July 15, 1969 J. BECKER 3,455,271

PROPULSION SYSTEM FOR WATERCRAFT

Filed Feb. 7, 1967 2 Sheets-Sheet 1

Fig. 1

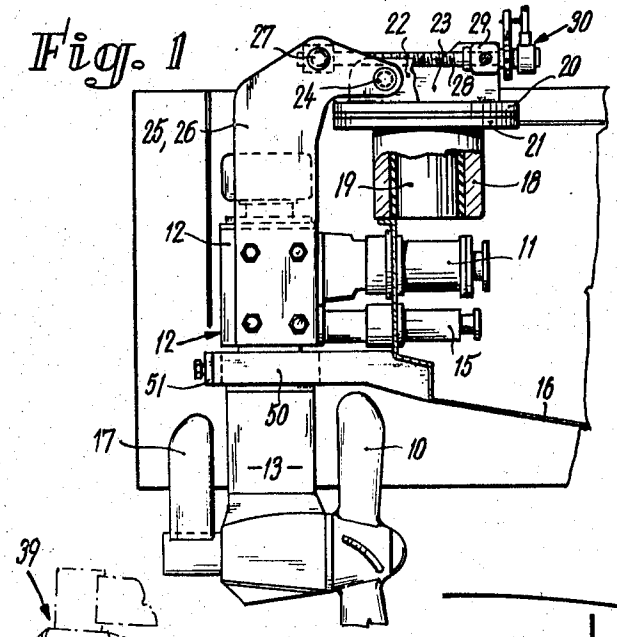

Fig. 2

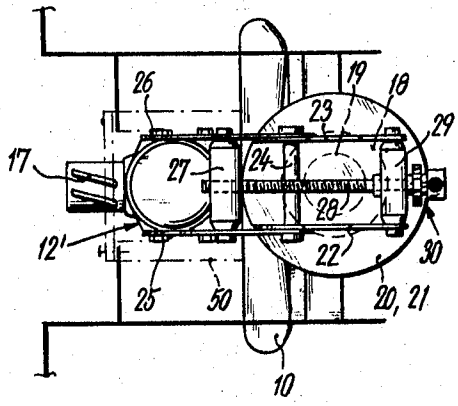

Fig. 3

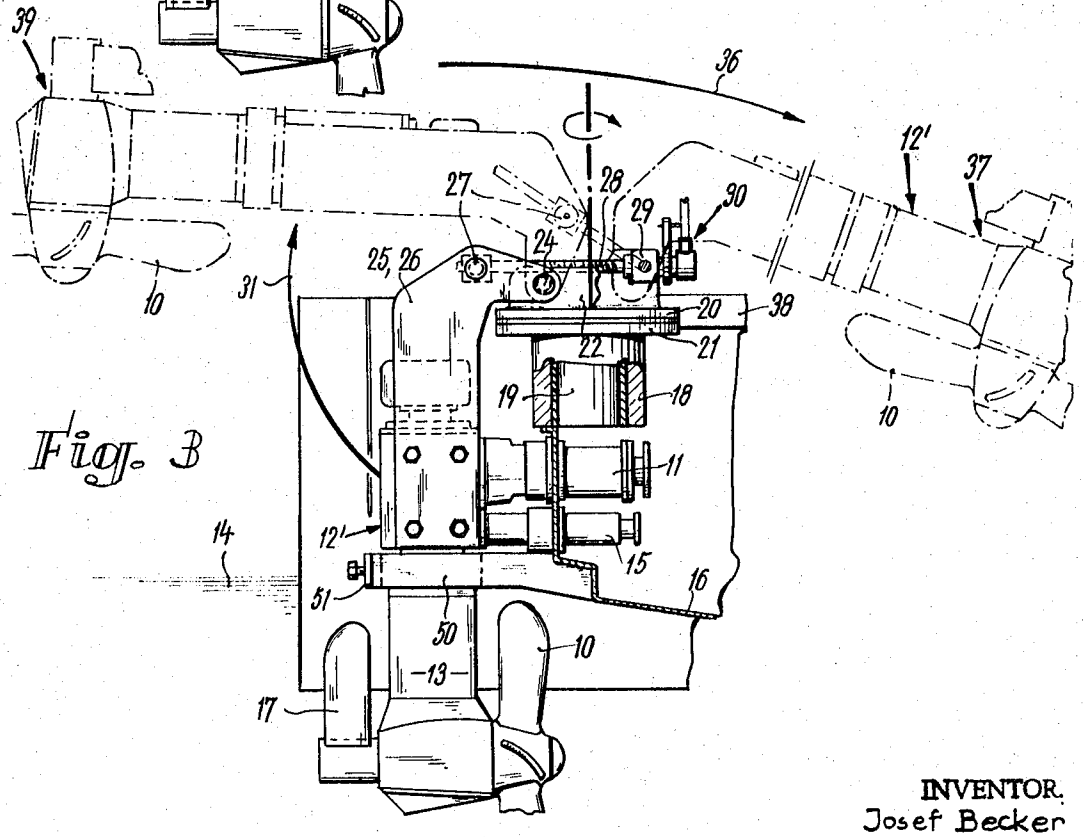

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Fig. 5

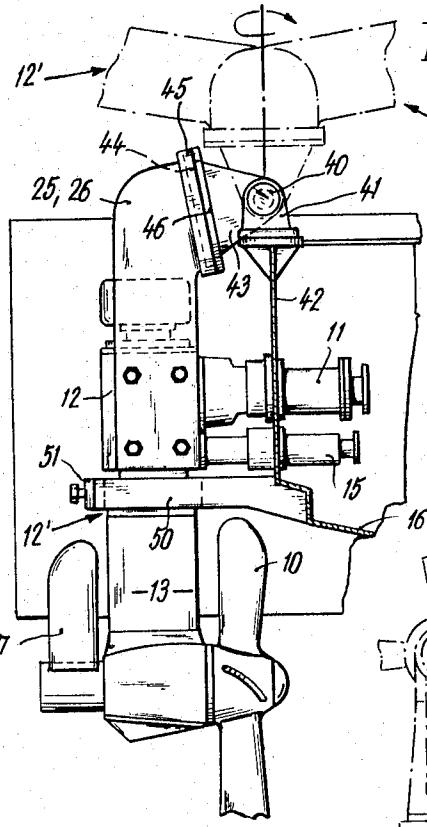


Fig. 6

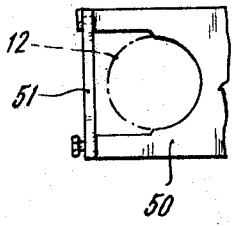
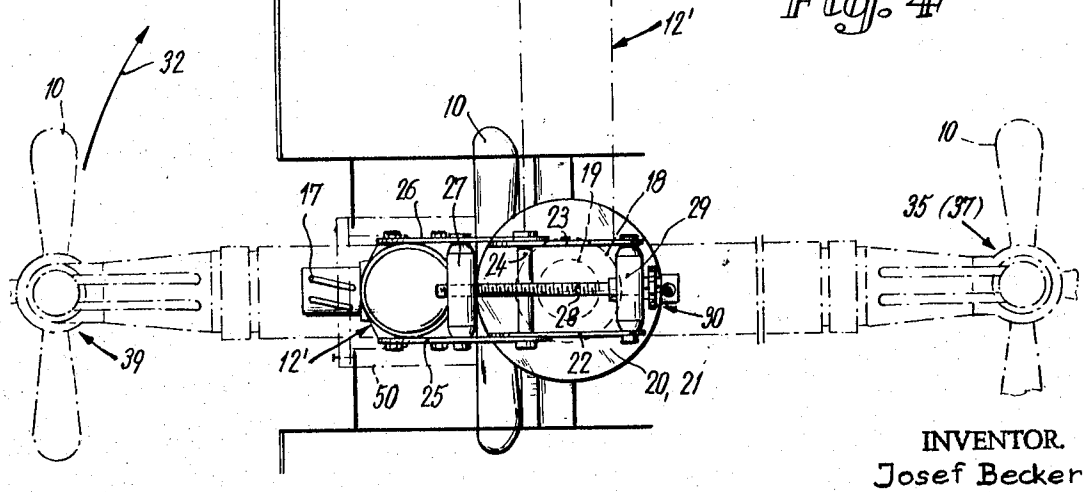


Fig. 4



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PROPULSION SYSTEM FOR WATERCRAFT

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Int. Cl. B63h 25/42, 21/26
U.S. Cl. 115—35 14 Claims

ABSTRACT OF THE DISCLOSURE

A propulsion system for watercraft wherein the propeller housing is turnable about horizontal and vertical pivot axes defined by pivots located above the water surface. By turning about the horizontal axis, the housing can move the propeller above the water surface and to a level above the adjoining part of the hull. By thereupon turning about the vertical axis, the housing can move the propeller to a position within the confines of the hull or adjacent to the one or the other side of the hull.

