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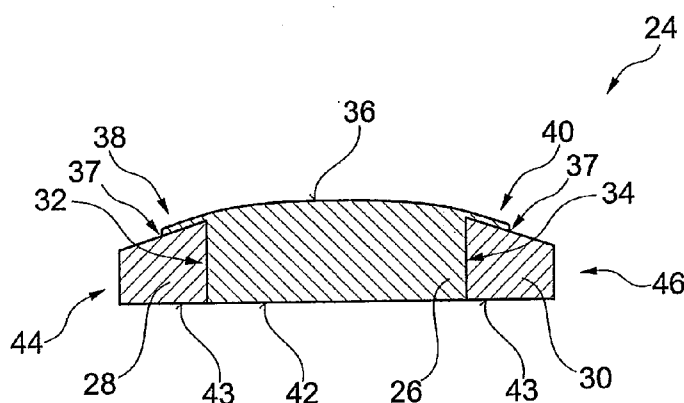


Fig. 3

(57) Abstract: A spar cap (24), a rotor blade (4), a wind turbine (2) and a method of manufacturing a spar cap is provided. A spar cap for a rotor blade of a wind turbine comprises a fiber-reinforced member (26) and at least a first edge member (30). The fiber-reinforced member comprises a first side (32) which is arranged towards a leading edge (16) of the rotor blade and a second side (34) which is arranged towards a trailing edge (18) of the rotor blade. The at least first edge member is arranged adjacent to the first side or adjacent to the second side of the fiber-reinforced member. The first edge member projects towards a leading edge of the rotor blade or towards a trailing edge of the rotor blade.



COMPOSITE SPAR CAP FOR A ROTOR BLADE OF A WIND TURBINE AND METHOD OF MANUFACTURING THE COMPOSITE SPAR CAP

FIELD OF THE INVENTION

5 The invention relates to a spar cap for a rotor blade of a wind turbine, a rotor blade for wind turbine and to a wind turbine. The invention also relates to a method of manufacturing a spar cap for a rotor blade and to a spar cap obtainable by said method.

BACKGROUND

10 As generally known in the art, wind turbines, also referred to as wind driven power plants or wind power plants have a rotor that carries rotor blades. Each blade is mounted to the rotor at the wing root and spans gradually towards to the free wing tip. The distance between the wing root and the wing tip is referred to as the span of the rotor blade. For modern wind turbines, the span can measure
15 about 50 m which means that the rotor blades are subject to considerable forces.

 The rotor blade has a leading edge which is the edge of the rotor blade that first contacts the moving air. Opposite to the leading edge is the trailing edge where the air flow that has been separated by the leading edge rejoins after passage over the suction surface and the pressure surface of the blade. The aerodynamic properties
20 of the rotor blade are mainly defined by the airfoil or wing-profile which is the shape of the suction surface and the pressure surface of the rotor blade, if considered in a cross section perpendicular to the span.

Rotor blades are often fabricated by building two or more skin shell portions, for example, from layers of woven fabric and synthetic resin. Spar caps are then placed in the shell portions. Typically, there is at least one upper spar cap, which is adjacent to the suction surface, and at least one lower spar cap which is adjacent to the pressure surface of the rotor blade. At least one web connects the upper and the lower spar cap(s) and substantially projects along the spar caps. This web, together with the upper and lower spar cap(s) forms a spar or wing spar of the rotor blade. The spar takes up the majority of mechanical forces during operation of the rotor blade and introduces the angular momentum into the rotor shaft.

10 The spar caps are manufactured by placing a plurality of fiber mats, layers of scrim or woven fabric into a mold, impregnating the fibrous material using a synthetic resin and curing the composite material so as to provide a fiber-reinforced member. The fibrous material may be impregnated for example by help of vacuum assisted resin in fusion. Pre-impregnated fiber material (prepreg) may be used for manufacturing the spar cap. Curing of the prepreg-fibers is typically performed by hot pressing.

However, when the spar cap is taken out of the mold, it typically has sharp and extending edges at the outer perimeter surrounding the shrinkage cavity. This means that edge planning has to be performed. The sharp protrusions are usually removed by grinding in order to prepare the spar cap for the subsequent process steps during manufacture of the rotor blade. However, this kind of edge planning is a very time consuming and labor intensive production step. Furthermore, in particular if carbon fibers are applied for manufacturing the spar cap, a high amount of dust is generated.

25 SUMMARY

It is an object of the invention to provide an improved spar cap, an improved rotor blade for a wind turbine, an improved wind turbine, an improved method of manufacturing a spar cap.

30 In one aspect of the invention, a spar cap for a rotor blade of a wind turbine is provided. The spar cap comprises a fiber-reinforced member and at least one edge member (a first edge member). The at least one edge member can be manufactured from the same or a similar material which is applied for manufacturing the core of the rotor blade. The edge member can be manufactured using a foam material, a wooden material or a kind of honeycomb structure. For

example, balsa wood may be applied. The fiber-reinforced member is configured to be arranged along a span of the rotor blade and substantially extends between the wing root and the wing tip, when the spar cap is mounted in the rotor blade. The fiber-reinforced member has a first side which is the side facing the leading edge of the rotor blade when the spar cap is in the rotor blade. Further, the fiber-reinforced member has a second side which is the side facing the trailing edge of the rotor blade when the spar cap is in the rotor blade.

