United States Patent [19]

Lagerquist

[11] **3,802,373**

[45] **Apr. 9, 1974**

[54] **ENCAPSULATING SLEEVE FOR HEADSTAY OF A SAILBOAT**

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[52] **U.S. Cl.** **114/105,** 114/102, 114/108

[51] **Int. Cl.** **B63h 9/04**

[58] **Field of Search** 114/102–107, 114/108, 111, 112

[56] **References Cited**

UNITED STATES PATENTS

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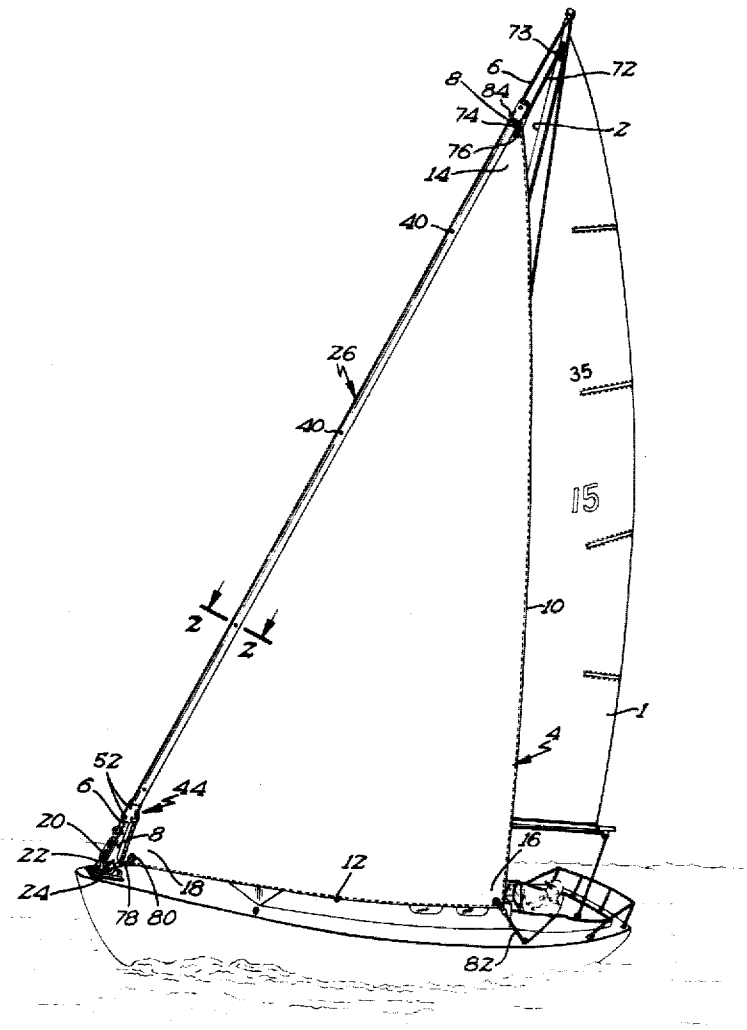
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Primary Examiner—Trygve M. Blix
Assistant Examiner—Stuart M. Goldstein
Attorney, Agent, or Firm—Williamson, Bains & Moore

[57] **ABSTRACT**

The leading edge of a sail, particularly a jib sail of a sailboat, is supported along the length of a headstay by an encapsulating sleeve embracing the headstay and having a through slot along its rear edge through which the cloth at the leading edge of the sail extends. An elongated channel in the sleeve communicates with the aforesaid slot and is shaped to contain and restrainably engage the leading edge or luff of a jib sail, whereby the leading edge of the sail is slidably supported along its entire length within the aforesaid sleeve. The encapsulating sleeve is free to rotate on the headstay, thereby permitting the rotational movement of the leading edge of the sail about the headstay with directional changes of the sailboat and the wind.

