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**Datasheet for the decision
of 18 March 2024**

Case Number: T 2211/22 - 3.2.04

Application Number: 18163865.1

Publication Number: 3546760

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F04D13/08, F04D29/66

Language of the proceedings: EN

Title of invention:
SUBMERSIBLE ELECTRIC MACHINE

Patent Proprietor:
Xylem Europe GmbH

Opponent:
WILO SE

Headword:

Relevant legal provisions:
EPC 1973 Art. 100(a), 56

Keyword:

Decisions cited:

Catchword:



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Case Number: T 2211/22 - 3.2.04

D E C I S I O N
of Technical Board of Appeal 3.2.04
of 18 March 2024

Appellant: WILO SE
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Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted on 28 July 2022
rejecting the opposition filed against European
patent No. 3546760 pursuant to Article 101(2)
EPC.**

Composition of the Board:

Chairman G. Martin Gonzalez
Members: J. Wright
M. Millet

Summary of Facts and Submissions

- I. The appeal was filed by the appellant (opponent) against the decision of the opposition division to reject the opposition filed against the patent in suit.
- II. The division held inter alia that claim 1 involved an inventive step over different prior art combinations starting from D9, D10, D11 or D13.
- III. In preparation for oral proceedings the board issued a communication setting out its provisional opinion on the relevant issues.

Oral proceedings by videoconference were held before the Board on 18 March 2024.

- IV. The appellant opponent requests cancellation of the impugned decision and revocation of the opposed patent.

The respondent proprietor requests dismissal of the appeal.

- V. Granted claim 1 (main and only request) reads as follows:

"A submersible electric machine (2) for transporting a liquid, the submersible electric machine (2) comprising:

- a hydraulic unit (9) that comprises an impeller (12) configured for propelling the liquid,
- a drive unit (10) that comprises a drive unit housing (17) defining a motor compartment (18), an electric motor (19) arranged in the motor compartment (18) and drive shaft (20) connected to

the electric motor (19), the drive shaft (20) extending from the electric motor (19) to the hydraulic unit (9) and being connected to the impeller (12),

- a top unit (11) that comprises a top unit housing (23) defining an electronics chamber (24), the electronics chamber (24) being separated from the motor compartment (18) by a dividing structural wall (25), and

- a vibration sensor (29)

characterized in that the vibration sensor (29) is directly or indirectly connected to a partition (30) arranged in the electronics chamber (24), is configured to monitor vibrations in at least two dimensions [2D] and is configured to monitor vibrations at frequencies ranging up to 500 Hz, and in that the partition (30) is made of metal, is connected to the top unit housing (23) and has a natural frequency equal to or more than 500 Hz."

VI. In the present decision, reference is made to the following documents:

(D9) KR 10-1007565

(D9a) Translation of KR 10-1007565 (D9)

(D10) EP 2 426 360 A2

(D13) KR 10-1578478

(D13a) Translation of KR 10-1578478 (D13)

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

Granted claim 1 lacks an inventive step starting from D9, D10 or D13. They also file verbatim repetitions of their submissions and arguments before the opposition division, see sections E-G of the grounds of appeal.

VIII. The respondent's arguments can be summarised as follows:

Granted claim 1 involves an inventive step over the cited prior art. The objections and arguments in sections E-G of the opponent's grounds of appeal are not admissible.

Reasons for the Decision

1. The appeal is admissible.

2. Background

The opposed patent pertains to submersible electric machines, particularly pumps, as outlined in paragraph 0001 of the patent specification. It specifically addresses an internal vibration sensor within the machine designed for detecting abnormal conditions, as explained in paragraph 0004. The claimed invention seeks to offer a vibration sensor configured to accurately and reliably monitor the entire range of harmful frequencies. The sensor's attachment structure is designed not to interfere with vibration monitoring in the essential measuring range, as detailed in paragraph 0008.

