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(54) Sail batten traveller car system

(57) A sail batten car system, relating to the method and apparatus of attaching a sail having sail battens 19 to a mast 1 in such a way that the sail can be hoisted up the mast and removed from it. This invention will allow the use of batten cars 8 to transfer the load of the sail to the rig and the use of a luff carrier 2 to provide a means of connecting the sail, batten cars and rig. The whole sail, batten, car and luff carrier will then act as a beam and pivot about a point in front of the luff carrier This system can used with 'in boom' furling systems and high roach sails.

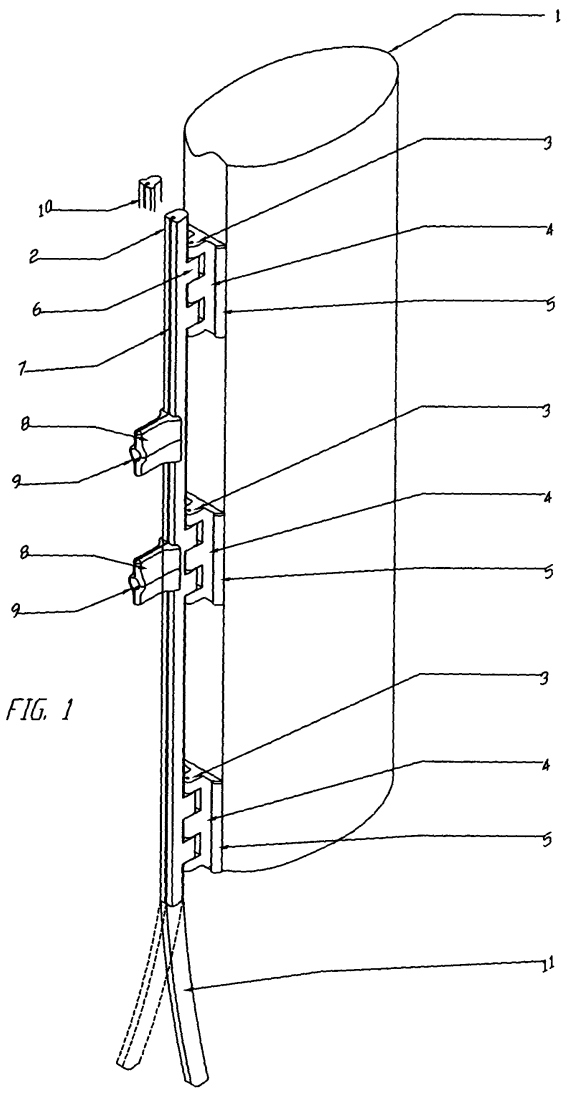

FIG. 1

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Description

Background

[0001] The present invention relates to a sail batten car system. The system is designed to transfer the loads of a sail batten to a mast.

[0002] On the sails of sailing vessels it is common to have a system of battens to stiffen the sail material providing good aerofoil shape to the sail. Invariably, by using battens that follow the whole camber of the sail from luff to leech, the best form of shape is created. These sails are known as 'full length' battens or 'fully battened sails'.

[0003] With certain shapes of sails, large forces are created in the battens and at the connection between the sail and the mast. The larger the sails become, the greater are the forces that have to be supported. This is particularly the case with sails that are designed to be furled within or on a boom, on a rotating mandrel or similar, known as 'in/on boom furling' systems.

[0004] There are systems currently in use with such battens on 'in/on boom furling' systems, however they are in many areas insufficient, in particular the method of attaching the sail to the mast in the region of the battens, where they are highly loaded and thereby considerably wearing the sail. With larger sails and consequently larger forces, this wear takes place much faster, with more significant consequences in terms of damage to the sails and consequently long and expensive efforts are required for repair.

[0005] There are systems available that have been developed for dealing with the above-mentioned problem. One alternative system comprise a track and cars, but it is not applicable in boom furling systems as they do not permit the removal of the sail, to allow rolling the sail on a mandrel. Normally a system is used wherein the sail is attached to a fitting on the mast directly at the luff. The luff is the forward edge of the sail. Forward being towards the bow and aft, or after, being towards the stern. The top of a sail is referred to as the head, and the bottom forward corner the tack.

[0006] The US patent no. 6.351.037, by Cook et al. published April 16, 2002, disclose a sail furling system for sailing yachts wherein the sail are furled around a rotating mandrel housed within the boom of the vessel. The patent describes a luff extrusion having a U-shaped cross-section with the arms of the U being long enough to firmly support the leading edge of the sail battens.