10 Claims, 5 Drawing Figures



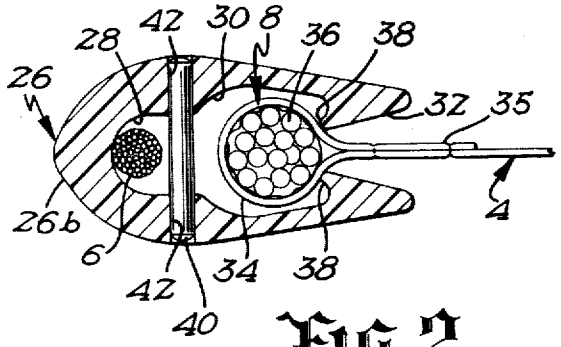


Fig 2

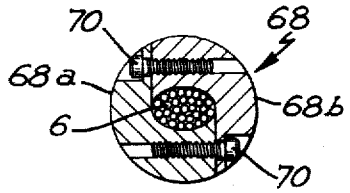


Fig 5

Fig 1

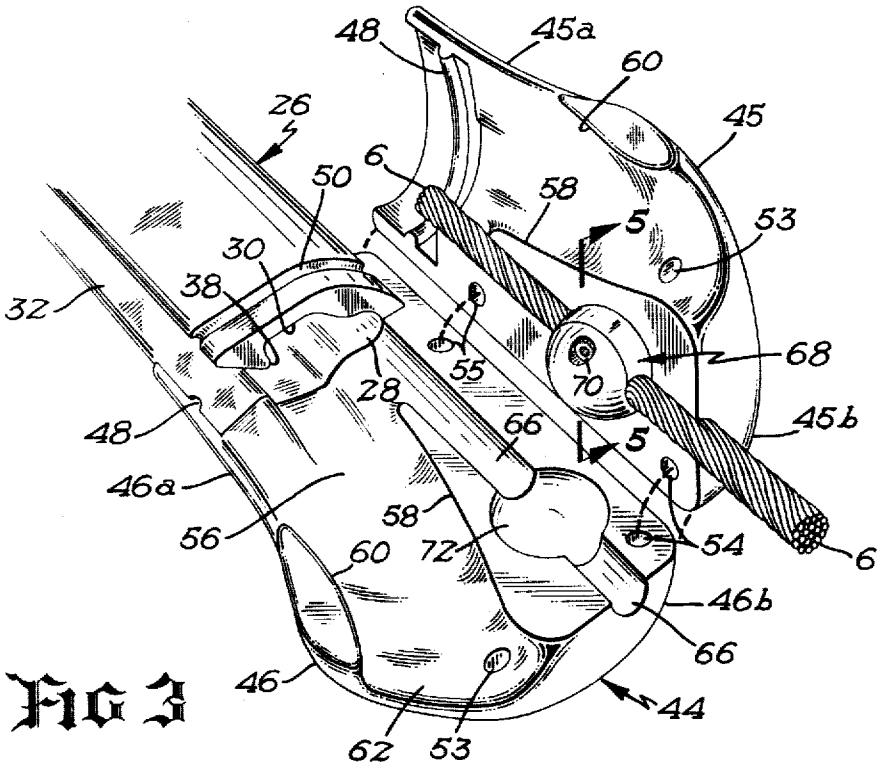

48
45a
60
26
45
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5
53
30
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32
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68
70
28
45b
48
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46a
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72
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46b
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44
62
53

