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D E C I S I O N
of 11 October 1995

Case Number: T 0503/94 - 3.2.4

Application Number: 89117553.1

Publication Number: 0361328

IPC: F04D 9/06

Language of the proceedings: EN

Title of invention:

Self-priming jet pump with an axial diffuser

Patentee:

CALPEDA S.p.A.

Opponent:

EBARA ITALIA S.p.A.

Headword:

-

Relevant legal provisions:

EPC Art. 114(2), 54(1), 56

Keyword:

"Fresh case"

"Novelty - yes"

"Inventive step - yes"

Decisions cited:

G 0010/91

Catchword:

-

Case Number: T 0503/94 - 3.2.4

D E C I S I O N
of the Technical Board of Appeal 3.2.4
of 11 October 1995

Appellant: EBARA ITALIA S.p.A.
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Decision under appeal: Decision of the Opposition Division of the European Patent Office dispatched on 13 June 1994 rejecting the opposition filed against European patent No. 0 361 328 pursuant to Article 102(2) EPC.

Composition of the Board:

Chairman: C. A. J. Andries
Members: M. G. Hatherly
J. P. B. Seitz

Summary of Facts and Submissions

I. The decision of the opposition division to reject the opposition against European patent No. 0 361 328 (resulting from application No. 89 117 553.1 filed on 22 September 1989 and claiming priority from Italian patent application No. 8 564 488 of 26 September 1988) was dispatched on 13 June 1994.

An appeal against this decision was received on 23 June 1994 and the fee was paid the same day. The statement of grounds of appeal was received on 21 October 1994.

II. Claim 1 as granted reads as follows:

"A centrifugal self-priming jet pump with a single impeller comprising a pump casing (2), within which an impeller (6), a diffuser (10) and an ejector unit (3) are arranged, characterized in that the diffuser (10) is of the axial type and is arranged facing the impeller (6) on its suction side and is attached between the interior of the pump casing (2) and the exterior of the ejector (3), said diffuser presenting in its interior some return channels (16) with a tendentially radial arrangement, suited to axially convey through a central opening (15) into the pressure chamber (17) of the pump casing (2) the flow streaming out of the impeller (6)."

III. In the statement of grounds of appeal the appellants (opponents) cited the following documents

D2: US-A-2 941 474

D5: DE-C-906 894

- D6: GB-A-1 201 721
D7: IT-A-1 176 089
D8: A. J. Stepanoff "Centrifugal and Axial Flow Pumps", 2nd edition, 1957, Chapman and Hall, Ltd., London, pages 129 to 132
D9: A. De Kováts and G. Desmur "Pumpen, Ventilatoren und Kompressoren", 1968, Verlag G. Braun GmbH, Karlsruhe, page 126
D10: M. Medici "Le pompe", 1967, Ulrico Hoepli, Milano, page 204

and argued that

- the subject-matter of claim 1 is not new or at least not inventive over the disclosure of document D6;
- the subject-matter of claim 1 is not inventive if the radial diffuser of the pump of document D2 is replaced by an axial diffuser from any one of documents D5 to D10;
- the patent contains insufficient information to enable a skilled person to put the invention into practice (Article 100(b) EPC); and
- claim 1 should include a disclaimer to an extra radial diffuser to meet the object of reducing the overall pump diameter.

IV. The appellants appended the following documents to a facsimile dated and received on 27 September 1995 (ie two weeks before the oral proceedings)

- D11: EP-A-0 323 384
- D12: DE-C-2 249 883
- D13: DE-A-3 718 273
- D14: DE-C-2 034 489
- Attachment 1 "Affidavit" by Mr Pagés
- Attachment 2 Definition of "diffuser" in "Europump Terminology"
- Attachment 3 Translation of the present European patent 0 361 328 into Italian (the conversion into an Italian patent)

and argued that

- although document D11 is an "Article 54(3) and (4) EPC" document, due to attachment 1 it can be used as Article 54(2) EPC prior art and can thus be combined with document D6 or D12 to destroy inventive step;
- claim 1 is not inventive over document D13, or over document D14 with either document D6 or D12;
- it can be seen using attachment 2 that an essential feature is missing from claim 1 and there is insufficient disclosure; and
- claim 1 of attachment 3 (the conversion to an Italian patent) is broader in scope than claim 1 of the European patent specification.