The Invention

[0007] To support and use sails effectively, this system proposes a design of sail batten car system that can transmit these large forces through from the sail to the mast in a way that will create minimum wear and tear or damage to the sail, yet still permit a system of in/on boom furling to be used.

[0008] The inventive system comprises a track system attached to the mast incorporating a pivoting point incl. a fitting attached to the sail at the batten end to connect the sail to the mast.

[0009] The inventive system will work effectively in all operating conditions.

Advantages

[0010] The design of the track and car system will transfer the loads of the sail and battens through to the mast without relying on the fabric of the sail itself. This will prevent any chafe on the sail, in particular at the transition point between the sail and mast. This allows the use of sail shapes and sizes, which cause high loadings at this point. It will also allow the sail to be fully detached from the mast as necessary and permit it's rolling around a mandrel or boom for storage when not in use and for reefing down to reduce sail area when required. This system will also allow raising and lowering of the sail with little friction between the mast and the sails batten ends consequently reducing wear of the sail.

Brief description of the drawings

[0011]

Figure 1 shows a mast section from close to the boom to an indeterminate height with the sail batten car system of the present invention.

Figure 2 shows a side elevation of the system with the minimum number of mast attachment units and their position at the sails' full hoist.

Figure 3 shows a plan view of a section through the mast and sail batten car system attached to the mast.

Figure 4 shows a plan view of an alternative type of car system, which must be used for the head car arrangement and may be used for the batten supporting cars.

Figure 5 shows a cut away view through the batten car carrier showing the arrangement of a proposed locking mechanism.

Figure 6 shows an aft elevation of the batten car of either alternative indicating the two-sided arrangement and the receptacle for a batten.

Detailed description

[0012] As per the above, the present invention seeks to solve the need of a system being able to transfer the forces generated in a sail to a mast in such a manner that damage to the sail are avoided.

[0013] A shaped luff carrier 2, running the length of a mast 1 is attached, by means of a hinge 3, to either a full

length hinge section or hinge pieces placed at intervals along the length of the mast. The latter is the preferred embodiment due to savings in weight of the overall rig. The hinge pieces will be referred to as mast attachment units 4. The full length hinge is of the form of a 'piano hinge' and a hinge at intervals, small sections thereof. The sections of hinged mast attachments 4 (figure 2) should be placed as a minimum, where the battens 19 will reside at the points of full hoist and at each reef point, and then at intervals evenly spaced for the remainder of the length of the luff carrier. They should also be placed at the top and bottom ends of the luff carrier.

[0014] The mast attachment sections are attached to the mast by suitable means 15 e.g. bolts, screw or rivets or any means suitable considering the materials and forces involved. On the aft facing side of the mast attachment units, there can be provided means reducing the impact of the luff carrier working against the mast attachment units 5 in case of the vessel rolling and the luff carrier swings from side to side. For this reason also the hinges are designed with a certain amount of friction so that they will not swing frictionless in the event of the mast having no sail 21 attached. There is also provided, within the hinge, a locking device as per figure 5, for precisely this occurrence, that is, of a sailing vessel making passage without sails or at anchor or in port. This will fix the hinge in one position such that it cannot move.

[0015] One embodiment of the locking mechanism is illustrated with a cam 15 that is operated by the action of passing the luff cord into the luff groove 7. The cam is spring loaded 17 about a pivot such that the opposite side of the cam engages by spring action with a slot in the other side of the carrier support hinge on the mast attachment unit.

[0016] As the sail is passed into the slot, the luff cord presses against the section of the cam protruding into the luff groove 16 and displaces the cam about the pivot against the spring whereby the carrier is allowed to pivot freely in its support hinges. On removal of the luff cord, the spring will return the cam by force to locate in its locked position.

[0017] The shaped luff carrier 2 is designed such that the forward side has the hinge design 6 and in the aft edge of its shape is a slot of keyhole shape 7 such that a luff cord on a luff tape or similar system, will pass up into the slot and may move vertically along the slot but may not be removed from the slot by pulling aft. To the luff tape is attached the sail. The aft side of the luff carrier is also designed to act as a bearing surface for a car to rest against.

