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**Datasheet for the decision  
of 22 October 2021**

**Case Number:** T 1813/17 - 3.2.04

**Application Number:** 11718129.7

**Publication Number:** 2558727

**IPC:** F04C7/00, F04C29/12, F04C19/00,  
F04C27/00

**Language of the proceedings:** EN

**Title of invention:**  
LIQUID RING PUMP AND METHOD FOR OPERATING A LIQUID RING PUMP

**Patent Proprietor:**  
Evac Oy

**Opponent:**  
Jets Oy

**Headword:**

**Relevant legal provisions:**  
EPC Art. 54, 56

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

**Decisions cited:**

**Catchword:**



**Beschwerdekammern**

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Case Number: T 1813/17 - 3.2.04

**D E C I S I O N**  
**of Technical Board of Appeal 3.2.04**  
**of 22 October 2021**

**Appellant:** Jets Oy  
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**Decision under appeal:** **Interlocutory decision of the Opposition  
Division of the European Patent Office posted on  
28 June 2017 concerning maintenance of the  
European Patent No. 2558727 in amended form.**

**Composition of the Board:**

**Chairman** A. de Vries  
**Members:** S. Oechsner de Coninck  
W. Van der Eijk

## **Summary of Facts and Submissions**

- I. The opponent appeals against the interlocutory decision of the Opposition Division of the European Patent Office concerning maintenance of the European Patent No. 2558727 in amended form.
  
- II. The opposition was based on the grounds of Articles 100(c) 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 met the requirements of the EPC, having regard in particular to the following documents:  
  
D1: EP 1 397 595 B1  
D2: WO 90/10123  
D3: EP 0 494 041 A1  
D4: DK 92 00177 U3
  
- III. In a communication of 31 January 2020 in preparation for oral proceedings the Board gave a provisional opinion on the relevant issues.
  
- IV. Oral proceedings were held on 22 October 2021 in the form of a videoconference, in the absence of the appellant, who had declared with letter of 5 October 2021 that they would not attend.
  
- V. The appellant (opponent) requested in writing that the decision under appeal be set aside and that the European patent No. 2558727 be revoked.
  
- VI. The respondent (patent proprietor) requested that the appeal be dismissed.

VII. Claim 1 as upheld reads as follows:

"Liquid ring pump for generating vacuum and for pumping a flow of sewage in a vacuum sewage system (6), which liquid ring pump (1) comprises in the direction of the flow of sewage a pump inlet (11), an inlet chamber (13), a pump housing (14) provided with a rotor (15) arranged on a drive shaft (16) provided with a mechanical seal (20), an outlet chamber (17), which mechanical seal (20) is arranged within the outlet chamber (17), and a pump outlet (19), which pump inlet (11) is arranged to be connected to a collector (73) for receiving the flow of sewage, and which pump outlet (19) is arranged to be connected to a discharge pipe (8) for discharging the flow of sewage, characterised in that the outlet chamber (17) is provided with an integrated extension (18), which extends over the outlet chamber (17) and at least over a part of the pump housing (14) in the direction of the drive shaft (16) and which provides a continuation and enlargement of the outlet chamber (17), that the pump outlet (19) is arranged at the downstream end of the integrated extension (18) in the direction of the flow of sewage, and in that the mechanical seal (20) is arranged to be lubricated by the flow of sewage as the flow of sewage flows into and through the outlet chamber (17) and the integrated extension (18) of the outlet chamber (17)."

VIII. The appellant argues as follows

- D1, D2, D3 and D4 disclose all the features of claim 1 as upheld.
- Starting from either D2 to D4, the skilled person would find the solution of avoiding overheating in D1, and apply it to arrive at the claimed subject-matter.

- IX. The respondent argues as follows
- None of the documents D1 to D4 discloses a mechanical seal and an integrated extension of the outlet chamber as defined in claim 1.
  - Starting from either D2, D3 or D4 the skilled person would not find any incentive in D1 to provide an integrated extension of the outlet chamber.