The at least one edge member can be arranged adjacent to the first side or adjacent to the second side of the fiber-reinforced member. Dependent on whether the edge member is arranged adjacent to the first side or adjacent to the second side of the fiber-reinforced member, it projects towards the leading edge of the rotor blade or towards the trailing edge of the rotor blade when the spar cap is placed in the rotor blade.

Advantageously, the spar cap comprises the first edge member and a second edge member. The first edge member can be arranged adjacent to the first side of the fiber-reinforced member and the second edge member can be arranged adjacent to the second side of the fiber reinforced member. According to this aspect of the invention, the first edge member is configured to project towards the leading edge of the rotor blade and the second edge member is configured to project towards the trailing edge of the rotor blade.

Accordingly, there are less or no sharp edges or protrusions of fibrous material at the lateral sides or edges of the spar cap. Labor intensive edge planning or grinding is not necessary. This is advantageous in particular with respect to the production cost of a spar cap. Furthermore, the edge members can, at least partly, serve as a molding form. They may be positioned very precisely prior to molding. The spar cap then perfectly fits into a corresponding void in the rotor blade skin without the need for extensive further treatment or finishing. If the edges of the spar cap should need some adaption, the grinding or surface finish treatment, of the edge members is much easier compared to grinding of the sharp edges of the fiber-reinforced member. Any wooden dust which is generated when grinding the, for example balsa edge members is less problematic in comparison to the dust which is generated when grinding carbon fiber edges of the fiber-reinforced member. Furthermore, the edge members may be manufactured separately, remote from the manufacturing site of the rotor blades. The grinding of the edge member material can be performed more easily and faster than grinding of carbon

fiber-reinforced material. Still further, a wood machining facility may be used, for example for a very fast serial production of balsa wood edge parts or members.

Advantageously, the at least one edge member covers almost the entire first side and / or the entire second side of the adjacent fiber-reinforced member.

5 According to an advantageous embodiment of the invention, the first side and / or the second side of the fiber-reinforced member can have a recess for accommodating the at least one edge member. In other words, in a cross sectional view substantially perpendicular to the span of the rotor blade, the fiber-reinforced member comprises a recess and the edge member at least partly projects into said
10 recess. This can improve stability and integrity of the spar cap.

The fiber-reinforced member can comprise an outer side which is configured to be arranged towards a suction surface or towards a pressure surface of the rotor blade, when the spar cap is mounted in the rotor blade. Advantageously, there can be a recess in the outer side and in the first side and / or the second side of the
15 fiber-reinforced member so as to accommodate the at least one edge member.

The fiber-reinforced member can also comprise an inner side, which is arranged opposite to said outer side. This inner side can extend over the edge member in a direction towards the leading edge or in a direction towards the trailing edge of the rotor blade. In other words, a width of the inner side of the fiber-reinforced member in a cross sectional plane substantially perpendicular to the span of the rotor blade (or parallel to the airfoil of the rotor blade) is greater than a width of the fiber-reinforced member at the outer side. During manufacture of a spar cap, the fibrous material may be arranged so as to overlap the edge member. The fiber-reinforced member and the edge member are in contact in order to
20 provide a reliable connection between the two members.
25

The fibrous material overlapping the edge member can be peel ply material. If there is fibrous material overlapping the lateral edges of the molded spar cap, the fibrous material may be removed by simply tearing off the overlapping portions. Advantageously, no grinding of the edges of the spar cap is necessary.

30 According to an advantageous embodiment of the invention, the fiber-reinforced member comprises an outer side and the edge member comprises an outer side. The outer sides of the two members are arranged towards the suction surface or towards the pressure surface of the rotor blade, when the spar cap is mounted in the rotor blade.

The outer side of the reinforced member and the outer side of the edge member can be aligned to be flush with each other. Advantageously, the flush fitting of the two members provides a smooth surface of the spar cap which can then be arranged adjacent to the suction surface or the pressure surface of the rotor blade when the spar cap is placed in the rotor blade. Finishing of the outer side of the spar cap is reduced to minimal fine grinding if necessary at all.

Furthermore, an outer edge of the edge member may be tapered. The outer edge of the edge member can be averted from the first side or from the second side of the fiber-reinforced member. This can provide improved properties during manufacture.

The edge member can be wedge-shaped and an inner side of the edge member, which is averted from the suction surface or the pressure surface of the rotor blade, when the spar cap is arranged in the rotor blade, follows a contoured edge. This contoured edge can gradually reduce a thickness of the edge member, starting from a first thickness that can be substantially equal to a thickness of the fiber-reinforced member down to a desired second thickness. The second thickness is then lower than the first thickness. The second thickness may be adapted to a thickness of core material which is adjacent to a void for accommodating the spar cap in a shell of the rotor blade.

According to an aspect of the invention, the fiber reinforced member may be manufactured from carbon fiber reinforced material. For example, layers of scrim, advantageously UD-carbon fiber layers or mats may be applied. However, other fibrous material, for example glass-fibers may be suitable for manufacturing the fiber-reinforced member.

