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D E C I S I O N
of 28 January 2004

Case Number: T 0779/99 - 3.5.3

Application Number: 90106299.2

Publication Number: 0392313

IPC: G05D 16/06

Language of the proceedings: EN

Title of invention:
Fuel pressure regulator valve

Patentee:
SIEMENS AKTIENGESELLSCHAFT

Opponent:
Robert Bosch GmbH

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step (yes)"

Decisions cited:
-

Catchword:
-



Case Number: T 0779/99 - 3.5.3

D E C I S I O N
of the Technical Board of Appeal 3.5.3
of 28 January 2004

Appellant: Robert Bosch GmbH
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Representative: -

Respondent: SIEMENS AKTIENGESELLSCHAFT
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Decision under appeal: Interlocutory decision of the Opposition
Division of the European Patent Office posted
28 May 1999 concerning maintenance of European
patent No. 0392313 in amended form.

Composition of the Board:

Chairman: A. S. Clelland
Members: A. J. Madenach
M. B. Tardo-Dino

Summary of Facts and Submissions

- I. This is an appeal against an interlocutory decision by the opposition division that European Patent No. 0 392 313 in an amended form met the requirements of the EPC.
- II. The opposition was on the grounds of lack of novelty and lack of inventive step.

The following documents cited in the course of the opposition proceedings are relevant for this present decision:

D3: DE-A-37 38 321

D6: FR-A-2 263 383

D7: DE-A-28 37 045

D8: DE-A-29 40 502

D9: EP-A-0 198 381

D14: DE-A-23 54 461

- III. In its decision the opposition division held *inter alia* that the invention claimed in an auxiliary request filed in the course of the opposition oral proceedings involved an inventive step with respect to the disclosure of D6, since this document did not relate to a valve element in the form of a truncated sphere although it disclosed a valve element having a surface with an analogous function. Interpreting the valve element shown in D6 as a truncated sphere was only

possible based on hindsight. D8 did disclose a truncated sphere but was distinguished from the invention as claimed by the form of the sealing washer; the skilled person would have no reason to combine the washer of D6 with the truncated sphere of D8.

IV. The opponent (appellant) appealed, requesting that the decision be set aside and that the patent be revoked. The appellant argued that the invention claimed in the amended claim 1 differed from the disclosure of D8 only in features which were well known in the prior art. Further objections of lack of inventive step were based on the disclosure of D6, and on the disclosure of D9 when read in the light of D16, which was introduced with the appeal:

D16: US-A-4 237 924.

D16 shows the same invention as D8 and is cited in D9.

V. The patentee (respondent) requested that the appeal be dismissed. It was argued that the invention claimed in the amended claim 1 was not rendered obvious by the combinations of prior art as submitted by the appellant. In particular, in all documents which disclosed a flat washer for retaining a valve element, the valve element was different from the claimed form. The combination of the teaching of such documents with that of D8 was only possible on the basis of an *ex post facto* analysis.

VI. The parties were summoned to oral proceedings, both parties having made an auxiliary request for oral proceedings. In a communication accompanying the summons the Board made a preliminary assessment of

novelty and inventive step in view of the cited prior art.

VII. Oral Proceedings were held before the Board on 28 January 2004. At the oral proceedings the parties maintained their existing requests (see points IV and V above).

VIII. Claim 1, as considered allowable by the Opposition Division, reads:

A fuel pressure regulator valve (10) comprising a housing (12) containing a diaphragm assembly (14) that divides the housing into two chambers, one chamber being a fuel chamber (18), and the other chamber being a control chamber (16), said fuel chamber having an inlet (20) adapted to be communicated to a supply of pressurized fluid whose pressure is to be regulated and an outlet (22) adapted to return excess fuel to a tank, said outlet having an inner end containing a valve seat (24) with which a valve element (32) carried by said diaphragm assembly coacts, said control chamber comprising means for establishing the pressure in said fuel chamber at which said valve element unseats from said valve seat, characterized in that said valve element is a truncated sphere having a circular face (42) at its truncation and being in size greater than a hemisphere, said sphere being received within a cavity (34) in a mount (28) carried by said diaphragm assembly such that said circular face of said sphere is presented to coact with said valve seat while said sphere is capable of swivelling within said mount, said sphere being retained within said mount by a washer (36) having a circular inside diameter that is less than the