### **Reasons for the Decision**

1. The appeal is admissible.

2. Background

The patent concerns a liquid ring pump and a method for operating such a pump in a vacuum sewage system. Liquid ring pumps or also liquid seal pumps use a liquid seal formed by the liquid to be pumped between the rotor and the stator of the pump. In paragraph 002 of the patent it is explained that in fluid pumps mechanical seals are used to replace glands and lip seals to prevent liquid leaking out along the drive shaft. However, mechanical seals have long term reliability problems. According to paragraph 004, the patent generally seeks an extended life time of the pump. This is done by providing a buffer volume of sewage liquid comprised in an integrated extension as defined in the characterising portion of claims 1 and 8. This extension provides an extra volume of liquid that helps to reduce operation of the mechanical seal in dry conditions.

3. Novelty

3.1 The appellant contests the decision's finding on novelty of the subject-matter of claims 1 and 8 with

respect to D1, and either one of D3, D2 or D4. It is in particular argued that either of D1 to D4 discloses an integrated extension which as in the characterising portion of claim 1 extends over the outlet chamber and at least over a part of the pump housing in the direction of the drive shaft and which provides a continuation and enlargement of the outlet chamber.

3.2 D1 discloses a liquid seal pump depicted in figure 1 with a housing 3, an inlet 2, an outlet 6 and a helical screw 7. A sealing liquid tank 4 is shown in figure 1 to be located above the pump. In lines 5 to 10 of paragraph 007 valves 1 and 5 are explained to be provided at the inlet and outlet ends of the pump. On the basis of claim 1, see its preamble, the pump outlet is identified as that part of the pump *connected to the discharge pipe*, corresponding to what D1 in paragraph 007 identifies as outlet 6 with outlet valve 5. Thus, the tank 4, which according to the description, column 2, line 9 and 10, is located at the outlet and shown in the figure downstream of the outlet 6 and outlet valve 5 does not belong to the liquid ring pump but is separate therefrom, hence not an integrated extension thereof as required by the claim or even a part thereof as interpreted by the appellant in their grounds (page 8, paragraph 1 of the grounds).

3.2.1 In addition the Board concurs with the respondent, that the provision and position of a mechanical seal is not clearly derivable from D1. On page 4, last paragraph of their grounds, the appellant correctly states that a seal must be present to prevent flow of sewage along the drive shaft to the motor. However neither its type nor its position within an outlet chamber is directly and unambiguously derivable from D1. In figure 1 the shaft that connects the motor to the helical screw 7

does not feature any recognisable seal structure. The only seal described in any detail is the liquid seal formed between screw and rotor and a necessary feature of the present liquid seal type pump to obtain the required suction delivery head (paragraphs 002, 007). Therefore D1 lacks any specific disclosure of a seal of any type or at any place, let alone a mechanical seal.

3.3 D3 discloses a fluid-ring pump of the kind comprising a rotor provided with helical blades. The second embodiment in figure 9 on which the appellant relies includes a housing 17 having a downstream cone-shaped part 56,58 at the end of which what could be interpreted as an outlet chamber is connected (col. 7, lines 6-27). The upper connection duct visible in figure 9, immediately right of the screw, forms the outlet of the housing, and has been proposed as an extension according to claim 1. Assuming this tubular duct section may be seen as an extension in the sense of claim 1, which the Board doubts, this upper connection extends radially outward, but fails to exhibit any axial extension over a part of the pump housing "in the direction of the drive shaft" as required by the wording of claim 1. According to the characterising portion of claim 1, the integrated extension is further required to provide a continuation and enlargement of the outlet chamber. As an enlargement of the outlet chamber the extension should be understood to provide additional volume or space that extends not only radially over the chamber itself, but, as required by the claim, also axially, in the direction of the drive shaft, over the pump housing. The claim defines the pump housing as "provided with a rotor arranged on a drive shaft provided with a mechanical seal", so that an axial extension over part of the housing is understood as requiring that it



extends along the rotor and seal arrangement, and thus more than a mere overlap with the end wall of the pump housing, as suggested.

3.3.1 Furthermore the Board concurs with the respondent that the embodiment of figure 9 does not mention any particular type of drive shaft seal. Figure 9 appears to show a simple gasket or gland seal provided on the drive shaft.