[0018] At the intersection of the sail and the sail battens, a specially shaped car 8 is attached to the sail on the forward end. This car is attached to either side of the sail in two halves 14, and held in place by a compressive force applied between the two halves of the car. This can be by means of through bolting or other equally strong mechanism. The halves of the car are positioned such that the luff tape protrudes forward of the forward inside edge of the half car.

[0019] This means that the car will have the luff cord sticking out of the middle of its front side allowing the luff cord to engage with the slot in the luff carrier, figures 3, 4 & 6, while the forward side of the car is shaped and intended to engage with the aft and side faces of the luff carrier. Within the interface between the car and the luff carrier, there are placed roller bearings 12, 13, held captive within the car to reduce the friction between the two objects. This will allow the upward and downward vertical movement of the car and sail on the luff carrier whilst the unit is under forward compressive force from the resultant forces of the sail and batten.

[0020] The car comprises a receptacle within its aft edge to accept the batten, such that the batten and car becomes a uniform beam from the bending point of view 9.

[0021] The car is the forward termination of the battens and the means to transfer the load of the entire batten and sail onto the luff carrier. The aft end of the batten(s) may be fastened by means of one of the many existing designs used for such a purpose and to generate tension in the sail and compression in the battens.

[0022] The design and position of the car relative to the luff tape are such that when the sail is hoisted, via the luff tape into the luff carrier, and the car is engaged with the bearings against the luff carrier, the batten is engaged with the batten receptacle and this becomes a rigid beam that can only pivot about the hinge on the forward side of the luff carrier, between the luff carrier and the mast attachment mechanism.

[0023] This system is designed such, that the sail batten is separated into two parts and that one smaller batten is attached to either side if the sail, such that the cumulative effect of the two battens is equivalent to the same with only one batten on one side of the sail.

[0024] The shape of the battens is unimportant to this design, but the shape of the car receptacle and its size must be accurately matched to the shape and size of the batten. This will be done by estimating the load that the batten will produce and creating a batten, car receptacle and car, analogous with this load.

[0025] The smaller and therefore lighter in weight the entire unit can be manufactured, whilst still maintaining adequate strength, the better, as this will reduce sail weight for handling as well as overall weight aloft which will affect righting moment.

[0026] The system can also however be used with the batten on one side of the sail but the car and receptacle have to modified and increased in strength accordingly to resist the bending force and offset load created.

[0027] The top of the sail is permanently attached to the luff carrier by means of a headboard and head car. This car has a slightly different role. It does not have a batten receptacle; instead it has an attachment for a stiffening plate on the sail and is in most respects similar to most other head cars available. However, it must be slid over the end of the luff carrier with a shape that encap-

sulates the luff carrier. It has bearing surfaces on the front and on the back of the encapsulation and there is a stopper attached on the bottom of the luff carrier on the front side to prevent it from detaching when the sail is lowered.

[0028] In order to allow the sail to follow up, from the mandrel around which it is rolled, onto the luff carrier, by means of the luff tape, there is comprised a flexible section of luff carrier 11, of the same profile as the luff carrier, feeding the sail onto the luff carrier.

[0029] On the mast where normally a halyard turning sheave would be located, within the structure of the mast, such that the aft face of the circle is close to or in line with the aft face of the mast, the mast should be constructed with a crane or overhang or modified such that the vertical tangent to the circle of the sheave is contiguous with the line of the mast head car in its trajectory along the luff carrier.

[0030] The top section of the luff carrier can also be made flexible in this case, analogous with the bottom section of the luff carrier to permit rotation and twist in the sail. This can also be achieved by the placing of a double sheave at the top of the luff carrier, attached to and rotating with it about the axis of rotation of the luff carrier, such that a halyard runs under the forward sheave and over the aft sheave, displacing the line of action of the halyard to make it congruent with the line of trajectory of the head car, but also allowing the halyard to twist at the entrance to the double block to give the luff carrier freedom to move. A halyard with 2:1 purchase would also achieve the same, with the bitter end attached at the top of the mast and a turning block attached to the head car.

[0031] An alternative design of the system could be such that the luff carrier is shaped much more slimly figure 4 and that, instead of the car resting against the aft face of the luff carrier, it bears against the sides of the luff carrier and a front face integrated into the shape of the carrier. The principle is the same as the car design in figure 3, with a key shaped slot and luff tape protruding from the car, but as the sail is hoisted now, the bearing surface is at the sides and the back and roller bearings are incorporated in both these locations. This design can be used for the head car with modification as described previously or for batten cars as illustrated.