nominal diameter of said sphere but greater than the diameter of said circular face, said mount (28) containing a recess (52) surrounding the open end of said cavity and within which recess (52) said washer (36) is disposed, a flange (54) on said mount radially overlapping the outer diameter of said washer, and crimps (56) being provided to secure the washer against said mount (28) by crimping said flange over the outer margin of the washer (36), so that said sphere (32) can protrude through the inside diameter of said washer (36) to present said circular face (42) to said seat while the sphere (32) remains capable of swivelling within said mount, wherein said washer (36) is flat.

IX. Claims 2 and 3 each depend on claim 1.

Reasons for the Decision

Background to the invention

1. The invention relates to a fuel pressure regulator valve with a valve element of truncated spherical form which can perform a swivelling movement in a mount. According to the patent, valve elements of truncated spherical form in prior art fuel pressure regulator valves were retained in the mount by swaging or crimping a flange. Such swaging or crimping requires the observation of close tolerances during manufacture. In order to simplify manufacture the valve element according to claim 1 is retained in the mount by a flat washer with an inside diameter rather less than the maximum girth of the truncated sphere. The washer itself is retained in a recess of the mount by crimping,

which is less critical than crimping the truncated sphere. The claimed valve is said to provide the advantage of easy and cheap manufacture as compared to prior art mountings.

The closest prior art

2. The appellant raised inventive step objections starting out from three different documents as closest prior art.
 - 2.1 D8 relates to a fuel pressure regulator valve with a valve element of truncated spherical form which in the Figure 3 embodiment is retained in a mount by a non-flat washer having flanges engaging the sphere at or slightly above its truncation, and extending below the truncation. The manner of fixation of the washer to the mount is not explicitly mentioned.
 - 2.2 D6 relates to a fuel pressure regulator valve with a frustro-conical valve element, which according to the description has a spherical surface. This element is retained by a flat washer, which is fixed to the mount either by riveting or by claws extending through slots in the washer, and which also holds a diaphragm in place.
 - 2.3 D9 relates to a fuel pressure regulator valve with a spherical valve element, which is held in place by a flat washer arranged in a recess and itself movably retained by a retainer plate.

Inventive step

3.1 Considering D8 as the closest prior art, the difference between the claimed subject-matter and the device shown in the Figure 3 embodiment of D8 resides in the form and mounting of the washer. According to D8, the washer has a flange extending below the truncation of the valve element. A further difference resides in the relative diameters of the sphere, its truncation surface and the inside hole of the washer. Finally, D8 does not indicate how the washer is fixed to the mount.

3.2 With regard to the fixation of the washer, the Board takes the position that the skilled person would, in the absence of any information in D8, consider crimping as an obvious method as it is widely used in the technical field in question. For example, in D9, a retainer plate 30, serving in combination with a washer 29 a similar function as the washer according to claim 1, is held in place by "stakes" 32 (see Figure 2 of D9), which can be considered to be a form of crimping. Document D3 (see Figures 2 to 6) shows a retainer plate (no reference numeral) holding a valve element 21, 121 and apparently fixed by crimping. Document D14 refers on page 4, first paragraph to "verstemmen" (sealing, in the context) of a retainer plate 11. In the context of D14, this has to be interpreted as fixing the retainer plate by crimping. Since the cited prior art does not give any indication of other means to fix a washer in a recess of the mount, crimping must be considered as the most obvious for the skilled person.

- 3.3 The relative diameters of the sphere, its truncation surface and of the inside hole of the washer are a direct consequence of the form of the washer. If a flat washer were used the diameters would have to have the claimed relationship if the washer were to hold the truncated sphere in place.
- 3.4 For the question of inventive step it is, therefore, decisive whether it would have been obvious for the skilled person to modify the valve known from Figure 3 of D8 so as to provide a flat washer.
- 3.5 A flat washer as opposed to a washer having downwardly extending flanges provides the advantage of an easier manufacture and can be put in place more easily.
- 3.6 Various prior art documents show a flat washer holding a valve element. However, none of the prior art documents gives any incentive to the skilled person to modify the D8 valve to make use of a flat washer instead of one having flanges, since none of the documents indicates any advantage in doing so.

