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D E C I S I O N
of 28 November 2001

Case Number: T 0899/97 - 3.3.5

Application Number: 91900623.9

Publication Number: 0496837

IPC: B01D 47/00

Language of the proceedings: EN

Title of invention:

Separator for a vacuum cleaner system

Patentee:

REXAIR, INC

Opponent:

FULL POINT Srl
PROAIR GmbH Gerätebau

Headword:

Separator/REXAIR

Relevant legal provisions:

EPC Art. 54, 56, 108, 113(1), 123(2)
EPC R. 65(1), 67

Keyword:

"Missing statement of grounds - appeal inadmissible - refund of appeal fee refused"
"Expert allowed to speak at oral proceedings"
"Right to be heard - yes"
"Novelty - no - functional features implicitly disclosed by prior art"
"Inventive step - yes (after amendment)"

Decisions cited:

G 0004/95, T 0334/94

Catchword:

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Case Number: T 0899/97 - 3.3.5

D E C I S I O N
of the Technical Board of Appeal 3.3.5
of 28 November 2001

Appellant 01: FULL POINT Srl
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 27 June 1997
rejecting the oppositions filed against European
patent No. 0 496 837 pursuant to Article 102(2)
EPC.

Composition of the Board:

Chairman: R. K. Spangenberg

Members: B. P. Czech
J. H. Van Moer

Summary of Facts and Submissions

- I. The appeal is from the decision of the opposition division rejecting two oppositions against European patent 0 496 837.

Independent claims 1 and 13 of the granted patent read as follows:

"1. A separator (12,76,146,190) for a liquid bath-type air filtration device for separating liquid droplets (126) coalescing with dust and dirt particulates (122) entrained in ingested air (124) through an application of centrifugal force to the ingested air, said separator comprising:

annular housing means (78,150,194,236,246,260) operable to rotate axially about a vertical axis for generating a centrifugal force to be applied to the ingested air;

intake means (96,174,226,240,250,266) operatively associated with said annular housing means (78,150,194,236,246,260) for enabling dust and dirt particulates entrained in ingested air to be drawn into an interior area of said annular housing means, and for enabling liquid droplets (126) from a liquid source (34) entrained in the ingested air to be drawn into said interior area of said annular housing means to thereby enable the dust and dirt particulates and the liquid droplets to coalesce therein, whereby to subject the coalescing liquid droplets and dust and dirt particulates to centrifugal force and to thereby separate them from the ingested air; and

exhaust means (94,183,227,228,242,252,268) operatively associated with said annular housing means (78,150,194,236,246,260) for enabling the coalescing liquid droplets and dust and dirt particulates within said interior area of said annular housing means to be expelled therefrom as the coalescing liquid droplets and dust and dirt particulates are forced radially outward by centrifugal force towards and through said exhaust means by rapid, axial rotation of said annular housing means".

"13. A method of removing fine dust and dirt particulates entrained in intake air from an ambient environment using a separator as claimed in any preceding claim, said method comprising:

providing a liquid source (34) and axially rotating said separator (12,76,146,190) to generate centrifugal force on the liquid, dust and dirt particulates (122,126) entrained in the intake air into said separator;

intaking air (124) entrained with said dust and dirt particulates (122) into said separator (12,76,146,190);

allowing liquid particulates (126) and said dust and dirt particulate entrained air (122,124) to enter said separator and coalesce therein;

separating said coalescing liquid, dust and dirt particulates (128) from said dust and dirt particulate entrained air by applying said centrifugal force to said coalesced liquid, dust and dirt particulates;

using said centrifugal force generated by said separator (12,76,146,190) to exhaust said coalesced liquid particulates and said dust and dirt particulates (130,132) from said separator, thereby leaving a remaining relatively clean air mass (134) within said separator; and

expelling said remaining relatively clean air mass (134) from said separator."

II. In the contested decision, the opposition division inter alia considered eleven patent documents, including the following:

D1: US-A-2 221 572

D2: US-A-2 945 553

D3: US-A-2 608 268

D4: US-A-4 640 697

D5: US-A-4 693 734

D6: US-A-4 735 555

D6*: DE-A-36 32 993, corresponding to D6

D7: US-A-4 824 333

D8: US-A-2 228 750

D9: US-A-2 102 353.

The opposition division held

- that the patent disclosed the invention in a manner sufficiently clear and complete for it to be carried out by a skilled person,
- that the subject-matter of claims 1 and 13 was new, because it had not been convincingly shown that water droplets could pass through the slits of the prior art separators, and that
- the subject-matter of claims 1 and 13 involved an inventive step.