[0032] The methods and apparatus described provide a number of advantages as described above. Other advantages are inherent in the design. Modifications may be proposed to the teachings herein without departing from the original scope of the invention.

Claims

1. A sail batten car system for connecting a sail (21) incl. sail battens (19) to a mast (1), the system comprising:

- At least one batten car (8) comprising means for fastening the car (8) to the sail (21) and means allowing the batten cars to travel in a longitudinal direction of a luff carrier (2)
- At least one luff carrier (2), having a sectional profile allowing the batten cars (8) to travel in a longitudinal direction of the luff carrier (2), the luff carrier having means for attachment to the mast (1)

Characterized in that the luff carrier (2) are pivotally connected to the mast (1).

2. A sail batten car system according to claim 1, wherein the system comprise a mast (1) and boom, the luff carrier (2) extending from the intersection of mast (1) and boom to the top or nearby the top of the mast (1).

3. A sail batten car system according to claim 1, wherein the system comprise a sail (21) or a flexible aerofoil section with stiffening pieces, the cars (8) being attached to the sail and connected to the stiffening pieces and engaging with the luff carrier (2).

4. A sail batten car system according to claim 1, wherein the system comprising a sail (21) or flexible aerofoil section with stiffening pieces, including a bolt rope to engage with the luff carrier (2).

5. A sail batten car system according to claim 3 or 4 wherein the stiffening pieces are sail battens (19).

6. A sail batten car system according to any of the preceding claims, wherein a flexible feeder portion is provided at the lower end of the luff carrier (2).

7. A sail batten car system according to any of the preceding claims, wherein the system comprise a luff carrier (2) with its rotation created by a supported pivot along the entire length of the carrier.

8. A sail batten car system according to claim 1, wherein the luff carrier (2), with its points of pivot is spaced apart at intervals along the length of the sail (21).

9. A sail batten car system according to any of the preceding claims wherein luff carrier (2) is lockable.

10. A sail batten car system according to any of the preceding claims wherein the pivot supports are cushioned to prevent damage in the event of uncontrolled pivoting.

11. A sail batten car system according to claim 9 or 10 wherein the locking mechanism is in the form of a pivoting spring loaded rocking cam engaging in a locking slot by one side and being displaced by a luff cord from the other side of the axis of rotation to disengage the lock.

12. A sail batten car system according to claim 1 wherein the batten comprising a split structure whereby it can be attached to the sail by sandwiching the sail between the two parts of the structure and using fasteners to maintain its position.

13. A sail batten car system according to claim 1 wherein the system is self-supporting and self-coupling to the luff carrier as the sail is hoisted.

14. A sail batten car system according to claim 1 wherein the car entirely encloses the bearing surface of the luff carrier such that force is distributed both longitudinally fore and aft and athwart ships.

15. A sail batten car system according to claim 1 wherein the car rest only on the aft face of the luff carrier, such that the athwart ships forces are transferred through the coupling of the car and luff tape to the luff carrier, the luff tape being in tension while the respective side of the car is in compression.

16. A sail batten car system according to claim 1 wherein one or more of the cars will be a head car to be attached to the head of the sail.

17. A sail batten car system according to claim 1 wherein the bearing surfaces at the interfaces of the cars includes bearings.

