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 [33] **Great Britain**
 [31] **19928/68**

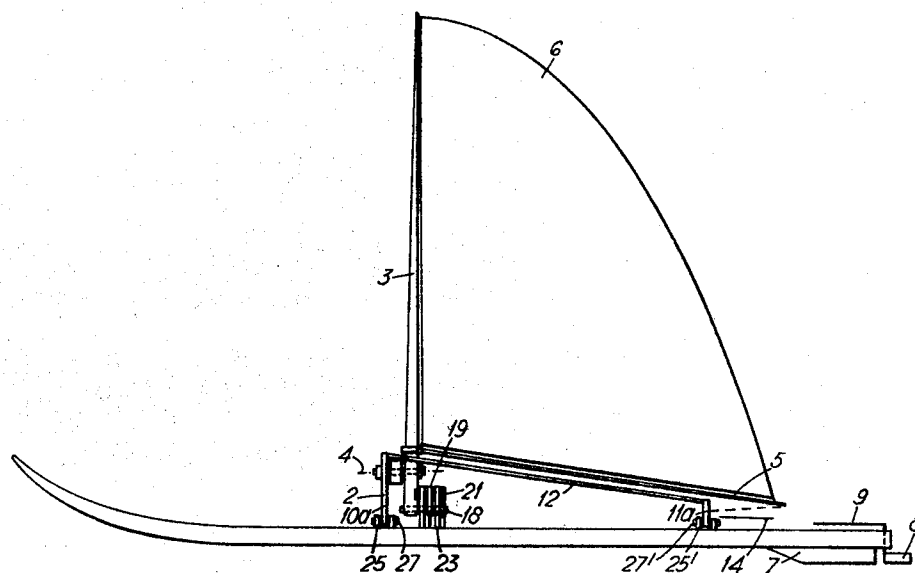
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[54] **SAILING CRAFT**
6 Claims, 6 Drawing Figs.

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 114/61, 114/102
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 B63h 9/04
 [50] Field of Search **114/39, 61,**
 102, 123

ABSTRACT: The disclosure provides a sailing craft having elongate parallel hulls pivotable about axes parallel to the length of the hulls, and a pivotable mast operatively connected to the hulls whereby pivotal motion of the mast in a first sense will result in pivotal motion of the two hulls in the reverse sense of rotation. The craft may be used either on water or as a snow yacht.