Background of the invention

The present invention relates to watercraft in general and more particularly to an improved propulsion system for watercraft. Still more particularly, the invention relates to a novel mode of installing an outboard propeller on the hull of a boat or the like.

It is already known to provide a boat with an outboard propulsion system which includes a housing for a propeller. The propeller is turnable about a vertical axis to effect changes in the direction of propulsion and the housing is tiltable or turnable about a transverse horizontal axis so that the propeller can be swung rearwardly and to a level above the water surface. The propeller and its housing are then more readily accessible for the purposes of inspection, repair or replacement. Furthermore, such lifting of the propeller is desirable in amphibious vehicles during travel on land, in shallow waters to avoid damage to the propeller and its housing, as well as during transportation of the boat on land or water.

As a rule, the housing is tiltable through an angle of 90 degrees so that it can be moved from a normal vertical position to a horizontal position in which the propeller is located above the water surface and is spaced from the stern of the boat. Therefore, the boat occupies more room when the propeller is lifted above the water surface and the propeller is not accessible to the occupants of the boat.

Accordingly, it is an important object of my invention to provide a propulsion system for watercraft wherein the propeller is mounted in such a way that it can be lifted above the water surface and is thereupon movable to a position within the confines of watercraft or adjacent to one side of the hull so that it can be readily reached by persons standing on land or by occupants of the craft.

Another object of the invention is to provide a propulsion system which does not occupy additional space when the propeller is moved to a position above the water surface so that the watercraft can be conveniently transported on land and that the thus lifted propeller is protected against accidental damage during storage of the craft or in transport.

A further object of the invention is to provide a novel system of pivots which connect the propeller housing of a propulsion system to the body of a watercraft.

An additional object of the invention is to provide a propulsion system of the above outlined character which can be installed in many types of small or large watercraft including pleasure boats, amphibian vehicles and others.

A concomitant object of the invention is to provide a propulsion system which can be installed in or on conventional watercraft.

Stillt another object of the invention is to provide a propulsion system whose propeller can be reached, inspected, repaired and/or replaced by occupants of the watercraft, either while the craft is docked or while the craft is remote from the shore.

Summary of the invention

Briefly stated, one feature of my invention resides in the provision of a propulsion system for watercraft which comprises a propeller housing having a lower portion turnable about a substantially vertical axis when the housing is held in its normal operative position, a propeller rotatably carried by the lower portion of the housing and normally located below the water surface, first pivot means defining a preferably horizontal first pivot axis about which the housing is turnable back and forth to respectively raise and lower the propeller above and below the water surface, and second pivot means defining a second pivot axis which is inclined with reference to the first axis and is preferably vertical. The housing is turnable about the second pivot axis to move the raised propeller to a position within the confines of or adjacent to the one or the other side of the hull.

One of the pivot means is mounted on the hull and carries the other pivot means, and the other pivot means carries the housing.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The improved propulsion system itself, however, both as to its construction and its mode of operation, together with additional features and advantages thereof, will be best understood upon perusal of the following detailed description of certain specific embodiments with reference to the accompanying drawing.

Brief description of the drawing

FIG. 1 is a somewhat schematic side elevational view of a propulsion system which embodies one form of my invention, the propeller being shown in its normal position below the water surface;

FIG. 2 is a top plan view of the structure shown in FIG. 1;

FIG. 3 illustrates the structure of FIG. 1 and further shows the propeller in two additional positions which are indicated by phantom lines;

FIG. 4 illustrates the structure of FIG. 2 and further shows the propeller in three additional positions which are indicated by phantom lines;

FIG. 5 is a side elevational view of a second propulsion system with the propeller shown in normal position, two additional positions of the propeller housing being indicated by phantom lines; and

FIG. 6 is a top plan view of a locating device which is utilized to hold the propeller in normal position.