V. In the oral proceedings held on 11 October 1995

- the board stated that the fresh ground of insufficient disclosure under Article 100(b) EPC

could only be considered if the respondents agreed thereto;

- the respondents stated that they did not agree to the introduction of this fresh ground;
- the board refused to allow the documents D11, D12, D14 and attachments 1 to 3 to be introduced into the proceedings;
- the appellants cited an article entitled

"The Unduly Broad Claim" by Matthias Brandi-Dohrn, IIC, volume 25, pages 648 to 657

to support their view that claim 1 was too broad and was anticipated by the prior art; and

- the respondents presented counter-arguments.

VI. The appellants request the revocation of the entire patent.

The respondents request the dismissal of the appeal ie the maintenance of the patent as granted.

Reasons for the Decision

1. The appeal is admissible.
2. *Insufficient disclosure under Article 100(b) EPC*

According to the Opinion of the Enlarged Board of Appeal G 10/91 (OJ EPO 1993, 420; see section 3 of the Opinion), fresh grounds for opposition may be considered in appeal proceedings only with the approval of the patentee.

The respondents do not agree to the introduction of the fresh ground for opposition of insufficient disclosure under Article 100(b) EPC, so this ground (and attachment 2 cited in support thereof) will not be considered.

3. *Late filed documents*

3.1 Prior use of pumps according to document D11 - attachment 1

Attachment 1 is an "affidavit" by Mr Pagés, the president of Bombas Eléctricas, S.A., stating that "our patent No. 8 800 215 relates to our jet pump offered on the market under the trade name DELTA that we have been manufacturing since the filing date of the above referenced Spanish patent, i.e. December 28, 1987 and selling throughout Europe, Middle East and South America since immediately after."

The appellants point out that European patent application D11 claims priority from said ES-8 800 215, they conclude that pumps made in accordance with document D11 were on the market before the present priority date and argue that it is obvious to modify these pumps using the teaching of document D6 or D12 to arrive at a pump satisfying the present claim 1.

This prior use allegation was however raised for the first time in the appeal proceedings and, even then, not in the statement of grounds of appeal but later ie only two weeks before the oral proceedings. The appellants have given no reason for making the allegation at this late stage. It raises a case entirely different from that on which the decision under appeal is based. The board would only admit this fresh case into the proceedings if it were prima facie highly relevant. The evidence supplied is however deficient.

The construction of the allegedly prior used Delta pump is unclear. Attachment 1 is vague in saying that ES-8 800 215 "relates to" the Delta pump. Moreover the appellants have not filed a copy of the Spanish patent but merely of the European patent application D11. So there is no evidence of how close the Delta pump of the alleged prior use is to the Spanish patent and, more importantly, how close it is to the European patent application D11 relied upon by the appellants.

Moreover the evidence presented for the manufacturing and marketing of the Delta pump is unsatisfactory. Attachment 1 is vague in referring to manufacturing the Delta pump since the filing date of the Spanish patent and selling since immediately after. The priority date of the present patent is 26 September 1988, just nine months after the Spanish patent's filing date of 28 December 1987. There is no evidence of public availability of the Delta pump in this nine month period. There is no evidence of a specific offer, order or delivery made to anyone.

Thus, even at this late stage of the proceedings (Article 114(2) EPC), the appellants have failed to provide evidence on precisely what was marketed, precisely when and to whom. The fresh case made by the appellants is not prima facie highly relevant and so the board refuses its admission into the proceedings.

The appellants accept that document D11 itself does not destroy the novelty of the subject-matter of claim 1 and moreover cannot itself be used for an inventive step attack because it was published (on 5 July 1989) after the validly claimed priority date of the present patent (26 September 1988).

Thus attachment 1 and document D11 (with document D12 in so far as its teaching is added to document D11) will be disregarded.

3.2 Admissibility of documents D12 to D14

3.2.1 Document 12 has already been mentioned in section 3.1 above. In so far as the appellants use document D12 to clarify document D6, the board considers that no such clarification is necessary.

The lower half of the Figure of document D14 shows return channels 25 in an axial diffuser of a two stage centrifugal pump but this embodiment is neither a centrifugal self-priming jet pump nor a single impeller pump. This pump would not be seriously considered by the skilled person seeking to improve a centrifugal self-priming jet pump.

Accordingly the documents D12 and D14 are not admitted (Article 114(2) EPC).

3.2.2 Document D13 is a short document which is already mentioned in the patent specification. Although mentioned in the appeal only at a late stage, exceptionally the document will be admitted.

3.3 Attachment 3

The European patent specification in these appeal proceedings is in English and the board's competence does not include the examination of the subsequent translation of the European patent specification into Italian (attachment 3). Thus attachment 3 is not admitted.