Fig 3

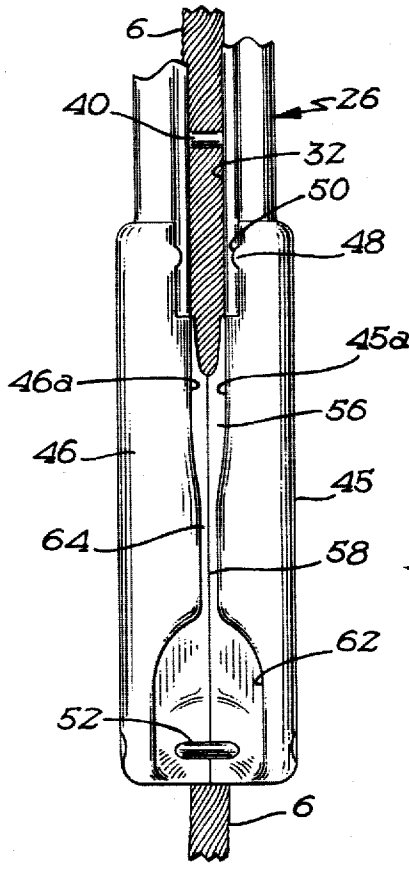

6
40
26
32
50
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45a
46a
56
46
45
64
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62
52
6

Fig 4

ENCAPSULATING SLEEVE FOR HEADSTAY OF A SAILBOAT

BACKGROUND OF THE INVENTION

One of the factors contributing most significantly to lost efficiency and wind drive in the operation of sailboats is the particular manner of mounting sails, particularly jib sails on a supporting stay. Traditionally, jib sails have been support along their upright leading edge of luff on a headstay or forestay by a plurality of vertically spaced snap hooks attached to the leading edge of the sailcloth. This arrangement necessarily creates a series of open spaces along the jib luff between the attachment points to the headstay, with resulting wind turbulence that interferes with smooth airflow over the jib and maximum efficiency under varying wind conditions. Also, such a snap hook attachment of jibs to headstays is cumbersome for changing jibs and requires a mucg longer time for such changes. Safety on a sailboat is greatly enhanced using the encapsulating sleeve to change a jib.

Modified jib mounting arrangements which have been devised, as disclosed in U. S. Pat. Nos. 2,858,789 and 3,147,729 have helped to a degree in overcoming these problems, but have fallen short of providing a jib mounted in such a way as to be sufficient for sail handling and operation of the smallest to the largest of jibs for all size sailboats. The headstay mounting arrangement of the latter patent, for example, improves airflow over the jib luff by the use of a continuous flap attachment means between the jib and the headstay, with the folded flap embracing the headstay. However, since the flap which is folded around the headstay or a tube enclosing the headstay, is attached to the jib sailcloth and is thus subjected to the same forces and tension exerted on the jib by wind, jib halyard and jib sheet, it is not feasible to attach very large jibs (1500 sq. ft. or 200 sq. meters) and still handle the sail efficiently. The jib mounting arrangement of this invention has been designated with a view towards overcoming all of these difficulties.

BRIEF SUMMARY OF THE INVENTION

The jib sail support device of this invention is particularly characterized by an elongated, self-supporting sleeve enclosing the headstay of a sailboat and supporting the leading edge or luff of a jib sail along its length in such a way as to reduce turbulence along the jib luff, with the sleeve being freely rotatably about the headstay as the angle of approach to the wind changes, thereby providing maximum jib efficiency at all times.

These basic objectives have been realized by utilizing such a self-supporting sleeve, preferably made from plastic, which has a through slot extending longitudinally along one edge thereof, and an elongated channel therein into which the slot opens, the channel being shaped to contain and restrainably engage the leading edge of a jib sail with the sailcloth extending through the slot. An elongated passage within the sleeve adjacent its leading edge serves to contain the headstay, and the sleeve is rotatable about the longitudinal axis of the headstay.

In mounting a jib sail, the leading edge of the saidcloth at th head of the sail is slidably guided into the aforesaid elongated channel in the sleeve and is pulled downwardly by the jib halyard attached to the head of the jib sail. Sleeve retainer means securely fastened on the headstay, preferably adjacent the bottom end thereof, serves to hold the sleeve in a desired position of generally vertical adjustment on the headstay.

As a particularly advantageous feature of my jib sail support device, the aforesaid sleeve is formed to an airfoil shape, and has a rounded leading edge opposite the rear edge thereof through which said slot extends. The airfoil shaped sleeve, being in supporting engagement with the luff of the jib said along its entire length, reduces air turbulence along the luff of the jib sail, and smoothly directs air over the jib sail at all times as it freely rotates with the jib under changing wind and boat directions.

