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71 Applicant: **Brighi, Giorgio, Via Bartolomeo Parodi 264-266, I-16010 Ceranesi (Genova) (IT)**

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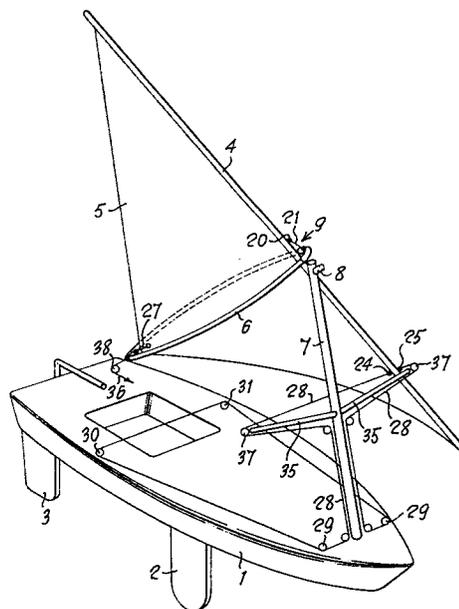
72 Inventor: **Brighi, Giorgio, Via Bartolomeo Parodi 264-266, I-16010 Ceranesi (Genova) (IT)**

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74 Representative: **Porsia, Dino, Dr. et al, c/o Succ. Ing. Fischetti & Weber Via Caffaro 3, I-16124 Genova (IT)**

54 **A sail rig for water crafts.**

57 The sail rig for water crafts comprises a mast (4) with the respective sail (5) and the boom (6). The mast (4) is articulated at an intermediate position along its length to the top end of a mast-supporting structure (7) consisting of a tubular mounting which is firmly fitted onto the framing of the hull (1) so as to lie on the craft center line, but so as to be cast astern. The joint (8) for articulating the mast (4) to the mounting (7) is a cylindrical joint with its axis of rotation extending longitudinally, more particularly extending in the direction parallel to the axis of boom (6). The mast may be thus caused to assume not only a position contained in a vertical plane passing through the boat center line, but also any desired inclined position about the said axis of rotation of the cylindrical joint (8), so as to attain the most favourable rake for the best point of sailing of the boat. Preferably, the angle of this rake will range from 35° to 45° on the one or the other side. The boom (6) is an arcuate, fork- or oval-shaped double boom of the so-called «wishbone» type as used in sailboards and at its apex it is articulated by means of joint (9), very simply made in form of a plain small link (21) fastened to an eye (20) provided on mast (4).



The present invention has for its object a sail rig for water crafts, particularly for pleasure and race sailing boats, catamarans, sailboards and the like, the said sail rig comprising a movable mast carrying a sail.

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The invention aims to provide a sail rig which should act upon the water craft so as to relieve its load during its heading, and to facilitate its gliding over the water even with not very strong winds, while reducing the heeling effect and eventually gaining speed with a rather simple and cheap sail which also allows to better catch the wind.

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The characteristic features of the invention and the advantages arising therefrom will appear evident in the following detailed description of some preferred embodiments, made by way of non-limiting examples and with reference to the accompanying drawings, in which:

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Figure 1 is a perspective view showing a sailing boat provided with the sail rig according to the invention, with the mast in inclined position;

5 Figure 2 is a side elevational view showing the sailing boat according to Figure 1 with the mast in vertical position;

 Figure 3 is a front view of the sailing boat
10 according to Figure 2;

 Figure 4 is a front view showing the same sailing boat as in Figures 1 to 3 with the mast in inclined position;

15 Figure 5 is a detail view showing the preferred embodiment of the sail, with the boom articulately connected to the mast, according to a modified embodiment.

20 Figure 6 is a detail showing a modified embodiment of the invention.

 Referring to Figures 1 to 4, reference numeral 1
25 indicates the hull of a sailing boat provided with a fin keel 2 and a rudder 3. The sail rig of said boat comprises a mast 4 with the respective sail 5 and the boom 6. The mast 4 is articulately connected at an intermediate point along its length to the top end of a mast-supporting
30 structure 7 consisting of a tubular mounting which is

firmly fitted onto the structure of hull 1 so as to lie on the craft centre plane, but so as to be inclined astern.

