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Anmeldenummer / Filing No / N^o de la demande : 85 114 014.5

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Bezeichnung der Erfindung: Air filter with high filtration power
Title of invention:
Titre de l'invention :

Klassifikation / Classification / Classement : F02M 35/026, B01D 46/10

ENTSCHEIDUNG / DECISION

vom / of / du 13 June 1990

Anmelder / Applicant / Demandeur : Lombardini Fabbrica Italiana Motori S.p.A.

Patentinhaber / Proprietor of the patent /
Titulaire du brevet :

Einsprechender / Opponent / Opposant :

Stichwort / Headword / Référence : Air filter/LOMBARDINI

EPO / EPC / CBE Art. 56

Schlagwort / Keyword / Mot clé : "Inventive step - yes"

Leitsatz / Headnote / Sommaire

Europäisches
Patentamt

Beschwerdekammern

European Patent
Office

Boards of Appeal

Office européen
des brevets

Chambres de recours



Case Number : T 11/90 - 3.2.2

D E C I S I O N
of the Technical Board of Appeal 3.2.2
of 13 June 1990

Appellant : Lombardini Fabbrica Italiana Motori S.p.A.
6, Via F.lli Manfredi
I-42100 Reggio Emilia (IT)

Representative : Corradini Corrado
4, Via Dante Alighieri
I-42100 Reggio Emilia (IT)

Decision under appeal : Decision of Examining Division 102
of the European Patent Office dated
28 August 1989 refusing European
patent application No. 85 114 014.5
pursuant to Article 97(1) EPC

Composition of the Board :

Chairman : G. Szabo
Members : C. Andries
O. Bossung

Summary of Facts and Submissions

- I. European patent application No. 85 114 014.5 filed on 4 November 1985 (publication No. 0 194 343) was refused by a decision of the Examining Division 102 dated 28 August 1989.

- II. The reason given for the refusal was that the subject-matter of Claim 1 did not involve an inventive step in view of the prior art disclosed in the following documents:

D1: DE-A-2 847 130; and
D2: US-A-4 265 647.

- III. On 19 October 1989 the Appellant lodged an appeal against this decision, filing the statement of grounds on the same date. The appropriate fee was paid on 6 November 1989.

- IV. The Board introduced into the proceedings the following document, disclosing an oil bath air filter, commonly known in the technical field of internal combustion engines:

D3: BUSSIEN, "Automobiltechnisches Handbuch", 18th edition, part 1, 1965, Technischer Verlag Herbert Cram, Berlin, pages 793 to 801 - page 800: Fig. 9.

- V. In reply to communications of the Board, the Appellant submitted with letters dated 16 and 29 May 1990 a new set of claims (1 and 2) and a new description (pages 1, 2, 2A, 2B, 2C, 3, 3A and 4 to 6).

Claim 1 reads now as follows:

"An air filter for internal combustion engines, comprising an outer casing (1) provided with an upper inlet port (5) and an upper lateral outlet port (4), from said inlet port there downwardly extending a central conduit (6,7) to a position in proximity to the base of the casing, where it is immersed in an oil bath (17), around said conduit there being mounted filtering masses consisting of a metal wire mesh, and of conventional air filtering means said filtering masses being traversed by the air stream passing through the filter, characterised in that it comprises only one lower filtering mass (8) consisting of a metal wire mesh and only one upper filtering mass (20) consisting of porous foamed open cell material, both the masses (8) and (20) completely occluding the annular space between the central conduit and the casing, the upper filtering mass (20) being disposed downstream and near to the lower filtering mass (8) to be wetted by the oil droplets entrained by the air stream, in order to improve its filtering effect."

VI. The Appellant requested that the decision under appeal should be set aside and that a patent should be granted on the basis of the following documents:

Claims:

- 1 and the first part of 2 (page 7) filed with letter dated 29 May 1990,
- the final part of 2 (page 8) filed with letter dated 16 May 1990;

Description:

- pages 1, 2, 2A, 2B, 3 and 3A filed with letter dated 29 May 1990,
- pages 2C and 4 to 6 filed with letter dated 16 May 1990;

Drawing:

- sheet 1/1 as published.