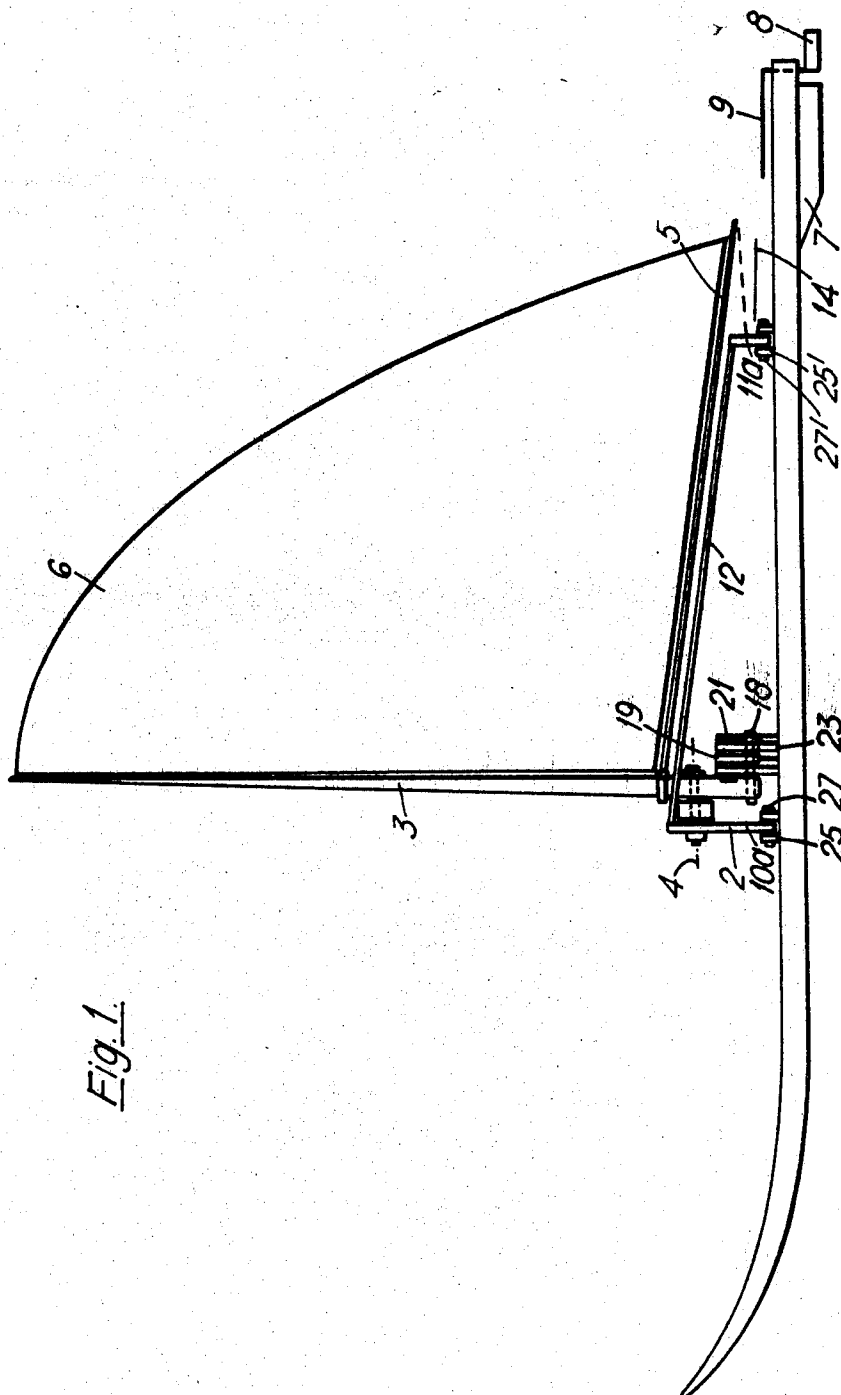


Fig. 1.

Fig. 2.

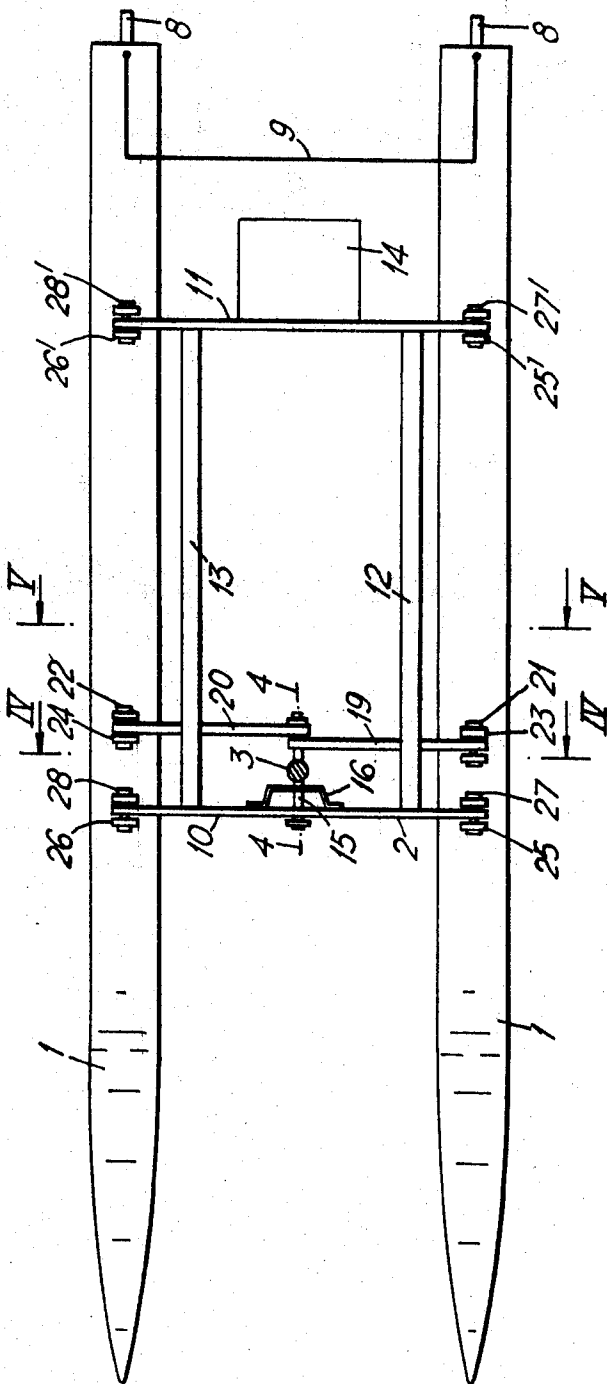


Fig. 3a.