4. *Discussion of claim 1*

4.1 The appellants maintain that claim 1 needs clarification and request its amendment in column 6, lines 34 to 39, to read: "the diffuser (10) **is axially spaced with respect to the impeller**, is arranged facing the impeller (6) ... said diffuser presenting in its interior some **diffusing** return channels (16) ...".

An allegation of lack of clarity against a granted, unamended claim does not constitute a ground for opposition and so does not need to be considered.

Nevertheless for comparison of a claim with the prior art it is necessary to decide how the claim is to be interpreted, referring if necessary to the description and drawings (Article 69 EPC).

4.2 The characterising portion of claim 1 commences with the words "the diffuser (10) is of the axial type".

According to column 5, lines 31 to 34, concerning a preferred embodiment of the invention shown in Figures 1 and 2, the medium flowing out of the impeller 6 enters through the openings 14 (ie axially located with respect to the impeller), along the channel 16 having a radial direction and flows into the pressure chamber 17 with an axial direction, as represented by arrow 18.

Therefore the preferred diffuser of the invention, although defined as being of the axial type, in fact has both axial and radial features.

However this is already sufficiently clear from claim 1 by the wording in column 6, lines 38 to 41 of "said diffuser presenting in its interior some ... channels (16) with a tendencially radial arrangement, suited to axially convey ... into the pressure chamber (17) ... the flow" (underlining added).

It is clear from the description of the patent that the reference in the claim to axial conveyance of the flow into the pressure chamber has to mean that the flow when leaving the diffuser is in the direction of the axis and is essentially without a rotational component, in order to make it easier for the air to exit from the pump (see column 1, lines 16 to 18; column 2, lines 37 to 40; the sentence bridging columns 3 and 4; and column 4, lines 44 to 49).

- 4.3 In column 6, lines 38 and 39, claim 1 refers to "said diffuser presenting in its interior some return channels (16) with a tendencially radial arrangement, suited to axially convey through a central opening (15) into the pressure chamber (17) of the pump casing (2) the flow streaming out of the impeller (6)".

It is clear by the choice of the term "diffuser" that diffusing takes place therein ie the decrease of speed of the stream, lowering its kinetic energy and raising its static pressure, this being achieved by the stream passing along a channel whose sectional area increases in the direction of flow (see column 1, lines 7 to 12 and column 4, lines 44 to 49) and which must be in the diffuser.

- 4.4 Claim 1 uses the term "central opening" in column 6, line 40.

It can be seen on Figure 1 that the outlet through which the flow leaves the diffuser is annular, between the inner diameter of the outer disc 12 of the diffuser and the ejector 3. There is indeed a central opening in the diffuser, but the ejector is located therein. This is consistent with column 6, lines 36 to 38 which state that the diffuser "is attached between the interior of the pump casing (2) and the exterior of the ejector (3)". Since in such a pump the ejector projects from the suction side of the impeller and since the diffuser is on the suction side (see column 6, lines 34 to 36: "facing the impeller (6) on its suction side"), the arrangement in Figure 1 is what the skilled person would expect after reading the claim. The fact emphasised by the appellants that the ends of the

blades 13, which have a certain thickness, are located in the central opening does not change the above finding.

- 4.5 Claim 1 speaks of the "flow" leaving the impeller without mentioning liquid (water), gas (air) or separation.

From the term "a centrifugal self-priming jet pump" the person skilled in the art knows that the pump initially contains some liquid (water) and the inlet pipe contains gas (air) with or without liquid (see eg prior art document D2 cited in both the patent specification and the originally filed application). During the priming phase the water passing through the ejector unit draws in air and these pass to the impeller. After leaving the impeller, the air-liquid mixture is separated into air (which leaves the pump via the outlet) and water (which is recirculated except for the excess which leaves with the air).

This can also be derived from column 4, lines 50 to 58 of the description of the patent specification.

- 4.6 According to claim 1, lines 34 to 36, "the diffuser ... is arranged facing the impeller (6) on its suction side" which means that the diffuser is not only adjacent the impeller but also axially located with respect to the impeller in the suction side direction.

It should be emphasised firstly that the axial-type diffuser in the centrifugal self-priming jet pump, which diffuser is axially located with respect to the impeller, has to be considered as an essential feature

solving the problems linked to self-priming jet pumps having a radial diffuser, and secondly that the disclosure of the application as filed points unequivocally in the direction of a pump with only one diffuser ie an "axial type" diffuser.

