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D E C I S I O N
of 24 October 2003

Case Number: T 0528/99 - 3.3.5

Application Number: 91112781.9

Publication Number: 0470485

IPC: B01D 29/11

Language of the proceedings: EN

Title of invention:
A filter

Patentee:
PALL CORPORATION

Opponent:
MAHLE Filtersysteme GmbH

Headword:
Filter/PALL

Relevant legal provisions:
EPC Art. 56

Keyword:
"Prior use: not convincingly established to the alleged extent"
"Common general acknowledge: not proven"
"Inventive step: yes"

Decisions cited:
-

Catchword:
-

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Case Number: T 0528/99 - 3.3.5

D E C I S I O N
of the Technical Board of Appeal 3.3.5
of 24 October 2003

Appellant: (Opponent)	MAHLE Filtersysteme GmbH Pragstr. 54 D-70376 Stuttgart (DE)
Representative:	Pfusch, Volker, Dipl.-Ing. Patentanwalts-Partnerschaft Rotermund + Pfusch Waiblinger Strase 11 D-70372 Stuttgart (DE)
Respondent: (Proprietor of the patent)	PALL CORPORATION 30 Sea Cliff Avenue Glen Cove New York 11542 (US)
Representative:	Hoeger, Stellrecht & Partner Uhlandstrasse 14 c D-70182 Stuttgart (DE)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted 26 March 1999 concerning maintenance of European patent No. 0470485 in amended form.**

Composition of the Board:

Chairman: M. M. Eberhard
Members: B. P. Czech
H. Preglau

Summary of Facts and Submissions

I. The appeal is from the decision of the opposition division dated 26 March 1999 concerning the maintenance of European patent No. 0 470 485 in amended form.

II. The decision was based on the amended set of claims 1 to 27 filed with the letter dated 12 June 1998. The sole independent claim thereof reads as follows (features amended during the opposition proceedings appear in **bold**):

"1. A filter having a pleated filter element including longitudinally extending pleats with peaks and a wrap member wrapped around the filter element and joined to the peaks of the pleats,
the filter being characterized by a wrap member comprising one or more strips of material **spirally wrapped around the filter element** and the total area of the openings in the strips and/or between them being less than about one-half of the total area of the surface of the whole tubular envelope defined by the peaks of the pleats".

III. In support of an alleged prior use, the opponent had offered the hearing of a witness (Mr Lenzen) and relied on the following further evidence:

E9-1: Technical drawing "782 970 8", date of first version: 30.03.1984

E9-2: Technical drawing "128 119 5", date of first version: 23.8.1977

E9-3: Technical drawing "M2692", undated

E10-1: Technical drawing numbered "124 037 3" and "0 647/2-100M1 WZ", date of first version: 7.1.80

E10-2: Technical drawing with crossed out numbers, "124 037 3" and "0 647/2-100M1 AZ", date of first version: 7.1.80

E10-3: Technical drawing "0 647/2-100M1 AZ", date of first version: 12.08.1975

E11-1: Technical drawing numbered "124 037 3", and "AF20/2 - 040 WZ", date of first version: 12.1.94

E11-2: Technical drawing numbered "124 037 3", and "AF20/2 - 040 AZ", date of first version: 16.3.1995, and

E12: "Lieferabruf" of Daimler-Benz AG dated 31.07.1978.

The opponent also cited nine patent publications, including the following, which are discussed in detail in the impugned decision:

E1: US-A-3 306 794,

E5: EP-A-0 083 789,

E7: GB-A-1 513 263, and

E13: EP-A-0 335 571.

IV. Concerning the alleged prior use, the opposition division came to the conclusion that filters as shown in E10-3 had been made available to the public by the deliveries referred to in E12. Moreover, the opposition division accepted that the small openings in the wrap were drawn to scale in E10-3 and that, consequently, the wrap represented in the drawing met the requirement concerning the total area of the openings as defined in claim 1. It considered the claimed filter to differ from the ones according to E12/E10-3 at least with regard to the spiral wrap. Concerning inventive step, it came to the conclusion that the claimed filters were not obvious in view of the prior art relied upon by the opponent. In particular, E13 did not disclose any openings of the wrap in the sense of the contested patent.