The mounting of a jib sail on a headstay utilizing my sleeve device is facilitated by providing a guide boot at the bottom end of the sleeve, the guide boot having a vertically extending guide channel therein and an enlarged mouth opening into the guide channel to receive the leading edge of the head of a jib sail. A vertical slot extending longitudinally along the rear edge of the boot from its mouth to its upper end opens into the boot guide channel for the extension of the cloth of a jib sail therethrough, and is aligned at its upper end with the slot on the rear edge of the sleeve, whereby the leading edge of a jib said may be fed into the mouth of the boot and pulled upwardly through the boot guide channel, and the elongated, luff receiving channel in the sleeve.

These and other objects and advantages of my invention will be readily understood as the following description is read in conjunction with the accompanying drawings wherein like references numerals are used to designate like elements throughout the several views.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a sailboat having the jib mounting sleeve of this invention installed thereon;

FIG. 2 is a horizontal section view of the support sleeve and luff of a jib sail, taken along lines 2—2 of FIG. 1;

FIG. 3 is an exploded, perspective view of the bottom end of the sleeve and guide boot;

FIG. 4 is a rear, elevation view of the guide boot and bottom of the sleeve; and

FIG. 5 is a section view of the sleeve retainer element taken along lines 5—5 of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, I have shown in FIG. 1 a sailboat having a mainsail 1 supported on a mast 2. Forwardly of the mainsail is a jib sail 4 supported on a headstay or forstay 6 secured between the bow of the boat and the top of mast 2. Headstay 6 may be in the form of a rod, or a cable as shown. Jib sail 4 is a triangular shaped sailcloth having a leading edge of luff 8 which is secured to headstay 6. The other two edges of jib sail 4 are the rear, upright edge 10 known as the leech, and bottom or foot edge 12. The intersection of these edges of jib sail 4 define the three jib corners known as the head 14 at the top of the jib said, clew 16 at the base of the jib, and tack 18 positioned adjacent the bow of the boat. Headstay 6 is attached to the bow of the boat in a conventional manner at its lower end

utilizing a turnbuckle **20** having a clevis **22** attached thereto. Clevis **22** is removably secured to a bracket or stemhead fitting **24** on the bow of the boat by a removable pin connection.

For the purpose of suspending the leading edge or luff **8** of jib sail **4** on headstay **6**, I have provided an elongated sleeve **26** which substantially encapsulates or embraces headstay **6**. Sleeve **26** is self-supporting, preferably semi-rigid, and may be made from various materials including metal and resins. Preferably, I form sleeve **26** as an extrusion utilizing specially formulated polyvinylchloride as the extrusion material. Such a sleeve is semi-rigid, and possesses sufficient flexibility to be stored and shipped in rolls. It will be appreciated that sleeve **26** can be cut to predetermined lengths for installation on various sizes and types of sailboats having masts of different heights. As is indicated in FIG. **1**, sleeve **26** is cut to a length to permit it to extend over substantially the entire length of headstay **6**.

As may best be understood by reference to FIG. **2**, sleeve **26** includes an elongated passage **28** adjacent the leading edge or nose **26***b* thereof within which headstay **6** is contained. Located rearwardly of headstay passage **28** is an elongated channel **30** which extends over the entire length of sleeve **26** and is sized and shaped to contain and restrainably engage the leading edge of luff **8** of jib sail **4**. Extending along the length of the rear edge of sleeve **26** opposite leading edge **26** is a trough slit **32** which opens into luff channel **30**.

