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D E C I S I O N
of 24 September 2002

Case Number: T 0240/01 - 3.2.4

Application Number: 94307156.3

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Language of the proceedings: EN

Title of invention:
Automotive fuel pump

Patentee:
FORD MOTOR COMPANY

Opponent:
Mannesmann VDO AG

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56, 100

Keyword:
"Novelty (yes)"
"Inventive step (no)"

Decisions cited:
-

Catchword:
Document cited in the appeal proceedings for the first time during the oral proceedings (sections 4.1 and 6).



Case Number: T 0240/01 - 3.2.4

D E C I S I O N
of the Technical Board of Appeal 3.2.4
of 24 September 2002

Appellant: Mannesmann VDO AG
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Respondent: FORD MOTOR COMPANY
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 6 February 2001
rejecting the opposition filed against European
patent No. 0 646 727 pursuant to Article 102(2)
EPC.

Composition of the Board:

Chairman: C. A. J. Andries
Members: C. D. A. Scheibling
C. Holtz

Summary of Facts and Submissions

I. By its decision dated 6 February 2001 the Opposition Division rejected the opposition. On 13 February 2001 the appellant (opponent) filed an appeal and paid the appeal fee simultaneously. The statement setting out the grounds of appeal was received on 12 June 2001.

II The patent was opposed on the grounds based on Article 100(a) (54 and 56) EPC.

III. The following documents played a role in the appeal proceedings:

E1: WO-A-92/00457

E4: US-A-2 015 200

E10: DE-A-33 03 352

E11: "Die Pumpen", Fuchslocher/Schulz, Springer Verlag, 1963, pages 176 and 185

IV. Oral proceeding took place on 24 September 2002.

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

The respondent (patentee) requested that the appeal be dismissed.

VI. Independent claim 1 as granted reads as follows:

"A fuel pump for supplying fuel from a fuel tank to an automotive engine, comprising:

a pump housing (12);
a motor (14) mounted within said housing (12) having a shaft (16) extending therefrom;
a rotary pumping element (18) attached to said shaft (16) for rotatably pumping fuel;
a pump bottom (20) mounted to said housing (12) having an outlet (22) therethrough in fluid communication with a motor chamber surrounding said motor, said pump bottom (20) having an opening for allowing said shaft (16) to pass through to connect to said rotary pumping element (18), and with a flow channel (40) formed along an outer circumference of a rotary pumping element mating surface (58) of said pump bottom (20);
a pump cover (30) mounted on one end of said housing (12) and attached to said pump bottom (20) with said rotary pumping element (18) therebetween such that a pumping chamber (26) is formed between a flow channel (40) formed along an outer circumference of a rotary pumping element mating surface (56) of said pump cover (30) and said flow channel (40) of said pump bottom, said flow channels being of part-elliptical cross-sectional shape so that elliptically shaped primary vortices (42) develop in said pumping chamber (26) conforming to the shape of said pumping chamber (26) upon rotation of said rotary pumping element (18) such that secondary vortices are minimised, said pump cover flow channel (40) and said pump bottom flow channel (40) having a depth less than half the minor axis of an ellipse which has the same cross-sectional shape and which has the minor axis less than the major axis, and with said pump cover (30) having a fuel inlet (32) therethrough for fluid communication with said fuel tank and with said pumping chamber (26)".

Reasons for the Decision

1. The appeal is admissible.

2. *Interpretation of the independent claim 1*
 - 2.1 The expression "said flow channels being of part-elliptical cross-sectional shape so that elliptically shaped primary vortices (42) develop in said pumping chamber (26) conforming to the shape of said pumping chamber (26) upon rotation of said rotary pumping element (18) such that secondary vortices are minimised" seems to define functional features which solely relate to the shape of the flow channels, independently of the shape of the associated rotor.

Such an expression could only be seen as a limitation of the flow channels by the expected result, not as an implicit limitation of another feature (i.e. the rotary pumping element). Since however the flow channels are already specified (namely as being of part elliptical cross-sectional shape) how a further limitation of the flow channels would be brought about by the expected result is not clear to the Board. This could also not be clarified by the respondent.

