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Case Number: T 2295/22 - 3.2.04

Application Number: 10168229.2

Publication Number: 2273102

IPC: F03D1/06, B29C73/10

Language of the proceedings: EN

Title of invention:
Wind turbine blade repair kit and method

Patent Proprietor:
General Electric Company

Opponents:
Vestas Wind Systems A/S
ENERCON GmbH

Headword:

Relevant legal provisions:
EPC 1973 Art. 100(c), 123(2)

Keyword:

Decisions cited:

Catchword:

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Case Number: T 2295/22 - 3.2.04

D E C I S I O N
of Technical Board of Appeal 3.2.04
of 26 April 2024

Appellant: (Patent Proprietor)	General Electric Company 1 River Road Schenectady, NY 12345 (US)
Representative:	Zimmermann & Partner Patentanwälte mbB Postfach 330 920 80069 München (DE)
Respondent: (Opponent 1)	Vestas Wind Systems A/S Hedeager 42 8200 Aarhus N (DK)
Representative:	Kent, Peter Joseph Keltie LLP No.1 London Bridge London SE1 9BA (GB)
Respondent: (Opponent 2)	ENERCON GmbH Dreekamp 5 26605 Aurich (DE)
Representative:	Eisenführ Speiser Patentanwälte Rechtsanwälte PartGmbB Johannes-Brahms-Platz 1 20355 Hamburg (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 1 September 2022 revoking European patent No. 2273102 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman	A. de Vries
Members:	G. Martin Gonzalez
	K. Kerber-Zubrzycka
	C. Kujat
	T. Bokor

Summary of Facts and Submissions

I. The appeal was filed by the appellant (patent proprietor) against the decision of the opposition division to revoke the patent in suit.

II. The division held inter alia that the main and auxiliary requests contained added subject-matter.

III. In preparation for oral proceedings the board issued a communication setting out its provisional opinion on the relevant issues.

Oral proceedings before the Board were held on 26 April 2024 in the presence of all parties, the respondent opponent 1 attending by videoconference.

IV. The appellant requests that the decision under appeal be set aside and the patent be maintained as granted (main request) or according to one of the auxiliary requests 1, 2, 2B, 3, 3B, 4, 4A, 4B, 5, 5A, 5B, 5C, 6, 6A, 6B, 7, 7A, 7B, 8, 8A, 8B, 9, 9B, 10B, 9C, 10C, re-filed with the statement setting out the grounds of appeal dated 11 January 2023.

The respondents (opponents 1 and 2) request that the appeal be dismissed.

V. Claim 1 of the requests relevant to this appeal reads as follows:

(a) Main request

"A patched wind turbine rotor blade (200) comprising,

(a) a prepared surface (214) including a scarf area (230) to remove damage (212) from the spar cap laminate layer (222) of the wind turbine rotor blade (108);
(b) an adhesive region (218) disposed on the prepared surface (214); and
(c) a repair (216) disposed on the adhesive region (218), wherein the adhesive region (218) sufficiently bonds the repair (216) to the prepared surface (214) to substantially match the mechanical properties of the bulk of the turbine rotor blade (108), wherein the repair (216) comprises a laminate layer, the laminate layer including a plurality of plies (238, 240, 242, 244) of composite fabric and a matrix material;
characterized in that
the plurality of composite fabric plies includes a first ply (238), a second ply (240) applied to the first ply, a plurality of intermediate plies (242) applied to the second ply, and a final ply (244) wherein each successive intermediate ply has approximately the same dimensional measurement in the width ("A") direction as the first ply and the second ply and is a predetermined size greater on each side than the previous ply in the length ("B") direction; and wherein the orientation of the plies (238, 240, 242, 244) and fibers of the laminate layer is substantially the same as that of plies and fibers of the existing spar cap laminate layer (222) of the wind turbine rotor blade (108)."

(b) Auxiliary request 1

Claim 1 as in the main request with the following amendment (emphasis by the Board to indicate added text):

"...wherein each successive intermediate ply has approximately the same dimensional measurement in the width ("A") direction as the first ply and the second ply and is a predetermined size greater on each side than the previous ply in the length ("B") direction, wherein the second ply (240) has a slightly longer dimensional measurement in the length ("B") direction on each side than the first ply (238); and wherein the orientation of the plies..."

(c) Auxiliary request 2

Claim 1 as in the main request with the following amendment (emphasis by the Board to indicate added text):

"...wherein each successive intermediate ply has approximately the same dimensional measurement in the width ("A") direction of the scarf area (230) as the first ply and the second ply and is a predetermined size greater on each side than the previous ply in the length ("B") direction of the scarf area(230); and wherein the orientation of the plies..."

