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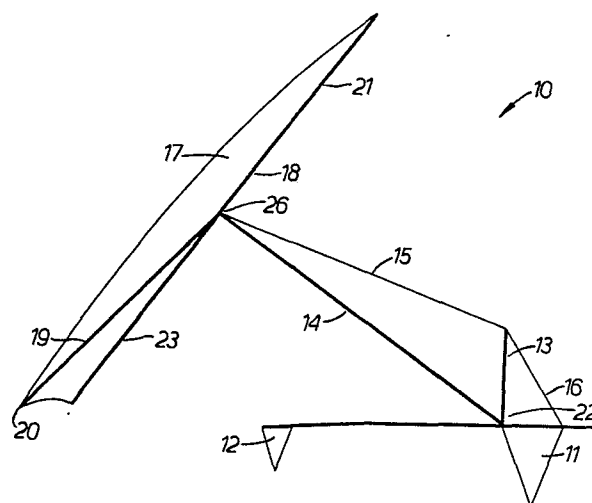
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⑤④ **A sailing rig.**

⑤⑦ A sailing rig for a proa which includes a pivotable support pole extending upwards at an angle from the main hull of the proa towards the outrigger thereof with a sail supported at the end of the pole. The sail is triangular and has one side connected to a luff spar which is pivoted to the support pole and the sail is disposed such that force exerted by the sail through its centre of effort acts through the centre of resistance of the proa.



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A SAILING RIG

THIS INVENTION relates to sailing craft and more particularly to a rig for such craft.

5 Conventional sailing craft have the sail approximately above the centre of the body of the craft which means that the centre of effort produced by the sail is above the centre of resistance of the craft causing a capsizing moment. In order to overcome this moment and support the conventional sailing rig, the vessel must be counter-balanced by ballast and/or a buoyancy shift righting moment. The resultant stresses produced by the sail and counterbalancing require that a vessel must be constructed strongly to resist such stresses.

15 Furthermore, the conventional sail at its best generates small turning moments which must be constantly corrected with a steering mechanism. The vast majority of vessels therefore require a rudder to maintain zero turning moments so that the vessel remains on a straight course.

20 Both the above effects are undesirable in that they decrease the speed of the vessel and increase the stresses on the vessel and its fittings. Further, the provision of ballasting or extra buoyancy and steering mechanisms can be complex and costly.

25 The present invention aims to overcome the above disadvantages of conventional sailing craft by providing a sailing rig which eliminates or minimises the capsizing moment thus enabling a low stressed and light weight speedy craft to be constructed. Furthermore,

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the rig of the invention allows the elimination of a rudder or other steering mechanism which reduces the cost and complexity of the craft.

5 With the above and other objects in view,  
the invention resided broadly in a rig for a sailing craft including support means adapted to support a sail assembly on the leeward side of said craft, said sail assembly being disposed and supported in such a manner that the force exerted thereby acts through the  
10 centre of resistance of said craft.

Preferably, the craft to which the rig is applied is one which is symmetrical about a line transverse to the longitudinal centre line of the craft such that the craft is able to sail in either  
15 direction. That is, the bow of the craft whilst sailing in one direction becomes the stern when sailing in another direction. Preferably also the craft is a proa, the main hull of which always remains to windward.

20 In order that the invention may be more readily understood and put into practical effect, reference will now be made to the accompanying drawings which illustrate the invention and wherein:-

25 Fig. 1 illustrates a schematic elevational view of a sailing craft incorporating the rig according to the invention;

Fig. 2 illustrates a schematic plan view of the craft and rig, and

Fig. 3 illustrates a schematic end view of

the craft and rig.