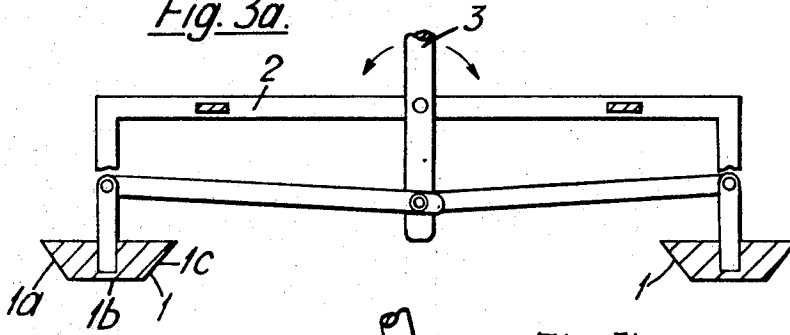


Fig. 3b.

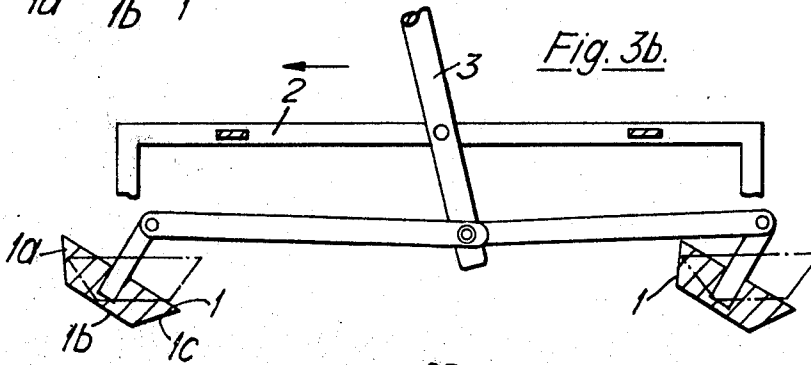


Fig. 4.

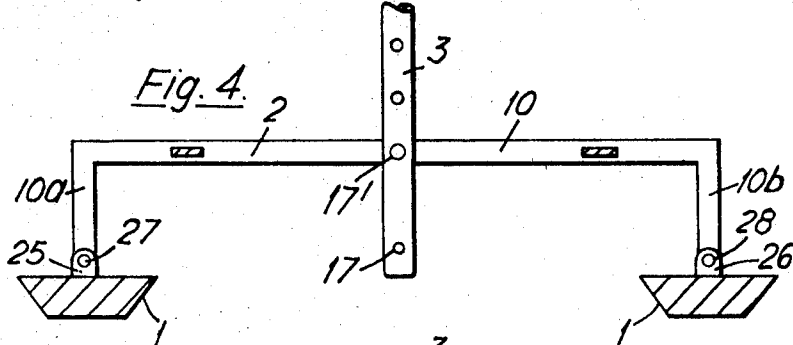
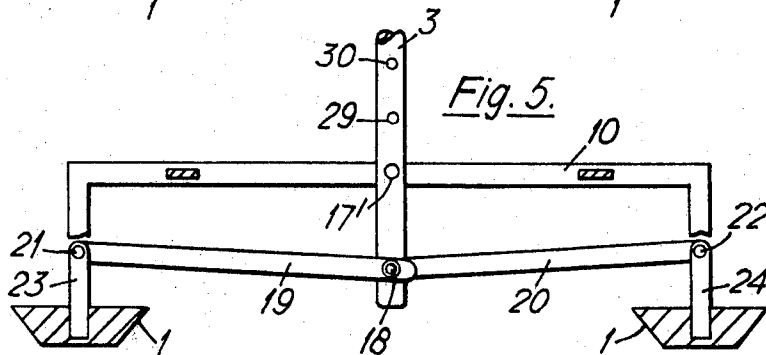


Fig. 5.



SAILING CRAFT

The present invention relates to an improved form of sailing craft, and more particularly to a twin-hulled craft having improved resistance to lateral slip when subjected to a crosswind component.

