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Datasheet for the decision of 17 May 2021

Case Number: T 2773/18 - 3.2.04

Application Number: 11180804.4

Publication Number: 2568169

IPC: F03D80/00

Language of the proceedings: EN

Title of invention:
Wind turbine with tower climatisation system using outside air

Patent Proprietor:
Adwen GmbH

Opponent:
Vestas Wind Systems A/S

Headword:

Relevant legal provisions:
EPC Art. 100(b), 54, 56

Keyword:
Sufficiency of disclosure - (yes)
Novelty - (yes)
Inventive step - (yes)

Decisions cited:

Catchword:
Reasons 3.2 on argument that claimed invention is insufficiently disclosed across whole breadth

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European Patent Office
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Beschwerdekammern

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Case Number: T 2773/18 - 3.2.04

D E C I S I O N
of Technical Board of Appeal 3.2.04
of 17 May 2021

Appellant: (Opponent)	Vestas Wind Systems A/S Hedeager 44 8200 Aarhus N (DK)
Representative:	Inspicos P/S Kogle Allé 2 2970 Hørsholm (DK)
Respondent: (Patent Proprietor)	Adwen GmbH Am Lunedeich 156 27572 Bremerhaven (DE)
Representative:	Aspacher, Karl-Georg Siemens Gamesa Renewable Energy GmbH & Co. KG Otto-Hahn-Ring 6 81739 München (DE)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 17 September 2018 concerning maintenance of the European Patent No. 2568169 in amended form.**

Composition of the Board:

Chairman	A. de Vries
Members:	S. Oechsner de Coninck
	T. Bokor

Summary of Facts and Submissions

I. The opponent appeals against the interlocutory decision of the Opposition Division of the European Patent Office posted on 17 September 2018 concerning maintenance of the European Patent No. 2568169 in amended form.

II. The opposition was based on the grounds of Articles 100(b) and 100(a) EPC in combination with lack of novelty and inventive step. In its written decision the Opposition Division held that the patent as amended according to the auxiliary request B met the requirements of the EPC, having regard in particular to the following documents:

D1: WO 2010/051815
D2: EP 1 736 665
D3: WO 2010/015674
D4: GB 2 253 478
D5: WO 2010/0308596
D6: WO 2010/015651
D7: EP 2589806
D8: US 2010/0133824
D9: CN 201714586U and its machine translation D9a
D10: US 6,439,832
D12: CN 201570345U and its machine translation D12a

The following documents were additionally cited in appeal:

D13: Blanchard et al: "The vertical distribution of the concentration of sea salt in the marine atmosphere near Hawaii", Tellus (1984), 36B, 118-125,

D14: Durstewitz et al: "Sea – Wind – Power, Research at the first German Offshore Wind farm Alpha Ventus", Springer Verlag, Germany, 2017

III. Oral proceedings were held on 17 May 2021 in the form of a videoconference.

IV. The appellant (opponent) requests that the decision under appeal be set aside, and that the European patent No. 2568169 be revoked.

V. The respondent (patent proprietor) requests that the appeal be dismissed, i.e. maintenance of the patent in the form held allowable by the Opposition Division. Alternatively the decision under appeal should be set aside and the patent be maintained with one of the Auxiliary requests I to VII, filed with the response to the grounds of appeal dated 21 May 2019.

VI. The main request is directed at the version upheld, with the apparatus claims as granted but the method claims deleted. Claim 1 according to this request reads as follows:

"A wind turbine (1) comprising:
- a tower (100), the tower having an upper part(4), a middle part (6) and a lower part (8), the lower and the middle part of the tower forming the base (9) of the tower;
- waste heat generating equipment (14) located in the middle part of the tower; and
- a cooling device (16) with at least one cooling device inlet (22) formed in the tower for introducing outside air (10) surrounding the tower into the tower; wherein the cooling device (16) is adapted to guide the outside air from the or each cooling device inlet (22)

into the lower part (8) of the tower such that the outside air can ascend towards the middle part and upper part of the tower while cooling the waste heat generating equipment (14), characterised in that the or each cooling device inlet (22) is located in the upper part (4) of the tower."