Description of the preferred embodiments

Referring first to FIGS. 1 to 4, there is shown a portion of a watercraft having a body or hull **16** whose stern portion supports a propulsion system including a propeller **10**. The drive for the propeller **10** comprises an engine (not shown) and a transmission including a gear train, a system of Cardan shafts or analogous motion transmitting means arranged to rotate the propeller about a substantially horizontal axis when the propeller assumes the normal position shown in FIG. 1. In such normal position, the propeller **10** is located at a level below the water surface **14**. The aforementioned transmission be-

tween the propeller **10** and the engine comprises a clutch **11** and a system of gears installed in the upper portion **12** of a composite propeller housing **12'**. The lower portion **13** of the housing **12'** carries the bearings for the propeller shaft and is rotatable with reference to the upper portion **12** about a vertical first axis for the purpose of steering the craft during travel in water. Steering is effected by remote control from a control stand (not shown) through the intermediary of a suitable operative connection including a clutch **15**. Such connection may further include a system of Cardanic shafts and enables the person in charge to rotate the lower housing portion **13** and propeller **10** with reference to the upper housing portion **12** and hull **16**. The clutch **15** can transmit motion to a system of bevel gears in the lower housing portion **13** to change the angular position of this portion relative to the upper housing portion **12**. The heretofore described parts of the propulsion system are well known in the art and their exact construction forms no part of the present invention. Therefore, the engine, the control stand, the transmission between the engine and the propeller shaft, and the steering system are not shown in the drawing.

The lower portion **13** of the housing **12'** carries a stabilizer here shown as a skeg **17**. The devices **11** and **15** may be constituted by claw or gear clutches wherein the driving and driven parts are disengageable from each other. The clutch **15** is preferably a one-tooth gear clutch.

In accordance with an important feature of my present invention, the upper and lower portions of the housing are not only turnable relative to each other about a first axis, but the whole housing **12'** for the propeller **10** is turnable about two mutually inclined second and third axes which may but need not cross each other in space. The second axis is horizontal and the third axis is vertical and the two pivot means which define such axes are located at a level above the water surface **14**.

The pivot means which defines the vertical third axis includes a fixed pivot member here shown as a sleeve **18** which is affixed to the body or hull **16**, and a second pivot member or pintle **19** which is rotatable in the sleeve **18** and is provided with a flange **20** which carries the housing **12'** through the intermediary of the other pivot means. The latter comprises a first pivot element including two spaced bearing brackets **22, 23** welded or otherwise rigidly affixed to the flange **20** and a horizontal shaft **24** which is mounted in the brackets **22, 23** and extends transversely of the hull **16**. The second pivot element of the pivot means which defines the horizontal second axis includes two arms **25, 26** which are turnable on the shaft **24** and are rigid with the upper portion **12** of the housing **12'**. The flange **20** rests on and is rotatable relative to a collar **21** at the upper end of the sleeve **18**. The shaft **24** is located at a level above the clutches **11, 15** in a plane including the zones of separation between the driving and driven parts of these clutches. The driving parts are mounted on the hull **16**.

The driving or actuating means for turning the housing **12'** about the shaft **24** comprises a spindle nut **27** installed between the arms **25, 26** for rocking movement about a horizontal axis which is parallel with the axis of the shaft **24**, a spindle **28** which meshes with the nut **27** and is rotatable in a bearing **29** installed between the brackets **22, 23**, and a reversible drive including a gear **30** which serves to rotate the spindle **28**. The bearing **29** is rockable about an axis which is parallel to the axis of the shaft **24** and holds the spindle **28** against axial movement.

By driving the gear **30** through the intermediary of a lever **30*a***, the operator can cause the nut **27** to move toward the bearing **29** whereby the housing **12'** turns about the axis of the shaft **24** (see the arrow **31** in FIG. 3) and assumes the phantom-line position **39**. In such angular position of the housing **12'**, the propeller **10** is located above the water surface **14** and at a level above the upper edges of the hull **16**. In the next step, the pintle **19** is caused to rotate in the sleeve **18** to move the housing

12' in the direction of the arrow **32** (FIG. 4) first to a position **33** and thereupon in the direction of arrow **34** to the position **35**. In the position **33** of FIG. 4, the housing **12'** and propeller **10** are readily accessible from land at one side of the hull **16**. In the position **35**, the housing **12'** and its propeller are located within the confines of the hull **16** so that the propeller can be reached by the occupants of the watercraft. If desired, the spindle **28** is thereupon rotated in a direction to move the nut **27** away from the bearing **29** (see the arrow **36** in FIG. 3) so that the housing **12'** and propeller **10** assume the position **37**. In such position **37**, the housing **12'** can rest on a suitable support to relieve the intermeshing threads of spindle **28** and nut **29**. The driven portions of the clutches **11, 15** are automatically detached from the driving portions as soon as the housing **12'** begins to move in the direction indicated in FIG. 3 by arrow **31**.

