Dec. 19, 1967 A. J. CURTISS ETAL 3,358,636

SELF-PROPELLED WATER VEHICLE

Filed March 21, 1966 2 Sheets-Sheet 1

FIG. 1

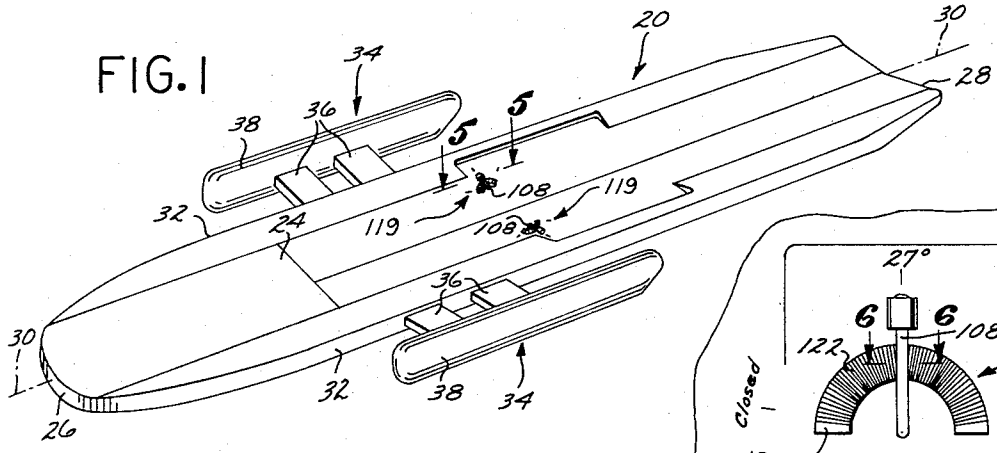


FIG. 5

FIG. 2

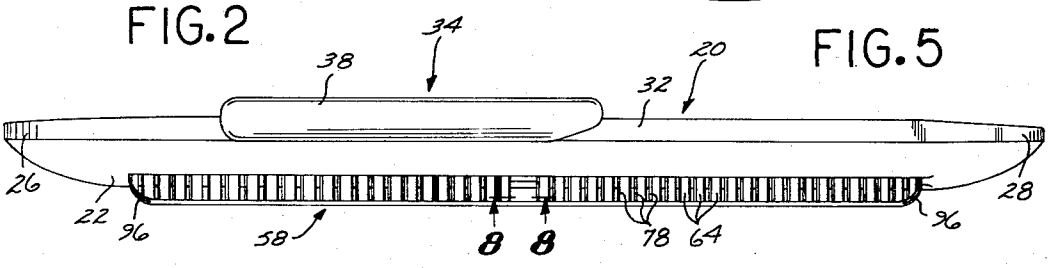


FIG. 3

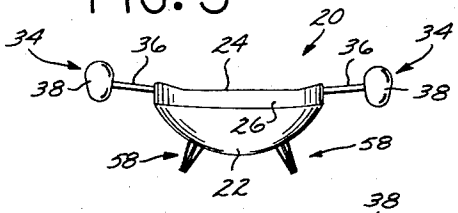
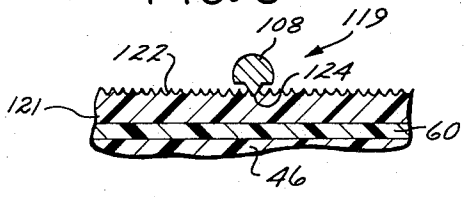