III. Appellant 01 (opponent I, Full Point Srl) filed a notice of appeal but subsequently indicated that it did not intend to present grounds of appeal and asked for the reimbursement of the appeal fee "for the part that is possibly reimbursable".

IV. In its statement setting out the grounds of appeal, appellant 02 (opponent II, Proair GmbH Gerätebau) maintained its objections against the novelty of the independent claims as granted, relying on documents D5, D6* and D9.

It contested the findings of the opposition division and filed two further documents and a video tape

R1 = Test report, Institut für Thermodynamik

R2 = Test report (plus corresponding video tape V1) of Mr Molerus and Mr Wirth.

V. With its reply, the respondent filed

R3 = a comparative test carried out by ETL Testing

Laboratories Inc., together with

a declaration of Mr Rohn allegedly showing flaws in appellant 02's test reports.

It refuted the appellant's objections and asked the board to refuse the admission of the appellant's test reports into the appeal proceedings for being late filed and of insufficient relevance.

VI. In the annex to the summons to oral proceedings, referring to case law, the board inter alia stated that a refund of the appeal fee paid by appellant 01, be it in full or in part, was highly unlikely.

VII. With letter dated 17 October 2001, the respondent filed four new sets of amended claims, labelled first to fourth auxiliary requests, and document

R4 = Report by Mr Harden of 9 October 2001,

comprising a further comparative test report and analyses of reports R1 and R2. Moreover, it indicated that Mr Howie, technical director of the respondent, would be present at the oral proceedings to possibly witness and/or perform demonstrations of machines and to answer any specific technical issues which the members of the appeal board may have.

Claim 1 of the first auxiliary request is identical to claim 1 of the second auxiliary request (see below).

Independent method claim 4 of the first auxiliary request has the same wording as method claim 13 as granted, but with the expression

"... using a separator as claimed in any preceding claim, said method comprising ..."

being replaced by

"... using a separator, the separator being for a liquid bath-type air filtration device for separating liquid droplets (126) coalescing with dust and dirt particulates (122) entrained in ingested air (124) through an application of centrifugal force to the ingested air, said separator comprising:

annular housing means (78,150,194,236,246,260) operable to rotate axially about a vertical axis for generating a centrifugal force to be applied to the ingested air;

intake means (96,174,226,240,250,266) operatively associated with said annular housing means (78,150,194,236,246,260) for enabling dust and dirt particulates entrained in ingested air to be drawn into an interior area of said annular housing means, and for enabling liquid droplets (126) from a liquid source (34) entrained in the ingested air to be drawn into said interior area of said annular housing means to thereby enable the dust and dirt particulates and the liquid droplets to coalesce therein, whereby to subject the coalescing liquid droplets and dust and dirt particulates to centrifugal force and to thereby separate them from the ingested air; and

exhaust means (94,183,227,228,242,252,268) operatively associated with said annular housing means (78,150,194,236,246,260) for enabling the coalescing liquid droplets and dust and dirt particulates within

said interior area of said annular housing means to be expelled therefrom as the coalescing liquid droplets and dust and dirt particulates are forced radially outward by centrifugal force towards and through said exhaust means by rapid, axial rotation of said annular housing means,

said method comprising ...".

Claim 1 of the second auxiliary request has essentially the same wording as claim 1 as granted (reference numerals 146, 150, 174, 183, 190, 194, 226, 227, 228, 236, 240, 242, 246, 250, 252 have been deleted), but with the following features being appended to it:

"... wherein said intake and said exhaust means comprise between about 40 and 110 slot-like cut-outs (92,264) disposed circumferentially around a slightly conical side portion (86) of said annular housing means (78,260), each slot-like cut-out (92,264) having a width (144) in the circumferential direction and a depth (142) in the radial direction and extending linearly in a plane containing said vertical axis, the depth (142) of each slot-like cut-out (92,264) being about two to three times as great as its width (144) measured at the exterior of the slightly conical side portion, a lower portion (96,266) of each said slot-like cut-out operating to allow an intake of the liquid droplets and dust and dirt particulates entrained to the ingested air, and an upper portion (94,268) of each said slot-like cut-out operating to allow exhaust of the liquid, dust and dirt particulates entrained in the intake air."

Claim 4 of the second auxiliary request is identical in

wording to claim 13 of the granted patent.

VIII. With letter dated 2 November 2001, appellant 02 rejected the respondent's arguments and commented on the report R4. With respect to the auxiliary requests, it raised objections concerning the lack of a supporting basis for some of the amendments carried out and concerning the clarity of the category of the independent process claims, and maintained its novelty objection. It also indicated that three further persons would be present at the oral proceedings, among them Mr Wirth, one of the authors of R2, to answer questions raised by the board, in particular concerning details and results of the appellant's experimental investigations.