According to the present invention I provide a sailing craft comprising a pair of laterally spaced buoyant hulls, a frame to which both of the hulls are pivotally mounted so as to be pivotable about its respective longitudinal axis, and a mast attached to said frame. Preferably the mast may be pivotally attached to the frame so as to be pivotable about a fore-and-aft axis of the craft, said mast being connected to the hulls so that movement of the mast about its pivot in one sense of rotation will result in movement of the hulls about their respective pivots in the reverse sense of rotation. Advantageously each hull may have an upwardly extending arm, and a pair of pivotally mounted links may be provided, each link being articulated to one of the arms and to a location on the mast, said location on the mast being lower than the point of pivotal attachment of the mast to the frame. Suitably the difference in height between said location and the point of pivotal connection of the mast to the frame may be adjustable. Desirably the mast may be provided with a plurality of holes through any one of which a pivot pin may be arranged to extend, said pivot pin also extending through a hole in the frame. Conveniently said location may be positioned above the level to which, in use of the craft, the water line will rise.

If desired the pivotable mast may include spring-biasing means tending to restore it to the erect condition. In one particularly convenient embodiment the hulls may be flat bottomed, elongate skids having a trapezoidal transverse section with symmetrical downwardly converging sidewalls.

In order that the present invention may more readily be understood, the following description is given, merely by way of example, of one embodiment of sailing craft constructed in accordance with the present invention. Reference will be made to the accompanying drawings in which:

FIG. 1 is a side elevational view of the sailing craft;

FIG. 2 is a top plan view of the craft of FIG. 1;

FIGS. 3a and 3b are front elevational partly schematic views showing the operation of the ski tilting mechanism; FIG. 4 shows a sectional view taken on the line 4-4 of FIG. 2; and

FIG. 5 shows a sectional view taken on the line 2-2 of FIG. 1.

Referring now to FIG. 1, the illustrated craft comprises a pair of hulls 1 supporting a frame 2 on which is mounted a mast 3 pivotable in the vertical plane about a horizontal pivot 4. A boom 5 mounted on the mast 3 serves, along with the mast, to support a sail 6. Each of the hulls is equipped with a stabilizing skid or keel 7 under the rear part thereof and is also equipped with a rudder 8, the rudders of the two hulls being interconnected by a tiller mechanism 9.

The top plan view of FIG. 2 shows more clearly the layout of the frame 2 which is in the form of a rectangular structure comprising fore-and-aft crossbeams 10 and 11 respectively and port and starboard longerons 12 and 13 respectively. A platform 14 is supported at the rear of the frame 2 in order to provide accommodation for a crewmember.

The pivotal mounting of the mast 3 is, as shown clearly in FIGS. 1 and 2, achieved by means of arranging the mast so that a pivot pin 15, extending through the forward crossbeam 10 and through a bracket 16 attached to such crossbeam, also extends through a hole 17' in the mast 3. Clearly some suitable form of bearing arrangement may be desirable in order to prevent undue wear or damage to the mast and pivot pin during pivotal movement of the mast.

The lower end of the mast 3, as shown in FIG. 5, is provided with a hole 17 through which is secured a pin 18 (see FIG. 5) for providing an articulated connection between the bottom of the mast 3 and port and starboard pivotal struts 19 and 20. The outer ends of the struts 19 and 20 are pivotally connected

by means of pins 21 and 22, respectively, to the upper ends of arms 23 and 24 extending upwardly from the port and starboard hulls 1.

As shown in FIG. 4, the front crossbeam 10 is provided with two downwardly extending transverse legs 10a and 10b to which short fixed brackets 25 and 26 of the port and starboard hulls respectively are pivotally attached by means of pivot pins 27 and 28, respectively. At the rear of the frame 2 is provided a similar arrangement comprising downwardly extending legs 11a and 11b which are pivotally attached to brackets 25' and 26' by means of pins 27' and 28'.

The port and starboard hulls 1 are thus pivotally mounted about the common axes of the pins 27 and 27' on the one hand and 28 and 28' on the other hand, and the hulls are thus able to tilt about their longitudinal axes.

By way of further explanation the operation of the above described sailing craft will now be described, and particular reference will be made to FIGS. 3a and 3b which show the mast in still wind conditions and under the effect of a crosswind.

