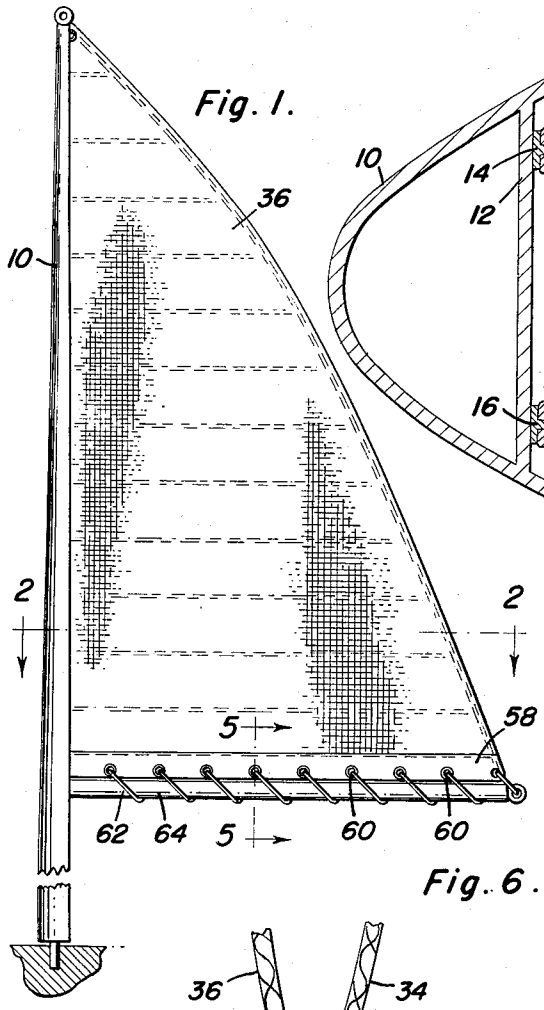
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SAIL FOR SAILING CRAFT

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Fig. 1.



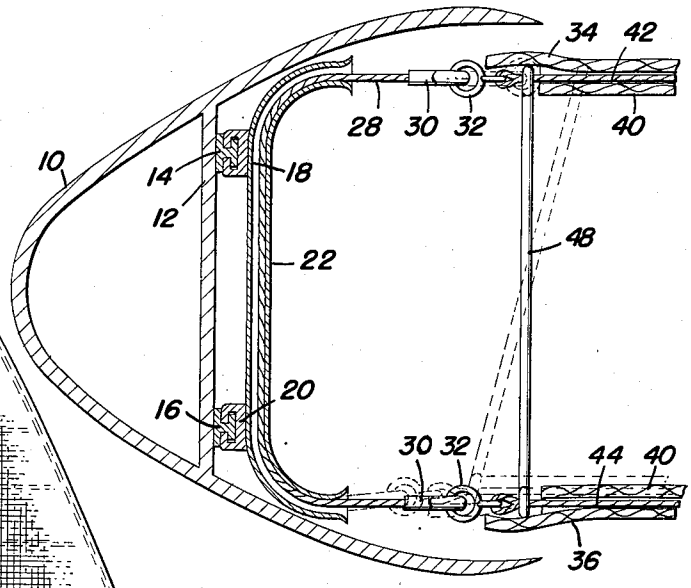
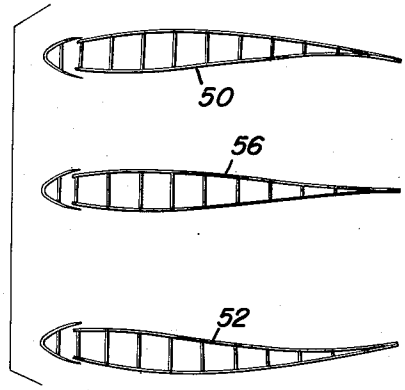




Fig. 4.

Fig. 6.



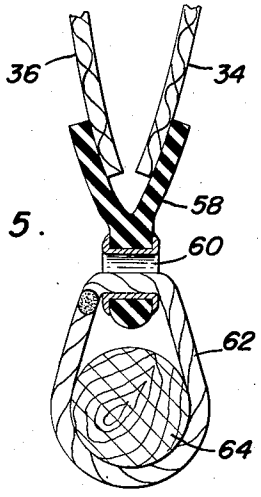




Fig. 5.