FIG. 6



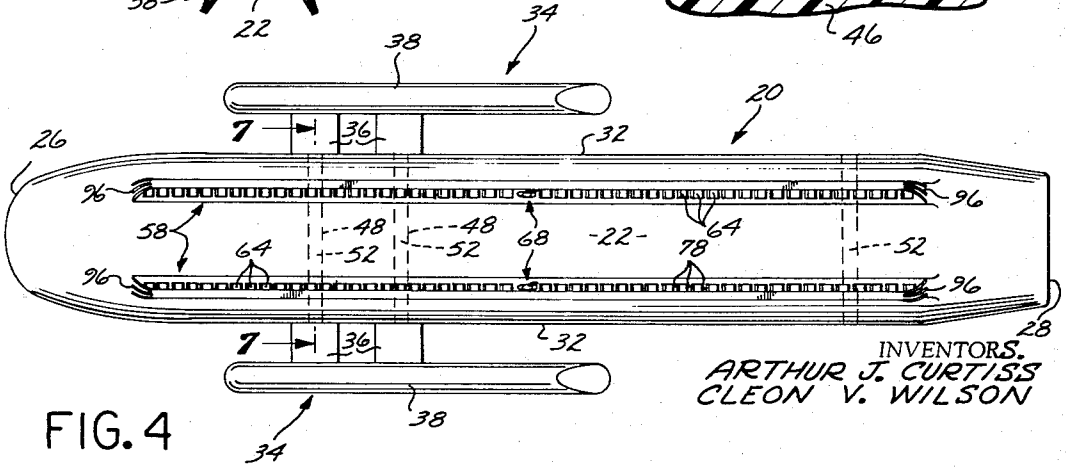


FIG. 4

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FIG. 7

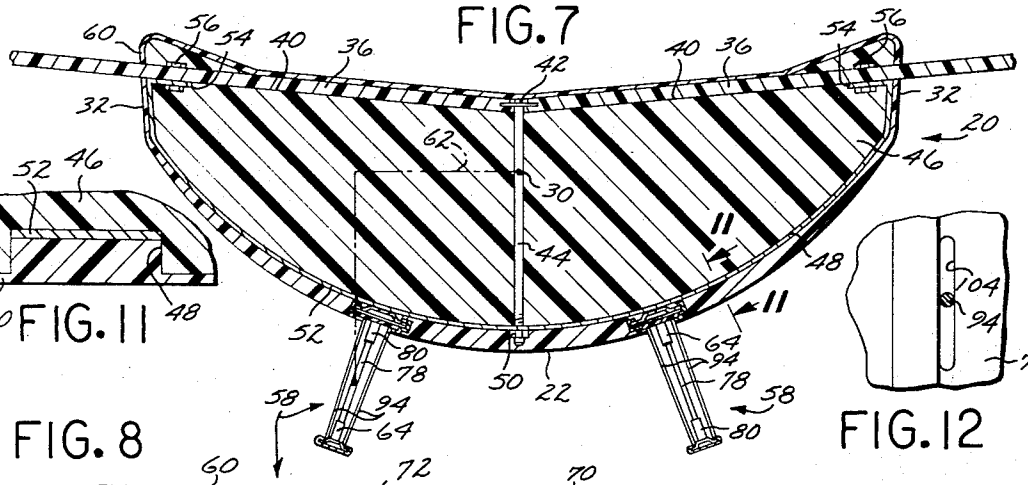


FIG. 11

FIG. 12

FIG. 8

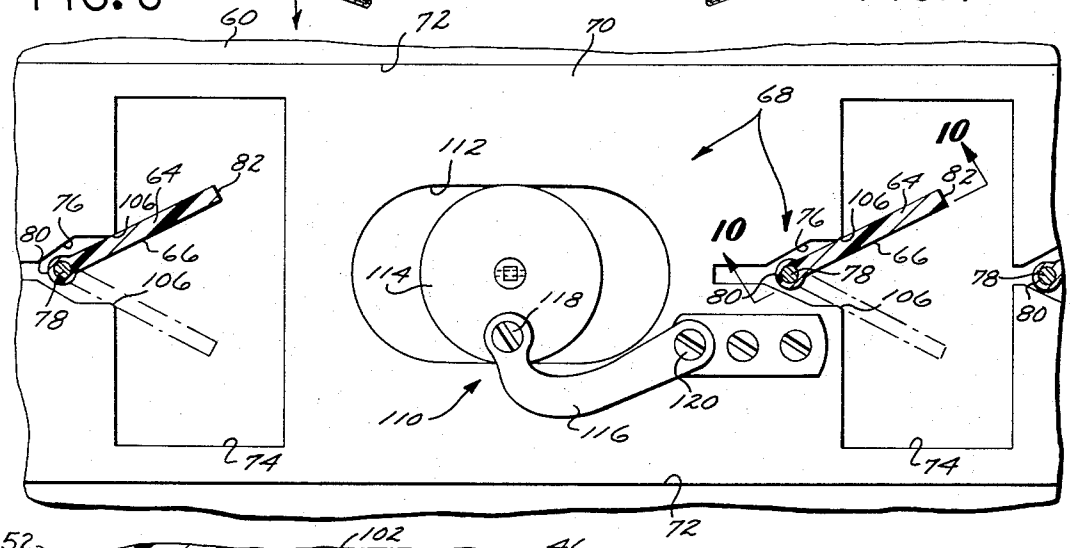


FIG. 9

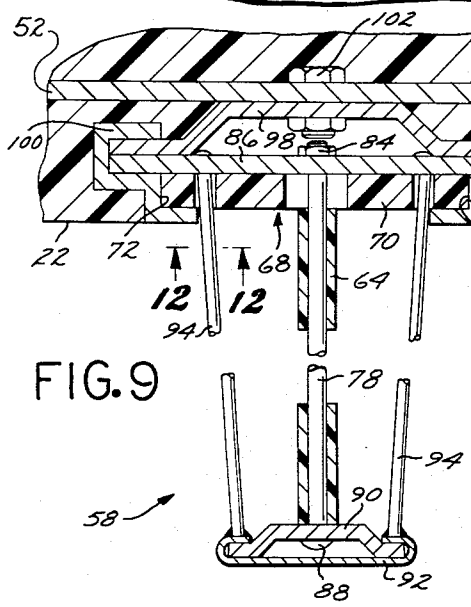
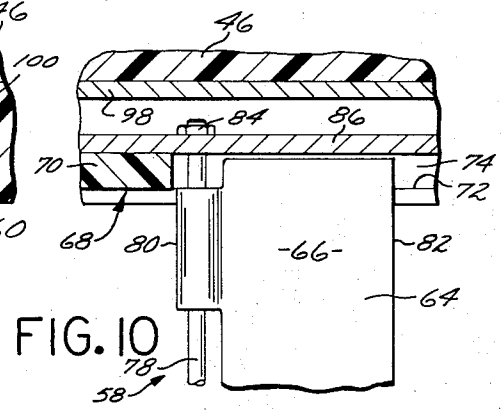


FIG. 10



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3,358,636

SELF-PROPELLED WATER VEHICLE

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Filed Mar. 21, 1966, Ser. No. 535,779
13 Claims. (Cl. 115—28)

ABSTRACT OF THE DISCLOSURE

A water vehicle including an elongate, buoyant, low-draft body having a plurality of freely pivoted vanes disposed in longitudinally spaced relationship therebelow which are adapted to oscillate within predetermined degrees of an arc when a person standing on said body rocks the same transversely about the centerline thereof, with said oscillation of said vanes propelling said body forwardly at a velocity related to the rapidity with which said body is rocked.

In other words, the novel self-propelled water vehicle of the present invention does not require the use of auxiliary oars or any other separate auxiliary propelling member or members in the convetnional manner of boats employing paddles, oars, or the like, but provides a completely self-contained water vehicle which merely requires that such oscillatory rocking motion around a longitudinal fore-and-aft axis may be imparted thereto in order to bring about the effective forward propulsion of the water vehicle through the water, thus providing a very interesting and novel type of self-propelling water vehicle which may be employed wherever such propulsion is desired, and is particularly useful in a water vehicle of an amusement type similar in construction to a surfboard, or the like—in other words, comprising a longitudinal low-draft vehicle body member of buoyant material having an effective average density less than that of water and upon which a person (or, in certain cases, more than one person) can stand, sit, lie, kneel, or otherwise be positioned while indulging in water sports, or the like, usually while wearing a bathing suit.

Thus it will be understood that the device may be used for purposes very similar to a conventional surfboard, or the like, but has the additional advantage of being capable of self-propulsion whenever a person positioned thereon desires to achieve forward movement through the water, and this merely requires that the person laterally rock the water vehicle in an alternating manner. This is considerably simpler to do than the conventional practice with a prior art surfboard of lying on the surface of the surfboard and paddling the adjacent water with one's hands and arms in a motion simulating that employed in conventional overhand or crawl-type swimming, which is a rather exhausting action to continue for any length of time. Therefore, it will be understood that the novel water vehicle of the present invention may be employed for all of the conventional purposes of such a surfboard, and when positive self-propulsion is desired, this may be achieved in a much simpler manner than with a conventional surfboard.