FIG. 3a shows the sailing craft in conditions of no crosswind and the mast is there shown as vertical, the ski hulls 1 and 2 a here also being shown in the untilted condition. When, as depicted in FIG. 3b, a crosswind from starboard is experienced, the effect of the wind against the sail 6 causes the mast 3 to undergo tilting motion about the pin 18 in the anticlockwise sense as illustrated in FIG. 3b; namely the top of the mast tilts to the left of the boat (i.e. to port) and the bottom of the mast tilts in the opposite direction (i.e. to starboard).

The illustration of FIG. 3b shows clearly the effect on the hulls 1 of the tilting of the mast, and it can be seen that the movement of the struts 19 and 20 has caused the upper ends of the brackets 23 and 24 of the hulls 1 to move to starboard, thereby causing each hull to undergo pivoting motion about the respective pivot pins 27, 27', and 28, 28'. Thus, as shown in FIG. 3b the two hulls have tilted to the right and will therefore present additional resistance against the tendency to slip to port which would otherwise occur as a crosswind from starboard fills the sail 6. This additional resistance to slipping motion occurs as a result of the increase in laterally presented area on the leftward side of each of the hulls. As shown in FIG. 3b, inclined left-hand sidewall 1a of the port hull 1 has increased its inclination to the horizontal and will therefore present a larger impact area to the water in contact therewith, and also the previously horizontal bottom wall 1b of the hull is now inclined with respect to the horizontal and will therefore present a lateral area where before no such area was exhibited. Clearly, the greater the angle of tilt of each hull the greater will be the increase in laterally presented area and therefore the greater the resistance to slipping motion of the craft. Since the weight of the boat acting downwardly on each of the hulls 1 will tend to cause the boat to sit squarely on the water, i.e. with the bottom surfaces of the hulls horizontal, this will tend to present a restoring moment on each of the hulls 1.

Additionally, if required, a spring biasing mechanism may be included in order to assist in erecting the mast after a gust. In any event because of the effect of the restoring moments acting on the hulls and, possibly also the restoring effect of any biasing mechanism incorporated, the mast will tend to remain erect and will therefore resist tilting motion. As a result the angle of tilt of the mast will be proportional to the strength of the crosswind which will in turn be proportional to the tendency of the craft to slip laterally. However, as explained above the resistance to slipping will increase as the mast tilt angle increases and there will thus be a direct relationship between slipping resistance and slipping tendency, with the result that the craft will resist the tendency to track sideways when experiencing a crosswind. A further factor effecting the stability of the craft will be that, as the mast tilts, the lateral surface presented by the sail 6 will decrease and this will in turn assist in arriving at a state of equilibrium in which the pivoting moments about the pin 15, resulting from wind deflection and hull restoration, are in balance.

It is to be noted that despite the tilting of the two hulls 1 and the mast 3 and sail 6 the frame 2 will at all times remain substantially level as will the crewman's platform 14.

If desired some means of locking the mast upright may be included so that the craft may then operate as a normal twin-hulled boat and will suffer the usual tendencies to skidding, since the slip resistance provided by the keels 7 will only be of a small degree of magnitude.

FIGS. 4 and 5 show that the mast 3 is provided with additional holes 29 and 30 through which the pin 15 may be passed, as an alternative arrangement to that actually shown in FIGS. 4 and 5. Clearly the result of passing the pin 15 through hull 29 will be to lower the mast with respect to the frame 2, and this will in turn tend to bring the pivot pins 21 and 22 towards each other with the result that the two hulls 1 will tend to pivot inwardly. This particular arrangement will give an increased stability against slipping both in the "fixed mast" and "pivotable mast" conditions since the downwind hull will already have a certain degree of stabilizing tilt when the mast is erect and thus as the mast tilts under the effect of a crosswind the downwind hull will tilt to arrive at an even steeper angle of inclination.

Moreover, if the hole 17 is still used for the articulation of the struts 19 and 20 to the bottom of the mast 3, then clearly the circumferential travel of the hole 17 and pin 18 during pivoting of the mast about the pin 15 will be greater since the radius of the path of pin 18 about hole 29 is greater than the radius of the motion of hole 17 about the hole 17' in FIGS. 4 and 5, and thus the movement of the struts 19 and 20 will be increased giving an exaggerated tilting effect with mast tilt.

Tests have shown that there is a distinct increase in stability of the craft when operating in the pivotable mast mode, as compared with operation in the fixed mast mode. The sailing craft of this invention has therefore been found to offer considerably increased stability, particularly in that the resistance to slipping is improved without the addition of deep keels which would in turn reduce the draft of the craft. Clearly the craft illustrated in FIG. 1 is of extremely shallow draft in that the depth of the skids or keels 7 is merely sufficient to provide protection for the rudders 8 so that in the event of the craft running aground then the rear part of each hull 1 will be supported on the keel 7 rather than on the bottom edge of the rudder 8.