Drawings

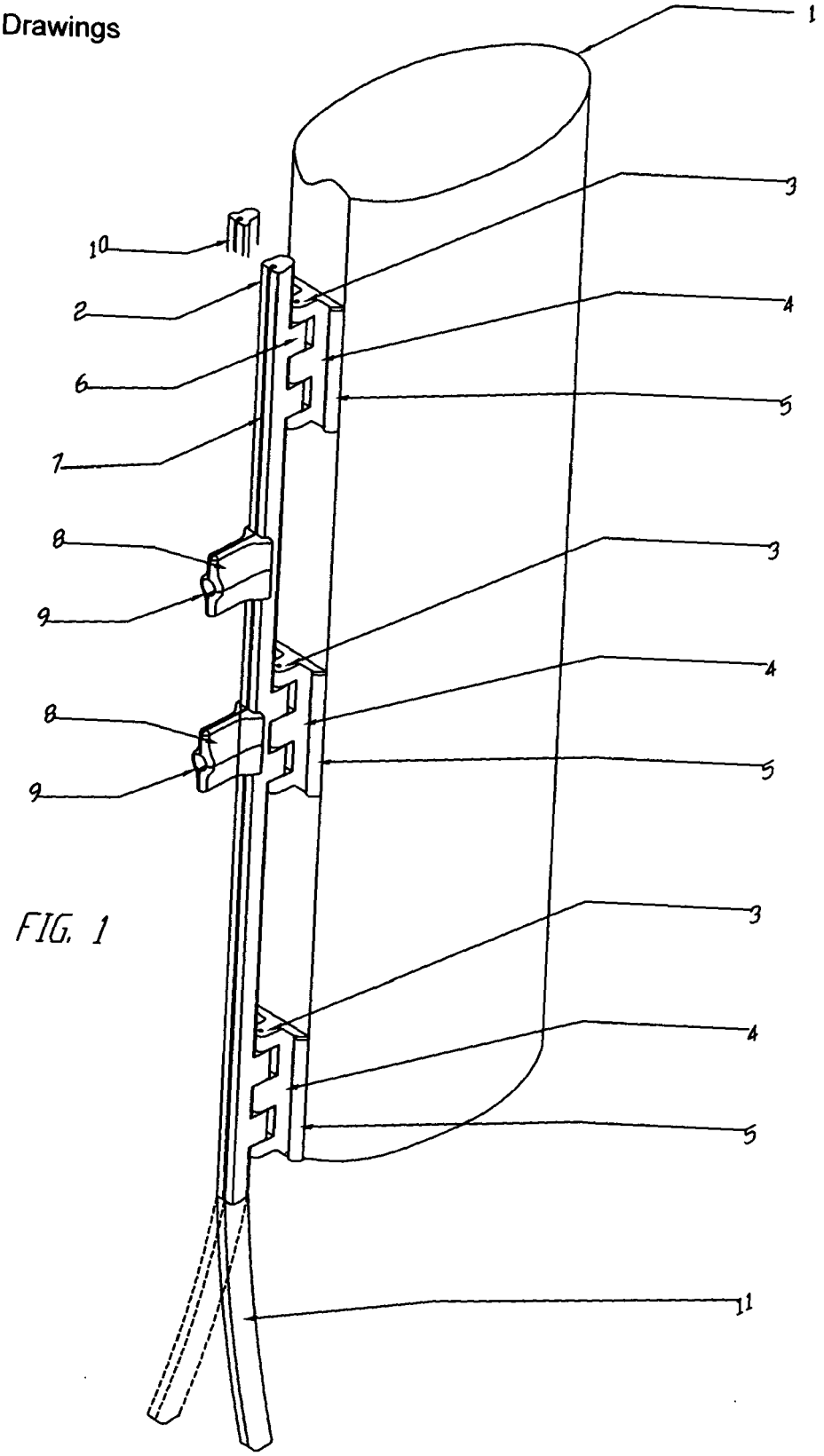


FIG. 1

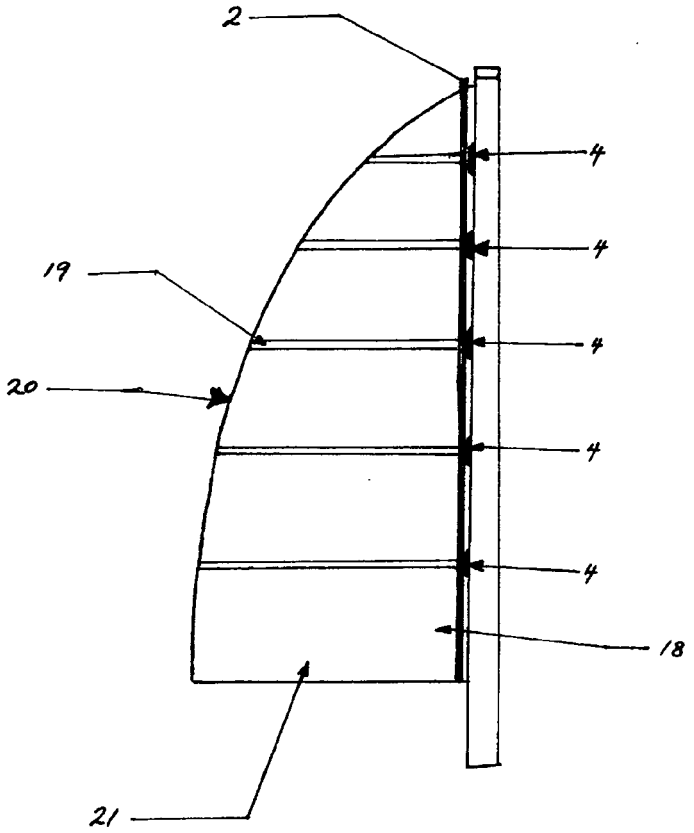