According to another aspect of the invention, a rotor blade for a wind turbine is provided. The rotor blade comprises at least one spar cap according to aspects of the invention. Advantageously, the rotor blade comprises at least two, further advantageously four spar caps, at least one of which is configured in accordance with aspects of the invention. A first pair of spar caps may be arranged adjacent to a pressure surface of the rotor blade, a second pair of spar caps may be arranged adjacent to a suction surface of the rotor blade.

According to still another aspect of the invention, a wind turbine is provided having a rotor comprising at least one rotor blade with at least one spar cap configured in accordance with aspects of the invention.

Same or similar advantages which have already been mentioned with respect to the spar cap apply to the rotor blade and to the wind turbine in a same or similar way and are therefore not repeated.

According to another aspect of the invention, a method of manufacturing a spar cap for a rotor blade of a wind turbine is provided. At least one edge member, advantageously a first edge member and a second edge member, is / are arranged or positioned in a mold for manufacturing the spar cap. The edge member(s) is / are arranged adjacent to a surface of the mold which is for molding a front edge or a rear edge of the spar cap. The front edge and the rear edge of the spar cap are configured to be arranged towards a leading edge and a trailing edge of the rotor blade, respectively. The alignment of the first side and the second side are considered if the spar cap is mounted in the rotor blade.

Subsequently, fibrous material, for example layers of scrim of carbon fibers or glass fibers, is arranged in the mold so as to be in contact with the edge member(s). For example, UD-layers of scrim may be used.

A curing step can be performed so as to provide a spar cap comprising a fiber-reinforced member and at least one edge member. The spar cap may be manufactured using known molding technologies such as resin transfer molding (RTM), resin infusion molding (RIM) or vacuum assisted resin infusion (VARI). Furthermore, pre-impregnated fibers may be applied. Accordingly, infusion of resin may be not necessary.

Advantageously, the fibrous material is arranged in the mold so as to cover almost an entire vertical inner side of the at least one edge member. The vertical inner side of the edge member is averted from a surface of the mold which is for manufacturing a front edge or a rear edge of the spar cap. Advantageously, a bottom wall of the mold which is for manufacturing an outer side of the spar cap is a plane wall, wherein the outer side is conceived to be arranged towards a suction surface or a pressure surface of the rotor blade, when the spar cap is placed in the rotor blade. The at least one edge member and the fibrous material can be arranged side-by-side on the bottom wall so as to manufacture a spar cap comprising at least one edge member and a fiber-reinforced member which are aligned flush with each other.

The fibrous material can be arranged in the mold so as to cover an inner surface of the edge member. The inner surface is averted from the bottom of the

mold and a fiber-reinforced member which projects over the edge member at a side which is opposite to the bottom wall of the mold may be provided. The fiber-reinforced member projects over the edge member in a direction towards the leading edge and / or in direction towards the trailing edge of the rotor blade. The
5 projection(s) form(s) a recess for accommodating the at least one edge member.

Advantageously, the established process flow during manufacture of the spar cap needs to be changed very slightly. A single additional process step, namely the placement or insertion of the edge member(s) is added. Subsequent process steps do not need to be changed. However, edge planning is no longer necessary and
10 the omission of this labor intensive process step accelerates the manufacture of the spar cap and reduces the production cost.

Further advantages of the method according to aspects of the invention are similar to the advantages which have been already mentioned with respect to the spar cap and therefore, they will not be repeated.

15 BRIEF DESCRIPTION OF DRAWINGS

Further aspects and characteristics of the invention ensue from the following description of the preferred embodiments of the invention with reference to the accompanying drawings, wherein

FIG. 1 is a wind turbine according to an embodiment of the invention,

20 FIG. 2 is a simplified perspective view of a rotor blade according to an embodiment of the invention,

FIG. 3 is a simplified cross section of a spar cap according to an embodiment of the invention,

FIG. 4 is a simplified cross section illustrating the insertion of a spar cap
25 according to an embodiment of the invention into a rotor blade and

FIG. 5 is a simplified perspective view of a spar cap according to another embodiment of the invention.

DETAILED DESCRIPTION OF EXAMPLE EMBODIMENTS

FIG. 1 is a simplified view of a wind turbine 2 according to an embodiment of
30 the invention. The wind turbine 2 comprises a rotor having a plurality of rotor blades 4 which are mounted to a rotor hub 6. A nacelle 8 carries a generator and a drive train which is coupled to a generator inside the rotor hub 6. The nacelle 8 is

mounted on a tower 10 which is founded in the sea, if the wind turbine 2 is an offshore plant or on the ground if the wind turbine 2 is land based.

In FIG. 2, there is a simplified perspective view of a rotor blade 4 according to an embodiment of the invention. The wind turbine 2 in FIG. 1 may be supplied with
5 rotor blades 4 according to this embodiment. The rotor blade 4 comprises a wing root 12 and a wing tip 14. The leading edge 16 of the rotor blade 4 is the front most point of the rotor blade 4 which contacts the air during operation of the wind turbine 2. The trailing edge 18 is the edge opposite to the leading edge 16. The distance between the wing root 12 and the wing tip 14 is the span of the rotor
10 blade 4. The airfoil of the rotor blade 4 is illustrated in a simplified cross section 20 substantially perpendicular to the span of the rotor blade 4. It defines the shape of the suction surface 22 and the pressure surface which is opposite to the suction surface (not visible in this view). There is a spar cap 24 configured in accordance with aspects of the invention which substantially extends along the span of the
15 rotor blade 4 between the wing root 12 and the wing tip 14. The spar cap 24 is mounted directly adjacent to but underneath the suction surface 22 and is depicted in dashed line. Although only one spar cap 24 is shown, there can be more than one spar cap 24 within one rotor blade.

