MOTORLESS WATER-BORNE VEHICLES

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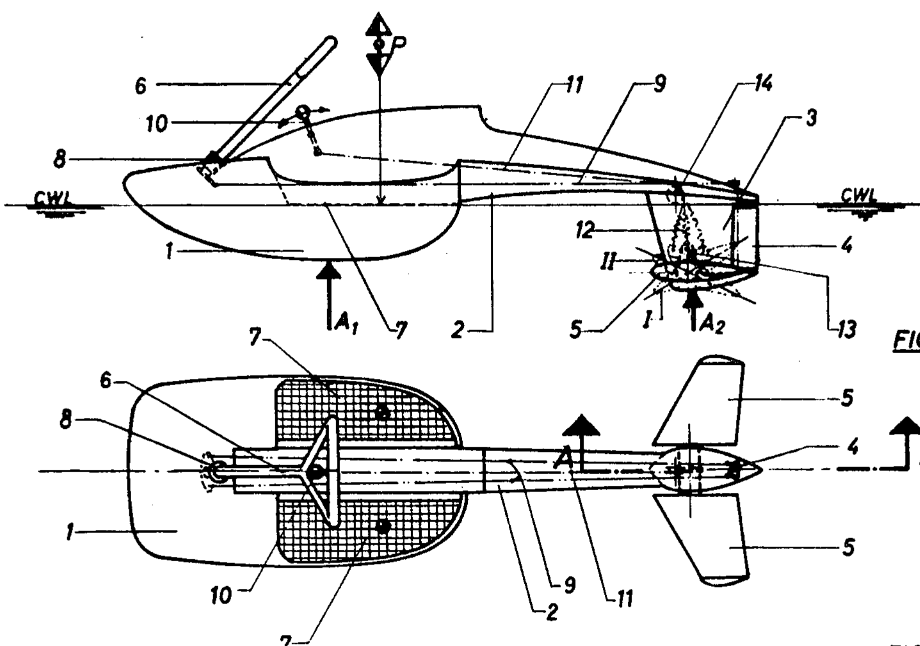

FIG. 1

FIG. 2

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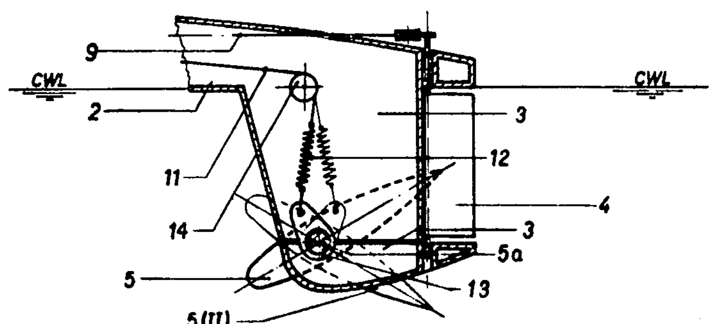

FIG. 3

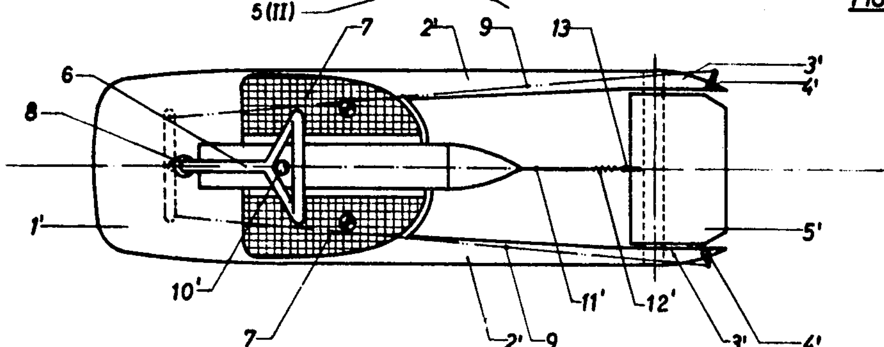

FIG. 4

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MOTORLESS WATER-BORNE VEHICLES