IX. Oral proceedings were held on 28 November 2001 in the presence of appellant 02 and the respondent.

During the oral proceedings appellant 02 requested that Mr Wirth be allowed to speak in order to explain the physical phenomena that occur when a prior art separator is used. Pointing out that a copy of the above mentioned letter of appellant 02 only reached it two weeks before the oral proceedings, and referring to decisions G 4/95 (OJ EPO 1996, 412) and T 334/94 of 25 September 1997, the respondent requested that Mr Wirth should be refused to speak.

The board authorised both Mr Wirth and Mr Howie to speak. Moreover, both parties were given the opportunity to carry out demonstrations of the operation of various separators in liquid bath-type vacuum cleaners.

- X. The relevant submissions of appellant 02, as maintained and/or raised during the oral proceedings, can be summarised as follows:

Concerning independent apparatus claim 1 according to the main request and independent method claim 4 according to the first auxiliary request, it argued that they did not refer to any specific constructional features of the separator which were not already known from the prior art as illustrated by D2, D5, D6/D6* or D9, and in particular did not comprise any indications concerning the exact configuration of the slots. More particularly, D6* disclosed that dirt and water particles would be drawn into the separator and subsequently be separated by centrifugal forces. It pointed out that the respondent had not presented any technical arguments supporting its allegation that water droplets would not penetrate prior art separators although dust particles did. This allegation was in contradiction with basic laws of physics. Moreover, the experimental evidence presented in the course of the proceedings did demonstrate that all the effects mentioned in the independent claims, and in particular the intake of water droplets through the slots, would also implicitly occur upon use of the prior art separators having angled slots, such as the ones disclosed in D6*. Hence the claimed subject-matter lacked novelty.

Concerning the claims of the second auxiliary request, it argued that the feature "measured at the exterior" had not been disclosed in the application as filed. It argued that starting from D5 or D6 as closest prior art, the further features of the claimed subject-matter could be derived in an obvious manner from the

disclosures of D3 and D7.

- XI. During the oral proceedings, the respondent essentially argued as follows:

None of documents D2, D5, D6/D6* or D9 disclosed or suggested an intake of liquid droplets into the separator. According to these documents, such an intake of liquid droplets was to be avoided. Due to the shape of the slots, and in particular to the angled configuration of the slots of the prior art separators, drops of water would be directed downwards and back into the main water reservoir. According to the test report of Mr Harden, it can be concluded from the presence or absence of deposits of wet dust inside the separator whether coalescence and expulsion of wet particles does occur, or does not occur, in a given separator. The comparative tests and demonstrations did show that such a coalescence and wet dust expulsion did not occur in prior art separators with helical slots. Moreover, as shown by the ETL test report, a separator according to the invention led to superior filtration efficiencies. The separators according to claim 1 of the main request did thus differ from those known from the prior art by means of the indications concerning form and function of the housing, intake and exhaust means. Concerning method claim 4 according to the second auxiliary request, it submitted that even if the prior art was found to show separators suitable for use in such a process, it did not disclose the actual steps referred to in this claim.

- XII. Requests

With his notice of appeal, appellant 01 had requested

the cancellation of the decision of the opposition division and the rejection of the patent as a whole. He later "asked for the reimbursement of the appeal fees, for the part that is possibly reimbursable".

Appellant 02 requested that the decision under appeal be set aside and the patent be revoked.

The respondent requested that the appeal be dismissed and the patent be maintained as granted or, in the alternative, on the basis of any of the auxiliary requests 1 to 4 filed with letter of 17 October 2001.

Reasons for the Decision

1. The appeal of appellant 01

1.1 Subsequent to the filing of his notice of appeal and the payment of the appeal fee, appellant 01 (opponent I) decided not to submit a written statement of grounds. The appeal is therefore inadmissible pursuant to Article 108 EPC in conjunction with Rule 65(1) EPC.

1.2 Since no substantial procedural violation has occurred and/or been invoked, and since - in any case - the appeal was declared inadmissible, a refund of the entire appeal fee, or a part thereof, is not justified pursuant to Rule 67 EPC. This finding is in accordance with earlier case law, see e.g. Case Law of the Boards of Appeal of the EPO, 3rd edition, 1998, section VII-D, 15.1, p.511, 3rd and 4th paragraphs.