VII. The appellant argues as follows:
- The invention is not disclosed sufficiently over its whole scope, given that the air intake can be positioned quite low according to the claim.
- The subject-matter of claim 1 lacks novelty in respect of either one of the disclosures D5, D6, D7, D9 or D12.
- Starting from either D12 or D8, the skilled person would provide a cooling device inlet that is located in the upper part of the tower based on their common general knowledge as illustrated in D13 or D14, or use this knowledge to provide an air inlet higher up in the tower as disclosed in either D1, D2 or D10.

VIII. The respondent argues as follows:
- The patent provides sufficient information on how the location of each of the upper, middle and lower part of the tower is to be interpreted.
- The subject-matter of claim 1 is novel in respect of any one of the disclosures D5, D6, D7, D9 or D12.
- Starting from either D12 or D8, the skilled person would not find any incentive based on their common general knowledge as illustrated in D13 or D14, or from any of D1, D2 or D10 to locate an air inlet higher up in a wind turbine tower.

Reasons for the Decision

1. The appeal is admissible.

2. Background and claim interpretation

2.1 The patent is concerned with a wind turbine with a cooling device using outside air. In particular for marine environments, a cooling device is proposed that remains simple, cheap and which has a low energy consumption (paragraph 008).

2.2 The solution as defined in claim 1 relies on the following architecture and operation of the cooling device within the wind turbine tower. The tower has an upper part, a middle part and a lower part. The cooling device guides the outside air from at least one inlet, located in an upper part of the tower, into the lower part of the tower. The outside air can then ascend towards the middle part and cool the waste heat generating equipment located in that middle part; afterwards it continues to ascend to the upper part of the tower.

2.3 According to the established case law, see for example the Case Law of the Boards of Appeal, 9th edition, 2019 (CLBA) II.A.6.1, the skilled person should try, with synthetical propensity, i.e. building up rather than tearing down, to arrive at an interpretation of the claim which is technically sensible and takes into account the whole disclosure of the patent. Reading the claims thus, with their mind willing to understand and making technical sense of the claimed invention and the problem it sets out to solve, the skilled person gives the relative terms *upper*, *middle* and *lower parts*" used

in the claim to define parts of the wind turbine tower a meaning compatible with the scale of a wind turbine tower that they define and which is also technically meaningful in the light of the problem that can be inferred from paragraphs 0002, 0008 and and 0011, namely to provide a simple and cheap way of cooling the inside of a wind turbine tower using outside air without elaborate air treatment, such as would be necessary at marine locations. The claim already requires that the heat generating equipment is *located in the middle part*, so that the middle part is clearly a substantial chunk of the tower structure big enough to accommodate such equipment, which is understood to include the turbine transformers. Likewise, it can be inferred by a reasonable mind from the wording of the claim, which requires the outside air to be *guided into the lower part* of the tower (implying it is hollow) *such that it can ascend to the middle part*, that the lower part of the tower is also a substantial chunk of the tower structure below the middle part. Consequently, in that reasonable reading of the claim the heat generating equipment (in the middle part) is at a significantly elevated position within the tower, well above the bottom floor of the tower. Likewise the air inlet, located in the upper part above middle and lower parts will be located even higher and thus high above the level at which outside air quality is poor.

This understanding is not contradicted by the claim (as also repeated in paragraph 0021) defining the lower and the middle part to *form the base of the tower*. A reasonable mind infers from this rather that the upper part constitutes an even more substantial chunk of the tower, larger than the two other parts, representing (by way of example) maybe half or more of the total tower height.

On the scale of modern day wind turbine towers which measure between 60 and 100 meters height (e.g. paragraph 011 "around 100 meters") corresponding to a 15 to 25-storey building, these substantial chunks will in a reasonable reading lead to sizes in the order of storeys. Such an understanding fits well within the context of the broader disclosure, and the problem addressed by the invention. Thus in specification paragraph 0022 read in conjunction with paragraph 019 of the patent the upper part of the tower is located above the sea spray zone that is at a height of at least 30 meters (about 7 storeys).

2.4 Consequently, and contrary to the appellant's opinion each of the lower and middle part of the wind turbine tower that according to claim 1 form the base of the tower has a substantial size commensurate with the tower's height.

