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**Datasheet for the decision
of 25 October 2023**

Case Number: T 2235/21 - 3.2.04

Application Number: 15824635.5

Publication Number: 3172431

IPC: F03B3/12, F03B3/02, F03B3/18

Language of the proceedings: EN

Title of invention:
FRANCIS TURBINE WITH SHORT BLADE AND SHORT BAND

Patent Proprietor:
Andritz Hydro Canada Inc.

Opponent:
Voith Patent GmbH

Headword:

Relevant legal provisions:
EPC Art. 54, 56

Keyword:
Novelty - (yes)
Inventive step - (yes)

Decisions cited:

Catchword:



Beschwerdekammern
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Chambres de recours

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Case Number: T 2235/21 - 3.2.04

D E C I S I O N
of Technical Board of Appeal 3.2.04
of 25 October 2023

Appellant: Voith Patent GmbH
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Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted on 13 October 2021
rejecting the opposition filed against European
patent No. 3172431 pursuant to Article 101(2)
EPC.**

Composition of the Board:

Chairman C. Heath
Members: S. Oechsner de Coninck
G. Martin Gonzalez

Summary of Facts and Submissions

- I. The appellant (opponent) lodged an appeal against the decision of the Opposition Division of the European Patent Office posted on 13 October 2021 rejecting the opposition filed against European patent No. 3172431 pursuant to Article 101(2) EPC.
- II. The Opposition Division held that the grounds for opposition mentioned in Article 100 (a) EPC did not prejudice the maintenance of the patent as granted having regard inter alia to the following documents:
- D1: US 6,135,716
D5: US 560.301
F10: Turbine Water-Wheel Tests and Power tables by Robert E. Horton", Washington government printing office, 1906
F32: Effective Utilization of Hydraulic Energy through Improved Turbine Runner Characteristics. Hitachi Review Vol. 60 (2011), No. 7
F35: Camerer, R.: Vorlesungen über Wasserkraftmaschinen, Verlag von Wilhelm Engelmann in Leipzig 1924.
F35a: Gemeinde Mühleberg, "Bauinventar", 2001; U. Schaad, "Seit 100 Jahren die gleichen Turbinen", BZ Local, 26 August 2020.
F36: Quantz L.: Wasserkraftmaschinen. Verlag von Julius Springer 1920, Berlin.
- III. In a communication in preparation for oral proceedings the Board gave its preliminary opinion on the relevant issues.

- IV. Oral proceedings were held on 25 October 2023 in presence of all the parties.
- V. The appellant-opponent requests that the decision under appeal be set aside and the patent be revoked.
- VI. The proprietor-respondent requests that the appeal be dismissed, in the auxiliary that the patent be maintained on the basis of one of auxiliary requests 1 - 8 filed on 22 July 2021 and re-filed with the reply to the grounds of appeal dated 27 June 2022.
- VII. The independent claims 1 and 4 of the main request read as follows:

Claim 1:

"A Francis hydraulic turbine runner (26, 48, 64) comprising: a band (32, 62); a crown (34, 56); and runner blades (30, 50) extending from the crown (34,56) to the band (32, 62); characterized in that for each of the runner blades (30, 50), a junction (Q) between a leading edge (36, 52) of the runner blade (30, 50) and the band (32, 62) foreruns a junction (P) between the leading edge (36, 52) with the crown (34, 56) in a rotational direction (R), and the runner (26, 48, 64) has a band length ratio (L/D) of no greater than 17% (0.17), wherein the band length ratio (L/D) is a length (L) to diameter (D) ratio wherein the length (L) is a distance measured between a bottom (15) of a distributor (13) of the runner (26, 48, 64) to a trailing edge (T) of the runner blade (30, 50) at the band (32, 62), and wherein the diameter (D) is the diameter (D) of the band (32, 62) at a junction (T) with a trailing edge (40, 54, 66) of the runner blade (30, 50)."