The appellant argued that the skilled person would immediately recognise the above advantage; the Board disagrees. In particular page 11, last four lines of D8, point out that the washer is formed with a flange such that it generally corresponds to the form of the truncated spherical valve element. The skilled person is accordingly taught that the form of the washer in D8 has a particular functionality allowing a better guidance of the valve element in its swivelling motion, a feature which would *prima facie* not be achieved by a flat washer. Therefore, the invention can be considered

as residing in the insight that a simplified flat washer would still permit the required functionality if used in combination with a valve element of truncated spherical form.

3.7 Nor would the disclosure of D8, viewed in the light of any other document cited by the appellant, lead the skilled person to the claimed arrangement. All other documents use valve elements having a form different from the claimed truncated spherical form.

3.7.1 In D6 the valve element is in the form of a section of a sphere. As a result, the swivelling movement of the valve element is limited as compared with a valve element of truncated spherical form. In the Board's view the skilled person would not consider replacing the flanged washer of D8 by a flat washer as known from D6 since he would be aware of the problem that the flat washer, which is suitable for limited swivelling motions, may not support more extended swivelling movements in the valve element of D8.

3.7.2 Turning to D9, this document discloses a valve element retained by a flat washer. According to the appellant, document D9 would teach the skilled person to replace the washer having a flange as known from D8 by a flat washer. The flat washer in D9 is, however, necessitated by a valve element in the form of a full sphere which requires the possibility of lateral movement for exact valve seating (see page 3, line 14 to 24 of D9). This lateral movement is assured by the combination of a flat washer with a retainer plate, so that in effect two washers are necessary. D9 indicates the advantage of an easier manufacture only in relation to the

particular form of the valve element. In the Board's view, the skilled person would not consider the flat washer arrangement of D9 as suitable for use with the truncated spherical valve element of D8 since it does not appear that a flat washer as disclosed in D9 would maintain the full functionality of the flanged washer as known from D8. Moreover, the combination of a movable flat washer held by a retainer plate as used in D9 is not considered to be an obvious simplification of the washer having a flange as known from D8.

4. The appellant also argued that claim 1 lacked an inventive step starting out from D6 as the closest prior art. The differences between the claimed invention and the device shown in D6 are firstly that the claimed valve element is a truncated sphere, whereas it is a section of a sphere in D6, and secondly that the retaining washer is arranged within a recess of the valve mount and fixed to it by crimping, whereas, according to D6, the washer is formed on top of the mount and fixed to it by riveting or by claws extending through slots in the washer. The appellant argued that a valve element in the form of a truncated sphere was known from D7 and D8, and replacing an element in the form of a section of a sphere by such a known element would allow a simplified manufacture of the whole device and would, thus, be obvious for the skilled person. This argument is difficult to follow, since replacing the valve element of D6 by one in the form of a truncated sphere would require a complete redesign of the fuel pressure regulator valve. It is apparent from Figure 1 of D6 that the structure has a narrow space between the outlet and the mount which would not accommodate a valve element in the form of a truncated

sphere with a much larger vertical extension. Moreover, mounting the flat washer in a recess as in the claimed invention would also require a major redesign of the device of D6 since, as is again apparent from Figure 1 of D6, a recess in the valve mount could not be formed without a complete rearrangement of the diaphragm.

5. With regard to the appellant's inventive step argument starting out from D9, it follows from what has already been discussed under point 3.7.2 that the skilled person would consider a flat washer only in combination with a spherical valve element.
6. The Board accordingly concludes that none of the cited prior art documents, whether taken singly or in combination, leads in an obvious way to the subject-matter of claim 1.
7. There being no further objections, it follows that the appeal must be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

D. Magliano

A. S. Clelland