With luff **8** of jib sail **4** slidably contained within luff channel **30** of sleeve **26** in the manner illustrated in FIGS. **1** and **2**, the cloth of said **4** adjacent luff **8** will extend through slot **32** into channel **30**. In order to form the leading edge or luff **8** of sail **4** so that it can be slidably inserted and contained within luff chamber **30**, the front edge of luff **8** is folded back on itself and stitched to the sailcloth of jib sail **4** to provide a cloth tube or channel **34** within which a luff rope **36** is contained. Such an arrangement to provide a suspension or mounting edge at the luff of a jib sail is known. The looped forward edge **34** of luff **8** containing luff rope **36** is sewed to jib sail **4** along the portion thereof designated by reference numeral **35**. Located between luff channel **30** and slot **32** in sleeve **26** are a pair of spaced apart, inwardly directed detent shoulders **38** which define therebetween a restricted opening communicating luff passage **30** with slot **32**. The restricted opening between detent shoulders **38** is of lesser width than the parallel dimension across the width of luff channel **30**, thereby giving channel **30** the shape of a re-entrant cavity. As clearly appears in FIG. **2**, luff rope **36** is of a predetermined diameter such that the luff **8** of jib sail **4**, defined by rope **36** and cloth loop or tunnel **34** will be restrainably engaged by detent shoulders **38** to prevent luff **8** from being pulled out of channel **30** through slot **32**. In order to insure that headstay **6** is positively contained within elongated retention members **40** are inserted through aligned apertures **42** in sleeve **26**. Retention members **40** preferably taken the form of roll pins which extend transversely through sleeve **26** between headstay passage **28** and luff channel **30**.

To assist in guiding and slidably inserting the head **14** of jib sail **4** into channel **30** of encapsulating sleeve **26**, I prefer to utilize a boot **44** at the bottom end of sleeve **26**. Guide boot **44** is shown in place at he bottom of sleeve **26** in FIG. **1**, and may be best understood by reference to the larger scale views thereof shown in FIGS. **3** and **4**. Boot **44** could be formed as an integral portion of sleeve **26** on the bottom end thereof. However, I have found it convenient from a manufacturing and assembly standpoint to form boot **44** as a separate assembly comprised of two halves **45** and **46**. Although various materials may be used to make boot **44**, I have found it desirable and satisfactory to injection mold the two boot halves **45** and **46** from a high impact resin. Boot halves **45** and **46** are each formed at their upper ends to include inner, peripheral ribs **48** which fit into receiving slot **50** on opposite sides of the bottom end of encapsulating sleeve **26**. Slot **50** is formed around the external, peripheral surface of sleeve **26** in the manner shown in FIG. **3**. Boot halves **45** and **46** are held together by a plurality of threaded fasteners **52** (shown in FIG. **1**) inserted through aligned holes **53**, **54**, and **55** in the two boot halves. Boot halves **45** and **46** fit over the bottom end of encapsulating sleeve **26**, and are rounded at their leading edges **45b** and **46b** to give boot **44** an airfoil shape to further assist in smoothly directing air over the lower end of luff **8** of jib **4** to reduce turbulence.

Boot halves **45** an **46** are of identical shape, one half being the mirror image of the other and the two halves being formed to provide a plurality of passages for headstay **6**, and for the luff or leading edge **8** of a sail **4**. Extending lengthwise within boot **44** is a generally vertically oriented guide channel **56** which is aligned at its upper end with the bottom of luff channel **30** of sleeve **26**. Guide channel **56** expands outwardly at it approaches its bottom end between boot ribs **58** and opposite, downwardly and rearwardly curving boot bottom walls **60**. Guide channel **56** thus assumes a generally funnel shaped configuration having an enlarged receiving mouth **62** adjacent its bottom end into which the leading edge of the head of a sail may be guided. Boot halves **45** and **46** are so shaped that when they are fastened together their upright, rear edges **45***a* and **46***a* are spaced apart a short distance to define therebetween a vertically extending slot **64** which extends along the rear edge of boot **44**, as is clearly shown in the rear elevation veiw of the boot in FIG. **4**, from mouth **62** to the upper end of the boot **44**. Vertical boot slot **64** opens into boot guide channel **56** and is vertically aligned with slot **32** in encapsulating sleeve **26**. Thus, it will be seen that the head of a sail may be threaded or guided into boot channel **56** through mouth **62** and then pulled upwardly with the luff **8** of the sail restrainably contained within sleeve channel **30** and the sailcloth extending through slot **32** and aligned boot slot **64**.

