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D E C I S I O N
of 2 December 1998

Case Number: T 0244/97 - 3.2.4

Application Number: 90101016.5

Publication Number: 0379196

IPC: F04D 29/42

Language of the proceedings: EN

Title of invention:
Pump casing

Patentee:
Ebara Corporation

Opponent:
01: KSB Aktiengesellschaft
02: Grundfos a/s

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step (yes)"

Decisions cited:
T 0002/83

Catchword:
-



Case Number: T 0244/97 - 3.2.4

D E C I S I O N
of the Technical Board of Appeal 3.2.4
of 2 December 1998

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Appellant: Grundfos a/s
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Respondent: Ebara Corporation
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 27 January 1997
rejecting the oppositions filed against European
patent No. 0 379 196 pursuant to Article 102(2)
EPC.

Composition of the Board:

Chairman: C. A. J. Andries
Members: M. G. Hatherly
M. Lewenton

Summary of Facts and Submissions

- I. The decision of the opposition division rejecting the oppositions against the European patent No. 0 379 196 was dispatched on 27 January 1997.

On 25 February 1997 the appellant (opponent 02) filed an appeal against this decision and paid the appeal fee. The statement of grounds of appeal was received on 26 May 1997.

- II. Independent claim 1 of the granted patent reads:

"A pump casing manufactured by press forming of steel plate and including a casing body (21) formed by press forming a metal plate, said casing body (21) having a cylindrical surface and being of a cylindrical cup shape with an opening portion formed at one side thereof and an aperture serving as a suction port (21d) at the other side thereof, and a casing flange (21b) outwardly extending from said opening portion, the pump casing further including a discharge port (28), characterized in that the pump casing includes a volute casing encircling a pump impeller (1) so as to form a fluid path around said pump impeller (1), the cross-sectional area of said fluid path being gradually increased towards said discharge port (28) of said pump casing, said casing body (21) having a volute portion (21a) integrally formed to radially outwardly expand from said cylindrical surface of said casing body (21) at an axially intermediate portion thereof which is radially opposite to said pump impeller (1), said volute portion (21a) being press formed from said cylindrical cup shaped casing body (21)."

Independent claim 14 of the granted patent reads:

"A method for manufacturing a steel plate pump casing comprising the steps of
press forming a metal plate to form a casing body (21) of a cylindrical cup shape having a cylindrical surface, an opening portion formed at one side thereof and a closed bottom portion at the other side,
press forming said casing body (21) so as to form a casing flange (21b) outwardly extending from said opening portion, press forming from said cylindrical cup shaped casing body (21) a volute portion radially outwardly expanding from said cylindrical surface of said casing body (21) at an axially intermediate portion thereof which is radially opposite to said pump impeller (1) so as to form a fluid path around said pump impeller (1), and
forming an aperture serving as a suction port (21d) at said bottom portion."

III. The parties were summoned to oral proceedings for 2 December 1998. The board was informed by facsimile on 1 December 1998 that opponent O1 (a party as of right under Article 107 EPC) would not attend. In accordance with Rule 71(2) EPC, the oral proceedings were held without opponent O1 but in the presence of the appellant and respondent (proprietor).

IV. In the appeal proceedings the appellant argued that the claimed invention was obvious in view of the cited prior art:

- D5: US-A-4 775 295
- D7: DE-A-2 047 501
- D8: DE-A-3 008 672
- D13: US-A-1 128 822
- D14: DE-C-847 739

G1: DE-C-3 210 526
G2: US-A-2 350 616
G7: FR-A-1 563 797
G8: US-A-2 786 261

The respondent countered the appellant's arguments.

Opponent 01 made no substantive comments in the appeal proceedings.

- V. The appellant requests that the decision under appeal be set aside and the patent revoked.

The respondent requests that the appeal be dismissed.

Opponent 01 made no requests in the appeal proceedings.

Reasons for the Decision

1. The appeal is admissible.
2. *Comments on claim 1*
 - 2.1 Claim 1 refers to "said casing body (21) having a volute portion (21a)". The term "volute portion" is seen as meaning "that portion of the casing body that is the volute" i.e. that the whole of the volute is "press formed from said cylindrical cup shaped casing body (21)".

The term "volute portion" does not mean "portion of the volute". Thus, in the view of the board, the claim cannot cover an arrangement in which the volute comprises a portion in the casing body and another portion since this would not satisfy the object of the invention set out in column 2, lines 28 to 33 of the

patent as granted that is "to provide a pump casing which directly provides a fluid path without providing any separate fluid path member, i.e. volute vane, inside an outer cylindrical casing manufactured by press forming".