V. In its statement setting out the grounds of appeal, the appellant (opponent) contested the findings of the opposition division and maintained that the claimed subject-matter lacked an inventive step in view of the prior use documented by E12/E10-3 and documents E13 and E5. In a further written submission, the appellant again offered the hearing of Mr Lenzen as a witness and commented on the meaning of certain terms used in claim 1 and on the evidence concerning the prior use. With its submission dated 3 September 2003, it filed a summary of the facts to be proven by the hearing of the witness, four sheets of photocopies of filter elements OX32 and AF85, and copies of dictionary extracts. In a further submission, it additionally attacked inventive

step on the basis of combinations of documents E1, E13 and E7 and filed print-outs of online dictionaries, as well as a copy of a document cited in E13, namely E14: US-A-4 594 202.

VI. In its replies, the respondent (proprietor of the patent) submitted that the appellant had failed to prove a prior use and that the claimed filter was not obvious in view of documents E1, E5 and E13.

VII. The parties were summoned to oral proceedings. In a subsequent communication, the board invited the appellant to arrange for the witness to appear at the oral proceedings for a possible hearing.

VIII. The oral proceedings took place on 23 and 24 October 2003. On 23 October 2003, the respondent filed an amended set of claims as an auxiliary request. Inventive step was discussed based on either E13 or the alleged prior use as closest prior art. After deliberation, the board announced its decision that evidence should be taken from Mr Lenzen as a witness. Concerning details of the testimony of the witness, reference is made to the corresponding minutes. On 24 October 2003, the alleged prior use was further discussed in the light of the testimony of the witness. The final discussion concerning inventive step was based on approaches starting from E1, E5 or E13 as closest prior art and taking E7 into consideration.

IX. The written and oral submissions of the parties, as far as they are relevant for the present decision, can be summarised as follows:

Concerning the prior use, the appellant essentially submitted that E12 referred to deliveries of 2711 filters "AF 20/2" with part number "403 184 00 25" that had taken place in 1978. As credibly confirmed by the witness, who had no personal interest in the outcome of the case, the filters delivered were of the type shown in drawing E10-3, which also referred to filters "AF20/2" and part number "403 184 00 25". Although there was no direct link in E10-3 towards the hole pattern shown in E9-2, it was clear from the consistent and convincing testimony of the witness that the wrapper of the delivered filters had a hole pattern as shown e.g. in E9-2, which was the usual pattern at the time of the deliveries. The later drawings E10-1, E10-2, E11-1 and E11-2 were in agreement with the witness' statements concerning the provision of wrappers covering almost the entire length of the pleats, and could thus be considered as indications that no shortening of the wrap member had been carried out in the time span from the date of the last amendment mentioned on E10-3 and the deliveries according to E12. The filters delivered according to E12 thus had a wrap member provided with the hole pattern shown in E9-2 and which covered the entire length of the pleats. Hence, the sole feature missing in the delivered filters was the provision of a spiral wrap, which was however obvious in view of E5, E7 and/or E13. The appellant argued that the claimed filter was obvious in view of E13 taken as closest prior art. The wrap materials disclosed in E13, and in particular the "open net" materials mentioned therein, could be assumed to have mesh sizes of 1 to 2 mm, and met the requirement concerning the total area of the openings as defined in claim 1. Replacing the filter media specifically

disclosed in E13 by pleated media was an obvious measure in view of the fact that annular pleated filter elements were generally known, e.g. from E1. Starting from E1 as closest prior art, the figures of which already hinted at total opening areas lying within the claimed range, the provision of a spiral wrap was obvious in view of the economically advantageous and generally known spiral wrapping techniques, as disclosed e.g. in E7, E5 and/or E13. The use of wrappers with a hole pattern having a total area of the openings as defined in claim 1 was generally known, e.g. from the prior-used filter elements, for the purpose of obtaining a good flow distribution. A hole pattern with the claimed total area of openings was also necessary from the point of view of the strength of the perforated material. Starting from E5 as closest prior art, the provision of a spiral wrap with smaller gaps between the windings was an obvious measure in order to obtain the known advantageous flow distribution.