Also, it should be clearly understood that the self-propelled water vehicle of the present invention is not limited to use as a water amusement device in the manner generally referred to above, but may be employed whereever such a low-draft water vehicle is to be self-propelled through a body of water.

With the above points in mind, it is an object of the present invention to provide a novel self-propelled water vehicle of the character referred to herein generically and/or specifically, and which may include any or all of the

features referred to herein, individually or in combination, and which is of relatively simple, inexpensive, easy-to-operate construction adapted for ready mass manufacture at a moderate cost per unit, whereby to be conducive to the widespread manufacture, distribution, and use of the invention.

Further objects are implicit in the detailed description which follows hereinafter (which is to be considered as exemplary of, but not specifically limiting, the present invention), and said objects will be apparent to persons skilled in the art after a careful study of the detailed description which follows.

For the purpose of clarifying the nature of the present invention, one exemplary embodiment of the invention is illustrated in the hereinbelow-described figures of the accompanying two sheets of drawings and is illustrated in detail hereinafter.

FIG. 1 is a greatly-reduced-size, three-dimensional pictorial perspective view of one exemplary embodiment of the invention as viewed from a position above, at one side of, and slightly in front of said exemplary embodiment of the invention.

FIG. 2 is a near side elevational view of the form of the invention illustrated in FIG. 1.

FIG. 3 is a front elevational view of the exemplary first embodiment of the invention.

FIG. 4 is a bottom plan view of the exemplary first form of the invention.

FIG. 5 is an enlarged fragmentary top plan view taken substantially in the direction of the arrows 5—5 of FIG. 1 and illustrates an exemplary one of the pair of control handles or levers which operate the pair of underlying traction vane means for the purpose of adjusting the magnitude of the forward traction which will be provided by said underlying traction vane means when oscillatory rocking motion around a longitudinal fore-and-aft axis is imparted to the entire water vehicle while floating in a body of water. It should be understood that the other control handle or lever means shown at the near side of FIG. 1 is of similar construction, although positionally reversed.