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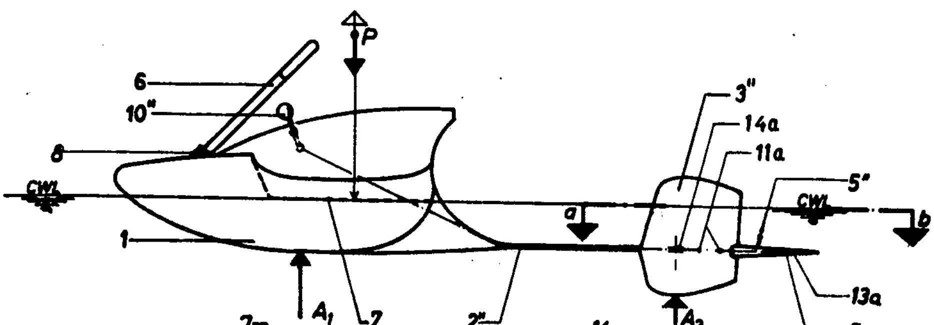

FIG. 5

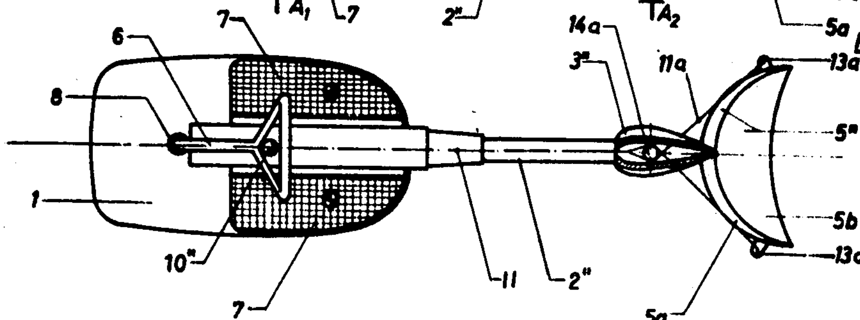

FIG. 6

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MOTORLESS WATER-BORNE VEHICLES

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Int. Cl. B63h *1/30, 19/02*
U.S. Cl. 115—21 14 Claims

ABSTRACT OF THE DISCLOSURE

A water-borne amusement craft having a large front float, and a smaller rear float connected by a spar, the rear float carrying a horizontal fin which can flex about a horizontal axis as the craft is rocked to propel the craft by a fish-tail effect. The fin may be pivoted on an axis or may be flexible or the spar may be flexible and two separate spars and rear floats may be used.

This invention relates to a motorless water-borne vehicle for use as a water-sports craft or as a children's toy.

It is an object of the invention to provide a water-borne vehicle which can be propelled solely by bodily movements of the person on the vehicle. In particular preferred forms of the invention propulsion can be otbained merely by vertical movements of the body.

The invention consists broadly in a motorless water-borne vehicle, having at least two buoyancy members of different sizes disposed one behind the other in the direction of propulsion and connected to each other, the larger member being situated adjacent the front end and the smaller member adjacent the rear end of the vehicle, a support surface for the user situated at least partly between the centres of gravity of the buoyancy members, and at least one vane adapted to flex or oscillate about a substantially horizontal axis and extending transversely with respect to the longitudinal axis of the vehicle.

Thus if a rider who is standing, kneeling, or sitting on the vehicle, causes his weight to shift, for example by bending or stretching, the buoyancy of the smaller buoyancy member and/or the weight of the rider will cause the vane to pivot or flex downwardly or upwardly about the horizontal, so generating a propulsive force. With corresponding rhythmic bending and stretching movements, the whole vehicle including essentially the two buoyancy members, can be caused to oscillate at resonance frequency, so that rapid propulsion is achieved with a minimum expenditure of energy.

The vane is preferably disposed on the rear buoyancy member since in this way the lever arm of the forces acting on the vane and originating from the weight of the user becomes as great as possible. In some cases the vane may form at least a part of the rear buoyancy member itself.

The buoyancy members can be connected to each other by one or a plurality of spars. When using a rigid spar the vane can be mounted to tilt or rotate about an axis extending transversely to the longitudinal axis of the water-borne vehicle, a spring being provided which tends to maintain the vane in a horizontal attitude. The tension of this spring can be adjustable in order to obtain a greater return force for high-speed propulsion, whereas for starting-up and slow propulsion, a lesser spring tension and hence a smaller return force can be advantageous. Instead of a rotatable vane, it is also possible to use a vane consisting of resilient flexible material and which yields upwardly or downwardly according to the forces acting on it, and so performs somewhat the same movements as a rotatable or pivoting vane.

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In some forms of the invention the spar consists of an elastically resilient material, in which case it is of advantage to mount the vane rigidly at the end of the spar. As a result of the bending of the spar as it is strained and relieved by the movements of the rider, the vane performs the desired oscillating movement which produces propulsion of the vehicle.