3. Sufficiency of disclosure - Article 100(b) EPC

3.1 The contention of lack of sufficiency of disclosure concerns the expression "upper part of the tower" that according to paragraph 022 of the patent is defined as the part of the tower located above the sea spray zone. The appellant argues that the claim is neither limited to an offshore wind turbine nor is the dimension of the lower and upper parts limited to a minimum size or height. The scope of claim 1 thus covers embodiments where the inlet is located quite low above sea level and therefore unable to achieve the technical effect of drawing outside air with a low water and salt content as explained in paragraphs 008 to 010 of the patent.

3.2 This argument fails to convince the Board, not least because it misapplies case law developed in the field of chemistry, where a claimed invention resides in a compositional range or other range of values but the associated effect may not be proven or plausible for large parts of that range, to a claimed invention in the mechanical field, even if it claims no ranges. By its very nature a claim in this field, which - often in functional or other generic terms - attempts to capture the essence of some concrete machine or mechanical structure (or its operation), is schematic allowing for some breadth of interpretation. It may be that on clever construction subject-matter can be found to be covered within that breadth that may not solve the problem or achieve the desired effect. However, this is normally not an issue of lack of disclosure, but rather of claim construction. Whether claims, description and figures provide the skilled person with sufficient information to carry out an invention, is a purely technical question, that is separate from that of what reasonably falls within the ambit of claim wording. In the Board's view if the skilled person upon consideration of the entire disclosure possibly using common general knowledge can infer what will and what will not work, a claimed invention is sufficiently disclosed, even if a broad construction might also encompass what doesn't work. Indeed that inference from the whole disclosure might lead to a more limited construction of the claim.

3.3 In the present cases the Board has no doubt whatsoever, that the skilled person, intent on making technical sense of the claim in the broader context of the whole disclosure, easily infers from it the basic, simple idea of the invention, which is to raise the air inlet

in the tower above an already raised position of the heat generating equipment. Insofar as the skilled person when putting the claimed invention needs any further practical guidance the patent description and figures provide them with ample detail. In figure 2 for example, read in conjunction with paragraph 0019, the inlet is provided above the spray zone Z which is of the order of 30 m above sea level. This is an exemplary value on the basis of which a person skilled in wind turbine design can find other workable heights depending on the known local climatic conditions of the installation, using routine measures. Using the content of the disclosure of the patent, in particular paragraph 0022 as submitted, the skilled person is able to directly recognise lower locations of the inlet that do not permit air intake with a low enough salt content. They would exclude such embodiments as they obviously would not achieve the sought effect. In particular they would disregard upper part that are placed much lower than 30 meters above sea lever where sea spray can be expected, or where the salt content of outside air is expected to be in excess.

3.4 The Board thus confirms the Opposition Division's positive assessment of sufficiency,
Article 100(b) EPC.

4. Main request - Novelty

4.1 Based on their broad interpretation of the terms "upper part, middle part and lower part" the appellant has in particular submitted that the disclosures of either one of D12/D12a, D5, D6, D7 or D9 would fall within the scope of claim 1.

4.2 D12/D12a discloses the lower part of a wind turbine. Figure 2 shows a schematic representation of what the skilled person interprets as the base portion of a wind tower, with, see paragraphs 0021 and 0022 of D12a, a bottom transformer chamber 41 accommodating a transformer 4 shown on an otherwise unreferenced base or pedestal on the bottom floor of the tower. Air entering somewhere from an undisclosed location above the cut out section leads to the chamber via duct 6 and reaches the second fan 5 with its outlet 52 located at about the same level as the transformer.

The transformer may be raised on a pedestal, yet the skilled person would not reasonably consider it to be located within a middle part of the tower in the sense of claim 1 as discussed above. Thus, they would not recognize the transformer as being substantially elevated within the tower. In their reading of D12/D12a both the second fan 5 and the transformer 4 are located in the same transformer chamber located in the same lowermost part of the wind turbine tower. Therefore in D12/D12a the air is not guided into a lower part and caused to ascend towards a middle part containing the waste heat equipment as required by claim 1.