The joint 8 for articulating the mast 4 to the mounting 7 is a cylindrical joint, with its axis of rotation extending longitudinally, more particularly extending in a direction parallel to the direction of the axis of boom 6; the mast may be thus caused to assume not only a position contained in a vertical plane passing through the boat center line, but also any desired inclined position about the axis of rotation of the said cylindrical joint 8, in order to attain the most favourable rake for the best point of sailing of the boat. Preferably, the angle of this rake will be of 35° to 45° on either side.

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The boom 6 is an arcuate, fork- or oval-shaped double boom of the so-called wishbone type as used in sailboards and it is articulated at its vertex by means of joint 9, very simply made in form of a simple tie rod or link secured to an eye 20 provided on mast 4.

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Figure 5 more clearly shows the configuration of a sail cut according to the preferred shape. This sail has a substantially triangular shape and its depth side, and possibly also its lower side, may be convex rather than straight, and may be provided with battens. The cut of the sail is such that the line along which it is properly set taut corresponds to the straight line extending from the joint 8 to the sheet point 38 on the boat deck. Since the cloth of such a sail would not be sufficiently stretched

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in the case of the points of sailing ranging from large-hauling to sailing free, a boom 6 is provided and used for maintaining constantly stretched the surface of the sail and for thus increasing the performance of the sail at high speeds. In this Figure there is shown a boom 6 provided with a universal joint 9 arranged on the stern side of the swingable mast 4.

In order to make it possible to use this boom, the sail must be of course provided with an opening 22 such as to permit the continuity of the oval-shaped boom.

In Figure 5 there is also shown that the axis of the cylindrical joint 8 exactly corresponds to the axis of the boom. In this case, the sail 5 during its rotation with the mast 4 is swung about the said axis, and therefore the boom sheet 36 while exerting its action for keeping the boom 6 so as to hug the wind, does not produce any strain either in the upper, or in the lower portion of the sail cloth. In the same Figure 5 there is visible the line 27 for initially stretching the sail cloth.

In Figures 1 to 4 there are illustrated also the devices which are provided for achieving the trim of the mast. The said devices comprise two crosstrees or poles 35, one of which is arranged on the left side and the other on the right side of mounting 7. On the ends of said crosstrees there are arranged the pulleys 37 for leading on either side thereof the running parts 28 led in a closed path to the cockpit, and by means of which it is

possible to cause the mast to be inclined on either side about its fulcrum 8, by applying a traction force upon the one or the other side of mast 4. By means of a standing part, the said running parts are fastened at points 24 and 5 25 on the mast 4. As it appears in Figure 1, the running parts 28 are led to the cockpit by means of transmissions 29-30-31.

In Figure 6 there is shown a modified embodiment 10 of the articulated connection of the swingable mast 4 to the mast-supporting structure 7. According to this modification, the mast-supporting structure 7 presents at its top end a guide bore 39 and a guide pulley 40 for guiding through the said structure 7 a line 41 by means of which 15 the swingable mast 4 is hoisted to its operative position. More particularly, the line 41 is secured to the mast 4 by means of a clove hitch 42 or any other suitable hitch.

As it will be appreciated, in this manner it is 20 possible to disassemble the mast 4 from the mast supporting structure 7 in a simple and easy manner and without any particular tool. Moreover, the clove hitch connection permits to adjust, within certain limits, the position of the point of articulation of the swingable mast 4, along 25 the mast itself.

As already mentioned in the preamble, the invention aims to provide a sail rig which should act upon the water craft so as to relieve the load therefrom during its 30 heading, and to facilitate its gliding over the water even

with not very strong winds, while reducing the heeling effect and eventually gaining speed with a rather simple and cheap sail, which also allows to better catch the wind.

5 As it clearly appears from the foregoing, this object is essentially attained by means of a sail rig in which the mast is articulated at an intermediate point thereof to the top end of a mast-supporting structure fitted onto the water craft and extending in the upward
10 direction up to such a height that the mast can be at will caused to assume a substantially vertical position, or it can be inclined to any desired degree.