Thus, this expression has to be interpreted as meaning that the expected result (i.e. so that elliptically shaped primary vortices develop in said pumping chamber conforming to the shape of said pumping chamber upon rotation of said rotary pumping element such that secondary vortices are minimised) will be obtained when the channels are of part-elliptical cross-sectional shape, irrespectively of the shape of the rotary pumping element.

2.2 During the oral proceedings the patentee (respondent) at first confirmed that elliptically shaped primary vortices develop in the pumping chamber of the considered class of pumps, independently of the shape of the associated rotary pumping element, although later on when discussing the difference between the subject-matter of claim 1 in suit and the closest prior art the respondent reconsidered his position regarding this point.

The Board however cannot detect either in the wording of claim 1 or in the description indications which define a specific construction of the rotary pumping element as well as of the pumping chamber as a whole, so that it cannot be upheld that the described effect of the flow channels on the one hand also implies specific constructional or functional features of either the rotary pumping element or the pumping chamber as a whole on the other hand.

3. *Novelty*

3.1 None of the cited documents discloses the features according to which:

- the flow channels of the pump bottom and of the pump cover are of part-elliptical cross-sectional shape, where the minor axis of the ellipse is less than the major axis.

Consequently, the subject-matter of claim 1 as granted is novel.

3.2 The appellant argued that from E10, figure 6, a skilled person would be able to derive that the channels should

have an approximately oval shape and that on the basis of his general knowledge, as illustrated by E11, he would realise that it is advantageous to provide the channels with a semi-oval or semi-circular shape, and that thereby he would adapt the channel shape of E10 to be elliptical.

- 3.3 However, "semi-circular" is excluded by the wording of claim 1 in suit (because major and minor axes would otherwise have the same dimension), whereas semi-oval is a generic disclosure which cannot take away the novelty of a specific example (i.e. elliptical, since an ellipse is a particular oval) falling within that disclosure.

Furthermore, this type of approach (see section 3.2, above) falls rather within the assessment of inventive step. In order to assess novelty, only what is known from one single document shall be considered, without adapting or transforming the disclosure of said document.

4. *Closest prior art*

- 4.1 Although neither the parties nor the Board itself referred to E1 during the appeal proceedings before oral proceedings took place, the Board in preparing for the oral proceedings came to the conclusion that E1 is the closest prior art document. This was announced to the parties in the oral proceedings.

E1 is not only the sole cited prior art document in the description of the patent specification in suit, since it was the most relevant document during examination, but it was also cited in the notice of opposition in

combination with E9 (DE-A-3 925 396) or E10 to substantiate a lack of inventive step, as well as in the decision in suit (section II, 4.5). It is therefore part of the present proceedings even if it was not considered to be extremely relevant during the previous stages.

- 4.2 The parties considered in the beginning of the proceedings E10 to be the closest prior art document. However E1 discloses in addition to what is known from E10 the feature according to which the flow channels have a depth less than half the minor axis of an ellipse which has the same cross-sectional shape (wherein the minor axis equals the major axis).
- 4.3 From E1 (claim 1; page 4, lines 1 to 15; Figures 1, 2) there is known a fuel pump for supplying fuel from a fuel tank to an automotive engine, comprising:
a pump housing (33);
a motor mounted within said housing (33) having a shaft (16) extending therefrom;
a rotary pumping element (14) attached to said shaft (16) for rotatably pumping fuel;
a pump bottom (22) mounted to said housing having an outlet (28) therethrough in fluid communication with a motor chamber (30) surrounding said motor, said pump bottom (22) having an opening for allowing said shaft (16) to pass through to connect to said rotary pumping element (14), and with a flow channel (56) formed along an outer circumference of a rotary pumping element mating surface of said pump bottom (22);
a pump cover (20) mounted on one end of said housing and attached to said pump bottom with said rotary pumping element (14) therebetween such that a pumping chamber is formed between a flow channel (54) formed