4.3 In D5, see figure 5, the transformer 22 within a closed housing 61 is likewise positioned on a pedestal or base on the bottom floor at the foot of the tower (see also paragraph 0049). Outside air is guided from air passage openings 6, 7 in order to ventilate the inner space of tower 2 (paragraph 0050) and cool the transformer 22 provided in the foot of tower 2.

Contrary to the appellant's opinion, even if cooling air does circulate within the space visible underneath the transformer 22, the corresponding very limited section of the tower is not (in the skilled person's eyes) a substantial part of tower, such that they would conclude that the transformer is at a significantly elevated position within the tower.

4.4 D6 discloses a similar location for the transformer in a transformer guard housing 10 (see figure 2). The guard housing has an internal channel 20 guiding cooling air from a higher inlet supply box 24 to the housing below it and to the transformer 28 within (page 6, lines 29-34, page 7, bottom paragraph, figure 3).

In the Board's view even if the guard house includes space below the transformer, the same comments as for D5 apply. Thus, a corresponding section of the tower would not qualify as a lower part of the tower in the sense of the claim, and the skilled person would not consider the transformer to be significantly elevated within the tower.

4.5 The Board is furthermore unconvinced that the other disclosures cited against novelty disclose all the features of claim 1. In its communication in preparation for the oral proceedings, see section 5, the Board gave the following provisional opinion on these further attacks:

"*In D7, the seventh and eighth embodiments of figure 18 depict the whole wind turbine tower. A cooling structure G is disclosed guiding air into a double cylindrical structure of the wall (paragraph 069). The heat-generating electrical equipment 14 ([080]) is*

depicted on the ground surface 2. Whether the introducing vent 21 is in the upper tower portion is far from clear. Although claim 1 defines the lower and middle part of the tower to form the base of the tower, the skilled person making technical sense of the claim would not consider the equipment 14 to be situated in an intermediate part above a lower part of the tower.

...

- D9/D9a discloses an offshore wind power generation system. According to paragraph 032, the waste heat generating equipment is composed of the transformer 42, high and low voltage cabinet 43 and a control cabinet 44. As illustrated in figure 2, a cooling air inlet with filter 41 is depicted to be on about the same height as the transformer. Paragraph 0032 has the transformer located in the "bottommost portion of the tower drum", so that the inlet, shown in figure 2 at the same location, is not in the upper part as required by the characterising feature of claim 1.

In conclusion, the subject-matter of claim 1 appears novel over the cited prior art as held in the decision under appeal."

4.5.1 As the appellant did not provide any further arguments on these particular lines of attack, the Board does not see any reason to depart from its provisional assessment.

4.6 The Board thus confirms the Opposition Division's positive assessment of novelty.

5. Main request - inventive step

5.1 Inventive step is challenged starting from D12/D12a.

In addition to the differences identified above in relation to novelty, D12/D12a does not provide a clear teaching as to the location of the air inlet. Even if the duct 6 extends from an upward location from the portion of the tower depicted in Figure 2, the exact location of the air inlet is not directly and unambiguously derivable from D12/D12a. Thus the subject-matter of claim 1 differs also from the disclosure of D12/D12a by its characterising feature that the or each cooling device inlet is located in the upper part of the tower.

5.2 As explained in paragraph 008 of the patent such an upper location for an air inlet is in particular beneficial for marine environments in that it allows to draw in air with low water and salt content, with associated advantages, namely that the air does not need to be treated before it can be used for cooling (see paragraph 008 and 010).

5.2.1 Contrary to the appellant's opinion, the fact that claim 1 does not specify the wind turbine being offshore does not render the low water and salt content irrelevant for assessing the technical advantages associated with an upper location of the air inlet. The Board rather concurs with the respondent that an onshore wind turbine might also be exposed to waves, if located on the coastline, for example on an island or when arranged on land close to the sea. It is also envisageable that even in more inland locations due to poor or damp air quality close to ground level a

location higher up on the tower would have a similar beneficial effect. Thus, the technical advantage of a location higher up on the tower is not limited to offshore towers.

5.2.2 Therefore the Board cannot follow the formulation of technical problem suggested by the appellant to merely find a suitable or alternative location for the inlet undisclosed in D12/D12a. Instead it regards the objective problem based on the above effect as improving quality of the cooling air used in the cooling device of a wind turbine.