Claim 4:

"A Francis hydraulic turbine runner (26, 48, 64) comprising: an outer periphery of the runner (26, 48, 64); a crown (34, 56); and runner blades (30, 50) extending from the crown (34, 56) to the outer periphery of the runner (26, 48, 64); characterized in that a corner (Q) of a leading edge (36, 52) of each of the runner blades (30, 50) at the outer periphery of the runner (26, 48, 64) is in advance in a rotational direction (R) of a corner (P) where the leading edge (36, 52) joins the crown (34, 56), and the runner (26, 48, 64) has a periphery length ratio of no greater than 17% (0.17), wherein the periphery length ratio (L/D) is a ratio between a length (L) that is a distance measured between a bottom (15) of a distributor (13) of the runner (26, 48, 64) to a point of a trailing edge (40, 54, 66) at the outer periphery of the runner (26, 48, 64), and diameter (D) of the runner (26, 48, 64) at an outer periphery of the runner (26, 48, 64)."

VIII. The appellant argues as follows:

- The subject-matter of claims 1 and 4 lacks novelty with respect to either D5 or F10,
- The subject-matter of claims 1 and 4 lacks an inventive step starting from D1 and considering common general knowledge, or starting from F35 and modernising the turbine as taught in F32.

IX. The respondent argues as follows:

- The appellant's new argument of lack of novelty over F10 should not be admitted,
- The subject-matter of claims 1 and 4 is novel with respect to D5 or F10,

- The appellant's argumentation on lack of inventive step starting from F35 is new and should not be admitted,
- The subject-matter of claims 1 and 4 involves an inventive step in view of the cited prior art.

Reasons for the Decision

1. The appeal is admissible.
2. Background
The patent concerns an improved Francis type water turbine, and seeks to further improve efficiency of the newer design with front runner also called Forward Lean Blade (FLB), paragraphs 024 and 025. According to claim 1, the solution involves reducing the bucket chord at its junction with the outer band in order to reduce cavitation and provide a lighter design. Claim 4 defines the same limitations for a bandless turbine wheel. The improved hydraulic efficiency of the water turbine defined in claims 1 and 4 against previous traditional designs is plotted in figure 15.
3. Main request - Novelty
 - 3.1 In its communication in preparation to the oral proceedings, see section 3, the Board gave the following provisional opinion on novelty with respect to D5:

"D5 discloses a water turbine runner comprising a band d; a crown; and runner blades. It appears undisputed that a junction between the leading edge of the runner blade and the band foreruns a junction between the leading edge with the crown in a rotational direction, page 2, lines 3-16; figure 1.

The appellant however contests the decision's finding that D5 does not disclose a technical teaching with respect to the band length ratio L/D derivable from figure 1 which however appears not greater than 17% as defined in the characterising portion of claims 1 and 4.

*D5 is a patent document and the representation of the turbine wheel in figure 1 is indeed of a schematic nature with the purpose to illustrate the general construction of the water turbine and the general spatial and functional relationships of its component parts. In the present case, the opposition division has assessed that the ratio of length may be below 17%, but has not associated these relative dimensions with a technical effect so that no technical teaching could be derived therefrom. Established case law relied upon in the decision and also quoted by the respondent indeed requires that for features shown solely in the drawings, in the absence of any other description the skilled person should be able to derive a technical teaching from them (see CLBA, I.C.4.6, 10th edition, 2022, see also decision **T 1200/05** where the presence of a technical feature was derived solely from the drawings).*

The appellant relies on the fact that the skilled person would have been able to reproduce the turbine wheel depicted in figure 1 of D5. However lacking any indication why the band has certain height, and one of the varying diameters of the band has a certain length, the appellant has not submitted reasons why the skilled person would have recognised any significance in providing the relationship between these dimensions being below 17% rather than above. Without any indication, the skilled person reproducing the turbine shown would have reproduced the essential feature explained in lines 3 to 8 of page 2 to set the

discharging portion in front of a vertical plane. Whether the skilled person would in addition have attempted and managed to reproduce the complex shape of the bucket at its interface within the band does not appear to meet the strict requirement of direct and unambiguous recognition of a technical teaching in relation to the length of the band to the diameter. Thus, the Board tends to agree with the decision's findings that D5 on the sole basis of figure 1 does not show a direct and unambiguous disclosure."

- 3.1.1 At the oral proceedings, the appellant apart from relying on their written submissions merely clarified that D5 is a US patent, thus meeting the US patent law best mode requirement. The disclosed embodiment is explained to be as the best mode and thus implies a carefully drafted scaled drawing. This observation not supported by further evidence cannot alter the above observation by the Board that the drawing in D5 is a patent drawing, therefore of a schematic nature. Thus, the Board sees no reason to change its provisional view regarding novelty of granted claims 1 and 4 over D5.