5. *State of the art*

5.1 **Document D2** discloses a centrifugal self-priming jet pump with a single impeller 42. The flow leaving the impeller 42 enters diffuser portion 48 radially and exits axially (via outlets 60) with a deliberate rotational component to enter vortex chamber 15 wherein there is a swirling movement (see column 3, line 60 to column 4, line 5). Air passes with liquid through port 46 of the vortex chamber 15 into chamber 16 wherein the air rises and is evacuated with liquid through a discharge opening 38.

The diffuser portion 48 of document D2 is located around the impeller 42 (not facing it on the suction side as required by the present claim 1), is not attached to the exterior of the ejector, and conveys the flow streaming out of the impeller in the axial direction (but with a deliberate rotational component) through an opening (which is not central) into the vortex chamber 15 (not into the pressure chamber 16).

5.2 Figure 1 of **document D6** shows a centrifugal self-priming jet pump. The air-water mixture leaving the impeller 5 during priming enters the annular duct 6 and is cyclone or centrifuge separated so that the air passes through the swirl attenuation element 9 and the transverse passages 13 in swirl attenuation element 7

(shown in more detail in Figure 2) to the pressure space 10. The water however flows through the tendencially radial passages in swirl attenuation element 7 to the jet pump (nozzle 8, suction gap 3 and diffuser 4) to draw in air and/or water from suction connector 1 through the transverse passages 12 in swirl attenuation element 7.

The tendencially radial passages in the swirl attenuation element 7 lead to the jet pump not to the pressure chamber (compare the present claim 1). The transverse passages 13 in the swirl attenuation element 7 lead to the pressure space 10 but are not disclosed as being diverging (a requirement of a diffuser) and are not central in the meaning of the present claim 1 because they are radially outside the passages 12. The transverse passages 12 in the swirl attenuation element 7 lead from the suction inlet 1 to the suction space 2 and jet pump.

The swirl attenuation element 9 is not disclosed as having diverging passages so there is no disclosure of it being a diffuser. There is moreover no disclosure of tendencially radial channels. The swirl attenuation element 9 cannot be termed an axial element because the outlet flow from the element per se (if not from the duct following it) is at some 45° to the axis, it does not face the impeller 5 because the air-liquid separation duct 6 separates them, it is not attached between the interior of the pump casing and the exterior of the ejector and it cannot be the same as the element 7 because they plainly differ already by the transverse passages 12 and 13. Even if the board were to accept that the elements 7 and 9 were the same,

and accept that element 9 had diverging (although according to Figure 2 apparently diverging and then converging), tendentially radial channels, the element 9 would still have a technically different function to the diffuser of the invention because the former carries predominantly air following a primary air-liquid separation in the annular duct 6 before the element 9 whereas the latter carries all the flow from the impeller which means that the separation takes place after the diffuser. Initially on start up the element 9 carries liquid but this is merely because no air has by then reached the pump.

Thus neither swirl attenuation element 7 nor swirl attenuation element 9 in document D6 fulfils the requirements for the diffuser set out in claim 1. The method by which the air-water mixture is separated is different.

5.3 Each of **documents D5 and D7** discloses a plurality of diffusers in a multistage centrifugal (non-jet) pump. **Documents D8 to D10** are text books showing diffusers.

5.4 **Document D13** discloses a centrifugal self-priming jet pump with a single impeller surrounded by a radial diffuser 2. In the pump housing, around the injector 7 and behind the impeller, is a separation device 1 which, according to the Figure, is frustoconical and provided with throughflow holes 5 and ribs 6.

6. *Novelty*

After examination of the cited documents, the board is satisfied that none of them discloses a centrifugal

self-priming jet pump having all the features set out in claim 1.

Only document D6 is in dispute in the appeal proceedings in this respect and this is examined in detail in section 5.2 above.

The subject matter of claim 1 is thus to be considered as novel within the meaning of Article 54 EPC.

7. *Closest prior art, problem and solution*

7.1 The board considers that the pump closest to that of the present invention is that disclosed by document D2.

7.2 Starting from the pump disclosed by document D2, the board sees the objective problem addressed by the invention as being to improve the air-liquid separation in the pump.

7.3 The board is satisfied that the objective problem can be solved by the features of the present claim 1 and in particular by the features of its characterising portion. By using a diffuser of the axial type (as discussed in section 4.2 above) for the flow leaving the impeller, the air-liquid mixture flows into the pressure chamber axially without any rotational component, making it easier for the air to exit from the delivery connection and thus improving the air-liquid separation.