- 2.2 The last part of the granted claim 1 specifies "a volute portion (21a) integrally formed to radially outwardly expand from said cylindrical surface of said casing body (21) at an axially intermediate portion thereof which is radially opposite to said pump impeller (1), said volute portion (21a) being press formed from said cylindrical cup shaped casing body (21)."

The casing body 21 thus has a cylindrical surface which can be seen at the bottom of Figure 1(a) of the granted patent. Towards the top of this Figure it can be seen that this cylindrical surface is radially outwardly expanded to form the volute portion 21a. The volute portion is axially located between the remainder of the cylindrical surface on both sides of the volute, and opposite the pump impeller. It will be seen that the volute portion is totally provided in the cup shaped member casing body 21.

3. *Claims 1 and 14 - novelty*

The board finds the subject-matter of each of claims 1 and 14 to be novel (Article 54 EPC), this moreover being undisputed by the parties.

4. *Inventive step - claim 1 - starting from D7*

- 4.1 In the oral proceedings the appellant took D7 as the closest prior art or starting point for the assessment of inventive step.

- 4.2 D7 discloses a spiral housing, for example for a deep drawn steel pump. The housing shown in Figure 1 comprises a first housing part 5 shown in Figure 3 and a second housing part 6 shown in Figure 4. The first housing part 5 is of a cylindrical cup shape with an opening portion formed at one side thereof (the right-hand side in Figures 1 and 3) and an aperture serving as a suction port 3 at the other side thereof, and a casing flange (shown in Figure 1 abutting a similar flange on the left-hand side of the second housing part 6) outwardly extending from said opening portion. The pump casing further includes a discharge port 2. There is a volute portion around the pump impeller 4 and the cross-sectional area of the fluid path gradually increases towards the discharge port 2.
- 4.3 The volute portion is defined by an annular wall (axially and radially) of the first housing part 5 and a wall of the second housing part 6, the latter wall running like part of a turn of a screw thread to be gradually farther from the former wall in the direction towards the discharge port, thus creating an axially expanding volute portion.
- 4.4 Claim 1 as granted specifies not an **axially** expanding volute portion but a **radially** expanding volute portion but the appellant maintains that it would be obvious to modify the D7 housing to provide it with such a radially expanding volute portion and thus to arrive at the subject-matter of the granted claim 1. Press forming is well known in general, radially expanding volute portions are well known in the pump art, and for example G8 explains how to make such a portion by radial expansion under pressure (see in particular Figures 1, 7 and 9).

- 4.5 The board cannot accept the appellant's reasoning summarised in the above section 4.4.
- 4.5.1 In D7 the axially expanding volute portion is bounded on one side by the wall in the second housing part 6. Simply to replace the axially varying deformation in this wall by a radially varying deformation is not possible without also modifying the first housing part 5 since this can be seen on Figure 1 to lie outside and abut the second housing part 6. Further it will be observed that the cylindrical walls of both housing parts 5 and 6 lie at an appreciable radial distance from the impeller tip so that it would be necessary to firstly reduce the absolute diameter of these cylindrical walls before expanding them again locally in a radial direction.
- 4.5.2 Moreover the volute in D7 is located between the walls of the two housing parts 5 and 6. Thus even providing a radially expanding channel in the second housing part 6 of D7 would not yield the subject-matter of claim 1 because this states that the volute portion is totally provided in the cup shaped member, i.e. in one member. To remove any doubt in this respect it will be pointed out that, while the bottom of Figure 1(a) of the patent shows a fluid space between the wall 23 attached to the casing body 21 and the casing cover 22 (a fluid space which appears similar to the situation in Figure 1 of D7 where the volute is provided between the housing parts 5 and 6), it will be realised on closer consideration that the bottom of Figure 1(a) of the patent is not depicting the volute portion (see also the section of Figure 3(a)). The volute portion of the present invention is shown at the top of Figure 1 and is located wholly in the cylindrical cup shaped member.

- 4.5.3 Even if D7 were to be modified to be provided with a radially expanding volute, this would be located in the second housing part 6 and not in the first housing part 5 (which is the cylindrical cup shaped member corresponding to that required by the granted claim 1).
- 4.5.4 The appellant points out that it is known from other documents (such as D13) to provide the volute in the cup shaped member but the fact remains that he is starting from D7 not from these documents. In any case also the volute of D13 is provided by two sheet metal parts 3, 4 (see Figure 4) and not wholly in one of them. Each modification that needs to be made to the spiral housing of D7 to arrive at the claimed subject-matter makes it more unlikely that the skilled person would have arrived at this subject-matter in an obvious way, without prior knowledge of the patent.
- 4.5.5 While the axially varying depression in the D7 housing part 6 is achieved by a simple forming step, producing a radially expanding depression (which is moreover undercut) would be more difficult, so that it is also not so likely that a skilled person would be led in an obvious manner to the claimed pump casing.
- 4.5.6 The method of making a seamless scroll disclosed by G8 is plainly lengthy and costly and appears incompatible with the method of making the D7 housing. The appellant essentially uses this document G8 merely as an illustration that radially expanding scrolls by pressure is known. However while this abstraction from the specific teaching of G8 might help the skilled person, G8 provides so many indications in the wrong direction (the scroll portion being for compressors or turbines and thus including vanes 22, the scroll portion being formed separately, using welding and then