FIG. 6 is a further enlarged fragmentary sectional view taken substantially along the plane indicated by the arrows 6—6 of FIG. 5.

FIG. 7 is an enlarged fragmentary view taken substantially along the plane indicated by the arrows 7—7 of FIG. 4.

FIG. 8 is a greatly enlarged fragmentary bottom view looking upwardly taken substantially along the plane indicated by the arrows 8—8 of FIG. 2 and clearly illustrates the controllable adjustment of the traction vane travel limiting or positioning control means and the coupling means coupling the longitudinally shiftable slider member thereof with respect to the top-positioned corresponding control lever or handle, such as the exemplary one shown in FIGS. 5 and 6.

FIG. 9 is a view of an exemplary one of the two traction vane means shown at the bottom of FIG. 7 enlarged substantially and with central portions thereof broken away for drawing space conservation reasons and also rotated from the true angular position thereof as shown in FIG. 7 into a rectilinearly erected position, also for drawing space conservation reasons. It should be clearly understood that the structure illustrated fragmentarily in FIG. 9 is illustrative of either the left traction vane means of FIG. 7 or the right traction vane means of FIG. 7 and is intended to provide a full and complete disclosure of each of said traction vane means.

FIG. 10 is a fragmentary view, partly in elevation and partly in section, and with the bottom portions thereof broken away for drawing space conservation reasons,

taken substantially along the plane indicated by the arrows 10—10 of FIG. 8, and clearly illustrates the pivotal mounting of a typical one of the traction vane members and the longitudinally slidable mounting relative thereto of the corresponding longitudinally shiftable slider member carrying the corresponding vane travel limiting means for controllably adjusting the amount of vane travel around the vertical pivot pin which is permitted and which, of course, is adjusted in order to provide variations in the forward thrust.

FIG. 11 is an enlarged fragmentary cross-sectional view taken substantially along the plane indicated by the arrows 11—11 of FIG. 7 and illustrates an exemplary highly-advantageous constructional detail of the exemplary embodiment of the invention illustrated.

FIG. 12 is an enlarged fragmentary bottom view looking upwardly substantially along the plane indicated by the arrows 12—12 of FIG. 9, and it should be understood that it is representative of the view which would be seen from a corresponding position at the other side of the structure shown in FIG. 9 and of the view which would be seen at both the left and right sides of the other traction vane means of FIG. 7 and, thus, is to be considered as illustrative of all four of same.

Generally speaking, the self-propelled water vehicle of the present invention may be said to comprise a longitudinal low-draft vehicle body member 20 which may be made of buoyant material having an effective average density less than that of water. This may be accomplished by employing a plastic foam material such as polyurethane foam, polyvinyl foam, or any of the other cellular plastic materials, or the like, characterized by having a large percentage of voids interconnected by cell wall portions and, thus, providing a very low effective average density material. Said cellular plastic material is preferably of the non-communicating-cell type since this provides an ideal multi-sealed-compartment buoyant material. However, cellular plastic material of the communicating-cell type may also be employed, and preferably provided with means for excluding the entry of water into the communicating cells thereof.

When the body member 20 is made of such foam material, the outer surface of the body member 20 is normally effectively surface-sealed so as to seal and close off all open cells at the surface of the body member 20 so as to prevent the entry of water thereinto and the semi-saturation of the cellular plastic material which would have the effect of greatly increasing the average density thereof, perhaps to the point where the body member 20 would no longer be buoyant. This is extremely important when the foam material is of the communicating-cell type referred to hereinbefore. However, such surface-sealing is of somewhat lesser importance when the foam material is of the non-communicating-cell type since water cannot penetrate very far into the surface thereof. However, even such small-extent penetration of the water can be prevented by surface-sealing such foam material of the non-communicating-cell type and, therefore, is usually preferable.

Such closure of surface cells may be provided in any of several different manners such as by spraying same or otherwise coating same with a sealing layer of plastic material, mastic material, paint, epoxy resin, or the like, or an actual layer of thin plastic film may be cemented, heat-sealed, or otherwise effectively joined to the outer surface of the cellular plastic material in order to provide such a sealed and water-impervious outer surface.

The above-mentioned sealing arrangements are of practical importance since they maintain the inherent buoyancy of the body member 20 but they do not touch upon the real inventive concept of the present invention and, therefore, are not shown in great detail in the drawings. In fact, the reference numeral 20 is to be construed as generally designating any of the types of surface-sealed plastic foam material comprising the body member and the sealing of the surface cells thereof is to be construed as being provided in the structure generally shown at 20 when such cellular plastic material is employed as the major material thereof.

