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D E C I S I O N
of 31 July 1997

Case Number: T 0295/95 - 3.2.4

Application Number: 90103364.7

Publication Number: 0384441

IPC: F02M 37/10

Language of the proceedings: EN

Title of invention:
Fuel filtering device

Patentee:
MITSUBISHI DENKI KABUSHIKI KAISHA

Opponent:
VDO Adolf Schindling AG

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step - yes"

Decisions cited:
-

Catchword:
-

Case Number: T 0295/95 - 3.2.4

D E C I S I O N
of the Technical Board of Appeal 3.2.4
of 31 July 1997

Appellant: (Opponent)
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Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted 29 March 1995 rejecting the opposition filed against European patent No. 0 384 441 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. 0 384 441 was dispatched on 29 March 1995.

On 5 April 1995 the appellants (opponents) both filed an appeal against this decision and paid the appeal fee. The Statement of Grounds of Appeal was received on 21 July 1995.

II. Claim 1 as granted reads as follows:

"A fuel pump filtering device, the pump (6) being arranged in a liquid fuel tank (1) of vehicles and feeding the liquid fuel (2) to the engine, said filtering device comprising:

a suction tube (15) which is connected to be extended from a suction port (6a) of the fuel pump housing and which has a suction opening (16); and

a screen (17, 23) filtering said liquid fuel (2) and covering at least a part of the suction tube, which is constituted as a bag with a bottom part thereof disposed in contact with or close to an inside wall of the bottom of said fuel tank and covers said suction opening, said screen being constructed with a dense web which forms a substantially air-tight liquid film by soaking said liquid fuel which makes contact with at least said bottom part of said screen when said screen is partially immersed in said liquid fuel,

characterised in that

- the suction tube (15) has an upwardly directed suction opening (16)."

III. The following documents were referred to during the appeal proceedings:

D1: US-A-4 617 121
D2: US-A-3 348 413
D9: DE-C-880 548
D10: US-A-2 394 860
D11: DE-U-86 03 736

IV. Oral proceedings took place on 31 July 1997 in the presence of the parties.

In the appeal proceedings the appellants argued that the subject-matter of claim 1 as granted lacked inventive step for the person skilled in the art starting from document D1 or document D11 optionally adding knowledge gained from document D2, D9 or D10.

The respondents essentially countered the appellants' arguments.

V. The appellants request that the decision under appeal be set aside and the patent revoked.

The respondents request the dismissal of the appeal (which would mean maintaining the patent as granted).

Reasons for the Decision

1. The appeal is admissible.

2. *Novelty*

No document on file discloses all the features of claim 1 as granted. This is not disputed by the appellants. Accordingly the subject-matter of this claim is considered as novel within the meaning of Article 54 EPC.

3. *Closest prior art, problem and solution*

3.1 Document D1 discloses a fuel filter for a pump 5 arranged in the fuel tank of an automobile for feeding liquid fuel to the engine carburettor (see column 1, lines 8 to 17 and Figure 1). An auxiliary tubular member 2 is connected via a hollow head member 1 to the inlet 5' of the pump 5 (see column 2, lines 4 to 9), this auxiliary tubular member 2 has a downwardly directed suction opening 10. A tubular filter member 3 for filtering the liquid fuel covers the auxiliary tubular member 2 and has a bottom part disposed close to an inside wall of the floor 4 of the fuel tank and covering the suction opening 10. When the mesh 11 of the tubular filter member 3 is soaked with fuel, fuel can be drawn out down to the lower surface 11' of the mesh 11 (see column 2, lines 57 to 65).

Apart from the fact that it does not disclose that the

screen is constituted as a bag, document D1 thus explicitly or implicitly discloses the features of the precharacterising portion of claim 1.

3.2 The disclosure of document D11 is similar (insofar as the features of the present claim 1 are concerned) to that of document D1. The appellants have taken document D1 as the closest prior art document or starting point for the invention and the board sees no compelling reason to do otherwise.

3.3 It is clear that the skilled person tries to design vehicles which are as quiet as possible and so he designs each vehicle part with noise avoidance in mind although he is aware that this may be only one of many conflicting requirements in vehicle design. Thus it is feasible that he will try to make the fuel delivery system known from document D1 quieter. Thus, the problem, formulated in such a way that it does not contain pointers to the solution, can be seen as being to reduce the noise level of the fuel delivery system.

3.4 In the fuel pump filtering device of document D1, it may be that pressure waves, i.e. noise, is developed by the pump, either due to its own rotation or due to its interaction with the fuel, and that this noise may propagate through the hollow head member 1 and the auxiliary tubular member 2 to the suction opening 10. Since this opening is close to and facing the floor of the fuel tank (see the Figures and column 2, line 21), the noise may be transmitted to the floor of the tank and cause it to vibrate, thus generating noise.