In FIG. 3, there is a simplified cross-section of a spar cap 24 according to an
20 embodiment of the invention. The spar cap 24 comprises a fiber-reinforced member 26, a first edge member 28 and a second edge member 30. The fiber-reinforced member 26 comprises a first side 32 and a second side 34. The first side 32 is arranged towards a leading edge 16 of the rotor blade 4, if the spar cap 24 is mounted in the rotor blade 4. Similar, the second side 34 is arranged
25 towards a trailing edge 18 of the rotor blade 4, if the spar cap 24 is mounted in the rotor blade 4. The first edge member 28 is arranged to be directly adjacent to the first side 32 of the fiber-reinforced member 26. Similar, the second edge member 30 is arranged to be directly adjacent to the second side 34 of the fiber-reinforced member 26. Advantageously, the edge members 28, 30 cover almost
30 the entire first side 32 and the entire second side 34 of the reinforced member 26, respectively. The edge members 28, 30 advantageously extend along an entire length of the fiber-reinforced member 26, which is arranged in a direction of the span of the rotor blade 4.

The fiber-reinforced member 26 is advantageously manufactured from a carbon
35 fiber-reinforced material. However, other materials, for example, a glass fiber-

reinforced material is applicable. The fibrous material may be embedded in a synthetic resin. Advantageously, the first edge member 28 and the second edge member 30 are manufactured from a same material which is applied for manufacturing a core of the rotor blade 4. This may be foam or a wooden material, for example, balsa wood may be applied. However, honeycomb structures or any other lightweight structure may be applied for manufacturing the first edge member 28 and the second edge member 30. Advantageously, the mentioned materials apply to all embodiments of the invention.

In the embodiment of FIG. 3, the fiber-reinforced member 26 overlaps the edge members 28, 30, or in other words, the edge members 28, 30 extend into the fiber-reinforced member 26. An inner side 36 of the fiber-reinforced member 26 projects over an inner surface 37 of the first edge member 28 and over an inner surface 37 of the second edge member 30. In other words, the fiber-reinforced member 26 comprises a first projection 38 which extends over the inner surface 37 of the first edge member 28 in a direction towards the leading edge 16 of the rotor blade 4. Opposite to the first projection 38, there is a second projection 40 of the fiber-reinforced member 26. The second projection 40 covers at least a part of an inner surface 37 of the second edge member 30. The second projection 40 extends in a direction towards the trailing edge 18 of the rotor blade 4.

The inner side 36 of the fiber-reinforced member 26 is averted from an outer surface 42 which is arranged adjacent to a pressure surface or adjacent to a suction surface 22 of the rotor blade 4, if the spar cap 24 is mounted in the rotor blade 4. The outer surface 42 of the fiber-reinforced member 26 and an outer surface 43 of the first edge member 28 and an outer surface 43 of the second edge member 30 are advantageously aligned to be flush with each other. This is advantageous because the outer surfaces 42, 43 are arranged directly adjacent to a suction surface 22 and a pressure surface of the rotor blade 4, respectively.

The edge members 28, 30 may be tapered, which means that their thickness gradually decreases. The edge members 28, 30 have a first thickness at the first side 32 and the second side 34 of the fiber-reinforced member 26. The thickness is reduced to a second thickness at the front edge 44 and at the rear edge 46 of the spar cap 24, respectively. The second thickness of the edge members 28, 30 may be adapted to be approximately equal to a thickness of a core material 50 which is adjacent to a void 48 for accommodating the spar cap 24. The second thickness is lower than the first thickness.

Assembly of the spar cap 24 in a shell of a rotor blade 4 is illustrated in the simplified cross section of FIG. 4. The spar cap 24 is arranged in a suitable void 48 which is adjacent to a suction surface 22 or a pressure surface of the rotor blade 4. By way of an example, the spar cap 24 is mounted at the suction surface 22 of the
5 rotor blade 4. The spar cap 24 may be taken directly from the mold. No finishing steps need to be performed. The spar cap 24 may be manufactured, i. e. molded to fit into the void 48 of the shell of the rotor blade 4.

A front edge 44 of the spar cap 24 is provided by a plane side surface of the first edge member 28. The fiber-reinforced member 26 overlaps the first edge
10 member 28 at the inner surface 37. However, during manufacture of the spar cap 24, the fibrous material for manufacture of the fiber-reinforced member 26, for example layers of scrim or fiber mats, are arranged to overlap the first edge member 28 but do not reach the front edge 44 of the first edge member 28. Similar, the fibrous material overlaps the second edge member 30 by the second
15 projection 40. However, the fibrous material does not reach the rear edge 46.