Referring to the figures, there is shown a sailing craft 10 having hulls 11 and 12 joined by a decking 30 which incorporates cross beams with the hull 12 comprising an outrigger to the main hull 11, the craft being in the form of a proa and symmetrical about a line transverse to the longitudinal direction of said hulls. The rig includes a sail supporting mechanism which comprises a stub mast 13, a support pole 14 pivotally mounted adjacent the base of the mast 13 and a line 15 running from the remote end 26 of the support pole 14 to the top of the mast 13. The mast 13 which is of limited height as illustrated in Fig. 1 is supported on the hull 11 by stays 16. Pivotally mounted at the remote end 26 of the support pole 14 is a sail assembly which includes a sail 17 attached to a luff spar 18 which is pivotally attached to pole end 26 and a boom 19 which extends from end 26 to a free corner 20 of the sail 17. The sail 17 in this embodiment is of generally isosceles triangular form, the unequal side thereof forming the sail luff and being attached in a conventional manner to the spar 18.

The sail, being of isosceles form therefore has the leech and foot of equal length so that the sail assembly is symmetrical and of similar shape in either direction of sailing.

The spar 18 preferably has a sail track on the leeward side thereof to receive the sail edge and provide for a clear air flow therepast.

The support pole 14 is under compression only in calm conditions, otherwise it is in tension when the winds are of medium and strong strength. As shown in the figures, the main hull 11 is to windward and always remains in this position relative to the wind whilst the sail 17 is always to leeward of the centre of resistance. The purpose of the outrigger is to provide the craft with static stability and provide a sheeting base for controlling the sail but it has little reserve buoyancy so that there is little stress on the outrigger hull. The drawings show the normal position of the sail rig when the vessel is sailing to windward on a starboard tack with the wind direction indicated by the arrow X in Fig. 1 and the point 17 on the main hull 11 indicating the bow of the vessel while point 25 indicates the stern.

The rig also includes a number of control lines which are not shown in the drawings for the purpose of clarity. One line A extends from the point 20 at the end of the boom 19 through a pulley at point 21 on the spar 18 and back to a cleat near point 22 to support the end of the boom 19. A further line B extends from a point 23 on the spar 18 and through pulleys at the points 24 near the end of the outrigger 12 and 25 on the end of the hull 12 to another cleat near point 22 to control the rake of the spar 18. A third line C extends from a point at the free end 26 of the pole 14 through a pulley on the end 17 of the

main hull 11 and back to another cleat near point 22 to pull the rig forward. A main sheet D extends from the point 20 at the end of the boom 19 to a further cleat at point 22. The area around point 22 constitutes a central control area where all the lines terminate and from where the craft can be controlled. The lines A, B, C, and D are all in tension while the vessel is on a starboard tack. Line A on this tack supports the end of the boom, thus freeing the leech to maintain the sail at the correct angle as shown in Fig. 2. Line B puts tension on line A and controls the luff spar rake, whilst line C acts to pivot the whole rig forward about the axis of the mast 13 against the pull of line B.

Lines A, B and C are duplicated on respective opposite sides of the spar 18 and the mast 13 for sailing on a port tack. Furthermore, lines B and C can be uncleated and joined together for quick manouvering in confined spaces which maintains desired luff spar rake for all rotational positions of the sail supporting mechanism.

Turning moments are automatically zeroed by virtue of the sail being to leeward of the centre of resistance of the vessel and the force exerted by the sail acting through the centre of resistance. The boat is self steering because of the relative position of the centre of effort of the sail and the centre of resistance. Should the boat go slightly off course, a small turning moment is automatically created to turn the boat back on course. All that is needed to steer

the boat is an ability to swing the sail fore and aft. To lay off the position shown in the drawings, the sail is simply swung forward by tension on the line C which rotates the support mechanism about the axis of the mast 13. The sail force then does not act through the centre of resistance but causes a turning moment about the centre of resistance and the vessel to turn until the sail force again acts through the centre of resistance to thus establish a new set course.

When it is desired to tack, the support pole 14 is rotated aft towards the stern 25 which causes the vessel to point higher into the wind and across the wind until the boom 19 is swung or flips to the other side of the mast 13 and the vessel proceeds on its new tack with the old stern point 25 constituting the new bow of the vessel and the old foot of the sail becomes the new leech. In very calm weather, the luff spar 18 can be rotated to a vertical position to give a higher aspect ratio sail shape.