The respondent accepted that E12 showed that filters had been delivered, but argued that the alleged presence of some features of these filters had not been convincingly demonstrated. In particular, it emphasised that there was no unambiguous link between E12 and E10-3 and between E10-3 and E9-2. It had not been shown that the filters actually delivered met the requirement concerning the total area of the openings as defined in claim 1 and that the peaks of the pleats were joined to the wrap member. Moreover, it had not been established that the filters delivered had not been modified in comparison to the ones shown in E10-3 in the time span between the date of the drawing E10-3 (final version) and the deliveries. E10-3 referred to several

modifications of the length of the wrapper and showed traces of an early version with a very short wrapper. In this connection, the respondent pointed out that according to E10-1, E10-2, E11-1 and E11-2 the filters "AF 20/2" had been further modified after the date indicated in E12, that the witness had not excluded that further modifications had been carried out in agreement with the client, and that filters with short wrappers (OX32) had been produced even after the said date. Hence, even taking into account the witness' testimony, it had not been convincingly established that the filters actually delivered according to E12 had a wrap of a length sufficient to ascertain that the requirement concerning the total area of the openings was met. The respondent also alleged that the witness might have a personal interest in the outcome of the case. Moreover, it did not accept that wrappers with a total area of the openings as claimed were generally known or suggested by the prior art. Concerning documents E1, E5, E7 and E13, the respondent inter alia submitted that none of these documents addressed the issue of the flow distribution along the filter element length. No teaching concerning a particular total area of the openings could be gathered from E1. E5 taught away from the claimed total area of the openings and E13 did not disclose pleated filter media or any wrap openings in the sense of claim 1, let alone a specific total area of the openings. E7 did not concern a wrap member and was therefore irrelevant. Hence, starting from any of these documents, it was not obvious to provide a wrapper with a total area of the openings as required by claim 1 to obtain thereby a filter with an improved flow distribution and hence an improved dirt capacity.

X. The appellant requested that the decision under appeal be set aside and that the patent be revoked. As an auxiliary request, in case the board were to doubt the credibility of the witness, it requested that the witness be heard on oath.

The respondent requested, as a main request, that the appeal be dismissed. As an auxiliary request, it requested that the decision under appeal be set aside and that the patent be maintained on the basis of the set of claims filed during the oral proceedings on 23 October 2003.

Reasons for the Decision

1. *Construction of claim 1 (main request)*

1.1 The parties agreed that the expression "a wrap member wrapped around the filter element and joined to the peaks of the pleats" does not necessarily imply that the wrap member and the pleats are actually bonded to each other.

1.2 Figure 8 and the passage on page 8, lines 47 to 54, of the patent in suit concern an embodiment wherein a spiral wrap without gaps is formed from a mesh material. In the quoted passage it is clearly stated that the mesh openings of such a wrap member are to be considered as openings in the sense of the claimed invention.

2. *Novelty*

2.1 The novelty of the claimed subject-matter has not been contested by the appellant. The board is also convinced that neither the filters according to the alleged prior use nor any of the filters disclosed in the prior art documents relied upon by the appellant show all the features of claim 1 according to the main request.

2.2 However, the parties had diverging views concerning the disclosure of several features of present claim 1 by the filters according to the alleged prior use and by E13 respectively. The differences between these filters and the filter according to claim 1 emanate from the following analysis in points 3. and 4.

3. *The prior use*

3.1 Document E12

The board accepts that the request for delivery E12 shows that 2711 articles, referred to therein as "Papier-Hauptstromeinsatz AF 20/2", were delivered to Daimler-Benz AG in the period from January to July 1978: see the fields labelled "(29) Bezeichnung der Lieferung", "Datum", "Ab 1.1. des Jahres gelieferte Menge" and "Letzte Lieferung". E12 also refers to a part number "A 403 184 0025", see the field labelled "(28) Sachnummer (Teil-Nummer etc.)". The board is satisfied that by virtue of these deliveries without any confidentiality agreement, the said articles were made available to the public before the priority dates of the contested patent. This was not contested by the respondent. E12 does not contain any explicit

indications concerning the technical features of the articles delivered. Hence it remains to be seen whether the further evidence presented by the appellant is sufficient to establish beyond doubt that the articles actually delivered to Daimler-Benz AG according to E12 showed all those features alleged by the appellant to be present.