FIG. 5 is a simplified perspective view showing a section of a spar cap 24 according to another embodiment of the invention. There is a fiber-reinforced member 26 and directly adjacent to a first side 32 of the fiber-reinforced member 26 there is a first edge member 28. An outer surface 42 of the fiber-
20 reinforced member 26 and the first edge member 28 is coated by an additional layer 52. This additional layer 52 may be applied to the outer surface 42 so as to provide a plan lower surface which may be arranged directly adjacent to a suction surface 22 or a pressure surface of the rotor blade 4.

In FIG. 5, a section of the spar cap 24 comprising the first edge member 28 is
25 depicted. An opposite edge of the spar cap 24 comprising the second edge member 30 (not shown in FIG. 5) may be configured similar.

An inner side 36 of the fiber-reinforced member 26 projects over the first edge member 28. There is a first projection 38 of fibrous material of the fiber-reinforced member 26 which projects over nearly the entire inner surface 37 of the first edge
30 member 28. However, this particular fibrous material, for example the topmost layers of scrim may be peel ply material. Accordingly, there is a tear-off edge 52 adjacent to the front edge 44 of the spar cap 24. Overlapping material may be removed by tearing off the overlapping portions. Further, the first projection 38 of the fiber-reinforced member 26 comprises a chamfered edge 54 so as to adjust a
35 thickness D of the spar cap 24 to a thickness of adjacent core material 50 and / or

to enhance adhesion of subsequent layers which are arranged on top of the spar cap 24 during assembly of the rotor blade 4.

Although the invention has been described hereinabove with reference to specific embodiments, it is not limited to these embodiments and no doubt further
5 alternatives will occur to the skilled person that lie within the scope of the invention as claimed.

CLAIMS

1. A spar cap for a rotor blade of a wind turbine, the spar cap comprising, a fiber-reinforced member which is configured to be arranged along a span of the rotor blade and substantially extends between the wing root and the wing tip, if the
5 spar cap is mounted in the rotor blade, the fiber-reinforced member having a first side which is configured to be arranged towards a leading edge of the rotor blade and a second side which is configured to be arranged towards a trailing edge of the rotor blade, if the spar cap is mounted in the rotor blade, **characterized in that**, the spar cap further comprises at least a first edge member which is arranged adjacent
10 to the first side or adjacent to the second side of the fiber-reinforced member to project towards the leading edge of the rotor blade or towards the trailing edge of the rotor blade, when the spar cap is arranged in the rotor blade.
2. The spar cap according to claim 1, comprising the first edge member arranged adjacent to the first side of the fiber-reinforced member and a second
15 edge member which is arranged adjacent to the second side of the fiber-reinforced member.
3. The spar cap according to claim 1 or 2, wherein a core of a rotor blade for which the spar cap is conceived comprises a core material, and wherein the at least first and/or second edge member is manufactured from the same core
20 material.
4. The spar cap according to claim 2 or 3, wherein the first edge member covers at least most of the entire first side and/or second edge member covers at least most of the entire second side of the adjacent fiber-reinforced member.
5. The spar cap according to anyone of claims 2 to 4, wherein the first side
25 and / or the second side of the fiber-reinforced member has a recess for accommodating the first and/or second edge member, respectively.
6. The spar cap according to claim 5, wherein the fiber-reinforced member comprises an outer side, which is configured to be arranged towards a suction surface or towards a pressure surface of the rotor blade, when the spar cap is
30 mounted in the rotor blade, the fiber-reinforced member further comprising an inner side, which is arranged opposite to the outer side, wherein the inner side of the fiber-reinforced member projects over the first and/or second edge member in a direction towards the leading edge and / or in a direction towards the trailing edge

of the rotor blade, so as to form the recess for accommodating the first and/or second edge member, respectively.

7. The spar cap according to anyone of claims 2 to 6, wherein the fiber-reinforced member comprises an outer side and the first and/or second edge member comprises an outer side, wherein the outer side of the fiber-reinforced member and the outer side of the first and/or second edge member are configured to be arranged adjacent to a suction surface or adjacent to a pressure surface of the rotor blade, when the spar cap is arranged in the rotor blade, and wherein the outer side of the fiber-reinforced member and the outer side of the first and/or second edge member are aligned to be flush with each other.

8. The spar cap according to anyone of claims 2 to 7, wherein an outer edge of the first and/or second edge member which is averted from the first side or averted from the second side of the fiber-reinforced member is tapered.

9. A rotor blade for a wind turbine, the rotor blade comprising at least one spar cap according to anyone of the preceding claims.

10. A wind turbine having a rotor comprising at least one rotor blade according to claim 9.

11. A method of manufacturing a spar cap for a rotor blade of a wind turbine, the method being **characterized by** the steps of:

- a) arranging at least one edge member in a mold for manufacturing the spar cap, wherein the edge member is arranged adjacent to a surface of the mold which is for manufacturing a front edge or a rear edge of the spar cap, wherein the front edge of the spar cap is configured to be arranged towards a leading edge of the rotor blade and the rear edge of the spar cap is configured to be arranged towards a trailing edge of the rotor blade, if the spar cap is mounted in the rotor blade,
- b) arranging fibrous material in the mold, wherein the fibrous material is arranged to be in intimate contact with the at least one edge member,
- c) curing the fibrous material so as to provide a spar cap comprising a fiber-reinforced member and the at least one edge member.