The above described sail rig as well as reducing turning moments in the vessel to a negligible amount also keeps the capsizing moments negligible as the inclination of the sail and its leeward position ensures that the propulsive force pulls through the centre of resistance. Furthermore, as the force is acting in this manner, the boat is partially lifted out of the water in a similar fashion to the windward hull of a catamaran due to the sail providing an upward vertical component of driving force causing the

apparent displacement to decrease which consequentially gives the vessel a higher speed potential.

One advantage of the foregoing described craft is that the hulls can be made of relatively light materials. For example, in a sixteen foot proa design, one person with a strop between the cross beams can carry the boat fully rigged down to the beach. Due to the low stress on the hulls quick release cross beams can be easily arranged which enable the hulls to be quickly disconnected and placed on a car roofrack for easy transport which reduces transport costs and the amount of storage space required.

As a modification an extended deck portion 31 may be arranged to windward of the main hull and a footwell 32 recessed into the hull as shown in Fig. 3. This will improve crew comfort and move the lateral centre of gravity very close to the centre of the main hull which will reduce wetted surface area. In further modifications of the rig, an equilateral triangular shaped, a square shaped or rigid "wing-type" sail may be employed. It is also desirable that buoyancy be built into the rig preferably the luff spar to stop complete overturning and assist in righting if a capsize does occur.

The sail as illustrated in the drawings is a variation of an old lateen type of sail which has low stress factors on both the spars and the sail cloth. It also has a very low centre of effort and does not have to be finely tuned as in conventional rigs.



It is also envisaged that instead of using  
a system of lines to control the rig, mechanical  
equivalents may be employed. For example, in place  
of the main sheet steering may be achieved by the use  
5 of steering vanes arranged behind the leech of the sail.

The rig of the invention may also be used  
on mono-hulled craft with ballast although a multi-hulled  
craft is preferred for simplicity in achieving static  
balance.

10 While the above has been given by way of  
illustrative example of the invention, all such  
modifications and variations which are apparent to  
persons skilled in the art are deemed to fall within  
the broad scope and ambit of the invention as herein  
15 set forth and defined by the claims.