5.3 The skilled person seeking improvement for the cooling device of a wind turbine is a practitioner qualified in the field of wind turbines such as an engineer specializing in wind turbine construction and operation. Though it is true that the manufacture of wind turbines may bring together different fields of expertise such as civil engineering for the structure, electric systems for the transformer and air conditioning for the cooling circuit, the Board is not convinced that in designing a cooling device in that field the skilled person or team would necessarily seek advice from a meteorological scientist. The problem-solution approach is rather meant to emulate the real-world process of technological development. Therefore the skilled person should have a solid basis in the real world. Rather than constituting a highly qualified team including specialised scientists, this team is expected to possess basic knowledge in the relevant fields of wind turbines, but not more than that.

5.4 The Board cannot follow the appellant in its assumption, in a first line of argument, that the skilled person even as a team would inevitably propose

to locate the inlet of the second air duct 6 of D12 in an upper location, because they would know from their common general knowledge that sea salt concentration decreases with height. D13 and D14 are provided as evidence. However, D13, which concerns the vertical distribution of the concentration of sea salt in the marine atmosphere near Hawaii, published by the Atmospheric Sciences Research Center is a scientific paper. Such a document is not normally considered evidence of common general knowledge, which is usually found in basic handbooks, monographs, encyclopedia, textbooks and reference books in the relevant fields (cf. CLBA, 9th edition 2019, I.C.2.8.1, 2.8.3). D13, which reports a single study, is rather directed at a select, specialist readership, which decidedly does not include the average wind turbine builder or designer or air conditioning engineer.

Irrespective of the question of its admission into the proceedings D14 is also not suitable to prove common general knowledge.

As with D13, D14 is not a handbook or textbook or other publication documenting long and well established, prevailing knowledge in the field. It rather concerns research at a particular wind farm (Alpha Ventus) covering a variety of aspects of wind turbine technology. It thus presents the results of typical research and development effort, which could be and possibly is the subject of one or more patents. However pertinent the relevant citation (chapter 11, page 96, right hand column first two sentences of the second paragraph) is thus specialist knowledge in the current field, unfortunately published *after* the filing date of the patent in suit as acknowledged by the appellant, and thus not prior art.

5.4.1 Therefore, contrary to the appellant's submission neither D13 nor D14 provide suitable evidence of the concentration of sea salt gradient as a function of altitude that a skilled technician in the field of wind turbine construction would be expected to know. Otherwise the Board has no reason to believe it would be common knowledge that the concentration of sea salt decreases to such an extent that the quality of intake air in an upper location of a wind turbine is sufficiently free of salt. Consequently, the skilled person would not have arrived at the claimed upper location of the inlet based on their own common general knowledge.

5.5 In a further line of argument D1, D2 or D10 have been submitted as teaching the claimed solution.

5.5.1 D10 has been particularly referred to as it discloses an offshore type wind turbine with a tower in which a device for preventing the penetration of salt particles into the generator and gear area is provided. In the vicinity of the generator and gear, an air inlet 10 is foreseen, to which depositing or settling hoses 12 are connected, that are located in the tower interior. A first hose connects the intake to depositing tank 14 close to the base, at the bottom of the tower. Lines 50 to 52 of column 2 explain that due to the long vertical path particles are collected into that lowermost tank so that air ascending in the second hose to the filter 16 close to the nacelle only contains light particles. This system of hoses and settling tank upstream of the filter thus effects a certain degree of separation of heavy particles of salt water.
In the nacelle the penetration of salt particles is avoided by maintaining a degree of overpressure in the

generator and gear area using the further filter device 16 and compressor 18 located upwards from the depositing tank (column 2, lines 45-49).
The recognition in column 1, lines 23-27 relied upon by the appellant that salt containing air may be detrimental is not related to the specific location of the air inlet 10 in a higher part of the tower on its downwind side (column 2, lines 35-37). Rather, the whole device including inlet, hoses settling tank, filter and compressor form a complete concept to trap saline water in the lower part of this closed circuit. The dehumidified and salt free air then serves to maintain a slight overpressure in the nacelle thereby preventing outside corrosive humid air from directly entering the nacelle where corrosion sensitive components are accommodated. Furthermore, to prevent outside air entering the nacelle at such a height also implies that the teaching of D10 considers outside air at the height of the nacelle as detrimental because of its salt content, against the teaching required to arrive at the solution of claim 1 that at higher position the air is sufficiently free of saline droplets. Hence the skilled person would not immediately recognise from D10 any benefit in locating an inlet at any height just below the nacelle.