- 3.2 Irrespective of the question of the admission into the proceedings of the objection of lack of novelty with respect to F10 alone for the first time in appeal, the Board remains unconvinced that the arguments put forward meet the strict requirements of direct and unambiguous disclosure for novelty. In particular, the Board has doubts as regards the type of turbine disclosed in F10 and is unable to clearly and unmistakably identify a band length ratio as defined in claim 1, which is defined as a distance between a bottom of a distributor to a trailing edge of the runner blade at the band on the sole basis of a picture on page 14.

3.2.1 The Appellant recognises all the features of claims 1 and 4 in the upper picture on page 14 alone. This picture bears the title "recent American type of Water-Wheel Runner". The skilled person reading the whole context of F10 cannot unmistakably identify an American type turbine to belong to the Francis type turbine. Contrary to the appellant's view, the Board holds that the skilled reader would not identify any centripetal turbine with axial outlet to be a Francis turbine. It rather shares the respondent's view that the Francis turbine in F10 is solely explained in the section "RADIAL INWARD-FLOW TURBINES THE FRANCIS TURBINE" on the previous page 13 in relation to figure 5 on the same page. The American types turbines are explained in the following section relating to "MIXED FLOW TURBINE", and are explained to be without guide, that is without stator vanes in the distributor as depicted in figure 1, page 12. On page 14, the sub-section "AMERICAN TYPE OF TURBINES" explains further details of this distinct type. It is not enough for the Board that the skilled person recognises an inward radial inlet and central axial outlet to qualify the turbine wheel as belonging to a "Francis" family to meet the required level of certainty for finding lack of novelty. For example, paragraph 002 of the patent explicitly discloses conventional Francis hydraulic turbines to have a distributor with guide vanes. No such distributor is visible in the picture, nor is it explained in the corresponding section.

3.2.2 Furthermore, contrary to the appellant's view, such a ratio of band length to diameter cannot be identified with the required level of accuracy from measurements on the upper picture of page 14. Indeed, the picture only depicts the runner alone and thus does not show

the distributor which is an external device. Hence, the first point for measuring the distance is not identifiable. This also applies to the second point which requires to spot a trailing edge of the blades at its junction with the band. However, the trailing edge of the blades are hidden behind the band.

3.2.3 The Board adds that it shares the same concern as the respondent in respect of the quality of the picture, and whether an accurate measurement between two clearly identifiable limits is at all possible. Furthermore, however small, the perspective view of a picture with twofold inclinations both towards the viewer and with respect to the both horizontal and vertical planes does not allow a precise calculation of the band width and diameter of the wheel.

3.3 The above conclusions for claim 1 also apply to granted claim 4. The Board concludes that the subject-matter of claims 1 and 4 of the granted patent is novel over the cited disclosures of D5 and F10. Thus, the decision's positive finding on novelty has to be confirmed.

4. Granted claims 1 and 4 - Inventive step

4.1 In its communication in preparation to the oral proceedings, see section 4, the Board gave the following provisional opinion on inventive step starting from D1:

"D1 discloses a Francis hydraulic turbine runner with a band -ring- 1; a crown 2; and runner blades 3 extending from the crown to the band, and a junction A between a leading edge 3x of the runner blade and the band 2 foreruns a junction C between the leading edge with the crown in a rotational direction.

Both the appellant and the respondent base their reasoning on the subject-matter of claim 1 as distinguished from D1 by a band length ratio (L/D) of no greater than 17% (0.17).

Relatively shorter band length allows to connect blades of a shorter outer chord length that together with fore runner leading edge have a positive effect on cavitation, paragraphs 024 and 025 of the patent. D1 already discloses fore runner blades, an objective technical problem of further improving hydraulic efficiency may thus be formulated.

The prior art documents relied upon by the appellant as evidence of common general knowledge of the person skilled in water turbines F35 and F36 do not contain a specific teaching as regards the band width, indeed the appellant does not appear to rely on any teaching in relation to the significance or advantage to provide a reduced relative band width.