FIG. 2

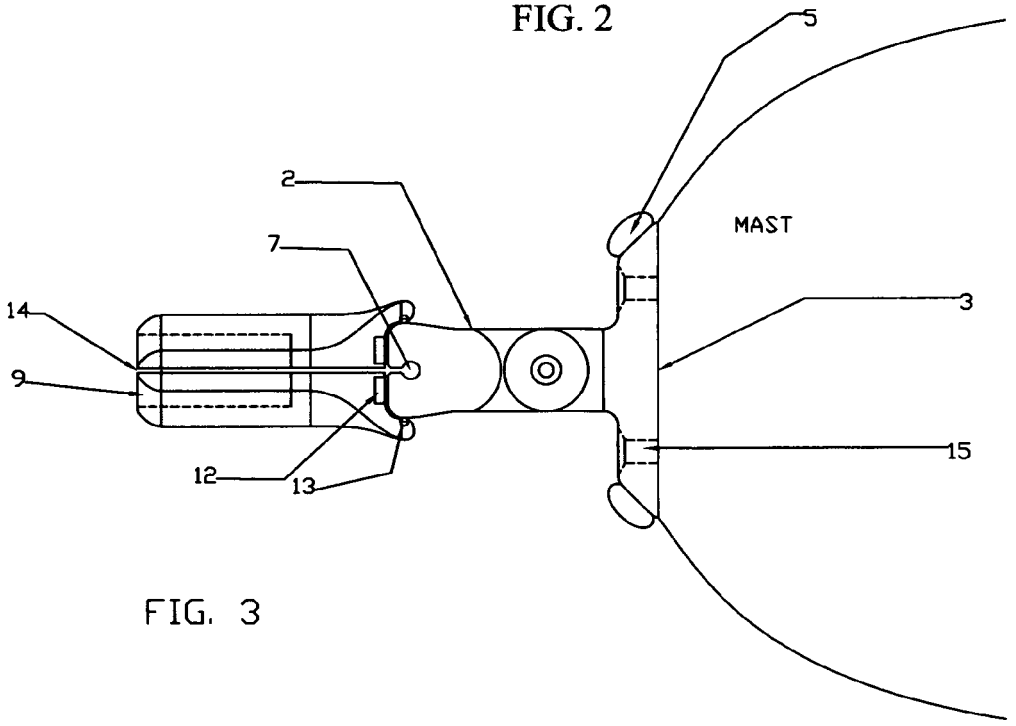
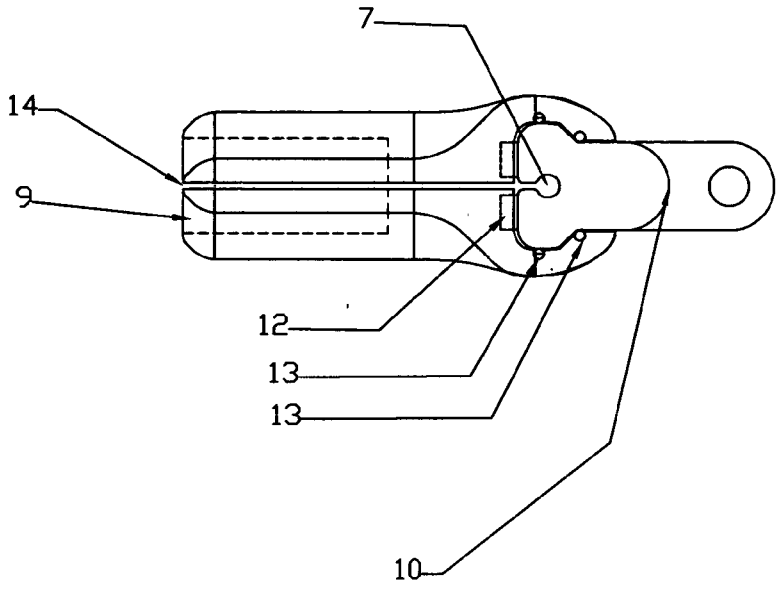