(d) Auxiliary request 2B

Claim 1 as in the auxiliary request 2 with the following amendment (emphasis by the Board to indicate added text):

"...wherein each successive intermediate ply has approximately the same dimensional measurement in the width ("A") direction of the scarf area (230) as the first ply and the second ply and is a predetermined size greater on each side than the previous ply in the

length ("B") direction of the scarf area(230), wherein the second ply (240) has a slightly longer dimensional measurement in the length ("B") direction on each side than the first ply (238); and
wherein the orientation of the plies..."

(e) Auxiliary request 3

Claim 1 as in the auxiliary request 2 with the following amendment (emphasis by the Board to indicate added text):

"...wherein each successive intermediate ply has approximately the same dimensional measurement in the width ("A") direction of the scarf area (230) as the first ply and the second ply and is a predetermined size greater on each side than the previous ply in the length ("B") direction of the scarf area(230);
wherein the plurality of composite fabric plies all have a dimensional measurement that is approximately the same measurement, namely sides that correspond to approximately the width (A) of scarf area (230); and
wherein the orientation of the plies..."

(f) Auxiliary request 3B

Claim 1 as in auxiliary request 3 with the additional amendments as indicated for auxiliary request 2B.

(g) Auxiliary request 4

Claim 1 as in the main request with the following amendment (emphasis by the Board to indicate added text):

"...(b) an adhesive region (218) disposed on the prepared surface (214) to provide greater than about 93% to approximately 100% or greater of full tensile strength and stiffness for patched wind turbine rotor blade (200), compared to the mechanical properties of wind turbine rotor blade (108) as originally fabricated; and..."

(h) Auxiliary request 4A

Claim 1 as in auxiliary request 4 with the additional amendments as indicated for auxiliary request 2.

(i) Auxiliary request 4B

Claim 1 as in auxiliary request 4A with the additional amendments as indicated for auxiliary request 2B.

(j) Auxiliary request 5

Claim 1 as in the main request with the following amendment (emphasis by the Board to indicate added text):

"...(b) an adhesive region (218) disposed on the prepared surface (214), wherein the adhesive region (218) is applied to the entire surface of prepared surface (214) and comprises at least one composite fabric ply and a matrix material; and..."

(k) Auxiliary request 5A

Claim 1 as in auxiliary request 5 with the additional amendments as indicated for auxiliary request 2.

(l) Auxiliary request 5B

Claim 1 as in auxiliary request 5A with the additional amendments as indicated for auxiliary request 2B.

(m) Auxiliary request 5C

Claim 1 as in auxiliary request 5B with the following amendments (emphasis by the Board to indicate added or removed text):

"...(b) an adhesive region (218) disposed on the prepared surface (214), wherein the adhesive region (218) is applied to the entire surface of prepared surface (214) and comprises ~~at least one~~ a single composite fabric ply and ~~a~~ matrix material parallel along the entire surface of the scarf area; and
(c) a repair (216) disposed on the adhesive region (218), wherein the adhesive region (218) sufficiently bonds the repair (216) to the prepared surface (214) to substantially match the mechanical properties of the bulk of the turbine rotor blade (108), wherein the repair (216) comprises a laminate layer, the laminate layer including a plurality of unidirectional composite fabric plies (238, 240, 242, 244) ~~of composite fabric~~ and a matrix material;..."

(n) Auxiliary request 6

Claim 1 as in the main request with the following amendment at the end of the claim (emphasis by the Board to indicate added text):

"...of the wind turbine rotor blade (108), wherein the plurality of plies (238, 240, 242, 244) of composite fabric of the laminate layer are disposed in

layers on the adhesive region (218) and on the preceding ply of composite fabric of the laminate layer, and wherein each of the plurality of plies of co mposite fabric of the laminate layer (238, 240, 242, 244) butts-up to a portion of the adhesive region (218)."

(o) Auxiliary request 6A

Claim 1 as in auxiliary request 6 with the additional amendments as indicated for auxiliary request 2.

(p) Auxiliary request 6B

Claim 1 as in auxiliary request 6A with the additional amendments as indicated for auxiliary request 2B.