 In the sail rig according to the invention, it is
15 thus possible to cause the mast articulated to the mast-supporting structure to assume at will a standing position, i.e. a vertical, or preferably an astern-cast position with respect to its neutral position; moreover, this mast can be inclined in such a manner that its top end is
20 brought to the weather side, while its bottom end is moved to the lee side.

 Therefore, with the mast in such a tilted position, also the upper part of the sail is moved windward,
25 while the lower part of the sail is moved leeward, so that all the sail is substantially balanced as a whole or in part during its movement.

 Thus, the sail comes to form a sort of slanting
30 wing with respect to the direction of the wind, so that

the resultant of the wind force acting upon the sail is substantially directed upwards and can be resolved into the following three components.

5 A first, upwardly directed vertical component which is opposed to the weight of the boat, whereby its gliding over the water is facilitated.

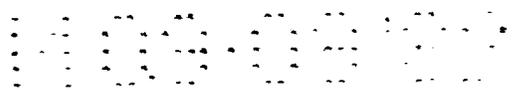
10 A second, horizontal component of a lesser magnitude than that of a conventional sail rig with a vertical mast, which produces a heeling effect.

15 A third, longitudinal forward component which is adapted for generating a propulsive force.

20 The fact of having the possibility of moving the sail toward the wind in order to better catch the wind by moving toward it the upper section of the tiltable mast, is particularly advantageous even when sailing before the wind.

25 In fact, in this last case, the sail behaves as if it were hauled on the weather side, or, in other words, the upper section of the mast being moved windward will come to perform the function of the boom in a sail of the spinnaker type.

30 Moreover, the barycenter of the sail is near to the center line of the boat, whereby the boat sails on a more balanced point.



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5 The articulated connection of the tiltable mast to the top end of the mast-supporting structure may consist of a ball or a universal joint, but preferably of a cylindrical joint with its axis of rotation extending in the longitudinal direction of the water craft.

10 The mast-supporting structure may be made in any desired manner, and may consist, for example, of a tripod or bipod structure, and may also be formed in the very framing of the craft and of the same material as the craft itself, or else it may consist of a plain, preferably tubular mounting made from light alloy, with or without windbracing.

15 The sail carried by the tiltable mast may be made in any desired manner, and preferably, but not necessarily, it presents an almost triangular shape with the head side on the tiltable mast, with a depth side at the rear, and a lower third side which is substantially parallel to the
20 boat.

The sail is brought to the tiltable mast by the ordinary headrope system or even by any other system, such as the head tabling system.

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The sail rig of the invention may also comprise a boom articulately connected to the tiltable mast, the said articulated connection of the boom being preferably located in proximity of the above-disclosed joint for the
30 mast.

The said articulated connection of the boom may be a plain hinge joint of a universal joint. In a more simple manner, and particularly in the case of a fork- or oval-shaped boom, it consists of a link fastened of the fore
5 side of the mast.

The said boom may consist of a plain tubular structure, but preferably it is a double, fork-bent or oval-shaped boom, such as the so-called wishbone in
10 sailboards, so as to guarantee a perfect hauling taut of the sail on either sides, the said boom being preferably arranged in such a manner as to not stand as the conventional booms on one side of the ordinary mainsails, but as to stand across the cloth of the sail itself.

15

As an alternative, the said boom may be replaced by a shaped batten threaded through a special tabling extending across the sail cloth.

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The opposite end of the said boom or the respective clew of the sail will be generally connected to a conventional type sheet (for a mainsail or a jib) in order to be enabled to lay the sail and catch the wind.

25

In order to make it possible to perform this operation in the correct manner even with the mast in a tilted position on the one or the other side of the boat, however without applying any abnormal strain on the sail cloth, the following characteristic features will be
30 preferably adopted as a whole or in part:

- Such a cut of the sail that the proper duck cloth-stretching line (foot) will be as much as possible near to the line extending from the joint point on the mast to the sheet-leading point on the hull.