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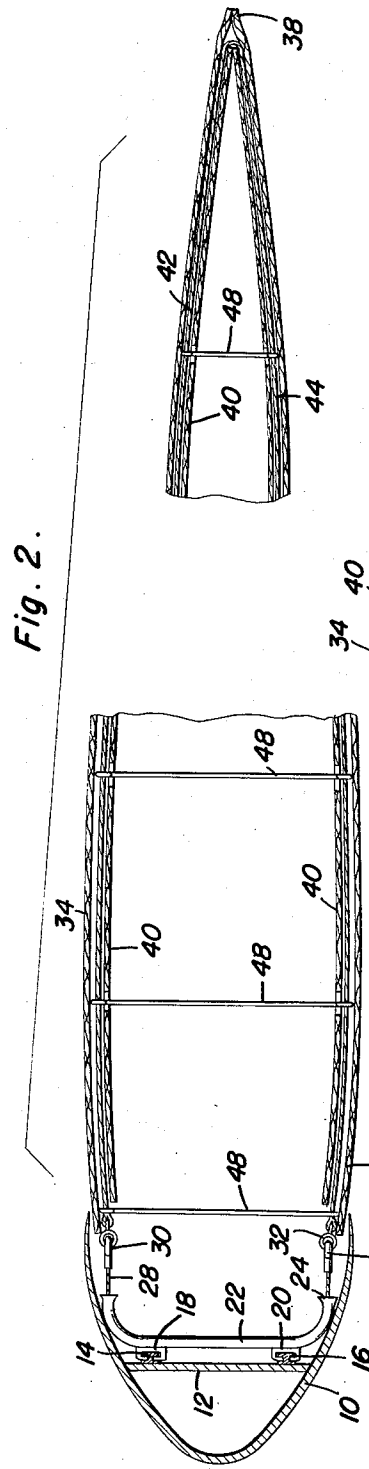



Fig. 2.

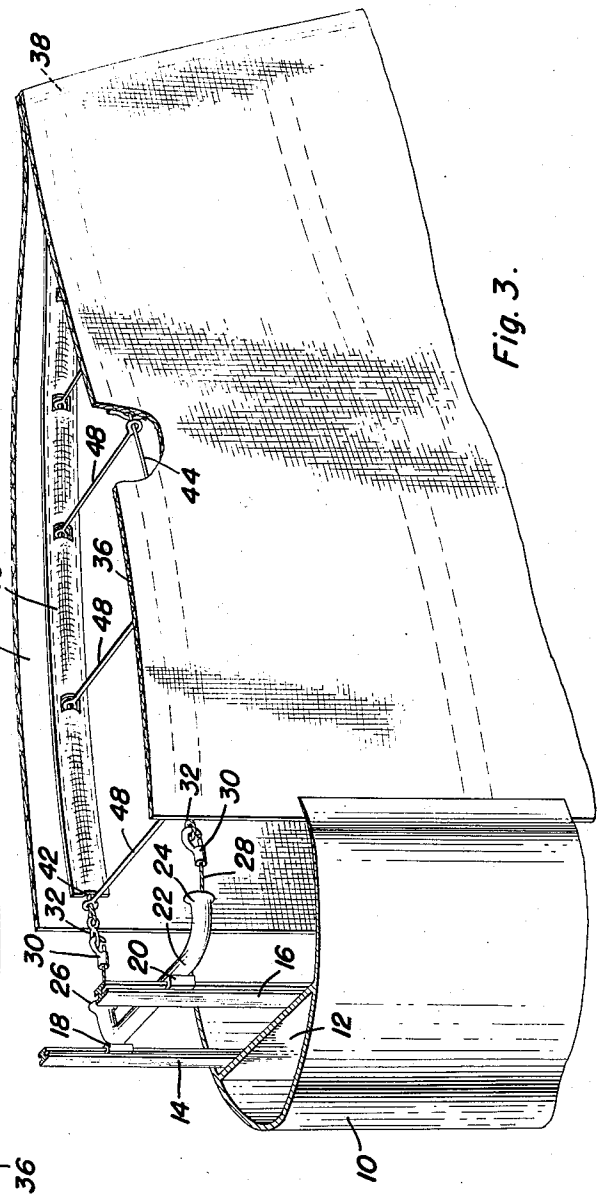



Fig. 3.