To achieve the above goal, the sensor is connected to a partition positioned in the electronics chamber defined by a top unit housing. It is configured to monitor vibrations in at least two dimensions [2D] and to observe vibrations at frequencies up to 500 Hz. The partition is composed of metal and connected to the top unit housing. It has a natural frequency equal to or greater than 500 Hz, as outlined in paragraphs 0010 and 0011.

3. Admission of submissions and arguments

3.1 As noted by the Board in section 5.4 of its written communication:

"Sections E-G of the appellant's grounds of appeal (pages 20-71) contain verbatim repetitions of their submissions and arguments before the opposition division, which they wish to maintain in the appeal proceedings. The Board does not take into account such mere repetitions of previous arguments made at first instance, as outlined in the Case Law of the Boards of Appeal, 10th edition 2022 (CLBA), V.A.2.6.5."

3.2 In its written reply of 16 February 2024 to the Board's preliminary opinion, the appellant only asks for clarification with regard to the admissibility of an appeal. The appellant submits that it would be desirable to clarify, with regard to the RPBA 2020, whether a lack of submissions at first instance precludes the admissibility of an appeal. However, the admissibility of the appeal is not at issue in the present case. That question is therefore irrelevant to the present appeal and does not need to be answered. The appellant did not submit any further written argument. During oral proceedings, the appellant refrained from further comment. They merely referred to their written submissions.

3.3 In the absence of further relevant submissions, the Board sees no reason to change its preliminary view. The Board therefore decided to disregard Sections E-G of the Appellant's Grounds of Appeal.

4. Inventive step

4.1 The opposition division, in section 10 of the contested decision, concluded that granted claim 1 involved an inventive step when starting from D9, D10, or D13 in combination with common general knowledge, Art 100(a) EPC in combination with Art 56 EPC. The appellant opponent challenges these conclusions.

4.2 Granted claim 1 is directed to a submersible electric machine comprising a drive unit housing and a top unit housing separated by a dividing structural wall. The top unit housing defines an electronics chamber, and the vibration sensor is directly or indirectly connected to a partition in the electronics chamber. This partition, which is made of metal, is connected to the top unit housing. Such structure is not disclosed by any of the documents cited as starting points D9, D10 or D13.

Additionally, claim 1 specifies that the sensor monitors vibrations in at least two dimensions [2D] at frequencies ranging up to 500 Hz, with the partition having a natural frequency equal or above 500 Hz. These features are also absent from the closest prior art documents.

4.3 These differentiating features result in a vibration sensor configured to monitor the entire range of harmful frequencies, with an attachment structure that does not interfere with vibration monitoring in the essential measuring range, as explained in paragraph 0008 of the patent specification. Therefore, they effectively address the technical problem of providing

a vibration sensor configured to reliably monitor the entire range of harmful frequencies.

In the Board's view, the claimed modifications to the structures of D9, D10 or D13 are not obvious per-se, nor are they suggested by the submitted prior art as explained below. Consequently, in the Board's opinion the claimed subject-matter involves an inventive step in the sense of Article 56 EPC.

4.4 In a first set of arguments presented by the appellant opponent, they interpret the opposed independent claim so that the main features of the claimed structure can be read in the closest prior art documents D9, D10 or D13. Additionally, they assert that the distinguishing features identified by the Board would, in any event, constitute modifications that are obvious to a person skilled in the art. However, the Board finds the appellant's arguments unpersuasive.

4.5 In relation to the interpretation of the features outlined in opposed claim 1, adhering to the general principles of claim interpretation, claims should be construed with a mind willing to understand, building up rather than tearing down, to arrive at an interpretation of the claim which is technically sensible, see Case Law of the Boards of Appeal, 10th Edition 2022 (CLBA), II.A.6.1.

The appellant references Board's case law (CLBA II.A. 6.1) in this context, asserting that the skilled reader should normally give the claims their broadest technically reasonable meaning. For a reader who is willing to understand, a broad expression does not have to be interpreted more narrowly. This principle fully aligns with the Board's approach and, contrary to what

the appellant may intend to convey, it is not contradictory to the aforementioned principle. While claims should be given their broadest interpretations, it is essential that these interpretations remain technically sensible.