5

- The boom, when it is provided, will be also set according to such a duck cloth-stretching line as provided just by the cut of the sail, so that the said boom either having a plain tubular structure, or being an arcuate double boom, or possibly consisting of a batten threaded through the sail tabling, will be prevailingly arranged with its articulated connection point at a high level near the joint for the mast, and with its opposite end on the stern side, near the deck of the boat and close to the sheet point. The sail will be set in the required position over the hull in such a manner that its lower side will permit, when windward sailing, to pass from the one to the other side of the boat, without standing too much in the way of the seafarer.

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- The cut of the above-disclosed sail will be substantially analogous to that of an ordinary head-sail (such as a Genoa foresail or a jib), and it will be however provided with the head being adapted for a mast rather than for a stay, and therefore with a convex, rather than with a concave shape.

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- The boom will stretch the sail along the foot, thus increasing its efficiency, especially when running before the wind.

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- The mast-supporting mounting and the inclined mast might be upstanding, but they will be preferably cast astern, in neutral position. This arrangement aids in positioning the above-disclosed boom which comes to be located almost intermediately of the said duck cloth, whereby a more uniform distribution over the whole sail of the sail tautness is made possible.

- The axis of the joint for the mast which is pivotable about the relative mounting will be preferably parallel or almost parallel to, or it will even coincide with the axis along which the sail is set taut, and which in turn coincides with the axis of the boom. The afore-disclosed feature is particularly important in order to prevent the boom sheet, when trimming the sail, from generating any abnormal strains on the sail cloth even with an inclined mast. In fact, in this particular arrangement, by causing the mast to be swung to the starboard side or to the port side, it will be obtained that the sail is substantially rotated about the axis along which it is set taut, or axis of the boom, while always maintaining the initial conditions with the mast in neutral position.

To sum up, the boom sheet acts in a plane containing the axis about which the sail is rotated and consequently it does not produce on the sail cloth any vertical strain which would give rise to a more taut upper portion of the cloth and to a slackening of the lower cloth portion underlying the boom. The sail is thus

maintained always in its shape and keeps its initially set tautness independently of the trim of the sail or of the position of the inclined mast.

5 As to the means for handling the sail rig and particularly for hugging the wind, one sheet of the conventional type as used for a conventional common mainsail, with or without a reduction block, may be provided, or else two sheets may be provided, one on the
10 starboard side and the other on the port side, just as for the conventional jibs.

 For moving the swingable mast, mast-handling means may be provided which consist of conventional running
15 ropes led or not on crosstrees; preferably, however, the mast handling will be performed by acting upon the lower section of the mast with respect to the mast joint, more particularly, by exerting a pulling, or (if the case) a pushing action on the said section of the mast.

20 For this purpose, the mast mounting may be rigged with one or more fixed, outwardly extending symmetrical structures in form of crosstrees or poles which may be fixed in position or may be shifted along the mast mounting.

25 On the ends of the said structure two running parts may be provided, one on each side thereof, with the standing part on the pivotable mast, and led over the boat cockpit so as to determine through their pulling trim
30 (inclination) of the mast to the one or the other side.



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Such a pulling action will be performed by the seafarer standing in the cockpit with the aid of simple transmissions.

5 The said running parts may be of the single pull type, or they may consist of two or more twines so as to reduce the mast handling effort, and the said right and left running parts will be generally connected together so as to form one single part in a closed path.

10 As an alternative, the two outwardly extending structures may be provided on the mast instead of on the mounting. In this case, the running parts fastened to the ends of said structures will be led on the mounting, on
15 the one or the other side thereof, whereby such a pulling effort will be exerted as to determine the trim of the mast.

20 Of course the invention is not limited to the just shown and described embodiments, but many changes and modifications are possible, particularly concerning the details of construction and of operation of the various components, without however departing from the scope of the invention itself.

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CLAIMS

1) A sail rig for water crafts (1), particularly for pleasure and race sailing boats, catamarans, sailboards and the like, comprising a movable mast (4) and at least one sail (5), characterized by the fact that the mast (4) is articulated by means of an articulation (8, 39-42), at a point intermediate of its height, to the top end of a mast-supporting structure (7) fixed onto the water craft (1) and extending upwardly to such a height so as to permit to the said mast (4) to swing around the said articulation point and to assume at will a substantially vertical position or to be inclined to any desired degree.