3.5 The solution provided by the present patent to this noise problem is to upwardly direct the suction opening of the suction tube. Sound waves leaving the suction tube via the suction opening then do not directly impinge on the floor of the fuel tank which would cause the latter to vibrate. The sound waves are instead dispersed into the fuel.

3.6 The feature of the characterising portion of the present claim 1, namely to upwardly direct the suction opening of the suction tube, thus makes for a quieter fuel pump filtering device and provides a solution to the noise problem.

4. *Inventive step*

4.1 It is clear that the skilled person would know that the fuel pump in the fuel delivery system of document D1 would be a source of noise and that noise might be transmitted from the pump along the suction pipe. However while it can now be seen that noise emitted from the end of the suction pipe impinges upon the floor of the fuel tank to cause it to vibrate, the board sees no evidence that this skilled person would have realised this without having been given the information in the present patent. Document D1 does not discuss the noise problem, neither does any of the documents D2, D9 and D10. While lines 7 to 10 of page 1 and lines 5 to 7 of page 2 of document D11 discuss a noise problem, this is a different noise problem, see section 4.8 below. This is all the more surprising since both documents D1 and D11 relate to suction openings near and even directed towards the bottom tank

wall and nevertheless give no indication whatsoever of the possibility of noise generation due to the downwardly directed suction openings. This is even more surprising since document D11 relates to noise avoidance in the same location.

Thus the board considers that the recognition of the precise cause of the noise problem arising in the arrangement of document D1 contributes to the inventive step of the solution specified in the present claim 1.

4.2 While the discussion up to now has concentrated on the noise problem and its solution by upwardly directing the suction opening of the suction tube, it is necessary to consider claim 1 as a whole and in particular the purpose of the screen 17, 23 filtering the liquid fuel. This bag-shaped screen is a dense web which when soaked by the liquid fuel is substantially air-tight but liquid-permeable. When the liquid level in the tank as a whole is below the suction opening but above the lowest part of the bag, the negative pressure in the bag causes liquid rather than air to flow into the bag. Consequently the liquid level in the bag is higher than in the tank as a whole and so liquid can still enter the suction tube.

4.3 The closeness of the suction opening of the suction tube to the floor of the fuel tank and the substantially air-tight but liquid-permeable filter cooperate to make it possible to extract the most fuel possible from the tank (see documents D1 and D11).

So the direction of the suction opening cannot be

considered on its own but only in combination with its distance from the tank floor and with the presence of the substantially air-tight but liquid-permeable filter.

The special filter of course has its limitations, it cannot provide for maximum fuel extraction with too great a distance between suction opening and floor. So the skilled person wishing to retain maximum fuel extraction must still keep the suction opening near the tank floor. This is why the suction opening 10 in document D1 faces downwards, if it were to face upwards then it would be further from the floor and hence, on the face of it, disadvantageous.

Once the skilled person's attention has been drawn to the fact that the noise leaving the suction opening in document D1 is impinging on the tank floor, he might consider increasing the distance therebetween. However the board sees no hints in the prior art to lead him to solve the noise problem by directing the suction opening upwardly, even after he was made aware of the cause of the noise problem. It is an ex post facto analysis to argue that the skilled person merely needs to look in the prior art for a fuel pump filtering device in which the suction inlet faces away from the tank floor.

4.4 Figure 4 of document D2 shows a filtering means 64 which is secured to a lower end of a tubular portion 41 so that fuel can be caused to pass centrally through the hollow tubular member 41, see column 4, lines 7 to 10. The filtering means 64 is angled upwardly but it is

not disclosed whether the tubular portion 41 extends with the filter and what the end of the tubular portion 41 looks like. It is possible, indeed even probable, that the end of the tubular portion 41 is at right angles to its longitudinal axis but, even with the help of the cross sections of similar embodiments in Figures 2 and 6, this is not proven.

Even if one assumes that the suction opening of the tubular portion 41 indeed is directly upwardly, it must be appreciated that the filtering means 64 is not a substantially air-tight but liquid-permeable filter as used in the device of document D1 and in the invention. So the skilled person would need to take the idea of the upwardly directed suction opening on its own from document D2 to modify the device of document D1.

The board however can see no reason why the skilled person would be led to transfer this feature to the device of document D1. The skilled person is dealing with a noise problem whereas document D2 is not. The significance of an upwardly directed suction opening is not discussed by document D2, indeed this is so insignificant that one cannot even be sure that the suction opening is upwardly facing (or that it is close to the tank floor), let alone that it is indicated that the presence of the specific filter web as claimed in the patent in suit allows the use of an upwardly directed suction opening without having to fear a reduced usability of the fuel contained in the tank.