(q) Auxiliary request 7

Claim 1 as in the main request with the following amendments at the end of the claim (emphasis by the Board to indicate added text):

"...of the wind turbine rotor blade (108), wherein the wind turbine rotor blade (200) further comprises a reinforcing layer (246) disposed on the repair (216), wherein the reinforcing layer (246) further includes at least one composite fabric ply and a matrix material."

(r) Auxiliary request 7A

Claim 1 as in auxiliary request 7 with the additional amendments as indicated for auxiliary request 2.

(s) Auxiliary request 7B

Claim 1 as in auxiliary request 7A with the additional amendments as indicated for auxiliary request 2B.

(t) Auxiliary request 8

Claim 1 as in the auxiliary request 7 with the following amendments at the end of the claim (emphasis by the Board to indicate added text):

"...further includes at least one composite fabric ply and a matrix material, and
wherein the reinforcing layer (246) disposed on the repair (216) and the adhesive layer (218) provides greater than 100% translation of tensile strength and stiffness to the patched wind turbine rotor blade (200)."

(u) Auxiliary request 8A

Claim 1 as in auxiliary request 8 with the additional amendments as indicated for auxiliary request 2.

(v) Auxiliary request 8B

Claim 1 as in auxiliary request 8A with the additional amendments as indicated for auxiliary request 2B.

(w) Auxiliary request 9

Claim 1 as in the auxiliary request 5 with the following amendments (emphasis by the Board to indicate added or removed text):

"...~~and~~

wherein the orientation of the plies (238, 240, 242, 244) and fibers of the laminate layer is unidirectional and substantially the same as that of unidirectional plies and fibers of the existing spar cap laminate layer (222) of the wind turbine rotor blade (108); and wherein the wind turbine rotor blade (200) further comprises a sealing layer (220) disposed on the repair (216), wherein the sealing layer (220) comprises at least one composite fabric ply and a matrix material, and wherein the at least one composite fabric ply of the sealing layer (220) further includes fibers having a biaxial orientation."

(x) Auxiliary request 9B

Claim 1 as in auxiliary request 9 with the additional amendments as indicated for auxiliary request 2.

(y) Auxiliary request 9C

Claim 1 as in auxiliary request 9A with the additional amendments as indicated for auxiliary request 2B and for auxiliary request 5C.

(z) Auxiliary request 10B

Claim 1 as in auxiliary request 5 with the additional amendments as indicated for auxiliary requests 2, 2B, 3, 7, 8 and 6.

(aa)Auxiliary request 10C

Claim 1 as in auxiliary request 10B with the additional amendments as indicated for auxiliary request 5C.

VI. The appellant's arguments can be summarised as follows:

None of the requests on file contains added subject-matter.

VII. The respondents' arguments can be summarised as follows:

Claim 1 of all requests contains added subject-matter in the form of an unallowable intermediate generalisation.

Reasons for the Decision

1. The appeal is admissible.

2. Background

The invention is directed to a patched wind turbine rotor blade. It relates in particular to the laminate repair, see patent specification par. 0001 and claim 1. The invention aims to provide a laminate repair that can be assembled on location, applied in various blade orientations and where the blade, after repair, matches the mechanical properties of the bulk of the turbine blade, see pars. 0007-0009. After identifying the damage, a scarf area is prepared. Scarfing is defined in par. 0014 as taper sanding or any other process in which composite material surfaces may be selectively removed. A prepared surface 214 with a scarf area 230 having a width dimension A and a length dimension B is shown in figures 3 and 5. An adhesive region 218 is disposed on the prepared surface 214 and a repair 216 is disposed on the adhesive region 218, see figure 5 and par. 0016. In accordance with granted claim 1 repair 216 comprises a plurality of composite fabric

plies 238-244, wherein each successive ply has approximately the same width dimension A and is a predetermined size greater on each side than the previous ply in the length direction B. The orientation of the plies and fibers is substantially the same as that of the plies and fibers of the existing laminate layer, see par. 0019. Adhesive region 218 is said to sufficiently bond the repair to the prepared surface to substantially match the mechanical properties of the bulk of the turbine blade, see pars. 0016, 0020 and comparative examples on pars. 0029-0035 and Table I.

3. Main request - Added subject-matter

3.1 The Board finds that claim 1 of the main request contains added subject-matter in the form of an unallowable intermediate generalisation, as also found by the division. This conclusion is based on established criteria in relevant case law.