3.2 Document E10-3

E10-3 is undisputedly an offer drawing ("**A**ngebots-**Z**eichnung", see number "0 647/2-100M1 **AZ**") of an article referred to as "micro-star-Einsatz". The drawing shows a filter with a pleated paper filter element and a cylindrical wrap with holes, made of an unspecified material, see the partially cut-away elevation in the left upper part and the written indications below it. According to E10-3, the filter bears the sales designation "AF 20/2", and the part number "DB-Nr.4031840025", see the front view of the filter in the right upper part and the field "Verk.-Bez.".

3.2.1 E10-3 and E12 both refer to the same article designation ("AF 20/2") and part number ("403 184 00 25"). Therefore, in the board's view, it is plausible that E12 relates to the delivery of pleated paper filters comprising a wrap member having holes and surrounding the pleats. This finding is further supported by the fact that drawings E10-1, E10-2, E11-1 and E11-2 also refer to the same article designation and part number, and also relate to a pleated paper filter having a wrapper with holes. Furthermore, either of the two drawing numbers "124 037 3" and

"0647/2-100M1" appearing on E10-1 and E10-2 also appears on E10-3, E11-1 and E11-2.

3.2.2 However, the last change recorded on drawing E10-3 was carried out on 13 August 1976, i.e. about one and a half years before the deliveries referred to in E12, and the filters shown in the later drawings E10-1, E10-2, E11-1 and E11-2, all drawn up after the said deliveries (i.e. in 1980, 1980, 1994 and 1995 respectively), still bear the same designation "AF 20/2" and part number "403 184 00 25" although they have been modified. Under these circumstances, it remains to be seen which features can clearly be attributed to the filters delivered according to E12.

3.2.3 It was not disputed that E10-3 did not show a spiral wrap.

3.2.4 It can be derived from E10-3 that the wrap member with holes is arranged in close proximity to the outer circumference of the pleated paper filter medium, and can thus be considered to be "joined" to the peaks of the pleats, in the broadest technically meaningful sense of the term as used in claim 1, which does not further specify the purpose of this arrangement. The board thus accepts that the close proximity of the wrap and the peaks of the pleats as shown in E10-3 will, at least to some degree, restrain the movements of the pleats upon use of the filter.

3.2.5 It is indicated in E10-3 that the original version of the drawing of 12 August 1975 has subsequently been modified several times. More particularly, E10-3 refers to a modification "a", dated 16 December 1975, which

consisted in lengthening a previously shorter wrap ("langer Mantel war kurz"), and to a modification "c", dated 23 April 1976, which consisted in shortening the wrap again ("Mantel gekürzt"). The wrap member as shown in E10-3 is shorter than the pleated filter element, and there is an open gap between the ends of the wrap member and the end caps of the filter. The width of the gap and the length of the wrap member are not specified in E10-3. In this connection, the board also notes that the partially cut-away elevation shows marks obviously emanating from the erasure of certain lines of an earlier version of the drawing, wherein the wrapper was apparently substantially shorter than in its present version.

3.2.6 As expressly accepted by the appellant during the oral proceedings, drawing E10-3 is not suitable for deriving from it absolute measures concerning the diameter and relative distances of the openings in the wrap member, in particular since the dimensions of the holes as shown in the cut-away part are different from the dimensions of the holes as shown in the top view part, although according to the appellant all the holes must have the same size. Therefore, E10-3, taken alone, cannot be considered to disclose a specific total area of the openings, let alone a total area of the openings as defined in claim 1.

3.3 Document E9-2 is a drawing of a cylindrical tubular member made of perforated cardboard (see the field "Werkstoff") and labelled "Mantel", i.e. wrapper. Its original version was drawn up on 23 August 1977, thus more than one year after the date of the last amendment of E10-3. E9-2 indicates the diameter of the holes

(3.5 mm), as well as their relative distances (5 and 6 mm from centre to centre) in two orthogonal directions, i.e. the hole pattern.

3.3.1 According to the appellant, the ratio of the area of the holes to the area of the central part of the sheet shown in the figure labelled "Abwicklung", i.e. the part that can be assumed to be fully covered with the said hole pattern, can be calculated to be around 36.7%, this percentage being even lower in the finished cylindrical member due to the overlapping non-perforated border parts shown in the figure labelled "geklebt".