2. Procedural issues

2.1 Reports filed upon appeal/during the appeal proceedings

During the opposition procedure, the opponents had repeatedly argued (see e.g. the contested decision, reasons 3.2 and 3.4) that water droplets would inevitably penetrate the rotating prior art separators in the same way as according to the contested patent. The evidence and arguments submitted up to and during the oral proceedings before the opposition division however led the latter to the conclusion "that it had not been convincingly shown that water droplets can pass through the slots of prior art separators", see reasons 3.5 of the contested decision. The board considers the filing of the two reports R1 and R2 and the video-tape V1 as a further attempt of appellant 02 to demonstrate, by means of experiments, the accuracy of his earlier arguments. The reports and the video-tape were thus filed in response to and in order to overcome some of the conclusions upon which the opposition division based its acknowledgment of the novelty of the claimed separators. For this reason, the board holds that they cannot be considered as being late filed. Moreover, since they both address the crucial issue of what happens within the separator, the board considered them as relevant. Hence, they were taken into consideration by the board, as were reports R3 and R4 filed by the respondent.

2.2 Oral submission by Mr Wirth as technical expert

2.2.1 Considering the particular circumstances of the present case, i.e.

- that no time limit for making further submissions was set by the board with the summons to oral

proceedings;

- that the respondent, although he was aware of the appearance of Mr Wirth at the oral proceedings two weeks in advance, did not take any immediate action in this respect, but only objected against the hearing of Mr Wirth at the beginning of the oral proceedings,
- that the respondent, when referring to the criteria (ii) and (iii) mentioned in headnote II.(b) of decision G 4/95, did not indicate any specific preparatory measure that had been rendered impossible or hindered by the relatively late presentation of Mr Wirth as technical expert, and
- that Mr Wirth was one of the authors of the report R2, that the board had raised some questions having regard to the physical phenomena occurring in the use of separators of the type in question in the annex to the summons to oral proceedings, that these phenomena, as well as the laws of physics involved, had already been discussed before the first instance (see e.g. the minutes of the oral proceedings before the opposition division item 3.1 and the contested decision, reason 3.3, last paragraph),

the board holds that the request to hear Mr Wirth had been submitted sufficiently in advance of the oral proceedings by appellant 02, and that the respondent had been able "properly to prepare" himself "in relation to the oral submissions" by Mr Wirth, including explanations concerning the physical

phenomena occurring in prior art separators as tested in R2, in the sense of G 4/95, order, item (3)(b)(ii). This view cannot be altered by the fact that another board, in a different case (T 334/94) and without a specific justification (obiter dictum), considered a period of one month to represent a minimum for naming a technical expert to be heard at oral proceedings. Consequently, there was no need to establish whether or not "exceptional circumstances" as referred to in G 4/95, order, item (3)(b)(iii), had occurred. Hence, the board authorised Mr Wirth to speak about specific questions related to the functioning of the prior art separators.

- 2.2.2 The question of what happened in prior art separators (intake of droplets, coalescence, expulsion of coalesced matter) had been one of the key issues during the entire proceedings up to the oral proceedings before the board. The laws of physics had already been invoked before the opposition division. Appellant 02 always argued along the line that these phenomena would also occur during the use of the prior art separators. Oral explanations, based on the laws of physics, for earlier statements and for the results obtained according to reports could thus have been reasonably expected by the respondent. During the oral proceedings, the respondent had ample opportunity to present comments concerning the contents of the oral submission of Mr Wirth. The representative of the respondent, who was assisted by his own technical expert, did not object to the accuracy of the technical contents of this submission. Neither did he argue that he was taken by surprise by it. Hence, the admission of Mr Wirth's oral submission is in line with the

considerations as developed in G 4/95, reasons 10, the four first paragraphs, and the requirement of Article 113(1) EPC was complied with.

3. *Main request - Claim 1 - Lack of novelty*

3.1 D6 undisputedly discloses a separator for liquid bath-type vacuum cleaners which comprises a generally annular cup-like housing. The generally cylindrical side wall of the separator is slightly conical and comprises slots for intaking air which are thus operatively associated with the housing and slanted with respect to the planes comprising the vertical axis of the separator. In operation, the air flow enters the interior of the separator by passing through the slots. The separator is rapidly rotated about its vertical axis and acts "to remove water droplets entrained in the air by centrifugal water separation action". See in particular Figures 1 and 2, reference numbers 76 and 77, column 3, lines 52 to 54 and column 5, lines 42 to 57.

3.2 D6 is silent about the intake - into the separator - of any small dust and dirt particles or water droplets. The board shares the view of the respondent that the passages of corresponding document D6* (column 8, lines 22 to 26) quoted by the appellant do **not** explicitly disclose the intake of water droplets into the separator and their separation from the air stream **within** the separator. Neither do these passages explicitly disclose that the separation of the water droplets takes place exclusively at the outer surface of the separator. The respondent argued that D6 did not clearly and unambiguously disclose the combined form and function of the inlet and exhaust means as

specified in claim 1.