However, it should be noted that the effective average density of the body member 20 specified above as being less than that of water may be achieved in another way—that is, by employing materials of greater density than water but defining a hollow interior within the body member 20. This is, of course, capable of producing an effective average density less than that of water so that the entire body member 20 will be buoyant and will float in water. Either type of construction mentioned above, or any other equivalent type of construction, of the vehicle body member 20 is intended to be included and comprehended within the scope of the disclosure provided by the drawings and specification when considered in the light of the above clarifying explanation.

In the exemplary form of the invention illustrated, the body member 20 has an effectively downwardly convex bottom surface 22 and has a slightly concave top surface 24, although the invention is not specifically so limited, and various other configurations are within the broad scope of the present invention. Also, in the example illustrated, the body member 20 is of longitudinal configuration having a front end 26 and a rear end 28 and with the body member 20 being symmetrical on each side of a longitudinal fore-and-aft axis such as is indicated at 30 in FIGS. 1 and 7.

In the exemplary form of the invention illustrated, the body member 20 also has side edges 32, each of which is provided with oppositely and outwardly directed stabilizing outrigger means, such as is generally designated at 34 in each case, and which includes a pair of connection members 36 firmly carrying the longitudinal buoyant outrigger float member 38 at the outer ends thereof and which has the inner ends thereof extended into the corresponding parts of the side edge 32 of the body member 20 for firmly fastened engagement with respect to the body member 20 in the manner best shown in FIG. 7 wherein two of the four multiple connection members 36 are shown as being extended inwardly through a groove or slot at the location indicated at 40 of the corresponding side of the body portion 20 to a central position where the inner ends of the two connection members 36 abut each other and are fastened by the head member 42 of fastening bolt 44, which extends vertically centrally downwardly through the center part of the inner plastic foam material 46 of the body member 20 to a lower bottom location within a pair of arcuate laterally directed grooves, such as are shown in broken lines in FIG. 4 at 48 and one of which is shown partially in cross-section in FIG. 11, where a nut 50 fastens the lower end of the bolt 44 to the outside of a metal reinforcing member 52, which lies in the corresponding arcuate groove 48 and which has its outer ends 54 fastened by corresponding fastening means 56 to corresponding outwardly displaced portions of the corresponding outrigger connection members 36, as is most clearly shown at the upper left and upper right sides of FIG. 7. This provides a very strong structural coupling attachment of the outrigger means 34 with respect to the body portion 20 and also, as is best illustrated in FIG. 9, provides a structurally strong means for mounting each of the traction vane means, generally designated at 58, relative to the bottom 22 of the body member 20. This will be described in greater detail hereinafter.

It should be noted that an exterior epoxy resin coating 60 is applied over the complete exterior of the plastic foam 46 of the body member 20 and also over each of the two metal fastening hoops 52 and the corresponding grooves 48 after the two outrigger means 34 and the two traction vane means 58 are mechanically fastened in place. This provides a completely-sealed exterior surface to the body member 20 and, at the same time, very

firmly and positively fastends the two outrigger means 34 and the two traction vane means 58 relative to the body member 20.

Each of the two traction vane means 58 is effectively mounted by the type of mounting structure best shown in FIG. 9 in a position below the curved bottom 22 of the body member 20 and in a position laterally displaced from the previously-mentioned longitudinal fore-and-aft axis 30 of the body member 20 by a distance such as that indicated in broken rectilinear component lines at 62 in FIG. 7 and which may be said to effectively define and/or indicate the pivot arm of said traction vane means when oscillatory rocking motion is imparted to the body member 20 around said longitudinal fore-and-aft axis 30 of the body member 20 by a person positioned on the top surface of the body member 20. Whenever this occurs, it is obvious that a first side of the body member 20 will arcuately rock or pivot downwardly around the longitudinal fore-and-aft axis 30 to a substantial degree, while the other or second side of the body member 20 will arcuately rise correspondingly, followed by the exact reversal of this action when the second side becomes arcuately depressed and the first side arcuately rises. Each time this occurs, the corresponding traction vane means 58 will move downwardly and inwardly until it is substantially on the vertical center line of FIG. 7—that is, until the depressed traction vane means 58 lies at the lowest possible position within a body of water. Immediately thereafter, the depressed traction vane means will arcuately rise and the other traction vane means 58 will be arcuately depressed to said maximum depth position.