3.4 Similar considerations arise with respect to D2 and D4. The pump according to the alternate embodiment of figure 3 of D2 is detailed in the last paragraph of page 5 which explains little of the structure of the outlet chamber shown on the right of the part of the housing for the screw and rotor in figure 3. The flat portion at the outlet end is a connection flange of the outlet duct of the outlet chamber and certainly does not form an enlargement or continuation of the outlet chamber. As with D3 the Board is thus unable to identify an extension of the outlet chamber over part of the pump housing 25 that forms an enlargement or continuation thereof. Finally, D2 is silent as to the nature of the seal on the drive shaft depicted between the right hand bearing and outlet chamber.

D4, see its sole figure, shows a related liquid pump with very similar configuration of its flanged outlet 17 as in figure 3 of D2.

3.5 Hence none of D1 to D4 discloses the subject-matter of claim 1 as upheld. This conclusion applies mutatis mutandis to the method claim 8. The Board thus confirms the opposition division's positive assessment of novelty.

4. Inventive step

4.1 The Appellant also contests the opposition division's decision starting from either D2,D3 or D4 in combination with D1. It is submitted that D1 clearly suggests the features of the characterising portion of claim 1, that solve in D1 the same objective technical problem as that indicated in paragraph [0004] of the patent. To incorporate those features of D1 into a liquid ring pump, such as known from D2,D3 or D4, would then not involve inventive skill.

4.2 As concluded above in relation to novelty, none of D2 to D4 discloses an integrated extension of the outlet chamber that extends over part of the pump housing, nor do they specify that the drive shaft seal located within the outlet chamber is a mechanical seal. The integrated extension of the outlet chamber that encloses the mechanical seal retains, according to lines 53-56 of paragraph 005, a steady and sufficient flow of lubricant in form of sewage water over the mechanical seal; by giving the outlet chamber a larger volume appropriate lubrication is ensured, see last sentence bridging columns 1 to 2. As stated in paragraph 0002 ensuring proper lubrication is particularly important for mechanical seals that replace packed glands and lip seals. Mechanical seals require a thin liquid film between the abutting surfaces of stator and rotor parts of the seal to provide cooling and lubrication.

Both differing features thus cooperate to provide the technical effect. Starting from the problem identified in paragraph 004 of the patent to achieve a liquid ring pump with an extended life time, the objective technical problem can be formulated as how to extend

pump life time, especially in respect of sealing and operation.

4.3 Contrary to the appellant's opinion, D1 lacks any teaching to use a mechanical seal, let alone that an extra volume of liquid extends the life of the seal and thus of the pump. D1 explains in relation to the sealing liquid tank 4, that it serves to supply liquid to the pump when idling and thus the purpose of this liquid supply is to ensure and maintain the liquid seal between screw and stator of the pump. During idle operation the liquid in the tank flows back to the pump, maintaining the liquid seal without liquid supply from a separate source and also keeping temperature of the housing and bearings low (col 2, lines 9-19), thus reducing wear and potential damage to the pump from supply blockage (cf. col. 1, lines 33-34). D1 thus offers a different solution to a different problem of maintaining enough liquid to avoid suction shortage.

4.4 Thus, the skilled person starting from D2, D3 or D4 might look toward D1 for a solution. Applying the teaching of D1 would lead to connecting the tank 4 to the (flanged) pipe outlets of D2, D3 or D4. However they would not arrive at the claimed arrangement of an outlet chamber with integrated extension extending over the pump housing and with a mechanical seal in the outlet chamber.

Furthermore, as stated above, D1 contains no disclosure of the type of drive shaft seal. Therefore any argument that the skilled person would have recognised that the extra volume is also beneficial for its mechanical seals is moot.

- 4.5 The Board concludes that the subject-matter of claim 1 involves an inventive step over D2, D3 or D4 in view of D1. This conclusion applies mutatis mutandis to the method claim 8.
5. The Board thus confirms the opposition division's positive assessment of novelty and inventive step, and its finding 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