2) A sail rig according to claim 1, characterized by the fact that the said articulation consists of a cylindrical joint (8) having its axis of rotation extending in the longitudinal direction of the craft (1).

3) A sail rig according to claim 1, characterized by the fact that the said articulation comprises a hoisting line (41) passing through suitable guide means (39, 40) provided at the top end of the mast-supporting structure, the said hoisting line being secured to the swingable mast by means of any suitable connection such as preferably a clove hitch (42), whereby the mast (4) is lifted and maintained by means of the said hoisting line up to the desired operative position.

4) A sail rig according to claim 1, characterized



by the fact that the mast-supporting structure (7) consists of a simple mounting fixed in any suitable manner to the boat hull and, if the case, suitably windbraced.

5 5) A sail rig according to claim 1, characterized
by the fact that it comprises at least one sail (5) having
a triangular shape, with one side brought to the swingable
mast (4) and with the clew near to the sheet leading point
(38) which is arranged at a more or less high position on
10 the deck, while the line along which the sail (5) is set
taut is close to, or it substantially coincides with the
line passing through the point of articulation of the mast
(4) and the said sheet leading point (38).

15 6) A sail rig according to claim 1, characterized
by the fact that it further comprises a boom (6) which is
connected by means of a joint (9) to the swingable mast
(4) said joint (9) of the boom being preferably located in
proximity to the articulation (8, 39-42) of the mast (4)
20 to the mast-supporting structure (7).

 7) A sail rig according to claim 6, characterized
by the fact that the boom (6) consists of a simple tubular
element.

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 8) A sail rig according to claim 6, characterized
by the fact that the boom (6) has an oval or fork shape,
similarly to the booms used for sailboards.

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 9) A sail rig according to claim 6, characterized

by the fact that the boom substantially consists of a batten fitted at least in part in a tabling of the sail.

10) A sail rig according to claim 1, characterized
5 by the fact that the mast-supporting structure (7) is located on the centre line of the boat (1) and is cast astern.

11) A sail rig according to claim 6, characterized
10 by the fact that the articulation (8) of the mast (4) to the mast-supporting structure (7) comprises a cylindrical joint having its axis extending in the longitudinal direction of the boat, and parallel to or coinciding with the line of proper stretching of the sail cloth, the said
15 line substantially coinciding with the geometrical axis of the boom (6).

12) A sail rig according to claim 1, characterized
by the fact that it comprises driving means (24,25,28,29,
20 30,31) for controlling the swinging of the mast (4), the said driving means acting upon the lower section of the mast, so as to exert thereon the required pulling or pushing action.

25 13) A sail rig according to claim 1, characterized by the fact that the said mast-supporting structure (7) presents a pair of crosstrees or side poles (35) adapted to lead two respective running parts (28) provided each with a standing part (24, 25) on either side of the
30 swingable mast (4) and adapted to control by pulling



action the trim of the mast (4).

14) A sail rig according to claim 13, characterized
by the fact that the said running parts are arranged in a
5 closed path and are led to the cockpit.

15) A sail rig according to claim 13, characterized
by the fact that the means for trimming the mast comprise
crosstrees or poles fixed on the swingable mast (4).