3.3 In order to assess the **implicit** disclosure of D6 the following questions need to be answered:

- (i) Does a prior art separator as disclosed in D6 allow the intake of water droplets along with dust and dirt particles when in operation?
- (ii) If yes, do the ingested droplets and fine dust particles coalesce within the separator?
- (iii) If yes, are the coalesced water and solids expelled from the separator by centrifugal forces?

3.3.1 Ad question (i) - Intake of droplets and particles

The slots in the separator according to D6 are provided for ingesting an air stream into the separator when the latter is in operation in a vacuum cleaner. It was not disputed that upon use of prior art separators of the type disclosed in e.g. D6, some fine dust particles always reach the interior of the rotating separator. In fact the penetration of these fine particles into the known separators, and their subsequent release to the atmosphere, were identified as a known problem associated with the prior art separators, see the contested patent, column 1, lines 38 to 53. Moreover, the tests carried out by the respondent confirm the penetration of fine dust into known separators and their deposition on the inner wall of the separators, see e.g. R4, page 4, items "Results 1." and "Results 2." and page 5, item "Conclusions 1.". Considering that small size **solid** particles enter the interior of the

separator, the board agrees with appellant 02 in that no reasons are immediately apparent to a skilled person, why **water** droplets of a roughly similar size/mass would **not** be drawn into the separator. According to general principles of physics there is every reason to believe that water droplets of a size/mass similar to the size/mass of the ingested dust particles would indeed penetrate the rotating separator as well. During the entire proceedings, up to and including the oral proceedings before the board, the respondent has not presented any technical explanation why water and dust particles should behave differently in this respect. Nor did it provide experimental evidence convincingly showing that small-sized water droplets, in contrast to small-sized dust particles, would not be drawn into the prior art separators. Referring to the results of demonstrations concerning the use of clean prior art separators with angled slots carried out both before the opposition division and the board (see e.g. the minutes oral proceedings before opposition division, item 3.2), the respondent argued that since no water was visible within these separators at the end of the tests conducted, water droplets did not penetrate the rotating separators. As pointed out by appellant 02, there are, however, other possible explanations for the absence of visible humidity. The very small size of the water droplets deposited and the duration of the test, and hence the amount of dust and water deposited, may have an influence on the observed results. Concerning the humidity visible on the inner side of "dirty" prior art separators at the end of the tests carried out before the board, the respondent argued that in view of the specky, rather than even appearance of the humidity observed, the latter was possibly due to condensation of water vapour, to

splashing of water during the running up to speed of the separator, or to the manipulation of the separator at the end of the test. In view of the contradictory interpretations of the results of the comparative tests and demonstrations, and considering the large number of experimental conditions that would need to be controlled (e.g. duration of the test, rotational speed, material of the separator, size and shape of the slots, type of dust, composition of bath liquid, manipulations of the separator, etc.) in order to obtain conclusive experimental results, the board cannot accept the results of the mentioned tests, carried out with specific separators under specific conditions of use, as a conclusive proof for the non-entrance of water into a given separator. On the other hand, R2 appears to confirm in a more direct way that very small water droplets may enter a rotating separator through angled slots in the same way as through axial slots, see pages 3 to 5, item "Versuche mit Laborluft und Aerosol". The respondent also repeatedly pointed out that the slots of the prior art separators were inclined in order to impart a downward oriented motion to the droplets colliding with its external surface, thereby hindering their entrance into its interior. Although this is certainly the case as far as larger drops and particles are concerned, this measure cannot be considered to exclude the intake of small sized droplets and particles. Hence, in view of the available facts and evidence, the board concludes that, during the conventional use of prior art separators such as the one disclosed in D6 in water bath-type vacuum cleaners, the angled slots inevitably allow the passage of fine water droplets, together with dust particles of a roughly similar size/mass, into the interior of the separator. Considering that angled

slots are not explicitly excluded by the present wording of claim 1, the slots of the separator known from D6 have to be considered as intake means suitable for performing the function indicated in claim 1, i.e. enabling dust and dirt particles as well as liquid droplets entrained in ingested air to be drawn into an interior area of said annular housing means.