The alternating inward and downward movement of each of the two traction vane means 58 as a result of the imparting of such oscillatory lateral rocking motion to the body member 20 around the longitudinal fore-and-aft axis 30 will cause the plurality of traction vane members 64 pivotally carried by the corresponding traction vane means 58 to be moved arcuately laterally through the underlying water, and, of course, the pressure of the water during such movement will strike the corresponding surface, such as that shown at 66 in FIG. 8, of each of the traction vane members 64 and will deflect it in the direction opposite to the arcuate movement of the corresponding traction vane means 58 to whatever angular extent is permitted by the positionally adjustable traction vane travel limiting means generally designated at 68. In other words, when said traction vane movement limiting means 68 is in one adjusted position, the free lateral movement of each traction vane member 64 may be at a minimum value for providing a certain degree of forward thrust (forward reaction thrust), which will be to the left as viewed in FIG. 8, while adjustment of the traction vane travel limiting means 68 toward another extreme will provide virtually 180 degrees of freedom for each traction vane member 64, which, therefore, will provide no forward thrust at all as a result of such lateral arcuate movement through underlying water.

We have found through experimentation that a substantially maximum thrust is provided when the included angle through which each traction vane member 64 is permitted to freely rotate is of approximately 54 to 55 degrees, and when the traction vane travel limiting means 68 is so positioned as to provide for just such a 54 to 55 degree include angle freedom for rotation of each traction vane member 64, the previously-mentioned lateral rocking motion of the body member 20 of the water vehicle, imparted thereto by a person positioned on top of said body member 20, will produce a maximum forward thrust (leftward thrust, as viewed in FIG. 8) of a magnitude sufficient to bring about a very effective forward propulsion of the entire water vehicle through a body of water.

On the other hand, when the traction vane travel limiting means 68 is adjusted so as to provide virtually a 180-degree included angle of rotary freedom for movement of each traction vane member 64, no amount of rocking oscillatory motion of the body member 20 produces any substantial measure of forward thrust.

From the above general description of the principle of operation of the pair of traction vane means 58, it will readily be understood that if one traction vane means 58 is adjusted for maximum thrust while the other is adjusted for minimum or no thrust, and the body member 20 is laterally rocked on the water, the maximum-thrust-adjusted traction vane means 58 will tend to move forwardly through the water while the minimum-thrust-adjusted traction vane means 58 will tend to remain relatively stationary in the water, thus producing a very abrupt and sharp turning movement of the entire water vehicle in the water. This makes it possible to turn the water vehicle in either direction very quickly, if desired.

In the exemplary form of the invention illustrated, the traction vane travel limiting means 68 for each of the two different traction vane means 58 comprises a longitudinally shiftable slider member 70 which is slidably mounted in a track member 72 for longitudinal slidable movement, and which has a rectangular cut-out portion 74 with an angularly converging slotted forward portion 76 forwardly passing around and on each side of the front positioned vertical pivot pin 78 mounting the front edge 80 of the corresponding traction vane member 64, and with the rear freely movable edge 82 of each traction vane member 64 being positioned so that its top edge lies in the rectangular cut-out portion 74.

Of course, each traction vane member's front pivot pin 78 is non-shiftably mounted and is fastened at the top by a nut 84 to a non-movable metallic member 86 and is fastened at the bottom by the pivot pin bolt head 88 to another non-movable longitudinal metallic member 90. The longitudinal member 90 is additionally provided with a bottom channel member 92 and a pair of outer reinforcing struts 94 connecting same to the previously-mentioned upper fixed metallic member 86, thus providing what might be termed a very rigid protective guard rail means for protecting the plurality of vane member 64 from damage and having an arcuate front and rear end portion 96 which extends upwardly so as to protect each of the two opposite end traction vane means 64.

The entire traction vane means 58 in each case is fastened by an upper outwardly flanged channel member 98 positioned within the inwardly directed retaining portion 100 of the previously-mentioned track member 72 and firmly bolted or otherwise mechanically fastened as indicated at 102 to the two previously-mentioned arcuate structural hoop member 52.

After all of the above-mentioned mounting is accomplished, epoxy resin is positioned in the two grooves 48, as best indicated at 60 in FIG. 11, in addition to being applied over the entire body member 20, thus firmly cementing and locking each of the traction vane means 58 in laterally arcuately offset mounted relationship underneath the arcuate bottom 22 of the body member 20. However, the important point to note is that the previously-mentioned longitudinally shiftable slider member 70 is free for longitudinal movement relative to the protective strut members 94 by reason of the provision of corresponding longitudinal slots 104, an exemplary one of which is most clearly shown in FIG. 12, and by reason of the fact that each of the fixed pivot pins 78 lies in the corresponding forwardly directed angular cut-out 76 of the slider member 70.

Thus, when either slider member 70, such as the one most clearly shown in FIG. 8, is moved forwardly or toward the left, as shown in FIG. 8, the angular cut-out portion 76 moves toward the left relative to the pivot pin 78 and, this moves the vane stop corners or angular constraint means 106 toward the left, also as viewed

in FIG. 8, which has the effect of increasing the angular extent of the included angle of free movement permitted to each of the corresponding vane members **64**. In fact, said slider member **70** may be moved forwardly, or toward the left as viewed in FIG. 8, to an extent such that each of the vane members **64** will have virtually 180 degrees of freedom and, on the other hand, said slider member **70** may be moved rearwardly, or toward the right as viewed in FIG. 8, to an extent such as to virtually prevent any substantial lateral pivotal movement of each of the traction vane members **64**. In the position illustrated in FIG. 8, said slider member **70** has been moved to the maximum thrust position which corresponds to an included angle of traction vane rotary freedom of approximately 54 to 55 degrees.