In one particular arrangement two substantially parallel spars extend rearwardly from the forward buoyancy member, and the vane is mounted between their ends. In this case, the ends of the spars may each support or even form a buoyancy member.

The buoyancy members and the spars may consist of wood or hollow glass-fibre reinforced synthetic platsic material. It is particularly advantageous if at least the buoyancy members consist of inflatable hollow bodies. This construction is inexpensive and is particularly suitable if the craft is designed to be used as a children's toy.

The invention may be performed in various ways and three specific embodiments with a number of possible modifications will now be described by way of example with reference to the accompanying drawings in which

FIG. 1 is a diagrammatic side elevation of the first embodiment,

FIG. 2 is a plan view of the vehicle illustrated in FIG. 1.

FIG. 3 is a cross-section on the line A–B in FIG. 2,

FIG. 4 is a diagrammatic plan view of the second embodiment,

FIG. 5 is a diagrammatic side elevation of the third embodiment, and

FIG. 6 is a plan view of the vehicle shown in FIG. 5 but with a part cut away according to the line *a–b* in FIG. 5.

The water-borne vehicle illustrated in FIGS. 1, 2 and 3 consists of a boat-shaped front buoyancy member **1** and a rear buoyancy member **3** which is rigidly connected to the first by a spar **2**. The rear buoyancy member **3** is pear-shaped or drop-shaped in cross section and extends downwardly. At its rear edge, it carries a rudder **4**, with which the vehicle can be steered by a tiller **6** through ropes **9**. The rear buoyancy member **3** also carries on each side a wing-shaped vane or fin **5** arrange to pivot or rotate about a horizontal axis extending transversely to the longitudinal axis through the vehicle. The two vanes **5** are secured to a shaft *5a* which is rotatably mounted in the rear buoyancy member **3**, and which has a lever **13** connected to a spring **12** which tends to maintain the vanes **5** in a horizontal plane. The spring **12** is attached to the end of a rope **11** which is guided over a pulley **14** to a hand lever **10**. By pivoting the hand lever **10**, it is possible to adjust the tension of the spring **12** and consequently the return force which is exerted on the vanes. The spring **12** at the same time constitutes an elastic abutment for the vanes.

The front buoyancy member **1** is larger than the rear buoyancy member **3** and its buoyancy is designated by the arrow A_1 while the buoyancy of the rear buoyancy member **3** is illustrated by the arrow A_2. Situated at least partly between the centres of gravity of the buoyancy members **1** and **3**, on which the buoyancy forces A_1 and A_2 act, is a supporting surface for the rider which, in the embodiment illustrated, is represented by two footrest areas **7** on which the rider stands or kneels.

The vehicle is propelled by the rider successively bending down and stretching or standing up, so that the centre of gravity P of the user is moved alternately upwardly and downwardly. When the rider is standing or kneeling stationary, the vehicle adopts a floating position which can be individually corrected by moving the body-weight towards A_1 or A_2. To generate propulsion, the user starts to rise and fall. When he bends downwards, the vanes **5** of the rear buoyancy member **3**, as the result of the sudden extra loading and the lesser buoyancy A_2, penetrate more deeply into the water than does the front buoyancy member **3**, the vanes **5** assume approximately which for practical purposes merely pivots about a transverse axis. During the downward movement of the rear buoyancy member **3**, the vanes **5** assume approximately the position I (FIG. 3), the actual position depending partly upon the initial tension in the spring **12**. When the rider moves upwards, the buoyancy A_2 becomes effective due to the load being relieved, and urges the rear buoyancy member **3** upwards again so that the vanes **5** assume approximately the position II which is again partly determined by the initial tension of the spring **12**.

As a result the vanes **5** are alternately stressed by the vibrating weight of the user at point P and the buoyancy A_2, so that the vanes are resiliently oscillated about the horizontal and perform angular movements in opposition to the direction of movement of the buoyancy member **3**. This movement resembles that of the tail-fin of a fish and produces a propulsive force. The higher the frequency at which the vehicle is rocked the greater the speed of propulsion. By rhythmic bending and stretching, the oscillating system which consists essentially of the spar **2** and the buoyancy members **1** and **3**, can be energised to the resonance frequency. By altering the initial tension of the spring **12** by means of the hand lever **10**, it is possible to change the returning force which acts on the vanes **5**; for starting-up and for slow running, a low initial spring tension will be set, a greater initial tension being set for high-speed running.

As already mentioned, the water-borne vehicle is steered by means of the steering handle **6** which is suspended in the mounting **8** and acts on the rudder **4** through ropes **9** or equivalent linkage. With sufficient practice, the rider may also be able to steer by appropriately shifting his weight, in which case the rudder **4** becomes unnecessary and the handle **6** becomes purely a steadying means.