along an outer circumference of a rotary pumping element mating surface of said pump cover (20) and said flow channel (56) of said pump bottom (22), said flow channels being of part-circular cross-sectional shape (i.e. part-elliptical cross-sectional shape with the minor axis being equal to the major axis) so that elliptically (i.e. circularly) shaped primary vortices develop in said pumping chamber conforming to the shape of said pumping chamber upon rotation of said rotary pumping element (14) such that secondary vortices are minimised (this result is to be obtained by E1, since it solely results from the shape of the channels, see section 2.1 above), said pump cover flow channel (54) and said pump bottom flow channel (56) having a depth less than half the minor axis of an ellipse which has the same cross-sectional shape (wherein the minor axis equals the major axis), and said pump cover (20) having a fuel inlet (26) therethrough for fluid communication with said fuel tank and with said pumping chamber.

The Board indeed considers a circle to be an ellipse having major and minor axes of equal length. This was also brought forward by the respondent in its letter dated 20 December 2001, page 1, last paragraph.

5. *Inventive step*

5.1 The fuel pump according to claim 1 in suit differs from the one known from E1 in that:

said ellipse has the minor axis less than the major axis.

5.2 The problem cannot be seen in improving the efficiency of the pump, as stated in the patent in suit column 1,

lines 54 to 57, since this problem must already have been solved by E1. Indeed a part-circular cross-sectional shape is by definition also part-elliptical and there is no indication in the description of the patent in suit that a further improvement with respect to E1 can be achieved only by having the minor axis of the ellipse less than its major axis.

In that respect it should be observed that the description of E1 in the patent in suit even does not mention any disadvantage of the pump according to E1 which has to be avoided. Furthermore it is clear for a person skilled in the art that the specific value for the minor axis a , namely $a = b$ (corresponding to a circle) which value lies just outside the claimed range for that minor axis, namely $a < b$ (corresponding to an ellipse) cannot provide a skilled person with a different teaching. If the end value for the minor axis a within the range $a < b$ still solves the problem of pump efficiency, then it cannot be upheld that the next value for the minor axis, i.e. $a = b$ cannot solve it.

Therefore, the problem to be solved can only be seen in providing an alternative solution to the one proposed in E1.

That the problem to be solved could be a packaging problem, i.e. to achieve a higher flow rate with a pump of the same thickness or to reduce the thickness of the pump for an identical flow rate as suggested by the respondent during oral proceedings does not convince the Board. Indeed the dimensions of the channels are so tiny compared to the length of the motor-pump assembly that a modification of the shape of the channels has almost no impact on the overall length of the assembly.

Furthermore, according to claim 1 the shape of the channels can be so close to circular (a near to b) that no reduction of the overall dimensions would be achieved at all (see also section 5.5 below).

- 5.3 From E1, page 5 a skilled person knows that the efficiency of the pump is dependent on the geometrical configuration of the pump, the best pump efficiency being obtained by firstly the flow channels having a part-circular cross-sectional shape and secondly the centre of the circle having the same cross-sectional shape being located within the space occupied by the rotary pumping element or using the wording of the claim in suit by having a depth less than half the axis of the circle having the same cross-sectional shape.

Furthermore, E11 (page 185, ultimate paragraph) teaches a skilled person that the cross-sectional shape of the channels is important and that channels having a semi-circular or semi-oval shaped cross-section are advantageous, whereas E4 (page 1, left hand column, lines 42 to 55) teaches a skilled person to shape the cross-section of the channels so that the smallest possible resistance is offered to the helical flow movement of the transported fluid and that dead corners cause eddies which greatly influence the movement of the auxiliary liquid in the passage, i.e. to give said channels a rounded cross-section.

- 5.4 Thus, if a skilled person now wants to define an alternative shape for the channels of E1 without renouncing effectiveness of the pump, he obviously will try to modify as little as possible. He therefore will try to remain within the framework of cross-sectional shapes which are known to be advantageous (i.e.

circular or oval). Since starting from a circular shape which is a mathematically easily definable shape, the closest mathematically easily definable shape, which also is a particular oval, is the elliptical shape. Such an elliptical shape will therefore obviously be taken into consideration by a skilled person, particularly since as taught in E11 and E4, dead corners are avoided thereby and since such a shape is adapted to the helical flow movement of the fluid, is close to a circle and is an oval.