3.3.2 Ad question (ii) - Coalescence of particles and droplets

As can be taken from the contested patent, and as was confirmed by Mr Wirth during the oral proceedings, once the dust particles and the liquid droplets reach the interior of the claimed separator, they will, as a consequence, collide and coalesce. The coalescence is brought about by the rapidly rotating air mass within the separator, and is promoted by the movement of the ingested particles and droplets towards the axis of the separator. See in particular column 10, line 58 to column 11, line 11 of the patent in suit. Considering that the separators of D6 allow the intake of dust particles and droplets (see item 3.3.1), and considering that their construction is similar to the one of the claimed separators insofar as they have a generally annular side wall, they will inevitably allow the coalescence of the particles and droplets in their interior, at least to a certain, possibly small degree. No reason can be seen for which such a coalescence would not happen within the separators disclosed in D6. In R4 and during the oral proceedings, the respondent submitted that the occurrence of coalescence within the separator is to be established by a test involving taking a clean separator and sucking in dry dust. If, after a certain time, deposits of evenly wetted dust

could be observed near an outlet region of the separator, then the occurrence of coalescence would be established. The demonstrations carried out with prior art separators undisputedly showed that fine dust penetrated and was precipitated on the inner side of the separator. The board concludes that the same must happen with the ingested water droplets of comparable mass/size. For the reasons given under item i) above, the board is not convinced that the demonstrations carried out by the respondent provide sufficient evidence to exclude the occurrence of coalescence upon use of the prior art separators. The reference, in claim 1, to coalescence can thus not be considered to imply any specific constructional limitation in comparison to a separator as disclosed in D6.

3.3.3 Question (iii) - Expulsion of separated solids/liquids

According to the contested patent, the coalesced particles and droplets having an increased mass-to-surface ratio will be precipitated towards the inner separator wall portion due to the centrifugal forces generated therein, which increase towards the upper part of the separator due to the increasing diameter of the conical circumferential wall and the use of a spider. See in particular column 11, lines 11 to 41. Since during the use of the slightly conical separators of the type disclosed in D6 small-sized dust have been shown to be deposited on the interior separator wall, droplets of a similar size/mass, as well as coalesced solid/liquid particles of a similar or greater size/mass, will inevitably also be deposited there. The board also notes that according to D6 (see Figure 1 and 5), a spider is also used in conjunction with the separator. Once deposits of the coalesced matter are

deposited on the slots, see e.g. the drawing on page 9 of R4, at least parts thereof will inevitably be thrown back, by centrifugal forces, to the region outside of the separator. Hence, the angled slots disclosed in D6 are to be considered as exhaust means suitable for expelling the coalesced matter back into the region outside of the separator.

3.4 Summarising, the constructional features of the separator referred to in claim 1, which does not exclude angled slots, are all disclosed in D6. For the reasons given above, the further functional definitions of the housing, intake and exhaust means have to be considered as being inherently and inevitably met by the separators disclosed in D6. Hence, the said functional definitions cannot establish any further constructional differences of the claimed separator in comparison to the separator of D6.

3.5 The subject-matter of claim 1 not being novel (Articles 52(1)(2) and 54(1)(2) EPC) in view of the implicit disclosure of D6, the main request is not allowable.

4. *First auxiliary request - Claim 4*

4.1 Amendments

4.1.1 Amended method claim 4 according to this request results from the incorporation of all the features of the separator according to claim 1 as granted into method claim 13 as granted. Since claim 13 as granted comprised a general back-reference to any of the (granted) separator claims, the requirements of Articles 123(2) and (3) EPC are met as far as this

claim is concerned.

- 4.1.2 During the oral proceedings, appellant 02 did not uphold his objection as to the clarity of the category of claim 4. The board considers claim 4 to be clearly directed to a method defined by method features, the method making use of the specific apparatus defined by means of constructional and functional features in the first part of the claim (Article 84 EPC).
- 4.2 Claim 4 thus relates to the use of the separator of claim 1 as granted, which lacks novelty in view of D6, see item 3. here above. D6 undisputedly discloses a method for removing dust and dirt particulates from an air stream sucked through a liquid bath-type vacuum cleaner, comprising providing a liquid source and axially rotating the separator, ingesting the air stream into the rotating separator and expelling a relatively clean air mass from the separator. D6 is silent about intake of droplets, their coalescence with ingested fine dust particles, and the expulsion of coalesced matter from the separator.
- 4.3 During the oral proceedings, the respondent, when questioned by the board, stated that the claimed method encompassed the conventional use of the particular separators referred to in a conventional liquid bath type vacuum cleaner. Hence it remains to be seen whether the phenomena addressed as process steps in claim 4 also occur during the conventional use of the separators known from D6 in conventional liquid bath vacuum cleaners, so that they would have to be considered as being implicitly disclosed by D6. During its passage through the liquid bath, the air stream will entrain larger droplets of liquid, which will be