It is clear that the purely mechanical drive **30, 30*a*** for the spindle **28** can be replaced by a pneumatic, hydraulic or electrical drive, and that a second drive can be provided to turn the housing **12'** about the common vertical axis of the sleeve **18** and pintle **19**. It is further clear that the axis of the sleeve **18** can intersect the axis of the shaft **24** as well as that the axis of the shaft **24** need not be exactly horizontal and/or that the axis of the sleeve **18** need not be exactly vertical. All that counts is to construct the pivot means including the parts **22–26** (or analogous pivot means) in such a way that the inclination of the pivot axis defined by the shaft **24** insures that the housing **12'** can move the propeller **10** above and below the water surface **14** to place the propeller into normal position and into a second or raised position in which the propeller is preferably located at a level above the hull **16** for movement to the position **33, 35** or **37**.

A very important advantage of my propulsion system is that the propeller **10** can be moved to the position **37** of FIG. 3 without necessitating turning of housing **12'** about the shaft **24** through more than about 90 degrees. All that is necessary is to lift the housing **12'** to the position **39** and to rotate it about the axis of the sleeve **18**. Furthermore, the provision of pivot means **18–21** renders it possible to move the housing **12'** to the position **33** of FIG. 3 in which the propeller **10** and the parts mounted in the housing portions **12, 13** are readily accessible from land when the watercraft is adjacent to a dock or pier. The housing **12'** can have a length of several meters, and it would be highly impractical to pivot such a large housing about a horizontal axis and through more than 90 degrees, i.e., to move the housing **12'** from the solid-line position of FIG. 3 to the position **37** solely in response to turning about the shaft **24**. Moreover, and since the interior of the housing **12'** is normally accessible from the left-hand side, as viewed in FIG. 1, turning of the housing **12'** from the solid-line position of FIG. 3 directly to the position **37** would prevent access to the interior of the housing because the accessible side would face downwardly. The pivot means **18–21** contributes significantly to mobility of the housing **12'** by enabling the operators to move the housing to a large number of selected positions without necessitating lifting of the propeller **10** well above the upper edge **38** of the hull.

In the embodiment of FIGS. 1 to 4, the pivot means **22–26** which defines a horizontal second axis supports the housing **12'** and is supported by the pivot means **18–21** which latter defines the vertical third axis. FIG. 5 illustrates a second embodiment of my propulsion system wherein the pivot means which defines the horizontal second axis is mounted on the body of the watercraft and supports the propeller housing through the intermediary of the third pivot means.

The fixed pivot element of the second pivot means includes brackets **41** which are affixed to the body **42** of the watercraft and carry a horizontal shaft **40** which extends transversely of the hull. The second pivot element includes

arms 43 which are turnable on the shaft 40 and carry the first member 46 of the third pivot means. The member 46 carries a disk 44 which separates it from a second pivot member 45 provided on the housing 12'. The common axis of the parts 44–46 constitutes a pivot axis for the housing 12' and the latter is movable to the position 139 by turning about the shaft 40. In response to turning about the axis of the parts 44–46, the housing 12' is thereupon turnable to the position 135 in which the propeller 10 is located within the confines of the body 42. Of course, the housing 12' can be arrested in one or more intermediate positions so that the propeller can be reached from land by persons standing at the one or the other side of the hull. The pivot members 44, 46 preferably resemble flanges and the flange 45 is shown as forming an integral part of the upper housing portion 12.

The watercraft is preferably provided with suitable locating means for holding and locking the propeller housing 12' in normal position. As shown in FIG. 6, such locating means may comprise a bifurcated member 50 which is affixed to the stern of the boat and can accommodate a portion of the propeller housing 12'. A removable bar 51 holds the housing 12' in illustrated position. The member 50 preferably accommodates an intermediate part of the housing 12' directly above the lower portion 13. An important function of the member 50 and bar 51 is to insure proper engagement between the driving and driven portions of the clutches 11, 15 when the housing 12' is maintained in the solid-line position of FIG. 1 or 5.