8. *Inventive step*

8.1 Air-liquid separation in the pump disclosed by document D2 takes place in the vortex chamber 15 and the second chamber 16 (see column 3, line 60 to column 4, line 11). Having left the impeller, separation of air and liquid takes place to a "very considerable degree" in the vortex chamber due to the swirling movement therein and the separated, lighter air tends to collect at the central region and passes with liquid through port 46 into chamber 16 where the liquid is in a less turbulent condition, due in part to a baffle wall 73, so that the separated air readily rises to the top of the chamber.

No teaching is given in document D2 towards the use of the claimed axial-type diffuser. On the contrary it is central to the working of this prior art pump that the flow leaves the diffuser with a deliberate rotational component to achieve a swirling motion in the vortex chamber.

8.2 Each of documents D6 and D2 teaches that a separation takes place which is based on a swirling movement of the mixture (D2: column 3, lines 64 to 69; D6: page 3, lines 17 to 20), so that it cannot be obvious to obtain a separation based on an axial outflow (see section 4.2 above) by combining the teachings of documents D2 and D6. The board furthermore sees no reason why the skilled person would be led to replace the diffuser of document D2 by the swirl attenuation element 9 of document D6. Even if he were to do so, he would not achieve an axial flow with no rotational component centrally into the pressure chamber.

The same applies of course if, as maintained by the appellants, document D6 is considered as representing the closest prior art. The board cannot accept the appellants' argument that it would be obvious to mount in a pump according to document D6 the element 9 immediately adjacent the impeller 5 (as taught by document D2 where the diffuser portion 48 is next - radially - to the impeller 42) because this would mean the removal of the duct 6 and thus the removal of the essential primary air-liquid separation. In this respect, starting from document D6, the board furthermore sees no document which could lead the skilled person in an obvious way from the pump of document D6 to the pump defined by the present claim 1.

- 8.3 The mere existence of diffusers with axial outlets does not mean that it is obvious for the skilled person to incorporate them in the centrifugal self-priming jet pump of document D2. In fact it would make no technical sense to replace the diffuser outputting a flow with a rotational component with a diffuser which produces an axial flow with no rotational component and then to lead this flow into the vortex chamber for centrifugal air separation. Moreover the flow leaves the diffuser according to claim 1 through a central opening whereas, to achieve separation, the flow into the vortex chamber of document D2 must be at the periphery (see document D2: claim 1, column 5, lines 18 to 20).

The diffuser replacement would in fact need to go hand in hand with the removal of the vortex chamber. However this would not be obvious to the skilled person since he would then lose the "very considerable degree" of air separation which occurs in the vortex chamber.

The board therefore does not see the replacement of the diffuser of document D2 by the diffuser of any one of documents D5 and D7 to D10 as being obvious to the person skilled in the art.

- 8.4 The appellants argue that the jet pump according to document D13 differs from that defined by the present claim 1 merely in that the holes 5 in the separating device 1 are not central but that it would be obvious to make the holes 5 central because claim 6 of document D13 states that they may have any desirable shape, number and position.

Claim 6 of document D13 in fact states "daß die Trenneinrichtung (1) definierte Durchströmöffnungen (5) in beliebiger Form, Anzahl und definierter Anordnung enthält." The term "Anordnung" can be translated as "arrangement" and could well refer to the pattern of the holes not to their position. The Figure shows the holes above the axis which makes technical sense as the air is to leave the pump at the outlet 4. The board sees no hint in document D13 towards putting the holes at the centre. Moreover the holes 5 are in the separating device 1 not in the diffuser 2 where the diffusing takes place.

- 8.5 The board thus finds that the prior art documents in the appeal proceedings, taken singly or in combination, are not prejudicial to the jet pump of claim 1.

9. *"The Unduly Broad Claim" by Matthias Brandi-Dohrn*

This article bemoans the fact that lack of clarity of a claim is not a ground for opposition. This fact is laid

down by the EPC and not the concern of the board in this appeal proceedings. The appellants' view that claim 1 is too broad and is anticipated by the prior art is not shared by the board (see sections 6 and 8 above).

10. For the above reasons, the board concludes that the subject-matter of claim 1 as granted involves an inventive step within the meaning of Article 56 EPC.
11. The patent may therefore be maintained unamended based on this independent claim and dependent claims 2 to 5 which concern preferred embodiments of the pump according to claim 1.

The appellants' request must therefore be refused.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

N. Maslin

C. Andries