FIG. 4 shows a modification of the embodiment of FIGS. 1 to 3. In this case, the vehicle is of catamaran construction having two spars **2'** extending substantially parallel with each other from the front buoyancy member **1'** rearwardly and carrying between their ends a pivoting vane **5'** which is loaded by a spring **12'**, the initial tension in which is adjustable by means of a hand lever **10'** and rope **11'**. The vane **5'** functions in the same manner as in the first example. At the end of each spar **2'** is a buoyancy member **3'** constructed for example as shown in FIG. 3 and bearing a rudder **4'** which may be pivoted by the steering handle **6'**. For the rest, the same reference numerals as in FIGS. 1 to 3 are used for identical parts.

The embodiment illustrated in FIGS. 5 and 6 differs from the previous examples mainly in that the spar **2''** is of resilient construction. The rear buoyancy member **3''** carries at its rear edge a vane **5''** which is in this case rigidly, in other words not-rotatably, secured to the buoyancy member **3''**. In this case, pivotal movement of the vane **5''** is created at least partly by the elastic bending of the spar **2''** during bending and stretching movements of the rider. The resilient spar **2''** is shaped like a leaf spring in the embodiment illustrated. Since it lies below the waterline CWL, the spar also contributes to propulsion as the rider bends and stretches.

In this case, the vane **5''** may be constructed as shown in FIG. 6. It has a markedly bifurcated or arc-shaped edge **5a** made from resilient material and having, between its horns, a flexible foil **5b** which can bulge into a troughlike shape and become inclined as a result of the movements of the rider. Secured to the ends **13a** of the edge **5a** are cables **11a** which lead over a pulley **14a** to the handle **10''**. When the rider pulls on the lever **10''**, the bifurcated edge **5a** becomes widened and the foil **5b** is stretched, which is favourable for fast running. At the same time, the resilient spar **2''** becomes stiffened.

In the embodiments shown in FIGS. 1 to 4, the vanes **5**, **5'** are arranged to pivot on the rear buoyancy member **3**, **3'**. However, it is also possible to attach the vane rigidly if it consists of a resilient material, so that it is flexed alternately upwardly and downwardly as the user bends and stretches, and thus performs the same oscillating movement about the horizontal as does a pivotable vane.

I claim:

1. A motorless water-borne vehicle, having at least two buoyancy members of different sizes disposed one behind the other in the direction of propulsion and positively connected to each other by a non-pivotal longitudinally extending connecting member, the larger member being situated adjacent the front end and the smaller member adjacent the rear end of the vehicle, a support surface for the user situated at least partly between the centres of gravity of said buoyancy members, and at least one vane situated adjacent said rear buoyancy member and adapted to flex or oscillate about a substantially horizontal axis and extending transversely with respect to the longitudinal axis of said vehicle.

2. A water-borne vehicle according to claim **1**, in which said vane is mounted on said rear buoyancy member.

3. A water-borne vehicle according to claim **2**, in which said vane forms a part of said rear buoyancy member.

4. A water-borne vehicle according to claim **1**, in which said front and rear buoyancy members are non-pivotally connected to each other by one or more spars.

5. A water-borne vehicle according to claim **4**, in which the spar or spars consist of elastically resilient material.

6. A water-borne vehicle according to claim **5**, in which the vane is rigidly secured to the elastically resilient spar.

7. A water-borne vehicle according to claim **1**, comprising two substantially parallel spars extending rearwardly from the front buoyancy member, with the vane disposed between their ends.

8. A water-borne vehicle according to claim **7**, in which the ends of the spars each carry or form a bouyancy member.

9. A water-borne vehicle according to claim **1**, in which the vane is arranged to pivot about a horizontal axis extending transversely to the longitudinal axis of the water-borne vehicle, and including a spring which tends to maintain the vane in a horizontal attitude, and means for adjusting the tension of the spring.

10. A water-borne vehicle according to claim **1**, having a vane on each of the two sides of the rear buoyancy member.

11. A water-borne vehicle according to claim **1**, in which the vane is formed of a resilient material.

12. A water-borne vehicle according to claim **11**, including means for widening the vane.

13. A water-borne vehicle according to claim **1**, including a manually-operated rudder connected to the rear buoyancy member.

14. A water-borne vehicle according to claim **1**, in which the buoyancy members consist of inflatable hollow bodies.

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U.S. Cl. X.R.

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