cutting away the welded seam) that the board cannot see that, on balance, G8 would lead the skilled person to modify the D7 housing in such a way as to arrive at the claimed subject-matter.

- 4.5.7 The appellant also refers to G7 but this, as explained in column 2, lines 17 to 27 of the present patent, concerns a pump casing made in two halves so that the volute is also assembled of two halves.

Similarly, the volute portion of G1 is formed by a plurality of parts 1, 2 and 5 (see claim 1 and Figure 2), as is scroll of G2 (rear scroll section 12 and front scroll section 17, see Figure 4).

In D8 the spiral space 5 is indeed prefabricated in one piece but is a separate piece to the pump housing (see the last sentence of page 6).

D14 teaches assembling a number of flat strips of sheet metal to make a volute as shown in Figure 4 which is polygonal in the cross section of the fluid passage and polygonal transversely to the impeller axis and then making the shape more like the optimal shape of Figures 2 and 3 by bringing in sand and heating and pressurising it.

Such teachings cannot lead the skilled person in the direction of the undercut radially expanded volute portion of the present invention.

- 4.6 To summarise, the board sees no logical chain of reasoning taking the skilled person in an obvious manner from the spiral housing of D7 to the subject-matter of claim 1. While the skilled person **could** carry out individual modifications to the D7 housing to take him nearer the claimed subject-matter, the board cannot see that he **would** have carried out any of these

individual modifications (see the decision T 2/83, OJ EPO 1984, 265 "could-would approach"), let alone the specific **collection** of modifications necessary to yield the claimed subject-matter, unless of course he had had the knowledge of the invention presented by the present patent.

5. *Inventive step - claim 1 - starting from D5*

5.1 In the written appeal proceedings the appellant took D5 as the closest prior art or starting point for the inventive step assessment.

5.2 The board agrees with the respondent that D5 is better than D7 as a starting point for the invention because D5 discloses a pump casing jacket 1 which already is in one piece in the vicinity of the impeller 3 (instead of the two pieces of D7), is cup shaped and has a cylindrical surface, see Figure 1.

5.3 The D5 pump lacks a volute portion but the appellant maintains that it would be obvious for the skilled person to wish to provide one and would choose a radially expanding version. The appellant considers that G8 would help the skilled person in this respect.

5.4 The board accepts that to add a volute portion to the D5 pump would be obvious to the skilled person. This would improve the pump efficiency and lower the noise emission. However there are so many ways of doing this that the board cannot see that the skilled person would be led to the specific construction set out in the granted claim 1, namely an undercut radially expanding volute portion located totally in the cup shaped member. In this way, in a economic way, a volute can be

provided without a step or join between the volute and the pump casing thus producing a smooth fluid path preventing pump performance deterioration and increase of noise.

- 5.5 Some of the comments made in the above section 4 apply also when starting from document D5, in particular that in sections 4.5.6 and 4.5.7 that the other documents mentioned in the appeal proceedings would not help the skilled person progress towards the present invention.
- 5.6 The board considers that, while the skilled person would have had little difficulty in providing the cup shaped portion of D5 with the volute portion defined in the granted claim 1 if he had wanted to do so, the board sees no hint in the prior art which would have led him to want to do so.
6. The subject-matter of claim 1 is thus patentable as required by Article 52 EPC.
7. The independent method claim 14 sets out the way of making a pump casing broadly as defined by the independent device claim 1. The appellant argues that the steps of the method are known as such or at least obvious and that since the pump casing is itself obvious, then this method of making it is obvious too. However the board has found that the pump casing of claim 1 is not obvious. Accordingly the board finds that the claimed method - which is clearly tied to the non-obvious pump casing - also is not obvious.
8. The patent may therefore be maintained unamended, based on these granted independent claims 1 and 14, granted claims 2 to 13 dependent on claim 1, granted claims 15 to 20 dependent on claim 14, the granted description and the granted drawings.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:



S. Fabiani

The Chairman:



C. Andries