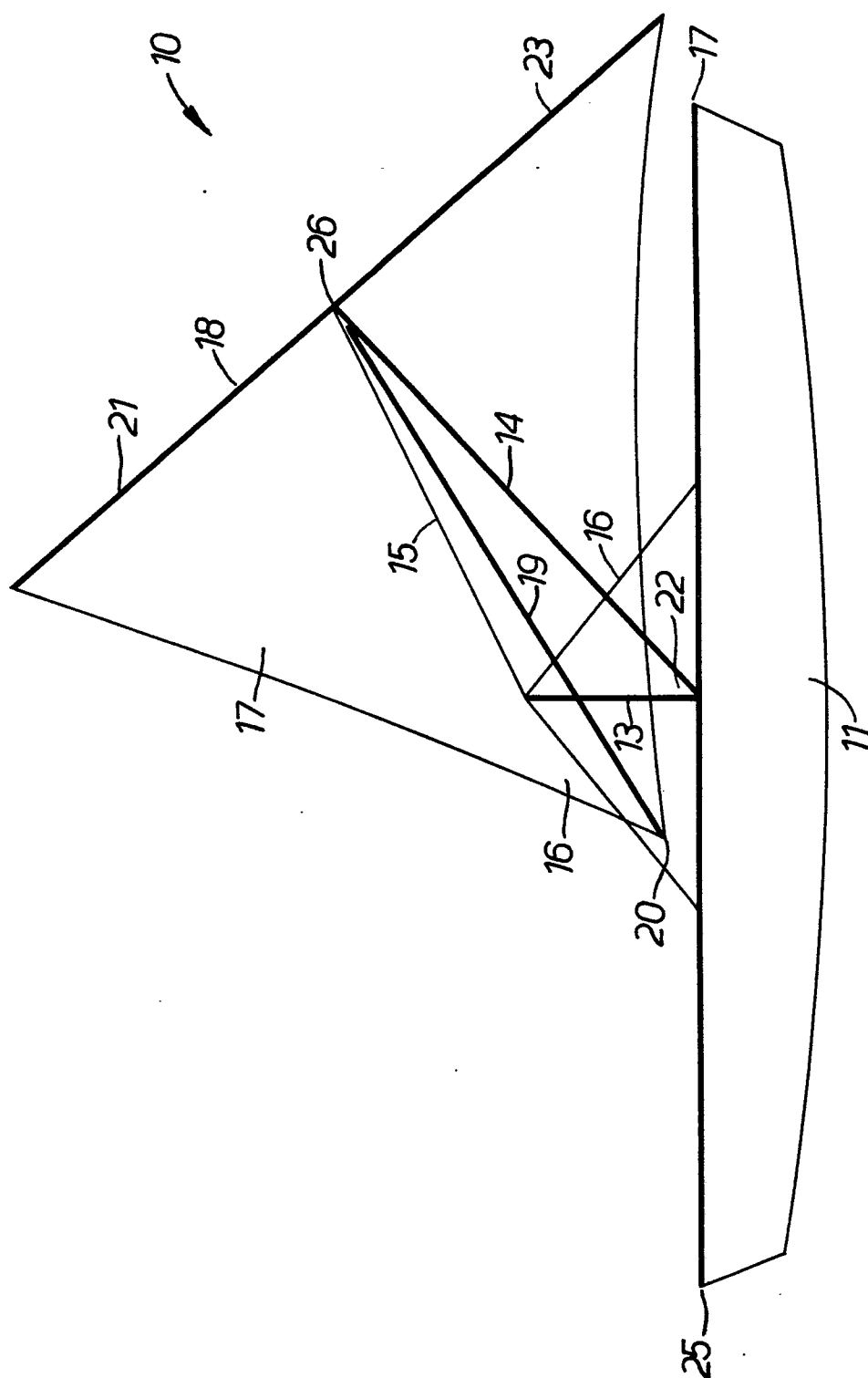
1. A rig for a sailing craft including support means adapted to support a sail assembly on the leeward side of said craft, said sail assembly being disposed and supported in such a manner that the force exerted thereby acts through the centre of resistance of said craft.
2. A rig for a sailing craft according to claim 1 wherein said craft is symmetrical about a line transverse to its longitudinal centre line.
3. A rig for a sailing craft according to claim 2 wherein said craft is a proa, the main hull of which is always to windward.
4. A rig for a sailing craft according to any one of the preceding claims wherein said sail assembly includes a spar supported pivotally intermediate its ends by said support means.
5. A rig for a sailing craft according to claim 4 wherein said sail assembly further includes a sail in the shape of an isosceles triangle, the unequal side thereof constituting the sail luff and being mounted to said spar.
6. A rig for a sailing craft according to claim 5 wherein said sail assembly further includes a boom extending from said intermediate pivot support of said spar to the free corner of said sail.
7. A rig for a sailing craft according to any one of claims 4 to 6 wherein said support means includes a mast, a support pole extending upwards and outwards from

the base of said mast, and a line between the remote end of said pole and the top of said mast supporting said pole at an angle to said mast, said spar being pivotally connected to the remote end of said pole.

8. A rig for a sailing craft according to claim 7 as appended to claim 6 including control means adapted to vary the rotational position of said pole, the rake of said spar and the angular position of said boom with respect to said spar.

9. A rig for a sailing craft according to claim 3 wherein said main hull includes a footwell and a wing extending to the windward side thereof.