Starting from D9

- 4.6 Turning to D9 as starting point for the assessment of inventive step, D9 discloses a drive unit housing 10 and a top unit housing 11 defining an electronics chamber similar to the claimed device, as depicted in figure 2. Figure 4 illustrates a vibration sensor unit 27 with a vibration sensor 27b, connected to a bracket 27a.

According to paragraph 0054 (see D9a), the vibration sensor unit 27 is arranged in an upper junction box of the motor. A junction box typically houses electrical connections, such as wires or cables. It does not house electronic components and is thus not an electronics chamber as required by the contested claim.

The appellant submits that the junction box is located inside the top unit housing 11 (electronics chamber). This is however not unambiguously disclosed in D9. D9a recites in para 0052 that a leak detection sensor may be located into the motor or the junction box (head cover), this meaning in the appellant's opinion that junction box and head cover are the same technical feature, head cover in turn being the top unit housing 11 of D9. This is not convincing. "Head cover" and "top unit housing" are clearly different terms, the terms head cover not being used elsewhere in D9a. On the other hand head cover in its context of para 0052 may well mean a cover of the motor itself within the motor

housing. At most, favoring the appellant's stance, there is no clear disclosure regarding the junction box's precise location – whether in the motor housing or the the top unit housing 11 (electronics chamber).

Additionally, contrary to the appellant's submissions, bracket 27b cannot be considered a partition in the normal sense of the term. It is not evident to the Board, nor is it disclosed in D9, how or what chamber or space such a bracket could physically separate or divide.

- 4.7 Therefore, D9 fails to disclose the connection of the vibration sensor to a partition within the electronics chamber, wherein the partition is made of metal and linked to the top unit housing.
- 4.8 The appellant argues that a skilled person, aiming for reliable vibration detection or a moisture-proof design, or seeking cost-effective realization, would position the vibration sensor within the electronics chamber 11 of D9. This solution would be suggested either by common general knowledge or D10. D10 suggests in paragraph 0013 the use of a waterproof and/or pressure-encapsulated chamber for the placement of an acceleration sensor.
- 4.9 However, the combination of D9 with either common general knowledge or D10, regardless of its obviousness, does not lead to the claimed subject matter. Such a modification would not result in an arrangement where the accelerometer was connected to a partition within the electronics chamber, as required by the claim. Mere placement of the accelerometer 27b with bracket 27a, as suggested by the appellant, within the electronics chamber 11 would still leave the

accelerometer connected to a bracket. Bracket 27a, as explained earlier, does not qualify as a partition.

Regarding D10, this document teaches to situate the accelerometer close to motor bearings 28 in a bore drilled into wall 8, as depicted in Figure 2. However, wall 8 is not a partition within the electronics chamber; it serves as a separation wall between the motor and the electronics chamber.

4.10 Therefore, the appellant's inventive step arguments starting from D9 fail.

Starting from D10

4.11 Document D10 shows a submersible electric machine with a drive unit housing 9, a top unit housing 7,8 defining electronics chamber 15,54 with partition wall 50, as illustrated in figure 2. The machine has a 2D vibration sensor 36 positioned in a bore within the structural wall 8 that separates the drive unit housing 9 and the top unit housing 7,8, as detailed in figure 2 and para 0035.

The appellant contends that sensor 36 of D10, located in bore of wall 8, is indirectly connected to partition 50 through wall 8 and thus meets the claim requirement that the acceleration is directly or indirectly connected to the partition wall. However, the Board maintains that in the claim's context and reading the claim with synthetical propensity and a mind willing to understand, this feature means that the sensor must be affixed to the partition to receive vibrations, making the partition the sensor's support. This is supported by the claim requirements for sensor frequency band monitoring and partition natural frequency, ensuring

compatibility with reliable vibration transmission for accurate readings in the frequency range of interest. Thus, "directly or indirectly connected to" implies a sensor attachment to the partition, which is at most facilitated by intermediary elements such as a printed circuit board, a bracket, washer, etc. Sensor 36's connection to wall 8 does not meet claim requirements, as it does not physically attach it to partition 50 in the sense of the claim. Wall 8 and partition 50 are themselves only connected at a point remote from sensor 36.