Tests have also shown that sail control provides considerable assistance in the steering of the craft and it is therefore envisaged that a subsequent development to the craft of this invention may reside in the provision of a rudderless craft which, by virtue of its increased resistance to slipping, will be able to be steered by movement of the sail alone and will not therefore require the provision of keels 7 or rudders 8. Such a craft, provided the hull construction is appropriate, will present virtually no submerged surface and will have an extremely shallow draft, at least in the mast erect condition.

Although not clearly shown in the drawings, it is envisaged that the design of the craft will be such that the bottom pivot pin 18 will at all times be clear of the water, as suggested by the view of FIG. 5 where the pin 18 is positioned at a higher level than the decking of the hulls 1. This will reduce the risk of corrosion of the pin 18 and associated articulated components, and will provide for longer life of the mast tilting mechanism as a whole.

A study of the view of FIG. 3b will also show that, when the mast 3 is subjected to a crosswind on the sail 6, the resultant pivoting of the brackets 25, and 26 will cause a tendency for the downwind hull (namely the port hull) to be shifted laterally to port, thereby providing increased resistance to toppling of the craft since the center of buoyancy of the port hull

1, about which toppling will presumably occur, will move laterally away from the center of gravity of the craft and provided the mast 3 is of a lightweight construction the effect of shift of the hull centers of gravity, as a result of pivoting of the linkage 3, 19, 20 and the hulls 1, will be negligible in comparison to the leftward movement of the center of buoyancy of the port hull. Thus the moment of the weight of the craft about the center of buoyancy of the port hull will increase as the mast tilt angle increases and toppling will be resisted.

In the arrangement described and illustrated, the two hulls are each twelve feet long and fifteen inches wide and are constructed of resin bonded glass fibre material, so as to comprise water tight compartments. However, any suitable alternative construction may be employed. The craft illustrated can attain high speeds and the maximum speed is obtained when the sail is set near the fore-and-aft condition and is experiencing a crosswind. The craft of this invention is considered most suitable for in-shore water sail ski sailing and it is envisaged that independent hull angle control may be provided so that the mast may remain erect while the hulls are tilted in order to provide increased, resistance to slipping. The principle of operation employed in the one man craft illustrated may well be adapted to suit boats of any size.

Although, as suggested above, the craft of the invention might be employed in a "rudderless" configuration it is expected that in a further embodiment the keels 7 may be steerable by being directly connected to the tiller 9, the rudders 8 then being dispense with entirely.

It is also envisaged that the craft of the invention may be used for winter sporting as a snow or ice yacht.

I claim:

1. A sailing craft comprising a frame; at least two elongate hulls extending generally parallel one with the other; a mast attached to said frame; pivot means connecting said mast to said frame for pivoting movement about an axis parallel to the length of said parallel hulls; means mounting each of said hulls pivotally with respect to said frame for pivotal motion about an axis extending parallel with the length of the parallel hulls; and control means operatively connecting said mast to said hulls for effecting simultaneous pivoting motion by, on the one hand, said mast in a first direction of rotation and, on the other hand, said hulls in the reverse sense of rotation.

2. A sailing craft as set forth in claim 1, wherein said control means operatively connecting said mast to said hulls comprises an upwardly extending arm formed on each hull, first articulation means on said mast below said pivot means, second articulation means formed at the free end of each of said arms, and a pair of pivotably mounted links each link being articulated to said first articulation means and a respective one of second articulation means.

3. A sailing craft as set forth in claim 2, and comprising means for adjustably spacing said pivot means and said first articulation means.

4. A sailing craft as set forth in claim 3, wherein said adjustable spacing means comprises means defining a plurality of spaced apertures along said mast; and wherein said pivot means comprises a pivot pin of a size sufficient to enable said pin to be journaled in association with each of said apertures, and means connecting said pivot pin to said frame.

5. A sailing craft as set forth in claim 2, wherein said hulls are buoyant and will support the craft for flotation partially immersed up to a water line, and wherein said first articulation means is positioned above said water line.

6. A sailing craft as set forth in claim 1, wherein said hulls are flat-bottomed elongate skids each having a trapezoidal transverse section with symmetrical downwardly converging sidewalls.