Also formed in boot **44** is an elongated, vertically extending passage **66** defined between semi-circular channels in boot halves **45** and **46** to receive and contain the bottom end of headstay **6**. As may be noted with reference to FIG. **1**, headstay **6** extends through the bottom of boot **44** to its point of connection with turnbuckle **20** utilized for attaching headstay **6** to the bow of a sailboat. In order to positively hold the assembly of sleeve **26** and boot **44** at a desired position of vertical adjustment on headstay **6**, to avoid the sliding movement of the sleeve and boot assembly thereon, I utilize a retainer element **68** fastened to the bottom of headstay **6**. Retainer element **68** conveniently takes the form of a sphere made up of two half sections **68***a* and **68***b* shown held together in FIG. **5** by screws **70**. Sphere

halves 68*a* and 68*b* are fastened around the bottom end of headstay 6 in the manner shown in FIG. 3, and are received within a spherical cavity formed in boot 44 by aligned, complementary hemisphere recesses 72 formed in boot halves 45 and 46. It will be apparent that with boot halves 45 and 46 clamped together around retainer sphere 68, and with boot 44 secured to the lower end of sleeve 26 by the engagement of ribs 48 in sleeve slot 50, the assembly of sleeve 26 and boot 44 will be securely restrained against sliding movement up and down on headstay 6.

In mounting the assembly of encapsulating sleeve 26 and boot 44 on a stay of a sailboat, sleeve 26 is first forced over headstay 6, preferably from the bottom up, with headstay 6 being snapped through slot 32 into elongated sleeve passage 28 as sleeve 26 is forced rearwardly along the length of headstay 6. Roll pins 40 are then put in place in order to maintain headstay 6 within passage 28 of sleeve 26. Encapsulating sleeve 26 is then vertically adjusted to the desired height on headstay 6 and held there while boot 44 is attached thereto. Retainer sphere 68 is fastened to headstay 6 below the bottom end of sleeve 26 before boot 44 is installed. Then, boot halves 45 and 46 are clamped over sphere 68 with their locking ribs 48 being snapped into receiving slot 50 on the bottom of sleeve 26. Next, the head 14 of jib sail 4 is guided into mouth 62 of boot 44 and is attached to a jib halyard 72 guided around a pulley 73 at the top of a sailboat mast 2. This is accomplished by using a snap shackle 74 attached to the end of jib halyard 72 and coupled to grommet 76 in the head 14 of jib sail 4 in a conventional manner. Grommet 76 is set rearwardly in the sailcloth of jib 4 a sufficient distance that it will be positioned to the rear of encapsulating sleeve 26 and will not have to be pulled through it. Jib 4 is then hoisted by pulling downwardly on halyard 72, and as this is done the luff 8 of jib sail 4 will be pulled upwardly through channel 30 in sleeve 26. Tack 18 of jib sail 4 is then secured to the bow of the sailboat by a snap shackle 78 coupled through a grommet 80 therein, shackle 78 being coupled through one of the apertures in stemhead fitting 24 in the manner shown in FIG. 1. Jib sheet 82 is attached to clew 16 of jib sail 4 in the conventional manner.