3.3.2 However, since there is no direct connection between the drawings E10-3 and E9-2 in terms of the indicated numbers, designations, measurements or wrap material, and since E9-2 was drawn up later than E10-3, the former cannot, taken alone, prove that the wrap member of the filter elements shown in E10-3, and hence of the filter elements allegedly delivered according to E12 had such a hole pattern.

3.4 The testimony of the witness Mr Lenzen

3.4.1 In the board's view, the mere fact that Mr Lenzen was an employee of Knecht Filterwerke GmbH, i.e. the company that filed the opposition to the patent in suit in the first place, and as such had been involved in development and patent-related activities, is not sufficient to question his credibility in the sense that he might be personally, although not financially, interested in the outcome of the case, as submitted by the respondent. In this context, the board observes

that the notice of opposition was filed by the present appellant's representative on 30 June 1997, i.e. in the year of Mr Lenzen's retirement, and there is no evidence that the witness had been personally involved in the preparation of the opposition against the patent in suit. In any case, even if the witness had participated therein, it is unlikely that about six years after his retirement he might have a personal interest in the outcome of the present case. Furthermore, the testimony of the witness did not contain anything that would cast doubts on its credibility.

3.4.2 According to the witness' testimony, the delivered filters referred to in E12 had a wrapper with the hole pattern shown in E9-2. At the relevant time (i.e. 1975 to 1978) the witness was in charge of product development in co-operation with customers such as Daimler-Benz A.G., the company which issued E12. He remembered a punching machine located in the factory in Lorch, on which the paper sheets for the wrappers were punched with the said hole pattern around the clock (see minutes, page 2, third paragraph, and page 1 to page 2, first paragraph). The hole pattern of the wraps used in the liquid filters produced had never been changed and the question of modifying this pattern had never arisen. Possible modifications to the filters occurred in the relevant period but never affected the hole pattern, see minutes, page 4, last paragraph, and page 3, third paragraph.

3.4.3 Considering the task and function the witness had in the company that produced the filters delivered to Daimler-Benz, the board does not doubt that he would

have been aware of changes affecting the hole patterns in the wrappers. The witness could remember that the hole pattern used for the wrappers of liquid filtering elements was never changed or questioned, and during his whole testimony his statements concerning the hole pattern were repeatedly clear, sure and consistent. For these reasons the witness' statement that the filters delivered according to E12 also included a wrapper with the hole pattern (hole diameter of 3.5 mm and hole distances of 5 and 6 mm from centre to centre) as shown in E9-2 is considered to be credible and convincing.

3.4.4 In the course of the hearing, the witness also stated that the filters delivered according to E12 were of the type shown in E10-3, see minutes page 2, third paragraph. Upon being asked by the board whether the filters actually delivered had long or short wraps, and how he could know the precise wrap length of the delivered filters, the witness stated that this could be derived from E12, and that all the filters had the same appearance (see minutes page 2, fourth paragraph, and page 3, first paragraph). The general aim was to cover, if possible, the entire length of the pleats and, in most cases, the wrappers extended up to the end-caps. The last amendment of the wrap length in E10-3, i.e. amendment "c", concerned the shortening of the wrap. The shortening "c" was carried out to avoid a penetration of the wrapper into the end-caps and its creasing, taking into account dimensional tolerances (see page 2, fourth and fifth paragraphs, and page 4, fourth paragraph).

3.4.5 On the other hand, confronted with the modified "AF 20/2" filters as shown in the later drawings E10-1 and E10-2, the witness could not rule out that further modifications had been carried out in agreement with the customer after the last modification (13.8.76) carried out in E10-3, except for the hole pattern, which always remained the same. The witness further indicated that a certain gap was indeed visible between the wrapper and the end-caps of the filter on drawing E10-3, but that no data was derivable from the drawing as to the width of this gap. The board observes in connection with the witness' statements about the length of the wrapper and/or the width of the said gap that E12 neither makes reference to drawing E10-3 (as already indicated above) nor contains any information from which these dimensions could be inferred. The witness' statements concerning the wrapper length and/or the gap width were less precise and consistent than those relating to the hole pattern. In particular, the witness could not exclude further modifications in the filters produced after August 1976 (date of the last amendment of E10-3) nor provide any precise data concerning the width of the gaps, if any, present in the filters. He himself not only acknowledged that no value was derivable from E10-3 but also that the wrappers did not always cover the pleats entirely (see minutes, page 3, third and fourth paragraphs, and page 2, fifth paragraph).