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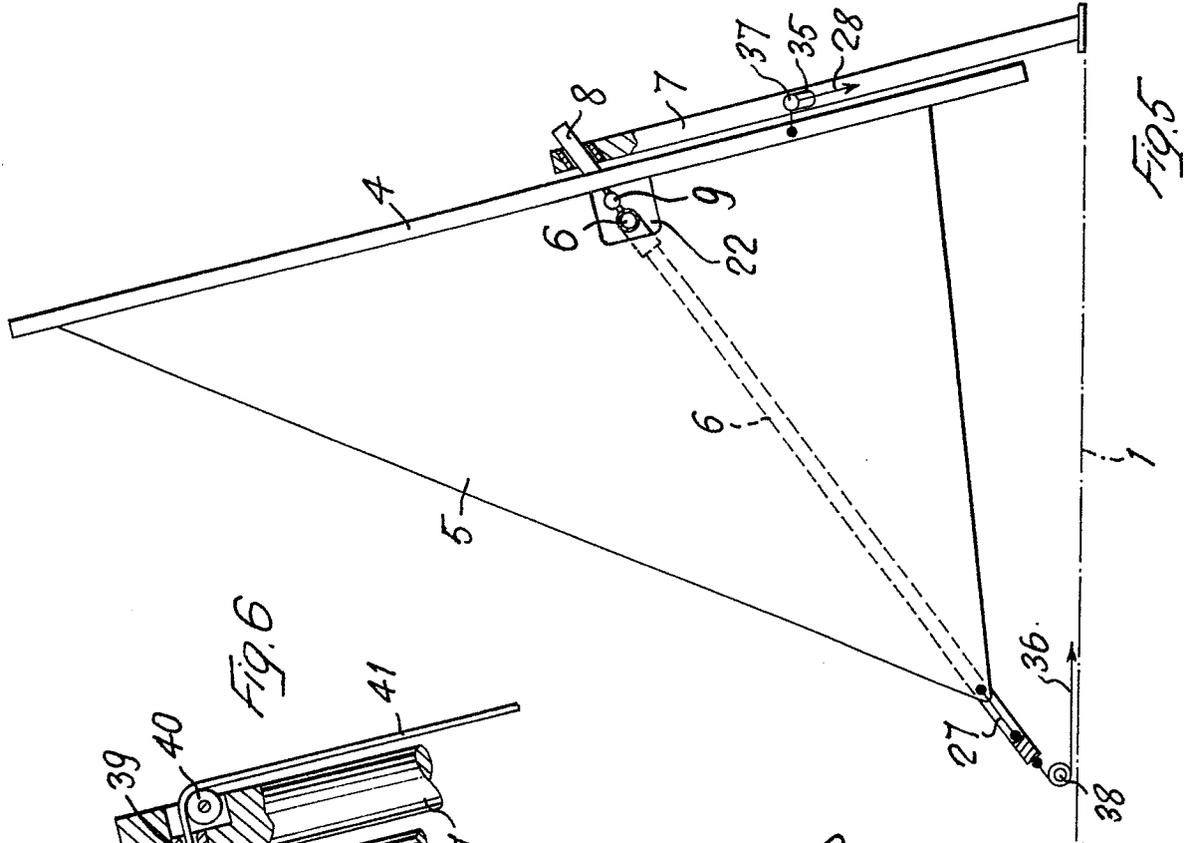