With jib sail 4 raised and set as shown in FIG. 1, the entire length of jib luff 8 will be contained within channel 30 of encapsulating sleeve 26. Thus, there will be no open spaces along the length of luff 8 through which wind can circulate and create turbulance, as is the case with conventional snap hook couplings used to attach the luff of a jib to a headstay. Airfoil shaped sleeve 26 will direct air smoothly across the entire length of luff 8 of jib sail 4. Since self-supporting encapsulating sleeve 26 is a separate member, engaging luff 8 of jib sail 4 only by the line contact of detent shoulders 38 with luff rope 36, sleeve 26 is not unduly restrained by the wind, halyard and jib sheet forces acting on jib sail 4, and is free to rotate on headstay 6. As wind and boat change direction, and the angle of attach of jib sail 4 to the apparent wind changes, sleeve 26 will rotate about the longitudinal axis of headstay 6, carrying luff 8 with it. Thus, at all times the forward length of jib sail 4 just to the rear of luff 8 will extend straight out of the middle of slot 32 of sleeve 26 in alignment with the nose of sleeve 26 in the manner shown in FIG. 2. Accordingly, under all wind and jib adjustment conditions, airfoil shaped sleeve 26 will direct air currents smoothly over the leading edge of jib sail 4, with the elimination of air turbulance that normally exists along this portion of a jib sail. Test results have shown, that, because of the rotation of the jib luff 8 on headstay 6 with encapsulating sleeve 26, the area of maximum pressure differential across the faces of jib sail 4 moves forwardly as the angle of approach of wind to jib increases. This provides the beneficial effect of not turning th boat into the wind with resultant "luffing" along the luff 8 of the jib sail with diminished drive, as normally occurs with rearward movement of the area of maximum pressure differential across the jib sail towards the boat rudder with conventional jib mounting arrangements. It will be appreciated by those skilled in the art, that as the area of maximum pressure differential moves rearwardly along the jib said towards the stern of a sailboat closer to the rudder, the boat will tend to turn into the wind because of a lesser moment of force near the forward end of the boat acting counter to the rudder force at the stern of the boat. The forward movement of the area of maximum pressure differential along the jib sail, with changes in angle of approach to the wind, utilizlng my encapsulating sleeve support arrangement for a jib sail increases the moment of force acting counter to the rudder force, thereby avoiding turning the bow of the boat into the wind and losing driving force.

As a safety feature, a keeper line 84, preferably a short length of Dacron line, is tied or otherwise secured to snap shackle 74 adjacent head 14 of jib sail 4 and loosely looped around encapsulating sleeve 26. The use of such a keeper line will positively prevent the head 14 of jib sail 4 from pulling out of encapsulating sleeve 26 through slot 32 under extreme conditions of wind force and downward tension along leech edge 10 of jib sail 4, with a resultant downward stripping of the whole length of luff 8 out of encapsulating sleeve 26.

I anticipate that various changes in the size, shape, and construction of my encapsulating sleeve arrangement for supporting the luff a sail may be made by those skilled in the art without departing from the spirit and scope of my invention as defined by the following claims.

I claim:

1. In combination with an elongated sailboat headstay having a base end affixed to the sailboat and an upper end attached to the upper end of the mast of the sailboat, a jib sail support member comprising;

an elongated, self-supporting sleeve enclosing said stay and extending lengthwise thereon, said sleeve being rotatably mounted on said stay for rotation about the longitudinal axis of said stay;

a through slot extending longitudinally along one edge of said sleeve;

an elongated channel within said sleeve into which said slot opens, said channel extending longitudinally of said sleeve and having a restricted opening of reduced width communicating with said slot; and

a jib sail having its leading edge slidably contained within said channel and restrainably engaged by said restricted opening.

2. A sailboat stay and sail support member as defined in claim 1 wherein:

said sleeve is airfoil shaped and has a rounded leading edge opposite said slot.

3. A sailboat stay and sail support member as defined in claim 1 wherein:

said sleeve includes an elongated passage adjacent the leading edge thereof within which said stay is contained; and

a plurality of vertically spaced, elongated retention members extending transversely through said sleeve behind said headstay between said elongated passage and said sail channel to hold said stay in said passage.

4. A sailboat stay and sail member as defined in claim **1**, and further including:

a sail guide boot at the bottom end of said sleeve having a vertically extending guide channel therein aligned at its upper end with the bottom of said elongated channel in said sleeve;

an enlarged mouth adjacent the bottom of said boot opening into said guide channel to receive the leading edge of the head of a sail, said mouth having a larger cross sectional area than said guide channel; and

a vertically extending slot through said boot extending longitudinally along the rear edge thereof from said mouth to the upper end of said boot, said slot opening into said guide channel for the extension of the cloth of a sail therethrough and being vertically aligned with said slot in said sleeve, whereby the leading edge at the head of a sail may be fed into said mouth of said boot and pulled upwardly through said elongated channel in said sleeve.