10. A rig for a sailing craft substantially as hereinbefore described with reference to the accompanying drawings.



**FIG. 1.**

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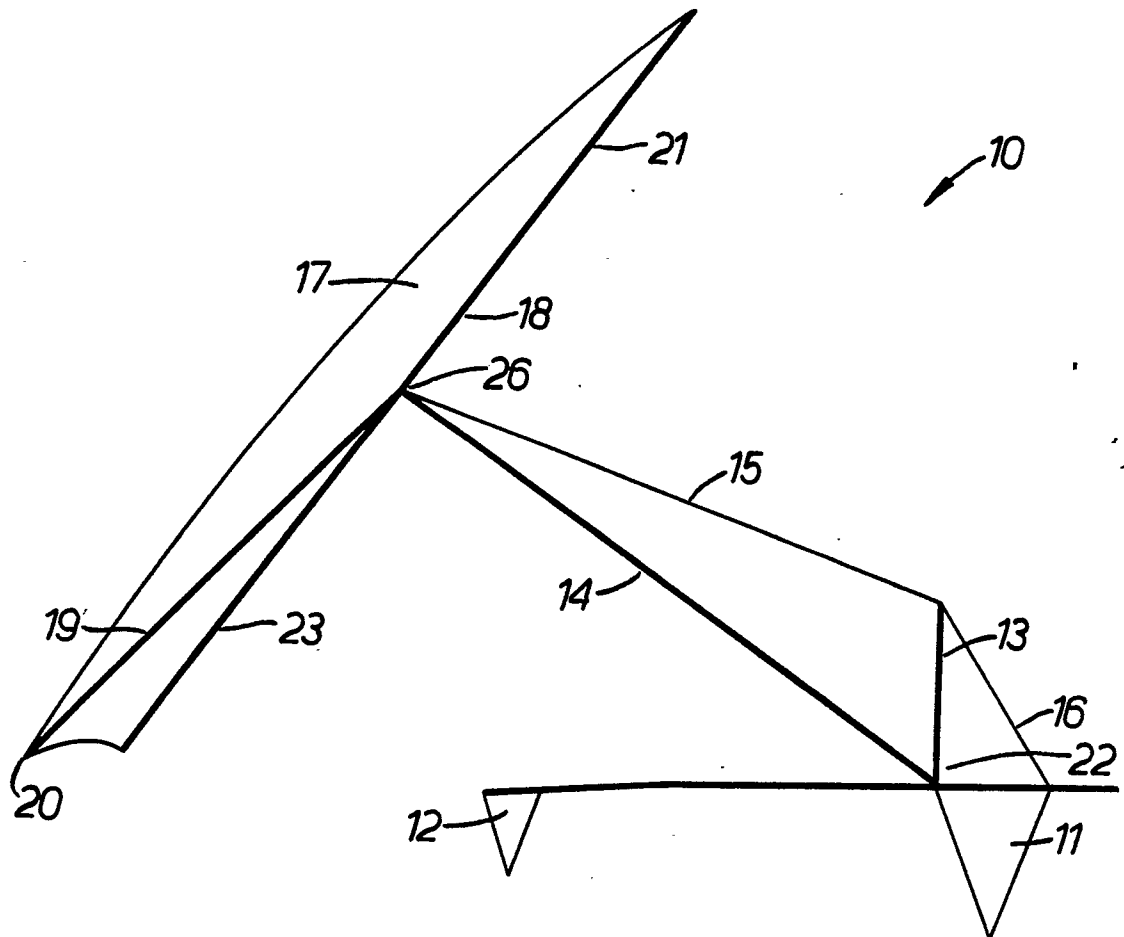


FIG. 2.





European Patent  
Office

# EUROPEAN SEARCH REPORT

Application number  
**0020121**  
EP 80 30 174.1

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
X	<u>US - A - 3 981 258</u> (SMITH) * The whole document * --	1,2,3	B 63 H 9/04
X	<u>US - A - 3 870 004</u> (BAILEY) * The whole document * --	1,3,4, 5,6,7, 8,9	
X	<u>DE - A - 2 036 147</u> (KUNZ) * The whole document * --	1	
X	<u>DE - C - 524 605</u> (BUDIG) * The whole document * --	1,3	TECHNICAL FIELDS SEARCHED (Int.Cl. 3)  B 63 H
X	<u>US - A - 1 670 936</u> (MC INTYRE) * The whole document * -- -- --	1,4,5, 7,8	
			CATEGORY OF CITED DOCUMENTS
			X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
			&: member of the same patent family, corresponding document
The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
THE HAGUE	04.09.1980	LUKAS	