3.2 Here it is useful to reiterate the relevant criteria as developed in the case law: an intermediate generalisation is the extraction of isolated features from a set of features originally disclosed only in combination, e.g. a specific embodiment in the description or drawings of the original application. It is only justified or allowable if the person skilled in the art recognises beyond doubt that the features in question are not closely related. It must be directly and unambiguously clear to the skilled person from the information in the application as filed that the relevant features are not linked, see Case Law of the Boards of Appeal, 10th edition 2022, II.E.1.9.1. Otherwise, it is an unallowable intermediate generalisation and constitutes added subject-matter within the meaning of Article 123(2) EPC.

3.3 Granted claim 1 has been amended during the examination phase to add the features that the plurality of composite fabric plies includes a first ply, a second ply, a plurality of intermediate plies, and a final ply wherein each successive intermediate ply has approximately the same dimensional measurement in the width ("A") direction as the first ply and the second ply and is a predetermined size greater on each side than the previous ply in the length ("B") direction; and wherein the orientation of the plies and fibers of the laminate layer is substantially the same as that of plies and fibers of the existing laminate layer.

The added features are indisputably taken from original page 8, lines 3-7 and lines 11-12, which unequivocally relate to the specific embodiment described from the last paragraph of page 7 to the last paragraph of page 8 continued onto page 9. These paragraphs start off stating "In one embodiment..." and describe a specific repair patch laminate structure, in which :

A) the plurality of plies have a rectangular shape (page 7, lines 14-15)
B) the "A" and "B" directions correspond to the width and length of the scarf area (page 7, lines 15-18),
C) the dimensional measurement in the "A" direction of all plies corresponds to approximately the width of the scarf area (page 7, lines 14-17),
D) the orientation of the plies is laid parallel to the width of the scarf area (page 7, lines 17-18),
E) the first ply has a size which corresponds to an area equal or slightly greater than the area

created by the grinding to the first ply of the spar cap laminate (page 7, lines 23-25),

F) the second ply has a slightly longer width on each side than the first ply (page 7, lines 29,30),

G) the final ply layer substantially covers the prepared area (page 8, lines 13-14), and

H) all plies butt up against the adhesive region (page 7, lines 21-27, page 8, lines 1, 10, 17).

3.4 It is evident from pages 7 and 8 that this repair structure has specific ply dimensions, orientations and layout, which together form the structural unit that is the repair patch. The passage itself follows a straightforward linear structure, wherein features are enumerated and described in a coherent manner, collectively defining the resultant repair structure. None of the features listed is given particular emphasis or otherwise given prominence. Thus, for the skilled person, who reads the original disclosure unprejudiced by knowledge of any amendments that were made after filing and that led to granted claim 1, each of these features is seen to be given equal weight and to contribute equally to the overall function and structural integrity of the laminate structure. All features of the unit cooperate to fulfil the common goal or function to obtain mechanical properties of the patched blade that substantially match those of the blade as originally fabricated, as also explained in the ensuing paragraph starting at page 8, line 20. They are therefore deemed to be inextricably structurally and functionally linked.

The argument presented by the appellant, suggesting that the skilled person would readily recognise and single out from the original disclosure certain of the

features as more important than others (such as all plies having the same dimension in the width "A" because it simplifies the repair procedure) is not reflected in the structure and content of the original disclosure. As noted, the two paragraphs do not emphasize any particular feature, nor do they associate specific advantages with specific ones of those features. The 2nd paragraph of page 8 rather sums up the collective effect of structure and placement of the resultant adhesive region considered as a whole.

3.5 The appellant further argued, as does the appealed decision, that omitted features would already be implicit in those included or already present in the claim. Thus, for example a rectangular shape (feature A)) would be implied by the mere mention of length and width. However, other geometric shapes, such as trapezoids or ovals, which are equally valid for repair plies, also possess length and width dimensions. That it might be implicit from the rectangular shape of the scarfed area depicted in Figure 3 is irrelevant as the claim does not require a rectangular shape for the scarf area. Because the claim does not require any specific shape of the scarf area, it is also not implicit that width and length directions of the plurality of repair plies and of the scarf area are the same (feature B)). The cited parts of the description indeed rather conveys the opposite, as the width of the first few (and visibly narrow) plies clearly extends in the length direction of the scarf area (and in the length direction of the patch as a whole).

The Board also does not agree with the division's finding that, because the claim requires an adhesive region on the prepared surface of the scarf area and bonding of the repair thereto, therefore it would be an

implicit feature of the claim that all plies must butt up against the adhesive region (feature H)), the final ply must cover the prepared area (feature G))and the first ply size must correspond to the cut out area of the first ply of laminate (feature E)).