5. A sailboat stay and sail support member as defined in claim **4** wherein:

said boot has a cavity therein within which a retainer element is restrainably contained, said retainer element being fastened to said stay and serving to restrain said sleeve and boot against generally vertical, sliding movement on said stay.

6. A sailboat stay and sail support member as defined in claim **1**, and further including:

sleeve retainer means fastened on said headstay at one end thereof and restrainably engaging said sleeve to hold said sleeve in a desired position of generally vertical adjustment on said stay.

7. A jib sail support sleeve for a sailboat comprising:

a semi-rigid, elongated sleeve having a through slot extending along substantially the entire length of one edge thereof for extension of the said cloth along the leading edge of a jib sail therethrough;

an elongated channel within said sleeve into which said slot opens, said channel being shaped to contain and restrainably engage the leading edge of a jib sail; and

an elongated passage within said sleeve for containing the headstay of a sailboat, said elongated passage extending longitudinally of said sleeve adjacent the opposite, leading edge of said sleeve from said slot;

a sail guide boot on the bottom end of said sleeve having a vertically extending guide channel aligned at its upper end with the bottom of said elongated channel in said sleeve;

an enlarged mouth adjacent the bottom end of said boot opening into said guide channel to receive the leading edge of a jib sail, said mouth being of greater cross sectional area than said guide channel in said sleeve; and

a slot through said boot extending longitudinally along one edge thereof from said mouth to the upper end of said boot, said slot opening into said guide channel for the extension of the cloth of a jib sail therethrough and being aligned with said slot in said sleeve, whereby the leading edge of a jib sail may be fed into said mouth of said boot and pulled upwardly through said guide channel and said elongated channel in said sleeve.

8. A jib sail support sleeve for a sailboat comprising:

a semi-rigid, elongated sleeve having a through slot extending along substantially the entire length of one edge thereof for extension of the sail cloth along the leading edge of a jib sail therethrough;

an elongated channel within said sleeve into which said slot opens, said channel having a restricted opening of reduced width communicating with said slot to contain and restrainably engage the leading edge of a jib sail;

a separate, elongated passage within said sleeve for containing the headstay of a sailboat, said elongated passage extending longitudinally of said sleeve parallel to said channel adjacent the opposite, leading edge of said sleeve from said slot, and being of reduced cross sectional area in comparison to that of said channel; and

separating means between said channel and said headstay passage projecting transversely of said sleeve.

9. A jib sail support sleeve as defined in claim **8** wherein:

said sleeve is formed from flexible plastic and is sufficiently flexible and resilient to be coiled and stored in rolls and to return to its normal straight shape for use as a jib sail support sleeve.

10. A jib sail support device for a sailboat comprising:

an elongated sleeve structure;

a sail supporting portion of said sleeve structure having a through slot extending along substantially the entire length of one edge thereof for extension of the sail cloth along the leading edge of a sail therethrough, and having an elongated channel into which said slot opens, said channel having a restricted opening of reduced width communicating with said slot to contain and restrainably engage the leading edge of a jib sail;

a headstay containing portion of said sleeve structure having an elongated passage therein for embracing and containing the headstay of a sailboat, said elongated passage extending longitudinally of said sleeve structure parallel to said channel adjacent the opposite edge of said sleeve structure from said slot; and

separating means between said channel and said elongated headstay passage projecting transversely of said sleeve.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,802,373 Dated April 9, 1974

Inventor(s) Rolf E. Lagerquist

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In claim 4, line 9, after "A sailboat stay and sail," add --support--.

In claim 7, line 46, delete "said" and insert --sail--.

Signed and sealed this 10th day of September 1974.

(SEAL)
Attest:

McCOY M. GIBSON, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334