FIG. 3

FIG. 4



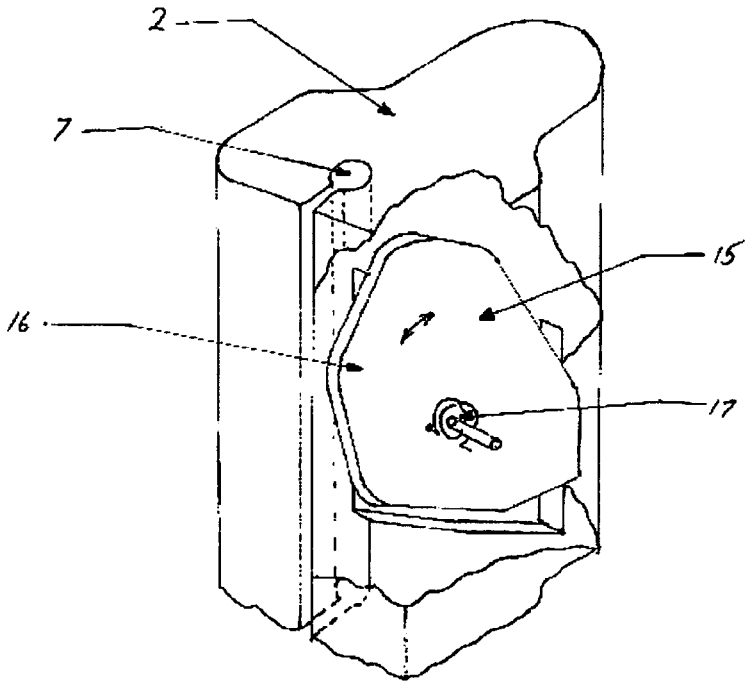


FIG. 5

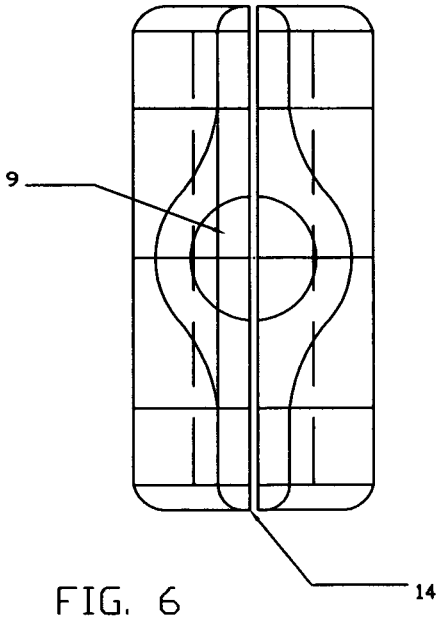


FIG. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 07 01 8467

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 0 614 803 A (JP MARECHAL SA SA [FR]) 14 September 1994 (1994-09-14) * abstract; figures * * column 2, line 41 - column 5, line 35 *	1-5,7,8, 13-16	INV. B63H9/08 B63H9/10
A Y	FR 2 690 893 A (DESPRES JEAN MICHEL [FR]) 12 November 1993 (1993-11-12) * abstract; figures * * page 6, lines 5-26 *	1 17	
A Y	FR 2 753 168 A (DESPRES JEAN MICHEL [FR]) 13 March 1998 (1998-03-13) * abstract; figures *	1 17	
A,D	US 6 371 037 B1 (COOK FRED C [US] ET AL) 16 April 2002 (2002-04-16) * column 7, lines 4-11 * * column 8, lines 4-22; figures *	1	
A	WO 91/06469 A (MAILLARD MICHEL [FR]) 16 May 1991 (1991-05-16) * abstract; figures *	1	TECHNICAL FIELDS SEARCHED (IPC) B63H

~~The present search report has been drawn up for all claims~~

Place of search	Date of completion of the search	Examiner
Munich	3 March 2008	Nicol, Yann

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

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Application Number
EP 07 01 8467

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

1-5, 7-8, 13-17

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

European Patent Office

LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 07 01 8467

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-5,7-8,13-17

   Sail batten car system with luff carrier pivotally connected to the mast

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2. claim: 6

   Sail batten car system with luff carrier provided at its lower end portion with a flexible feeder portion

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3. claims: 9-11

   Sail batten car system with lockable luff carrier

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4. claim: 12

   Sail batten car system with special batten for fastening the sail

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 07 01 8467

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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03-03-2008

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EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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