Reasons for the Decision

1. The appeal is admissible.

2. Amendments

The present application documents do not contain subject-matter extending beyond the content of the application documents as originally filed (Art. 123(2) EPC).

2.1 Present Claim 1 is supported by the originally filed Claim 1 and by the originally filed description.

2.1.1 The deletion of the words "axial" and "radial" in the expressions "upper axial inlet port" and "upper lateral radial outlet port" respectively, which were present in the originally filed Claim 1, is unequivocally supported by the originally filed description (page 3, lines 33 and 34: central intake cap at the top; and page 3, line 31: upper side discharge connector).

2.1.2 The features, added to the originally filed Claim 1, can be directly and unambiguously deduced from the originally filed description and drawings (Fig. 1, page 4, lines 35 and 36 and page 5, lines 26 to 33: the filtering masses and their location with respect to each other; page 5, lines 11 to 24: porous foamed open cell material).

2.2 Claim 2 corresponds to Claim 2 as originally filed.

2.3 The amendments in the description only relate to an adaptation of the description to the newly filed Claim 1 to an obvious error (page 1, line 19: 95-96%), and to the description of the state of the art. These amendments do not give rise to any objection.

3. **Novelty**

None of the cited documents discloses an air filter having all the features as defined in Claim 1. Since this has never been disputed, there is no need for further detailed substantiation of this matter. Therefore, the subject-matter as set forth in Claim 1 is to be considered novel within the meaning of Art. 54 EPC.

4. **Closest prior art**

4.1 The air filter according to document D1 is, according to the Board's opinion, the closest prior art, since it discloses an air filter comprising all the technical features present in the pre-characterising portion of Claim 1. Indeed the filter comprises a single, outer casing wherein (according to its Claim 1) at least one filtering mass consisting of a metal wire mesh and at least one paper filter are present downstream of an oil bath. According to Fig. 1, three filtering masses are present (two consisting of metal wire mesh and one consisting of paper). In both configurations (two or three filtering masses), the last or the most downstream located filtering mass has to be the paper filter. A communication exists between a space (60), located between the two metal wire mesh filtering masses and the oil bath. That communication is provided with the help of an annular channel (99) and holes (103) (page 16 - hand written, lines 1 to 5 and 8 to 11).

4.2 Document D3 discloses a commonly known oil bath air filter for internal combustion engines. It is mentioned in document D3 that a paper filter located downstream of the oil bath air filter is only needed for engines operating in very dusty environments. The paper filter is however located in a separate housing (Fig. 9).

Considering the fact that document D1 already teaches to use only one housing, the Board preferred therefore to consider document D1 as the closest prior art.

5. Problem and solution

- 5.1 The air filter, according to Fig. 1 of document D1, is used for engines operating in very dusty environments (page 9 - hand written: first paragraph). The object of the invention was to obtain a superior filtering capacity without increasing the overall dimensions of the air filter unit. Apart from the fact that an oil return passage is provided (cf. above point 4.1) within the air filter housing, additional means are provided within that housing to give the air stream a rotative movement (page 19 - hand written: lines 12 to 23) and to retain the separated oil from entering the second metal wire mesh filtering mass (feature 65). This air filter however needs a slight increase of the dimensions of known filter units (page 20 - hand written: lines 6 to 10).
- 5.2 A somewhat complicated combination of conventional filtering means is recommended in the cited art, and it was desirable to improve the construction and efficiency (housing dimensions) of such an oil bath air filter.
- 5.3 The technical problem to be solved therefore consists in providing an oil bath air filter for internal combustion engines having a very high filtering capacity and dust saturation capacity, while being of simple construction and while being housed in a single container of normal overall dimensions.
- 5.4 In view of the results revealed in the description (page 5, lines 26 to 33) and in view of Fig. 1 (single

container of simple construction), the Board accepts that this problem is solved by the co-operation of the features specified in Claim 1, in particular since only one metal wire mesh filtering mass is combined within a single filter housing with only one downstream located filtering mass consisting of porous foamed open cell material, which can be continuously wetted by the oil droplets entrained by the air stream.