12. The method according to claim 11, wherein a first edge member is arranged adjacent to a surface of the mold which is for manufacturing a front edge

of the spar cap and a second edge member is arranged adjacent to a surface of the mold which is for manufacturing a rear edge of the spar cap and the fibrous material is arranged in the mold so as to be in intimate contact with the first edge member and with the second edge member.

5 13. The method according to claim 11 or 12, wherein the fibrous material is arranged in the mold so as to cover almost an entire vertical inner side of the at least one edge member, wherein the vertical inner side of the edge member is averted from the surface of the mold which is for manufacturing a front edge or a rear edge of the spar cap.

10 14. The method according to anyone of claims 11 to 13, wherein a bottom wall of the mold is for manufacturing an outer side of the spar cap, which is configured to be arranged adjacent to a suction surface or adjacent to a pressure surface of the rotor blade, if the spar cap is mounted in the rotor blade, and the at least one edge member and the fibrous material are arranged side-by-side on the bottom
15 wall so as to manufacture a spar cap comprising at least one edge member and a fiber-reinforced member which are aligned to be flush with each other at the outer side, , wherein the inner surface of the edge member(s) is averted from the bottom of the mold, so as to provide a fiber-reinforced member which projects over the at least one edge member, wherein the fibrous material is arranged to project over
20 the edge member in a direction towards the leading edge and / or in a direction towards the trailing edge of the rotor blade.

15 15. The method according to anyone of claims 11 to 14, wherein any fibrous material overlapping the lateral edges of the molded spar cap is removed by tearing off the overlapping portions.

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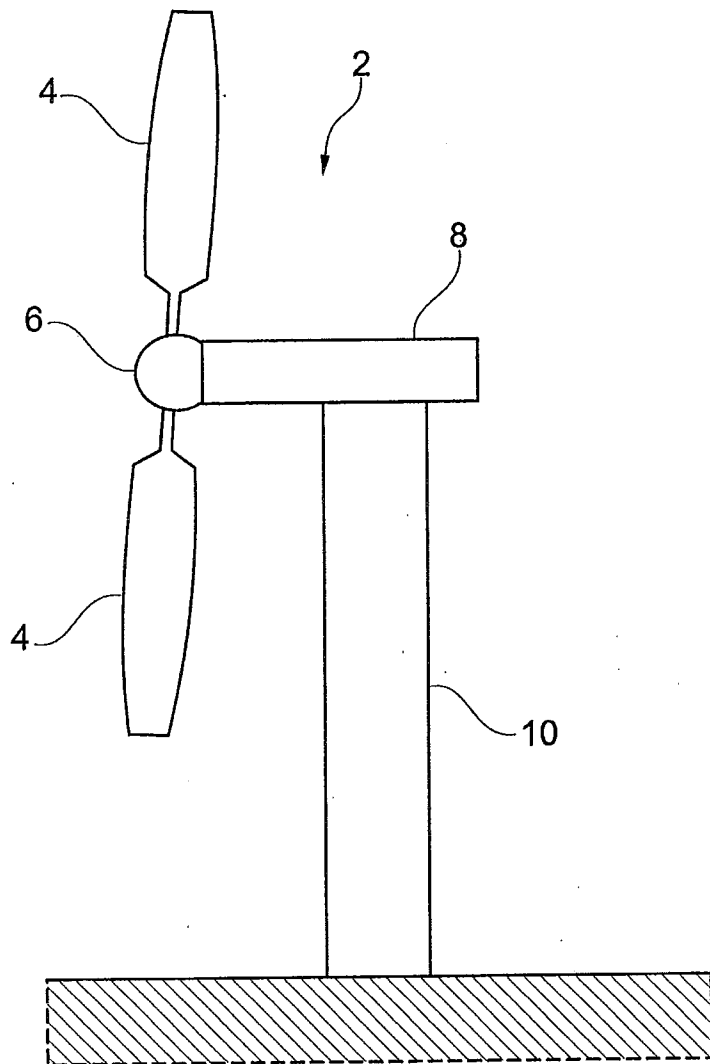