5.5 Furthermore, since claim 1 in suit only requires with respect to the axes of the ellipse to have the minor axis less than the major axis, the dimensions of both axes can become so close, that an elliptical cross-sectional shape is obviously the closest possible geometrical configuration to a circular cross-sectional shape, so that in a borderline case these shapes are hardly distinguishable from one another.

5.6. Therefore, the Board concludes that for a skilled person a channel of part-elliptical cross-sectional shape is an obvious alternative to a channel of part-circular cross-sectional shape.

Consequently, the subject-matter of claim 1 as granted does not involve an inventive step.

5.7 The respondent argued that as it can be seen in figure 2 of E1, there is a step between the end of the channel which is nearest to the motor shaft and the mating end of the cavity within the rotary pumping element. This step would be detrimental to the occurrence of elliptically shaped primary vortices in said pumping chamber conforming to the shape of said pumping chamber

upon rotation of said rotary pumping element such that secondary vortices are minimised.

It is true that such steps are detrimental to a good fluid flow. However, that is of common knowledge for a skilled person, who also knows, if necessary, how to avoid such steps when putting into practice the teaching of E1, particularly since E1 suggests that said steps only result from the fact that during manufacturing a better workability is wanted (see page 3, last for lines to page 4, line 1). Furthermore, the argument of the respondent cannot be accepted by the Board since according to the wording of claim 1 in suit, the occurrence of said primary and secondary vortices depends solely from the specific shape of the channels and not from the shape of the rotary pumping element and/or pumping chamber as a whole. This has been confirmed in the beginning of the oral proceedings by the respondent (see section 2.2 above).

It seems to be logical, that a fluid flow in the claimed pump depends not only on the form of said flow channels, but also on the form of the rotary pumping element, as well as the form of the pumping chamber as a whole. The wording of claim 1 however does not clearly specify this fact, let alone the specific constructional features of the rotary pumping element and/or of the pumping chamber as a whole, which would generate the wanted fluid flow. A functional feature alone, expressing the wish to obtain such perfect elliptically shaped vortices would not help further, since it could be argued that due to the presence of the features "a rotary pumping element 18" and "a pumping chamber 26" in claim 1, the result would already have been present in claim 1.

6. *Concerning document E1*

Parties to inter parties proceedings cannot expect any assistance by the Board with regard to requests. They must be prepared that anything on file may turn out to be decisive for the outcome of the appeal, even if the significance of one document (in the present case, E1) was only understood at a late stage of the appeal proceedings

The Board considers that the procedural rights to fair and equal treatment have been respected, by focussing oral proceedings on document E1 and extensively discussing this document with the parties. The attention of the respondent was drawn to the fact that he himself had to decide whether to introduce an auxiliary request or not, under the longstanding principle of party disposition, in particular valid for inter partes proceedings. The parties were furthermore invited at the end of the oral proceedings to reiterate their final requests. The respondent was specifically asked whether he had any further request to his main request (which he denied), before the debate was closed and the oral proceedings were adjourned for deliberation.

It should also not be forgotten that the respondent must have been aware of the importance of document E1, since during the procedure up to grant, the respondent himself limited, in the form of a positive disclaimer (namely $a < b$; disclaiming therefore $a = b$), the scope of claim 1 in order to take into account a novelty objection of the Examining division based on E1.

The Board may add that an amendment which could have

rendered claim 1 inventive in the light of E1 seems hardly conceivable for the reason that any definite range limitation (of the dimensions of the a and b axes of the ellipse) would suffer the fate that a solution outside that range would still be possible to border back to back to the chosen range; i.e. a range limitation would not permit to select values (dimensions of the a and b axes) providing any unexpected result which would be different from the result obtained with values outside the chosen range but close to it and thus, any further limitation of the claimed range would be unable to impart an inventive step to the subject-matter of a claim based on such a limited range.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The patent is revoked.

The Registrar:

The Chairman:

G. Magouliotis

C. Andries