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Patented Sept. 25, 1951 2,569,318

# UNITED STATES PATENT OFFICE

2,569,318

## SAIL FOR SAILING CRAFT

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Application June 13, 1949, Serial No. 98,889

7 Claims. (Cl. 114—103)

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This invention relates to novel and useful improvements in sail constructions for use on various and sundry types of sailing craft.

An object of this invention is to provide a flexible, airfoil type of sail body which will alter its contour in response to various air pressures in such a way as to improve the sailing characteristics of a craft and to improve the aerodynamic qualities and behavior of the sail as it passes through the air and as the sail together with the craft is urged through the water by means of the air pressure occasioned by the wind currents incident to the sail body.

Conventional sails, consisting of a single sheet of canvas which becomes a cambered surface in response to wind pressures are aerodynamically inefficient. This invention provides a sail body which will assume the contour of an airfoil in action. It will then have much higher aerodynamic efficiency as regards its effective thrust to drag ratio. It is so designed that it will automatically assume the proper contour in response to incident winds.

The feature of the invention resides in the construction which includes a curved leading edge member, or mast, having an open back and at least one vertical guide but preferably two disposed within the leading edge member and shoes mounted for slidable movement disposed on the guide or guides with tubes carried by the shoes so that a flexible member may pass through each tube and be directed rearwardly, the flexible member having attached at its ends a long batten which may be of one or two piece construction but which is carried by a flexible body and specifically in long batten pockets formed by suitable material secured thereto disposed between spaced sail surfaces of the body, and cross members connecting the battens.

Ancillary objects and features of novelty will become apparent to those skilled in the art, in following the description of the preferred form of the invention, illustrated in the accompanying drawings, wherein:

Figure 1 is an elevational view of the sail construction;

Figure 2 is a sectional view taken substantially on the line 2—2 of Figure 1 and in the direction of the arrows;

Figure 3 is a fragmentary perspective view of the sail construction;

Figure 4 is a fragmentary transverse sectional view in enlarged scale showing internal structure of the sail mechanism;

Figure 5 is an enlarged detail of construction

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taken on the line 5—5 of Figure 1 and in the direction of the arrows; and

Figure 6 is a series of schematic views showing the functional operation of the structure.

The structure of the present invention has been made with a view to commercial feasibility. To this end it is necessary that the structure be relatively simplified, easily fabricated and removed. Accordingly, a leading edge member 10 which is smoothly curved in cross section and which has an open back, is adapted for substantially vertical disposition on a craft. It is so mounted on the craft as to be capable of rotary motion on its vertical axis so as to permit proper alignment of the sail structure with incident air currents. The said leading edge member has a vertical partition 12 with a plurality of cross members disposed therein supporting rails or guides 14 and 16, respectively. These rails or guides have pairs of shoes 18 and 20, respectively, mounted for slidable movement thereon. The guides are preferably formed with side grooves therein and the shoes have complemental tongues disposed in the grooves so that the shoes are capable of only vertical movement. There are a number of pairs of such shoes 18 and 20 disposed in the guides.

Fixed to each pair of shoes is a tube 22 having flared ends 24 and 26, respectively, directed backward toward the trailing edge of the structure. A flexible element or member as a cable 28 is disposed in each tube. At each end of the flexible member 28 there is a fastener 30 releasably fixed to a ring 32 provided on sail surfaces 34 and 36, respectively, of a flexible body member.

The said flexible body member is preferably made of a conventional material and is of two spaced sail surfaces 34 and 36, joined together at the trailing edge by means of stitching 38 or the like. The body is cut to the desired specifications to form a substantially conventional sail-shaped member.

Spaced strips 40 of a material similar to that of the sail surfaces are stitched or otherwise secured to the interior aspect of each sail surface 34 and 36, forming batten pockets for the disposition of flexible battens 42 and 44, respectively. It is noted that the illustration shows the batten made of one piece. However, it is contemplated to use either one or two piece construction. In the single piece construction as disclosed in Figure 2, the two halves of the batten generally are considered individual battens.