The longitudinal shifting of the slider member **70** is accomplished in the exemplary form of the invention illustrated by a top-positioned operating lever means of which there are two, as indicated at **108** in the exemplary form of the invention illustrated, and each of which is provided with a coupling means such as is generally indicated at **110** with respect to an exemplary one of the two coupling means **110** in FIG. 8. Each of the operating levers **108** is laterally directed and extends vertically downwardly through the corresponding side part of the body member **20** and through a cut-out slot **112** in the corresponding slider member **70**, as is best shown in FIG. 8, and is there provided with an effective rotary crank member **114** provided with an off-center connecting rod **116** pivotally connected, as indicated at **118**, thereto at one end and pivotally connected, as indicated at **120**, at the other end to the longitudinal slider member **70**.

Thus, it will be understood that rotation of the rotary crank member **114** in one direction, such as a clockwise direction as viewed in FIG. 8, will cause the slider member **70** to be shifted forwardly or toward the left, while rotation of said crank member **114** in the opposite direction, such as a counter-clockwise direction as viewed in FIG. 8, will cause the slider member **70** to be shifted rearwardly or toward the right, as viewed in FIG. 8. Thus, it will be understood that corresponding movement of either of the top-positioned levers **108** will cause the desired forward or reaward shifting of the corresponding underlying slider member **70**, which will correspondingly modify the permissible angular deflection extent of the corresponding assembly of traction vane members **64** for the purpose of providing maximum or minimum forward thrust or any magnitude thereof between said maximum and minimum values, and this can be done independently for each of the two traction vane means **58**.

It should be noted that once either traction vane means **58** has been adjusted by adjustment of the corresponding operating lever **108**, it will remain in the adjusted position because of the fact that each of the operating levers **108** is provided with locking means for locking same in any adjusted position. This locking means is most clearly shown with respect to an exemplary one of the two locking levers **108** in FIGS. 5 and 6 wherein the locking means is generally designated by the reference numeral **119** and comprises an arcuate locking panel **121** having a plurality of radially arranged locking serrations **122** on the upper surface thereof and wherein the underside of the locking lever **108** is provided with a corresponding engaging edge **124** adapted to normally be resiliently engaged within any one of the radial locking serrations **122**, as is perhaps best shown in FIG. 6. This arrangement is such that the locking lever **108** may be moved by manually forcibly overriding the locked engagement most clearly shown in FIG. 6 so that adjustment of either traction vane means **58** may be effected. However, as soon as the forcible manual overriding movement of the corresponding locking lever **108** has ceased, the locking engagement of the edge **124** and any one of the radial serrations **122** again takes over and maintains the adjusted position until further later manual readjustment is again effected.

It should be noted that, if desired, both of the two traction vane means **58** may be removed by merely constructing the arcuate front and rear end portions **96** of the outer reinforcing struts **94**, the struts **94** themselves, and the members **86** in a manner which is not rigidly connected relative to the arcuate bottom **22** of the body portion **20** and which is capable of being longitudinally slidably moved relative thereto and relative to the track member **72** and the inwardly directed retaining portion **100** thereof so that the member **86** carrying said reinforcing struts **94**, the slider member **70**, and all portions of each traction vane means **58** therebelow can be longitudinally slidably moved out of engagement with the corresponding track members **72** and can be longitudinally slidably re-engaged therewith when desired. This will make it possible to remove the traction vane means **58** when the device is to be transported or stored and when it is thought that said traction vane means **58** might be damaged or injured thereby. Of course, subsequently each of the two traction vane means **58** may be re-engaged when the entire water vehicle is to be used. Means for positively locking each traction vane means **58** in the fully-engaged relationship illustrated in the figures of the drawing and capable of being unlocked to allow each traction vane means **58** to be removed, when desired, may also be employed and may assume a variety of different forms, all within the broad scope of the present invention.