- 4.12 Therefore D10 also fails to disclose the connection of the vibration sensor to a partition within the electronics chamber, wherein the partition is made of metal and linked to the top unit housing.

The appellant submits that the skilled person would search an alternative connection for the sensor of D10, out of the deep bore 38, in order facilitate its replacement in case of failure and thus maintenance, locating it on housing 42 as a matter of obviousness. Housing 42 can be considered a partition in the sense of the contested claim.

The board is not convinced by this argument. The teaching of D10 is predicated on placing the sensor 36 close to bearing 28, namely in the bore only drilled to that effect, for an accurate monitoring of the bearing's vibrations, see para 0035 of D10. In the board's view, given the centrality of the idea of placing the acceleration sensor as close as possible to the bearing 28, the skilled person would not, as a matter of obviousness, consider departing from this central teaching by relocating it, let alone to a

location as remote from the bearing as the housing 42 in compartment 54 above wall 8.

- 4.13 Thus, the appellant's inventive step arguments starting from D10 also fail.

Starting from D13

- 4.14 D13 is directed to a submersible pump featuring a vibration sensor 141, see Figure 2. The motor roller bearings 113 are supported by arc-shaped arms (with no reference numeral). In D13, a top electronics chamber 133 is separated from the motor or drive chamber 131 by terminal board 134. The vibration sensor 141 is connected to terminal board 134, see para 0031 of D13a. The appellant submits that the arc-shaped arms can be considered the dividing structural wall in the sense of the contested claim, that thus separates an electronics chamber (above the arcuate arms) from a motor compartment (below the supporting arms).

However, supporting arms cannot be considered a wall in its normal sense because they do not conform to the typical characteristics of a wall, which is commonly understood as a solid structure enclosing a space. These arcuate arms are designed to provide support for bearings or other mechanical components, rather than serving as a boundary or enclosure. Consequently they do not delimit a top unit housing and a drive unit housing in the sense of the opposed claim. Rather, the terminal board 134 is regarded as the separating wall, constituting the lower boundary wall of the top unit housing or of the electronics chamber in D13, so it is not a partition within the chamber.

4.15 Therefore D13 does not disclose a partition in the sense of the contested patent. It therefore fails to disclose the connection of the vibration sensor to a partition within the electronics chamber, wherein the partition is made of metal and linked to the top unit housing.

4.16 The appellant argues that, as a matter of obviousness, the skilled person would modify the radially extending support arms into a wall seeking to achieve a moisture seal between the motor compartment and the upper electronics chamber, thereby addressing the technical problem of improving moisture protection. According to this contention, the vibration sensor 141 would then be connected to a partition (board 134) of the upper electronics chamber delimited by the new wall. Furthermore, the appellant suggests that the skilled person would make board 134 metallic to achieve a better connection in terms of vibration.

However, this argument is not convincing. Regardless of whether the skilled person would, as a matter of obviousness, modify the supporting arms into a wall (a proposition that the Board finds unconvincing), they would still need to make the board 134 of metal. As described in D13, board 134 (see D13a, e.g., 0031, 0033, or 0040) serves as a terminal board. A terminal board is an insulating slab upon which electric terminals are mounted, providing support for electronic components and their electrical interconnections. The skilled person would not, as a matter of obviousness, make the terminal board of metal, as this would compromise its insulating capacity that is necessary for its intended function.

4.17 Thus the lack of inventive step objections starting from D13 are also unconvincing.

5. As all the objections raised by the appellant opponent fail, the Board confirms the findings of the Opposition Division.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



G. Magouliotis

G. Martin Gonzalez

Decision electronically authenticated