4.5 Document D9 discloses a submerged pump whose suction opening is upwardly directed. This document deals with

preventing sparks or short circuits in the motor reaching the fuel tank and causing an explosion. The document gives no details of where the fuel goes when it leaves the pump and no details of where the pump is to find application, appearing however to be totally unsuited to the vehicle field of document D1 and the present invention. There is no filter of any sort covering the inlet to the pump and indeed this inlet is annular and constituted by parts of the pump casing. The inlet is of such a shape that it is doubtful that it could be termed a suction **tube**. The document makes no mention of a noise problem.

The skilled person could not be expected to consult this document in his search for a solution to a noise problem in the particular type of fuel delivery system of document D1 and, even if he did, could not be expected to realise the significance of the upwardly directed inlet and hence to employ this feature in the system of document D1, let alone to employ the combination of the specific filter web and upwardly directed suction opening.

4.6 Document D10 discloses a pump submerged in the fuel tank of in particular a military vehicle. The inlet throat 70 of the centrifugal impeller 62 faces upwardly (see Figure 3 and page 1, left-hand column, line 43), is surrounded by a filter screen 72 (see page 2, left-hand column, lines 70 to 73), but is not a suction **tube** as specified in claim 1 of the patent in suit. The reason why the inlet throat faces upwardly is to prevent vapour lock by allowing the escape of any bubbles from liquid entering the throat, these bubbles

occurring due to abnormally high temperatures, as in military vehicles, where the engine and fuel tank are enclosed by armour plate (see page 3, right-hand column, lines 47 to 49 and page 1, left-hand column, lines 10 to 16 and 29 to 34). Corner bosses 24 provide for vibration damping mountings (see Figure 2 and page 1, right-hand column, lines 48 and 49) but this is the only explicit indication in the document concerning vibration or noise.

The board cannot see that the skilled person would consider this document for a solution to his noise problem. Even though the document deals with vehicles, the vehicles are military vehicles and the problem which the document sets out to solve arises because of the armoured construction of these military vehicles. Noise reduction is normally however not the priority of the military vehicle designer. Even if the skilled person consulted the document he could not be expected to see the significance of the single feature of the upwardly directed inlet throat for his noise problem, let alone to recognise the possibilities given by the combination of the specific filter web structure and the upwardly directed suction opening.

4.7 Thus the board's view is that the skilled person starting from the device known from document D1 would not seriously consider documents D2, D9 and D10. The view would not change if the skilled person were to start from document D11.

4.8 Document D11 discloses an in-tank pump unit 2 with a downwardly facing suction opening 3 in a housing 1

whose lower end constitutes a tubular, downwardly facing suction opening 5 surrounded by a screen 6 (see Figure 1 and page 3, lines 17 to 28). Bubbles in the fuel caused by heat are prevented from entering the pump by the dome or conical shape of the screen 6, 6' which cause bubbles to escape upwardly along the outside of the pump housing 1. These bubbles would otherwise interrupt the fuel flow and cause noise (see page 1, lines 8 to 11). Thus although the document D11 deals with a noise problem, it is a different noise problem to that which is solved by the patent in suit. The skilled person at this point apparently has not realised that there is a problem of transmission of noise from the pump inlet to the tank floor. Since no upwardly directed suction opening is present in document D11, no teaching in this respect can be derived therefrom.

4.9 Accordingly the board cannot see that the skilled person would be led to consider together any combination of the available documents and even if he were to he would not be led to combine their teachings in such a way as to arrive at the subject-matter of the present claim 1.

It is the inventor in the patent in suit who has recognised that, due to the presence of such a kind of filter web, it is possible to increase the distance between the suction tube opening and the fuel tank floor by directing the suction tube opening upwardly, so that noise emitted from the suction opening does not impinge on the tank floor and cause it to vibrate.

5. The device shown in Figures 7 to 9 of the patent, described in column 6, lines 26 to 50 and claimed in claim 3, has a lower suction opening 22 in the lowest part of the end wall of the suction tube and directed sideways. This is however in addition to and much smaller than the upwardly facing suction opening 16. While noise will radiate from this sideways facing opening 22, most of the noise will be emitted form the upwardly directed suction opening 16 and so the noise contacting the tank floor will be much less than it would have been had the main suction opening been directed downwardly. While this arrangement is not as effective at reducing noise as the arrangements of the other Figures 1 to 6, it nevertheless can be seen as an embodiment of the invention.

6. The subject-matter of claim 1 is thus patentable as required by Article 52 EPC. The patent may therefore be maintained unamended based on this allowable independent claim and on claims 2 to 7 which are dependent on claim 1, so that the appeal has to be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

N. Maslin C. Andries