rejected by the rotating separator. According to the contested patent (column 10, lines 41 to 56), a portion of these larger droplets will inevitably be broken down into smaller ones upon their impact on the outside of the rotating separator. The respondent did not submit convincing technical reasons for which this breaking down into smaller droplets would not occur, at the high rotational speeds involved, with angled slots having the cross-section shown in Figure 2 of D6. As mentioned under item 3. above, some fine solid and liquid particles will inevitably enter the interior of the separator disclosed in D6, together with the air stream. Due to the rapid rotation of the separator, the ingested air stream also rotates in the interior thereof, which rotation is further increased by the vanes of the spider shown in Figures 1 and 5 of D6. According to the laws of physics, centrifugal forces are generated, which increase towards the upper part of the separator (larger diameter of separator, effect of spider) and lead to the coalescence and precipitation of the ingested solid and liquid particles on the inner wall of the separator, at least to a certain degree. Once deposits of the coalesced matter are deposited on the slots, see e.g. the drawing on page 5 of R4, and operation is continued, at least parts thereof will inevitably eventually be thrown back to the region outside of the separator. Consequently, the air mass leaving the separator will be relatively cleaner than the air entering the separator.

Hence the board concludes that during conventional operation of the known separators in a conventional liquid bath-type vacuum cleaner all of the phenomena referred to in method claim 4 will inevitably occur.

4.5 The subject-matter of claim 4 not being novel (Articles 52(1) and 54(1) EPC) in view of the implicit disclosure of D6, the first auxiliary request is not allowable either.

5. *Second auxiliary request*

5.1 Amendments

Claim 1 as granted has been amended by incorporating features of dependent claim 2 as granted and features taken from the description, and by the removal of some of the reference numerals previously present. The only objection to the amended claims under Article 123(2) EPC maintained by the appellant during the oral proceedings concerned the feature "... the depth of each slot-like cut-out being about two to three times as great as its width **measured at the exterior** of ...".

5.1.1 The board considers the amendments to claim 1 to be sufficiently based on the patent as granted (and the application as filed). More particularly, the amendments are based

(i) on claim 2 of the patent as granted (and of the application as filed), which mentions the arrangement of the plurality of slot-like cut-outs and their dual function as intake and exhaust means;

(ii) on Figures 1 to 4, 13 and 14 of the patent as granted (and of the application as filed), which illustrate embodiments of the particular separator now claimed;

- (iii) on column 8, lines 28 to 45 of the granted patent (page 10, lines 18 to 33 of the application as filed), where the vertical orientation of the slots and their dual function (lower portion acting as intake means, upper portion acting as exhaust means) is described in connection with Figure 2; and

- (iv) on column 12, line 41 to column 13, line 13 of the granted patent (page 16, lines 1 to 28 of the application as filed), where the number of slots and the width to depth ratio now referred to in claim 1 are addressed in connection with Figure 4 as leading to a separator with well balanced properties. The description does not mention the feature "measured at the exterior". However, the board accepts the respondent's argument according to which Figure 4 shows that the width of the slot-like cut-out is to be measured at the outer circumference of the separator, and thus provides a sufficient basis for supporting the amendment objected to by the appellant.

The wording of the dependent claims 2 and 3 and of the independent method claim 4 is essentially identical with the one of claims 3, 4 and 13 as granted, respectively. By means of the back-reference to the restricted separator claim 1, independent method claim 4 is now also narrower in scope.

Hence, the board is satisfied that the amendments fulfill the requirements of Articles 123(2) and (3) EPC.

5.1.2 During the oral proceedings, appellant 02 did not uphold his objection as to the clarity of the category of claim 4. The board considers claim 4 to be clearly directed to a method defined by method features, the method making use of the specific apparatus as defined in any of the preceding apparatus claims.

5.2 Sufficiency of disclosure

During the appeal proceedings, appellant 02 did not raise any objections under Article 100(b) EPC. The board, in view of the considerations under item 3. here above, and in agreement with the contested decision (see reasons 2.1 and 2.2), is also satisfied that the requirement of sufficiency of disclosure is met.

5.3 Novelty - Separator claim 1

The board is satisfied that the subject-matter of claim 1 is novel (Articles 52(1) and 54(1) EPC). Novelty of the claimed separator was not contested. The board is also convinced that the prior art cited during the opposition and appeal proceedings does not disclose separators with all the features comprised in present claim 1. The differences between the prior art separators and the claimed separators will become apparent from the following discussion of inventive step.

5.4 Inventive step - Separator claim 1

During the oral proceedings, appellant 2 argued that, taking the separators disclosed in either D6 or D5 as a starting point, an axial arrangement of the slots was a minor and obvious modification of these separators in

view of D3.