Claim 1 does not link in any way the dimensions of the plies to the dimension of the adhesive region, the prepared surface or the scarf area, nor does adhesion between the repair as a whole and the prepared surface of the scarf area as a whole necessitate any particular positional or dimensional relationship between individual plies and laminate layers. It may be that these missing features are the most logical or obvious for the skilled person if they want to achieve optimal bonding, but these features are by no means the only way this could be achieved. For example it is conceivable that the first (repair) ply is smaller or larger than the area ground out in the first ply of the laminate. Other plies or more adhesive could contribute to filling the area, potentially compensating for any deficiencies in a smaller first ply. Or a larger first ply may establish a bond with multiple laminate plies. Similarly, the final ply could conceivably be smaller than the prepared scarf area, because lower plies overlap the final exposed laminate ply or to accommodate adhesive or for better bonding of a reinforcing or sealing layers overlying the repair area.

Nor are the missing features of shape, relative size and orientation (features A), B), D) to G)) an inevitable consequence of the claim requirement of the repair bonding to the prepared surface to substantially match the mechanical properties of the bulk of the blade. In the Board's understanding different internal

structures and ply properties can give rise to *bulk* mechanical properties that match those of the blade.

The Board adds that what may be obvious or immediately obvious, or most logical to the skilled person from their common general knowledge should not be confused with what would be implicit to them as a matter of direct and unambiguous disclosure. Implicit disclosure does not allow for any other reasonable inference from the available information, even if such a reasonable further inference would be less obvious.

3.6 The appellant has finally argued that features included in the claim would not be inextricably linked functionally or structurally with those omitted. Thus, for example, the shape or relative size of the first layer (features A), E), F)) is not inextricably functionally linked to the rest of the repair patch structure. According to the appellant, in the embodiment on pages 7 and 8 the first layer would play only a marginal load-bearing function compared to the other layers, so that its dimensions would be irrelevant. That this is so is not apparent to the Board from the passage on pages 7 and 8, which does not differentiate between the effects of the different repair plies. Nor is the Board convinced that this would be immediately apparent to the skilled person from straightforward considerations. Just like all the other repair plies it still bridges the gap in the corresponding laminate ply that has been cut through to form the scarf restoring some of its integrity. Just like those other plies that effect is enhanced by its bonding to an underlying ply of the laminate. Therefore, it still plays a similar role in the load-bearing function of the repair patch. Furthermore, if the first repair ply is not at least as wide as the

exposed area of the first laminate ply at the bottom of the scarf, than the wider second repair ply may not rest on the ends of that first laminate ply. It can thus not be concluded that the size of the first ply is not structurally and functionally linked to the other features of the embodiment.

Nor is it convincing that the rectangular shape (feature A)) is not inextricably linked to the other features because it would have no impact on the load bearing effect of the repair patch. The shape of the plies as well as their orientation within the scarf area, with ply width and length directions corresponding to those of the scarf area, (features A), B)), has a direct effect on the distribution of stresses to the adhesive layer and thus on the load-bearing capacity. Indeed all the missing features A) to H) together ensure that the repair plies form a bond joint that is contiguous with the sides of the scarfed recess in the laminate to realize "the structure and placement of the adhesive region [that] distributes the micro-stress concentrations .... to provide greater than about 93% to approximately 100% or greater of full tensile strength and stiffness ... compared to the mechanical properties of [the] blade as originally fabricated".

3.7 The Board therefore concludes that the ground for opposition under Article 100(c) EPC raised against claim 1 of the main request prejudices the maintenance of the patent as granted, due to the omission of the above listed features, constituting an unallowable intermediate generalization.

4. Auxiliary requests - Added subject-matter

4.1 None of the auxiliary requests overcomes the above added subject-matter objection, as also acknowledged by the appellant proprietor at the oral proceedings before the Board.

The cited set of omitted features is not contained in any of the auxiliary requests. At least the feature that the plurality of plies have a rectangular shape (feature A)), the feature that the first ply has a size corresponding to an area equal or slightly greater than the area resulting from processing the first layer (feature E)), and the feature that the final ply substantially covers the prepared area (feature G) discussed above in detail for the main request, are absent from claim 1 in all requests.

4.2 Therefore the Board concludes that, for similar reasons as the main request, all auxiliary requests contain added subject-matter in the form of an unallowable intermediate generalisation, Article 123(2) EPC.

5. As all of the appellant's requests fail, the Board confirms the decision of the opposition division.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

G. Magouliotis A. de Vries

Decision electronically authenticated