The structures shown in FIGS. 1–4 and in FIG. 5 may be provided with suitable retaining means for releasably or yieldably holding the housing 12' in one or more selected positions (such as the positions 39, 33, 35, 37, 139, 135). The retaining means may include depressible stop pins, fixed stops, chains, pivotable clamps or the like. One such retaining means is shown in FIG. 3 and includes a yoke 55 fixed to the boat portion 38 to straddle an intermediate part of the housing 12' in the position 37. It is also possible to utilize retaining means in the form of spring-biased detent devices. For example, the sleeve 18 of FIG. 1 can carry one or more spring-biased balls each of which enters a complementary notch in the periphery of the pintle 19 in response to rotation of the pintle through 90 degrees or through a whole multiple of 90 degrees. Such ball or balls will automatically hold the housing 12' in the positions 39, 33, 35 of FIG. 4 and also in the position 37 of FIG. 3.

Fixed retaining means are normally provided for the end positions of the housing 12' and yieldable or readily disengageable retaining means can be used to hold the housing in one or more intermediate positions. The position 37 of FIG. 3 can be said to constitute an end position and the position 39 or 33 of FIG. 4 is an intermediate position. The provision of fixed, yieldable and/or removable retaining means is of advantage by insuring that the housing 12' will not move in the course of inspection or repair work.

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 which fairly constitute essential characteristics of the generic and specific aspects of my contribution to the art.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims.

I claim:

1. In a watercraft, a propulsion system comprising a propeller housing having an upper portion and a lower portion; first pivot means between said upper and said lower portions of said housing, said first pivot means defining a first axis which during operation of the watercraft is substantially vertical and about which said lower portion is turnable relative to said upper portion; propeller means rotatably carried by said lower portion and normally located at a level below the water surface so that by turning said lower portion of said housing about said first axis the watercraft may be steered; second pivot means defining a second axis extending transverse to the first axis, said housing being turnable about said second axis to respectively raise and lower the propeller means above and below the water surface; and third pivot means defining a third axis extending transverse to said second axis, said housing being turnable about said third axis after being lifted out of the water by being turned about said second axis.

2. A propulsion system as defined in claim 1, wherein said third axis is at least nearly normal to said second

3. A propulsion system as defined in claim 1, wherein said third axis is at least nearly vertical.

4. A propulsion system as defined in claim 1, wherein said second axis is substantially horizontal and said third axis is substantially vertical.

5. A propulsion system as defined in claim 1, wherein said second and third axes cross each other in space.

6. A propulsion system as defined in claim 1, wherein said third pivot means comprises a fixed pivot member and a second pivot member which is turnable with reference to said fixed pivot member about said third axis, said second pivot means comprising a first pivot element carried by said second pivot member and a second pivot element turnable with reference to said first pivot element about said second pivot axis, said housing being carried by said second pivot element.

7. A propulsion system as defined in claim 6, wherein the fixed pivot member of said second pivot means comprises a sleeve affixed to the body of the watercraft and said second pivot member includes a pintle which is rotatable in said sleeve.

8. A propulsion system as defined in claim 7, wherein said pintle has a flange which supports said first pivot element.

9. A propulsion system as defined in claim 1, wherein said second pivot means comprises a fixed pivot element and a second pivot element which is turnable with reference to said first element about said second axis, said second pivot means comprising a first pivot member carried by said second pivot element and a second pivot member turnable with reference to said first pivot member about said third axis, said housing being carried by said second pivot member.

10. A propulsion system as defined in claim 1, wherein said third pivot means carries the second pivot means and wherein said second pivot means carries said housing.

11. A propulsion system as defined in claim 1, further comprising means for releasably locking said housing in at least one selected angular position with reference to at least one of said second and third axes.

12. A propulsion system as defined in claim 1, wherein said housing is pivotable about each of said second and third axes to a plurality of predetermined positions, and further comprising means for releasably locking the housing in at least one selected position.

13. A propulsion system as defined in claim 1, further comprising locating means for releasably holding said housing in a position in which said propeller means is located below the water surface.

14. A propulsion system as defined in claim 1, further comprising drive means for turning said housing at least about one of said second and third axes.

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U.S. Cl. X.R.

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