It is immediately apparent that, for a given filter element, the width of the gaps has an influence on the ratio of the total area of the openings (holes, perforations or gaps) to the total area of the surface of the whole tubular envelope defined by the peaks of

the pleats. The said ratio increases with an increase of the gap width.

3.5 According to the appellant's submission dated 3 September 2003, filters of type "OX 32" were produced in series in 1991, i.e. after the deliveries referred to in E12, and comprised wrappers still provided with the same hole pattern. The photocopies filed by the appellant further show that a substantial part of the length of the pleats is not covered by the wrapper.

3.6 From the above, and considering in particular

- that the length of the wrapper shown in E10-3 has been repeatedly varied,

- that neither the exact length of the wrapper nor the widths of the gaps between the wrapper and the end caps are indicated in E10-3,

- that the deliveries referred to in E12 took place about one and a half years after the last amendment of drawing E10-3,

- that the same designations "AF 20/2" and "403 184 00 25" were used for filters which had been modified several times after the date of the said deliveries,

- that further modifications, in accordance with the client's wishes, of the filter as shown in E10-3 were not ruled out by the witness,

- that an erased earlier version with a substantially shorter wrapper was still visible on E10-3,

- that despite the statements of the witness with respect to the general considerations concerning the desirable length of the wrappers (pleats to be fully covered in most cases), filters (e.g. the OX32 model) with substantially shorter wrappers than shown in E10-3 were still produced in series in 1991, and

- that the widths of the gaps indicated in drawings E10-1, E10-2, E11-1 and E11-2 are irrelevant since the latter have all been drawn up after the date indicated in E12,

the board concludes that the evidence on file, including the testimony of the witness, is not sufficient to establish beyond doubt that the filters delivered according to E12 necessarily had a wrap member long enough (or, in other words, gaps narrow enough), to result, in combination with its hole pattern, in a total area of the openings falling within the claimed range.

4. *Document E13*

4.1 E13 relates to a fluid-treatment element comprising a hollow permeable cartridge, preferably of a generally cylindrical shape, and a permeable wrap, see page 2, lines 1 to 7 and 25 to 26, and page 3, lines 25 to 27. The wrap is spirally wound around the cartridge, with the individual turns overlapping each other, and thus

completely covering the exterior surface of the cartridge, see page 2, lines to 43 to 48, and page 3, lines 56 to 57. The permeable wrap material may be a non-woven fibrous material, a ribbon of open net material or a woven material, see page 3, line 58, to page 4, line 1. The main purpose of the wrap is to mechanically stabilise the cartridge, see page 2, lines 8 to 24, and the examples, in particular page 7, lines 34 to 42, and page 8, lines 31 to 33. The cartridge comprises a fluid-treatment material, such as a filter medium, a demineraliser such as an ion-exchange resin, and/or a sorbent, see page 3, lines 21 to 25. Although the preferred fluid-treatment material is a single layer mass of non-woven microfibres free of fibre-to-fibre bonding, the cartridge may comprise any other suitable filter medium, multiple layers of a single filter medium, or multiple filter media, see claim 1, examples 1 to 5, and page 3, lines 28 to 37. E13 does not mention pleated annular filter media. These findings were not disputed.

4.2 E13 does not comprise explicit indications concerning the size of any openings in the permeable wrap materials or the total area thereof. The board can accept that in the case of a cartridge used for outside-in filtration, the wraps used would necessarily have openings of a size permitting the passage of a substantial amount of the particles to be filtered out by the filter medium. However, no particular ratio of the total area of such openings to the total cylindrical outer filter material surface can be inferred therefrom, since this ratio depends not only on the size of any openings in the material, but also on their relative spacing. In particular, the appellant

has not demonstrated that for an "open net material" having mesh openings in the order of 1 to 2 mm, the said ratio would necessarily have to be smaller than 50%.

4.3 Therefore, in the absence of any further supporting evidence, the board cannot accept the appellant's contested allegation that the spirally overlapping wraps made of the permeable materials mentioned in E13 would necessarily exhibit a total area of the openings falling within the range defined in claim 1 of the contested patent.

