,292,564	12/1966	Lehmann	114—16

FOREIGN PATENTS

1,092,794	11/1960	Germany.

TRYGVE M. BLIX, *Primary Examiner.*

U.S. Cl. X.R.

115—35