Fig. 5

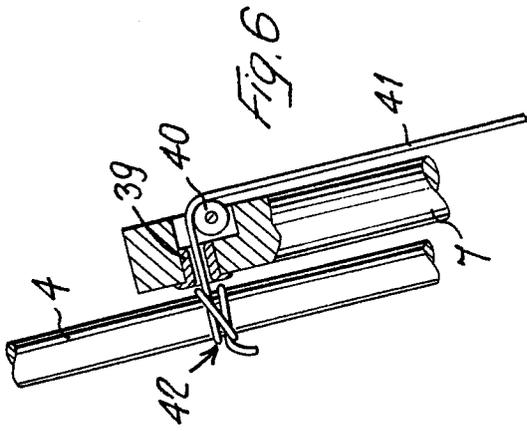


Fig. 6

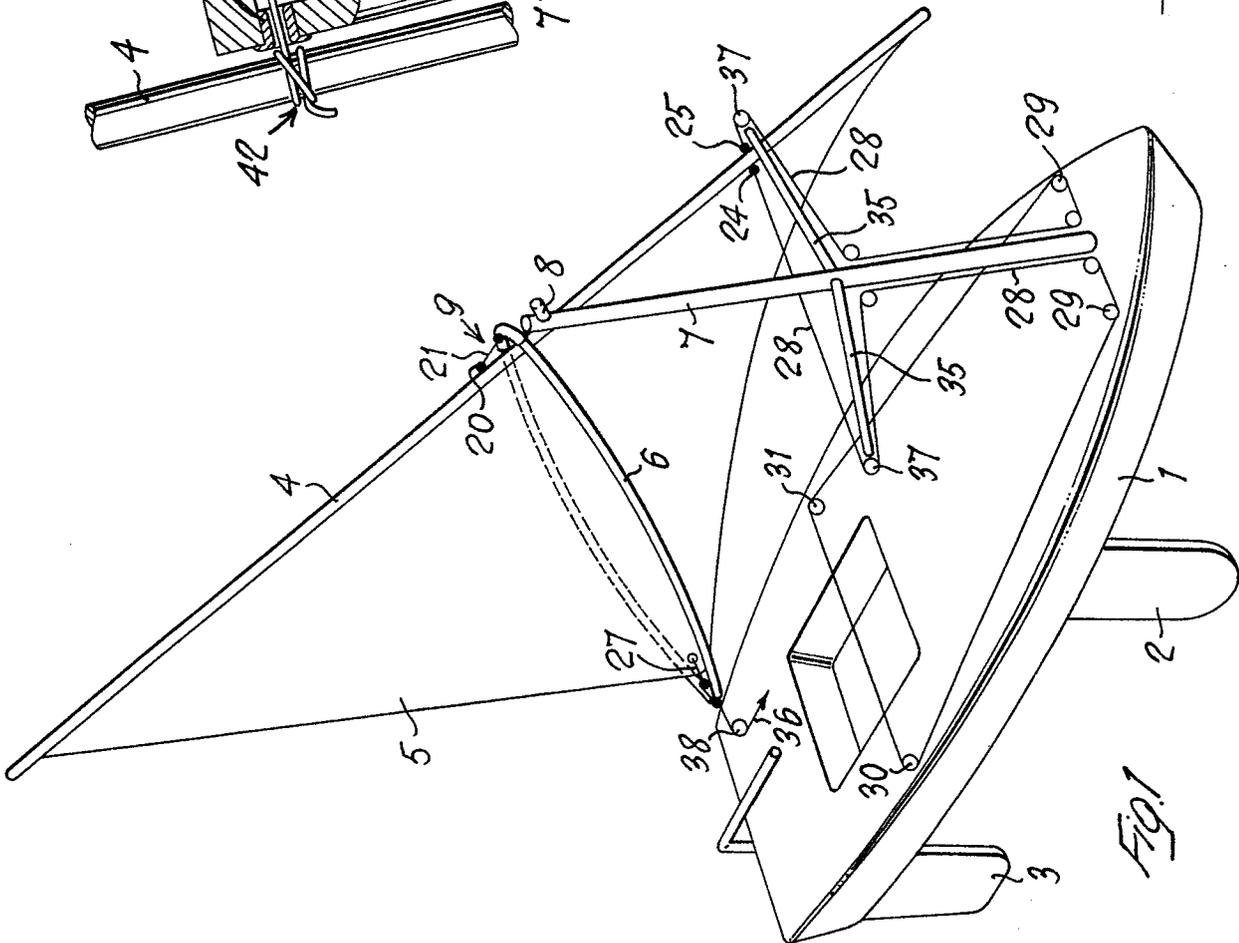


Fig. 1