5.4.1 In agreement with the appellant, the board considers separators of the type disclosed in - inter alia - documents D5, D6, D6*, but also in D7, a patent granted on a divisional application of D6, to represent the closest prior art for the purpose of assessing inventive step. The slots of the separators disclosed in these documents are always inclined with respect to the axis of the separators, see Figure 1 of D5, reference signs 26, 104 and 105, and the respective Figures 1 of each of D6, D6* and D7, reference signs 76 and 77.

5.4.2 Irrespective of whether an improvement in separation efficiency, attributable to the differences of the claimed separator in comparison to the closest prior art separators, is actually obtained upon use of the claimed separators, the technical problem to be solved can be seen in the provision of a further separator suitable for the intended purpose, i.e. for use in a liquid bath-type air filtration device. The suitability of the claimed separators for the intended purpose is immediately apparent and has not been disputed by appellant 02. It is thus credible that the stated technical problem has been solved by the claimed separator. Hence, it remains to be seen whether a separator with all the features of claim 1 is rendered obvious by the prior art.

5.4.3 D5, D6, D6* and D7 do not disclose or suggest slot orientations which differ from the ones shown in the figures. D5 explicitly mentions that upon rotation, such separators direct the dirt and dust particles into the liquid bath underneath it, while drawing in the

air, see column 5, lines 24 to 27 and column 7, lines 3 to 6. Referring to Figure 1 and column 2, line 34 of D3, the appellant 02 argued that since this document disclosed slots which were only "slightly" inclined, the skilled person could gather from it the possibility to make the minor modification of arranging the slots axially. The board cannot accept this argument, considering that the inclined arrangement of the slots in the separators shown in D3 has the dedicated purpose of imparting a downward movement to the matter rejected by the rotating separator, see D3, column 2, lines 33 to 37. Moreover, the inclination of the slots as disclosed in the schematic Figure 1 of D3 does not substantially differ from the inclinations shown in D5, D6/D6* and D7.

5.4.4 It appears from the other documents cited that separators for use in liquid bath type vacuum cleaners have always, and for more than fifty years, been provided with slots angled in order to direct particles separated from the ingested air stream downward, back into the water bath. See e.g. D1 (from 1940) Figure 1, reference 32, D2 (from 1960), Figure 1, reference 56, D4 (from 1987), Figure 1, references 26, 104 and 105, and column 5, lines 23 to 26, D8 (from 1941), Figure 1, reference 60, and D9 (from 1937), Figure 1, reference 32. Different modifications of cross-section of the slots have been proposed in the course of the years, see e.g. D5, Figure 1 and column 5, lines 6 to 8, D6, Figure 2, D8, Figure 8 and page 3, left-hand column, lines 62 to 65, and D9, page 2, right-hand column, lines 63 to 71. However, none of the documents relating to separators for the particular use envisaged suggests the modification of the inclination of the separator slots. Therefore, the board holds that giving up the

recommended and reliable angled arrangement of the slots is an option that the skilled person, confronted with the stated technical problem, would not have considered.

5.4.5 The board is convinced, and it was not disputed, that the remaining prior art on file does not come closer to the invention and does not contain any more relevant information.

5.4.6 The board therefore holds that the skilled person, trying to provide a further such separator, got no indication from the prior art to try an axial arrangement of the slots. Rather, there were good reasons not to do this. Therefore, the subject-matter of claim 1 is based on an inventive step (Articles 52(1) and 56 EPC).

5.5 Since the separator according to claim 1 is novel and inventive, the more specific separators according to dependent claims 2 and 3 are also novel and inventive. By means of the back-reference to the preceding claims, claim 4 is directed to the use of a novel and inventive separator with all the features of at least of claim 1. Consequently, the method according to claim 4 is also novel and inventive (Articles 52(1) and 56 EPC).

6. Description and drawings to be adapted

The respondent did not submit a description and drawings adapted to the restricted claims according to the second auxiliary request. In particular, it appears that some of the figures, and the corresponding parts of the description, relate to separators no longer falling under claim 1 due to differences in terms of

the slots. The board also notes that the respondent has removed some reference numerals from claim 1, e.g. reference signs 146 and 190, but not from claim 4, which however refers back to claim 1. In the view of the board, a deletion of the excess reference numerals from claim 4 would not have to be regarded as an amendment, but merely as an obvious correction under Rule 88 EPC.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the first instance with the order to maintain the patent with the following documents:
 - claims 1 to 4 according to the second auxiliary request,
 - description and drawings to be adapted accordingly.

The appeal of appellant 01 is declared inadmissible. His request for reimbursement of the appeal fee is rejected.

The Registrar:

The Chairman:

P. Martorana

R. Spangenberg