The leading edge portions of the body are

disposed slightly within the open back of the leading edge member 10 thereby positioning the ring 32 within the leading edge member although the ring may readily be removed from engagement with the clamp 30 by simply pressing the flexible body inwardly slightly.

A number of cross members 48 are disposed between the sail surfaces 34 and 36 and pass through suitable openings in the batten pockets so that they may connect with the battens 42 and 44 by means of eyes which are formed on the ends of the cross members.

In operation various wind pressures applied to the sides of the sail construction force the sail construction to assume the position as shown at 50 in Figure 6, or at 52 in Figure 6. When there is a direct head wind, the sail structure assumes the position 56 shown in Figure 6.

At the lower edge of the body there is an elastic strip 58 fastened, having eyelets 60 therein so that the string or rope 62 may pass therethrough so that it also may be wrapped around the boom or pole 64. This boom is attached to the leading edge member or mast in the conventional disposition. The elastic strip 58 permits a certain degree of vertical resiliency in said surface 34 and 36 permitting them to maintain an aerodynamically smooth contour in all positions relative to incident air currents.

The sail construction will, in operation, be made to function as an airfoil by properly adjusting its angle of incidence to wind currents. It will thus provide a higher degree of impelling thrust to the forward motion of the sailing craft in proportion to its drag than would a conventional single surface, cambered sail. This behavior characteristic will materially increase the efficiency of the sailing craft when it is sailing close-hauled or on a broad reach.

The general construction will permit removal of the sail construction from the sailing craft when not in use.

Having described the invention, what is claimed as new is:

1. A sail construction comprising a leading edge member adapted for substantially vertical disposition on a boat, a flexible double surfaced sail body, means operatively connected with said body for restraining the body from flexure beyond a predetermined position in response to air pressure, means adjustably supported by said leading edge member for retaining said restraining means including rails, shoes slidably disposed on said rails, tubes carried by said shoes, and said body restraining means having a part thereof carried by and slidably disposed in said tubes.

2. A sail construction comprising a leading edge member adapted for substantially vertical disposition on a boat, a flexible double surfaced sail body, means operatively connected with said body for restraining the body from flexure beyond a predetermined position in response to air pressure including members forming pockets in said sail body, battens disposed in said pockets, flexible elements connecting pairs of battens, rails disposed in said leading edge member, shoes mounted for sliding movement on said rails, and means having said flexible elements disposed therein and secured to said shoes for slidably supporting said elements.

3. The combination of claim 2, and a boom operatively connected at an angle with said leading edge member, and resilient means secured to said flexible body connecting said sail body with said boom.

4. In a sail construction, a substantially airfoil shaped flexible body movable in response to various directional air pressures to assume various corresponding positions and a leading edge member having one pair of edges of the body disposed therein, pairs of battens carried by said body and means connecting opposite battens of each pair, flexible elements secured to the ends of the battens of each pair, and means carried by said leading edge member securing said elements to said leading edge member including a plurality of shoes and vertical guides having said shoes disposed thereon.

5. A sail construction comprising a curved leading edge member having an open back and at least one vertical guide disposed within said leading edge member, shoes disposed on said guide and tubes carried by said shoes, a sail body formed of two thickness of flexible material joined at the trailing edges thereof forming two sail surfaces, longitudinal members carried by said material and forming pockets, and means disposed in said pockets and said tubes for transmitting movement of one of the thicknesses to movement of the other thickness of material.

6. A sail construction comprising a curved leading edge member having an open back and at least one vertical guide disposed within said leading edge member, shoes disposed on said guide and tubes carried by said shoes, a sail body formed of two sheets of flexible material joined at the trailing edges thereof, members carried by the inside surfaces of said sheets forming pockets, and means disposed in said pockets and said tube for transmitting movement of one of the sheets to movement of the other sheet of material and including pairs of battens, the battens in each pair being connected together at the leading edge by flexible elements disposed in said tubes.

7. The combination of claim 6, and a plurality of cross members disposed between said sheets and secured to said pairs of battens.

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