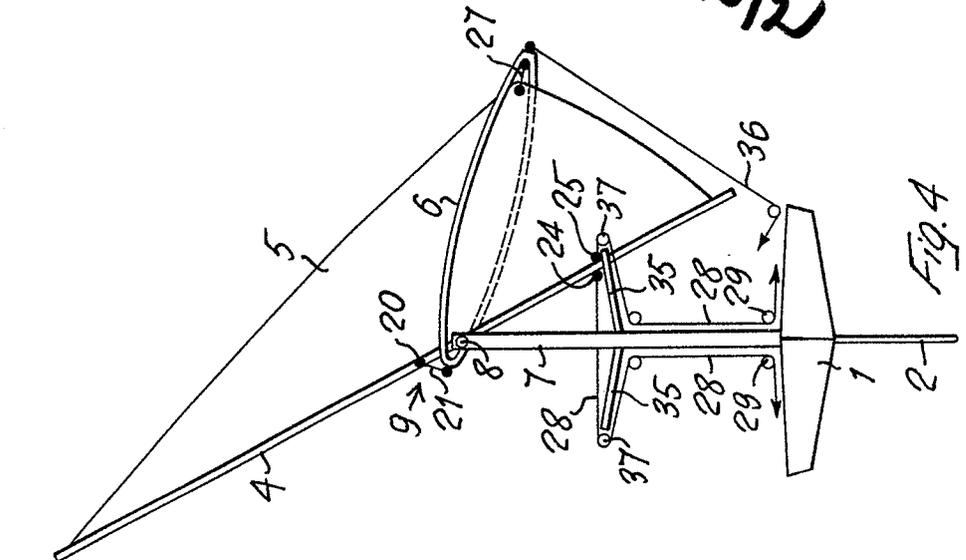


Fig. 4

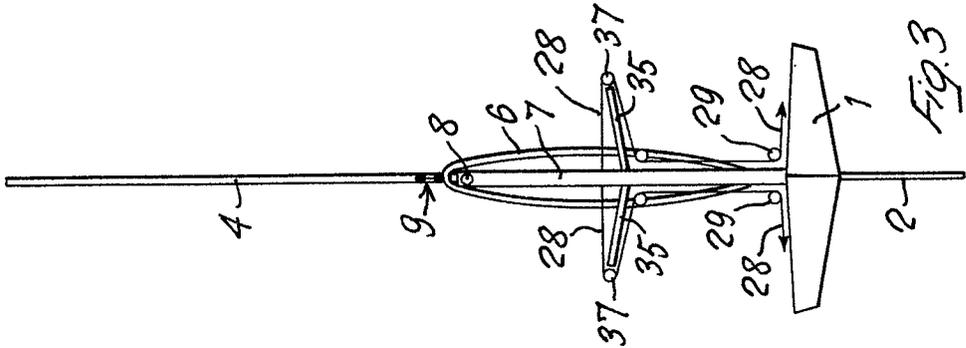


Fig. 3

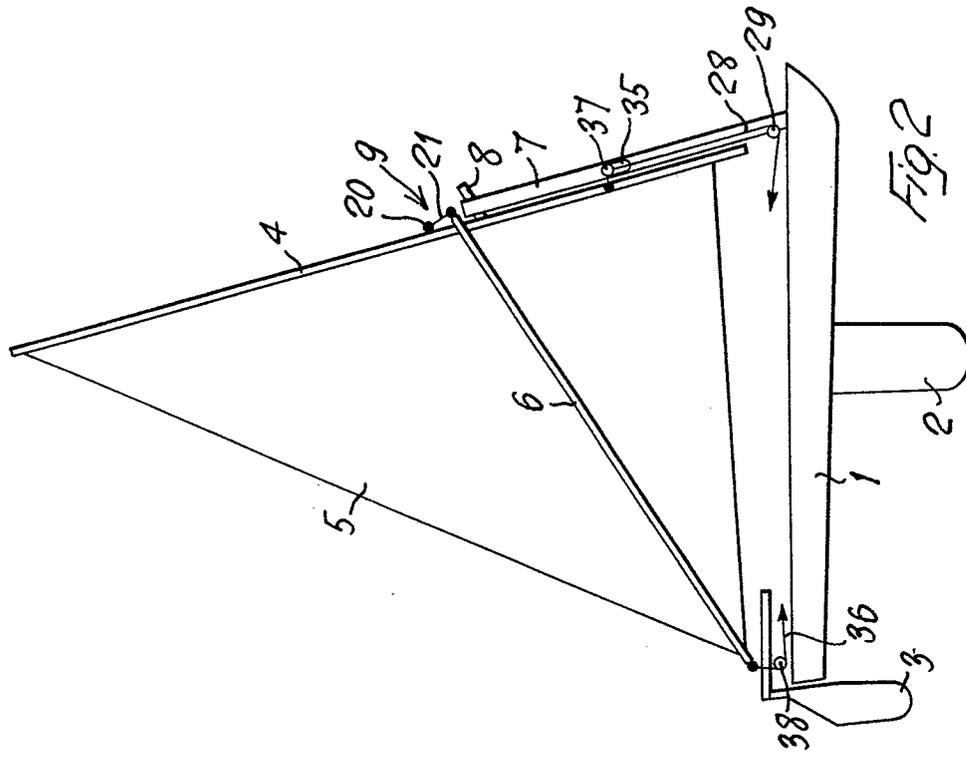


Fig. 2