The appellant relies on a whole new set of documents summarised in document F31 representing figures derived from F8,D11,D13,D14,D18,F23 to F28 as evidence of a shorter band width. All these new documents cited as further evidence of band width represent an amendment to the appellant's case the admission of which is at the Board's discretion pursuant to Article 12(4) RPBA. Apart from quoting and generally referring to all these documents in an unspecific manner, no justification is presented in relation to these new objections, nor is such justification apparent to the Board. Thus, the Board does not intend to admit any new inventive step attack that is not supported by appropriate substantiation as required by Art 12(3) RPBA."

- 4.1.1 The appellant at the oral proceedings expressly referred to their written submissions. Absent any further comment, the Board sees no reason to change its provisional view that the cited prior art lacks any useful teaching as regards the band width and its significance or technical effects. Thus, the skilled person would not have derived any incentive to modify the size of the band width of D1, and the lack of inventive step brought forward starting from D1 fails to convince.
- 4.2 Irrespective of the question of the contested admission into the proceedings of the objection of lack of inventive step starting from F35 using the teaching of F32 brought forward for the first time in appeal, the Board is unconvinced that the skilled person would obviously have replaced the wheel to be modernised by a runner having all the features of claim 1.
- 4.2.1 The appellant's reasoning is submitted on the basis of the following considerations. F35 is an extract of a conference about water turbines held in 1924. According to the appellant, a runner reproduced on page 15 of their letter of 29 January 2021, as on page 9 of their letter of 19 August 2021 was mounted in the hydraulic power plant of Mühlenberg as further supported in F35a. The old runner from 1920 will be modernised until 2027 as stated in the last paragraph on page 6 of F35a. However, the building architecture needs to be protected because of its classification as a heritage site ("Denkmalschutz"), which in particular applies to the spiral distributor inlet which cannot be modified because of its concrete structure. Thus, the small band length of the old runner shown in F35 needs to be retained with the same L/D ratio. In considering

modernisation of an old turbine, the skilled person would apply the teaching of F32 that explains how to replace an existing turbine by a modern one with forward lean blade.

4.2.2 The Board does not agree with this line of reasoning because it is based on the theoretical assumption that all design parameters of the old turbine wheel would be retained, the blade of the wheel just inclined at another inlet stacking angle. This reasoning is rather based on a technically unrealistic approach. Intent on replacing a turbine wheel designed more than a century ago, the skilled person would rather consider a full redesign taking into account technological developments over the past decades. The Board thus rather concurs with the respondent that in a real modernising approach, a completely new wheel configuration would be redesigned using finite element calculations and simulations.

In this process, it is unlikely that all design parameters of the previous turbine wheel would be kept unchanged, which is especially so for the blade profiles and dimensions that will lead to other external chord length and angle, and associated band length.

Likewise, the Board also does not consider that the interface region between the band and the concrete borders cannot be modified, neither by locally removing or adding concrete or by changing the shape and dimensions of the metallic insert building the static interface between the turbine assembly and the building structure, as depicted with thick black lines in the figures of F35. Again absent any teaching on the significance or advantage of providing band lengths against the diameter, the skilled person would not have

any reason to redesign the turbine dimensions keeping the same ratio of lengths as in 1920.

- 4.2.3 It would furthermore be artificial and thus not make technical sense for the skilled person to isolate the aspect of forward leaning the blade taught by F32 and merely consider adjusting the angle of the leading of an old designed turbine wheel without any consideration of other modifications required to modernise and adapt the design of the old runner to modern requirements. As convincingly argued by the respondent, if at all the skilled person would integrally replace the old runner by a modernised one as shown in figure 2 of F32. As visible in this figure as compared to the old runner depicted on the left, the FLB runner exhibits a larger band length. No reason is apparent to the Board why this larger length should be changed when modernising the runner in the Mühleberg power plant of F35, F35a.
- 4.3 The above conclusions for claim 1 also apply to claim 4 of the patent as granted. The Board confirms the opposition division's assessment that the subject-matter of claim 1 and 4 as granted involves an inventive step within the meaning of Article 56 EPC.
5. It follows from the above that the objections brought forward by the appellant against the decisions findings for claims 1 and 4 of the granted patent fail to convince the Board.

Order

For these reasons it is decided that:

The appeal is dismissed

The Registrar:

The Chairman:



G. Magouliotis

C. Heath

Decision electronically authenticated