According to the Appellant there is a 'synergetic' effect due to the fact that entrained oil constantly wetting the foamed material can adsorb more dust than the foam and the undispersed oil bath would do separately. The filtration effect of the foamed material is therefore greatly increased by the presence of the oil.

6. Inventive step

6.1 Document D1 does not state or suggest further modifications to improve its function or to limit the dimensions of its construction. A suggestion to replace respectively one or two of the filtering masses (paper, or paper and wire mesh) by a porous foamed open cell material filter which is wetted in use by the oil droplets entrained by the air stream, is not disclosed, and can therefore not be deduced from the teaching of document D1.

6.2 Document D2, as well as document FR-A-2 476 752 (D4), both disclose an air filter for an internal combustion engine comprising a pre-filter inserted before the filter element of the conventional filter in order to trap and to remove moisture and impurities which otherwise would be collected in the conventional filter element. The pre-filter is taking over a part of the filtering of the end (final) filter, which is therefore protected by that pre-filter. The pre-filter however does not replace the end (final)

filter, which itself remains in function. These documents teach that a pre-filter consisting of polyurethane foam can be used to help a commonly known paper filter, which is used as an end filter.

- 6.2.1 Therefore, an indication to replace a final or end filter (which seems to be a paper filter) by an oil-wetted porous foamed open cell material filter as defined in Claim 1 of the present application cannot be deduced from the teachings of these documents.
- 6.2.2 Furthermore, these documents neither indicate nor suggest that a polyurethane foam filter can be used as a final filter element, particularly since the use of a final paper filter in these documents clearly suggests that such additional filter is needed downstream of the polyurethane foam filter.
- 6.2.3 Even if it is true that the polyurethane foam filter is able to trap and remove moisture (rain, snow) before the sucked air contacts the final paper filter (D2: column 1, lines 32 to 58), both documents D2 and D4 do not disclose or suggest however that by wetting the foamed polyurethane filter with oil an increased filtering effect is obtained. Indeed, in document D4 it is only revealed to increase the filtering efficiency of the porous foamed open cell polyurethane by impregnating it with a resin (page 2, lines 7 to 12).
- 6.2.4 It should also be brought to attention that the polyurethane foam filters used in documents D2 and D4 are both pre-filters, in the meaning that the air entering the internal combustion engine device first attacks these pre-filters. Documents D2 and D4 therefore do not disclose even the use of such filters further downstream, i.e. after another filter element (for example after an oil

bath filter but before a final filter element), so that it cannot be suggested that documents D2 and D4 teach the use of a polyurethane foam filter downstream in a manner claimed by the present invention . In particular,

- the use of a foamed polyurethane filter as a final or end-filter;
- that a foamed polyurethane filter wetted with oil has an increased filtering effect; and
- the use of a foamed polyurethane filter located downstream of another filter element,

i.e. the essential features of the amended Claim 1 in the case have not been foreshadowed by these documents.

6.3 Document D3 teaches to use an additional paper filter in a separate housing to cope with engines functioning in a very dusty environment. No indication or suggestion can be found in this document to solve the above indicated problem (cf. point 8.3) with the features present in the characterising portion of Claim 1.

6.4 The subject-matter as set forth in Claim 1 therefore involves an inventive step within the meaning of Article 56 EPC.

7. The subject-matter of Claim 1 is therefore patentable within the meaning of Article 52 EPC, so that based on this allowable Claim 1, on the dependent Claim 2 which concerns a preferred embodiment of the air filter according to Claim 1, on the modified description and on the originally filed drawing, a patent may be granted.

Order

For these reasons, it is decided that:

1. The decision of the first instance is set aside.
2. The case is remitted to the first instance with the order to grant a patent on the basis of the documents defined in above point VI.

The Registrar:

The Chairman:



S. Fabiani


G. Szabo