5.5.2 D1 discloses a dehumidifying device for a wind turbine power plant placed a few meters above ground level, higher up in the tower or in the nacelle (page 9, lines 25-30). The air supply conduit 10 feeds the dehumidifying device with ambient air (page 10, lines 27-29). The dehumidifying device 4 comprises dehumidifying means 5 removing moisture from a mixture of ambient air from the intake conduit 10 and air 6 from inside the tower. A portion A of this mixture is exhausted as dehumidified air to the tower (page 11,

lines 16-22), and moisture transferred to a portion B that is then exhausted from the tower. Thus this teaching is directed at a specific dehumidifying arrangement that is separate from any tower cooling equipment. D1 also fails to explain any particular advantage for selecting the location of the intake to that dehumidifying pack higher up in the tower, let alone that this is connected to better air quality.

5.5.3 D2 contains a similar teaching for an air inlet to a an adsorption dehumidifier ("Adsorptionsentfeuchter" 50) located within the tower of an offshore wind turbine (paragraph 048). The inlet ("Eingang" 51) is located as shown in figure 4 close to the nacelle and serves to guide fresh air to the dehumidifier that is then exhausted through an outlet 52. According to paragraph 048, lines 48-51, this airflow forms a regeneration airflow ("Regenerationsluftstrom") that is substantially separate from the process airflow ("Prozessluftstrom") within the tower (humid air from the tower entering via internal inlet 53 ("Feuchtlufteingang") and exiting via dry air outlet 54 ("Trockenluftausgang"). Thus similar to D1, the outside air inlet 51 forms part of a dehumidifying arrangement, that is separate from the inner cooling circuit (paragraph 048, lines 48-51). As in D1 no advantage in relation to the raised location of the air inlet is identified, let alone that this would be related to better air quality.

5.5.4 It follows that none of the above documents provides any teaching that might motivate the skilled person to consider an upper location for the air intake of a cooling circuit or that an upper air intake is generally associated with better air quality. Thus, even if these documents could have been cited as

indicative of common general knowledge - as patent publications they cannot - they fail to provide a teaching that might have led the skilled person to the claimed invention.

5.6 Inventive step is also challenged starting from D8 considered again in combination with D1, D2 or D10. D8 discloses a system for cooling a wind turbine tower 12 that is divided into separate stacked segments divided by platforms 32, each including an airflow passage so that internal air 20 may move through the platforms 32. An air handling component 24 (e.g. fan 26) establishes a recirculating airstream of internal air 20 (paragraphs 021, 022). Heat generating control and power electronics 16 are located at the base of the tower (paragraph 0019), though a location in the nacelle is also considered (paragraph 0020). An external air flow regulator 36 is provided to control access of external air 22 (paragraph 36), which enters at the level of the control and power electronics 16 at the bottom of the tower, as shown in figure 2.

The subject-matter of claim 1 thus differs from the disclosure of D8 by the location of the air inlet in an upper part of the tower above the heat generating equipment in the middle part (and thus significantly raised within the tower). In the Board's view D8 offers an even less promising starting point as D12/D12a because the external air is drawn from the base of the wind turbine tower at bottom of the tower. Otherwise the same conclusions reached above for the combination of D12/D12a with D1,D2 and D10 or common general knowledge apply to D8 *mutatis mutandis*.

5.7 None of the challenges against inventive step succeeds. The Board concludes, therefore, that, in the light of the prior art cited, the subject-matter of claim 1 as upheld corresponding to claim 1 as granted involves an inventive step within the meaning of Article 56 EPC.

6. The Board thus confirms the Opposition Division's decision that, considering the amendments made to the patent according to the main request, the patent and the invention to which it relates meet the requirements of the EPC, and that therefore the patent can be maintained as amended, Art 101 (3)(a) EPC.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

G. Magouliotis A. de Vries

Decision electronically authenticated