Fig. 1

2/4

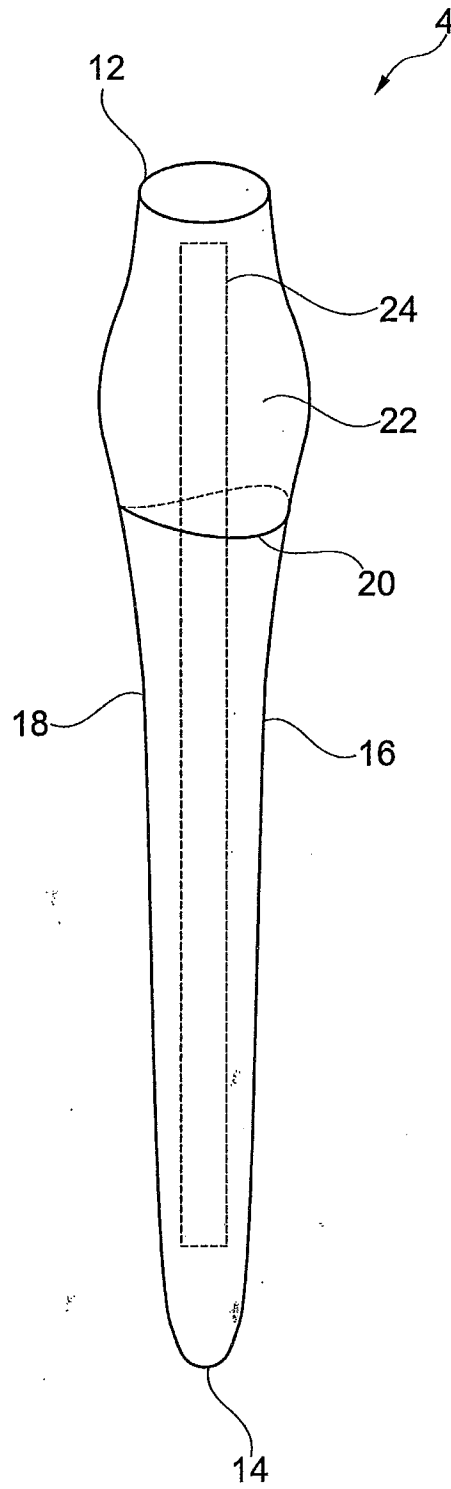


Fig. 2

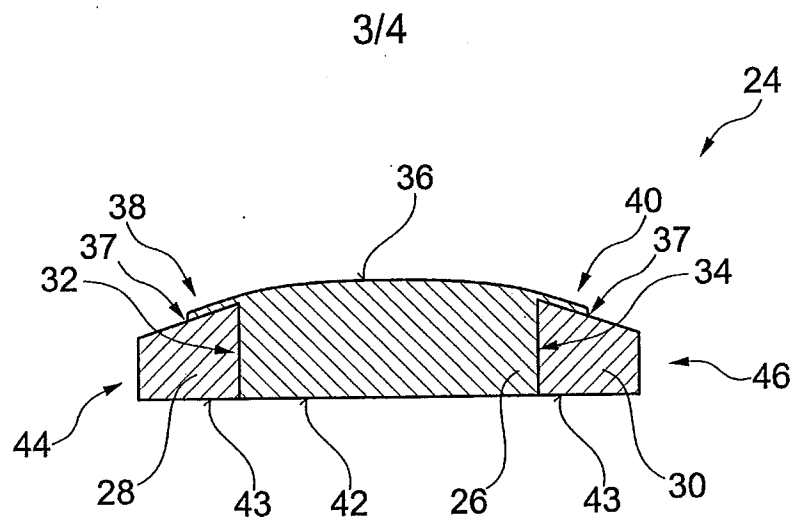


Fig. 3

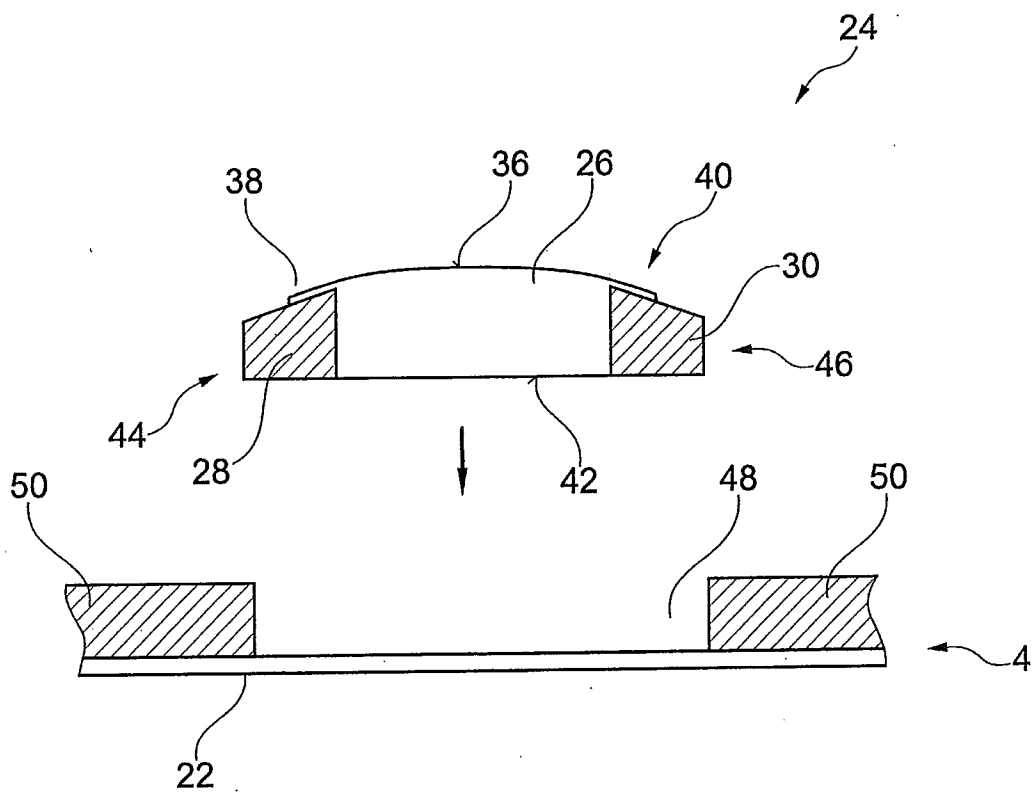


Fig. 4

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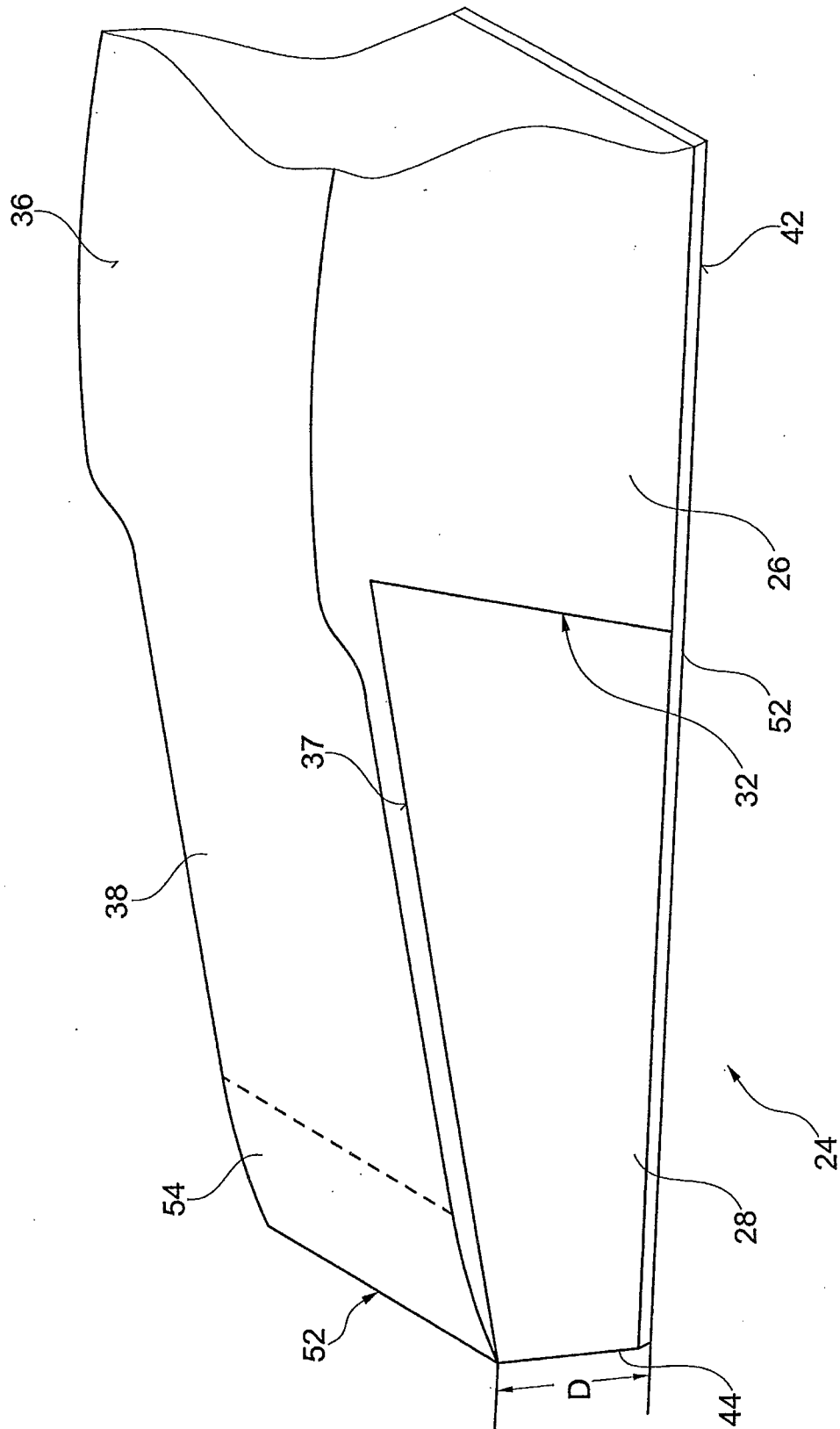


Fig. 5

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2013/070691

A. CLASSIFICATION OF SUBJECT MATTER

INV. F03D1/06 B29C70/84
 ADD. B29L31/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F03D B29C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2011/113812 A1 (VESTAS WIND SYS AS [DK]; HEDGES ANDREW [GB]; RICHTER JED [GB]; GILL AD) 22 September 2011 (2011-09-22) page 2 - page 5 figure 2	1-15
X	DE 10 2008 055537 A1 (GEN ELECTRIC [US]) 25 June 2009 (2009-06-25) figure 6 paragraphs [0024], [0025]	1-4,9,10



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

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Date of the actual completion of the international search

13 February 2014

Date of mailing of the international search report

21/02/2014

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Authorized officer

Jouannon, Fabien

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2013/070691

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2011113812 A1	22-09-2011	NONE	

DE 102008055537 A1	25-06-2009	CN 101463795 A	24-06-2009
		DE 102008055537 A1	25-06-2009
		US 2009162208 A1	25-06-2009