It should be understood that the longitudinal paired arrangement of the traction vane means **58** of the exemplary form of the invention illustrated, with each traction vane means **58** including a plurality of longitudinally spaced vane members **64** pivoted around pivot pins **78** which are substantially vertically oriented, is merely one advantageous arrangement and is not to be construed as specifically limiting the invention thereto. For example, it should be noted that it is possible to position the traction vane members **64** so that the pivot pins **78** are vertical, horizontal, or any other angle between vertical and horizontal just as long as they project outwardly from the body member **22** and are substantially transverse with respect to the plane of arcuate movement of each vane member **64**, and the language used in this application is to be broadly construed in the light of the explanation just given and, in particular, the word "vertical," with respect to the pivot pins **78**, is to be broadly construed as meaning "transverse" as just referred to. Also, it should be noted that the invention is not limited to the use of two traction vane means **58**, but might employ one such traction vane means **58** or any other desired number thereof. Additionally, it should be noted that the plurality of vane members **64** is not limited to being longitudinally spaced but may be spaced in various other directions or manners and will still be fully operative for the purposes of the present invention. Also, the number of such vane members **64** may be increased or decreased so as to comprise any arrangement from a single large vane member to a large number of relatively small vane members in various different forms of the present invention. Also, various other modifications of the structure wherein one or more such vane members function within the scope of the teachings of the present invention are all intended to be included and comprehended within the broad scope of the present invention.

It should be understood that the figures and the specific description thereof set forth in this application are for the purpose of illustrating the present invention and are not to be construed as limiting the present invention to the precise and detailed specific structure shown in the figures and specifically described hereinbefore. Rather, the real invention is intended to include substantially equivalent constructions embodying the basic teachings and inventive concept of the present invention.

We claim:

1. A water vehicle that is propelled forwardly as a

user mounted on the upper surface thereof alternately shifts his weight to impart a transversely directed rocking motion to said vehicle, including:

(a) an elongate, buoyant low-draft body having a longitudinally extending center line, and an upper surface of such configuration that said user can occupy a supported position on at least a portion thereof to impart said transverse rocking motion to said body;

(b) a plurality of spaced pins arranged in at least one longitudinally extending row under said body;

(c) first means for supporting said pins from the under portion of said body;

(d) a plurality of rigid vanes;

(e) second means for pivotally and freely supporting said vanes in rearwardly extending positions from said pins; and

(f) third means supported on said body for limiting the degree of oscillatory swing of said vanes on said pins to propel said body forwardly as said body is alternately rocked in opposing transverse directions by said user.

2. A water vehicle as defined in claim **1** wherein said pins are arranged in two longitudinally extending rows on opposite sides of said centerline.

3. A water vehicle as defined in claim **2** wherein the transverse lower surface of said body is convex, with said pins in said two rows projecting downwardly and outwardly in opposite directions therefrom.

4. A water vehicle as defined in claim **3** wherein said third means limits the swing of said vanes to an arc of substantially 55°.

5. A water vehicle as defined in claim **1** wherein said third means is adjustably supported for longitudinal movement on said body, and when said third means is selectively moved to a desired longitudinal position to vary the degree of arc through which said vanes can swing as said body is alternately rocked in opposing transverse directions.

6. Apparatus as defined in claim **1** wherein said third means comprises a longitudinally shiftable slider member provided with angular constraint means adapted to be longitudinally shifted with respect to said pins whereby to move rearwardly from a minimum constraint position corresponding to the maximum included angle of rotary freedom to a substantially rearwardly displaced maximum constrain position corresponding to said minimum included angle of rotary freedom of said vane member.

7. Apparatus as defined in claim **6** wherein each of said vanes has a free laterally arcuately movable rear edge and a front edge portion that pivotally engages one of said pins for said lateral arcuate movement of said free rear edge of said vane through any value of said included angle of rotary freedom between said minimum and maximum values thereof permitted by said movement of said third means.

8. Apparatus as defined in claim **7**, wherein said third means comprises a longitudinally shiftable slider member provided with angular constraint means adapted to be longitudinally shifted with respect to said pins whereby to move rearwardly from a minimum constraint position adjacent to said pin to said maximum included angle of rotary freedom to a substantially rearwardly displaced maximum constraint position corresponding to said minimum included angle of rotary freedom of said vanes.

9. Apparatus as defined in claim **1** which further includes: (g) a longitudinally longitudinal protective guard rail means for protecting said vanes from damage.

10. Apparatus as defined in claim **5**, wherein each of said plurality of vanes has a free laterally arcuately movable rear edge and a front edge portion of such structure as to provide said second means to permit lateral arcuate movement of each of said free rear edges of said vanes through any value of rotary freedom permitted by said movement of said third means.

11. Apparatus as defined in claim **10** wherein said third means comprises a longitudinally shiftable slider member provided with an angular constraint means for each vane adapted to be longitudinally shifted with respect to said pins to move rearwardly from a minimum constraint position adjacent said vanes to a substantially rearwardly displaced maximum constraint relative to said vanes.

12. Apparatus as defined in claim **11** which further includes an operating lever carried in a top accessible position by said body for operation by a person positioned on the top thereof; and coupling means effectively coupling said lever to the underlying longitudinally shiftable slider member for shifting movement thereof in response to manual operation of said lever.

13. Apparatus as defined in claim **12**, which further includes means for locking said operating lever in any adjusted position so that the corresponding position of the longitudinally shiftable slider member will be correspondingly maintained in any selected adjusted position.

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