Inventive step

5. *Closest prior art*

5.1 Document E1 discloses a filter comprising an annular filter element (42) with longitudinal pleats (26; 63; 65). A foraminous sheet of material is wrapped around the peaks (35) of the pleats, with the two ends (45, 46) of the sheet overlapping and being glued together, thereby forming a cylindrical wrapper (44) covering the pleats along their entire length. The peaks (35) of the pleats are fixed to the surrounding perforated wrap member by adhesive bonding (38; 62, 64), and are thereby restrained in their movement. See in particular claim 1, Figures 1 to 3, 6, 7 and 9, and column 5, lines 31 to 62. E1 does not literally refer to the diameters of or the relative distances between the holes (44') provided along the wrap member. Moreover, Figures 1 and 9 of E1 are only of a schematic nature as far as the amount and arrangement of the holes are concerned. Hence, E1 cannot be considered to disclose a

specific teaching concerning the ratio of the total area of the openings to the surface of the wrap member (44). These findings were not in dispute.

5.2 The claimed filter thus differs from the one disclosed in E1 in that it comprises a spiral wrap member and has a total area of the openings as defined in claim 1.

5.3 Considering the constructional similarity of these two filters and the fact that E1, like the patent in suit, addresses the problem of a reduced surface area of the pleats available for filtration and thus a reduced dirt capacity resulting from movements of the pleats during operation of the filter, see column 1, lines 38 to 59, and column 2, lines 54 to 56, the board takes the view that E1 is to be regarded as the closest piece of prior art.

6. *Technical problem*

6.1 As acknowledged by the appellant at the oral proceedings the wrapper disclosed in E1 is disadvantageous, in comparison to a spiral wrap, in terms of the feed flow distribution obtained since the overlapping ends of the wrapping sheet block off the inflow of fluid towards the pleats located in that longitudinally extending region. Moreover, at the oral proceedings the appellant did not contest that the provision of a spiral wrap member having openings such that the total area of the openings as defined in claim 1 is less than about 50% leads to a better flow distribution, and consequently to an improved dirt capacity and service life. The ratio of the total area of the openings to the total area of the surface of the

whole tubular envelope defined by the peaks of the pleats as defined in claim 1 is designated hereinafter as the "opening ratio".

6.2 Therefore, the board can accept the respondent's position that, starting from the filters as disclosed in E1, the technical problem solved by the filters according to claim 1 can be seen in the provision of a filter with a further improved dirt capacity and service life. See also the contested patent, page 2, lines 14 to 18 and lines 40 to 44.

7. *Claimed solution not obvious*

7.1 E1 does not address the issue of flow distribution in connection with the description of the wrapper and its pleat stabilising function. Hence it cannot by itself suggest the provision of a particular hole pattern leading to the claimed "opening ratio" of less than about 50%. Excluding hindsight considerations, the impression allegedly given at first glance by Figures 1 and 9 of E1 that the "opening ratio" of the wrapper shown therein was less than about 50% cannot be taken into consideration due to the merely schematic nature of these figures. As is apparent from the passage in column 5, lines 36 to 47, Figure 1 of E1 relates to an embodiment wherein the wrapper has optional, non-perforated annular areas aligned with the rows of adhesive material deposited on the peaks of the pleats. Hence, if provided at all, these non-perforated areas need only to be present in an amount and sizes corresponding to the number of rows of adhesive material. Considering the merely schematic nature of Figure 1, it cannot be inferred therefrom that the

annular non-perforated areas are such as to lead to an "opening ratio" of less than about 50%. Moreover, E1 refers to no other specific method for applying and bonding a wrapper to the pleated filter element than the one referred to under point 5.1 above. Hence, taken alone, it cannot suggest the application of a spiral wrap member.

7.2 To demonstrate the obviousness of the claimed filter, the appellant also relied on various combinations of E1 and common general knowledge in the field of filters and/or the other prior art cited. However, for the following reasons, none of these combinations leads to the claimed filters in an obvious manner.

7.3 In support of its contested allegation that it belonged to the common general knowledge to provide fluid filters with wrappers having an "opening ratio" of less than about 50% in order to obtain a good flow distribution, the appellant referred to the known hole pattern of the filter elements according to the prior use. However, the board has strong doubts whether filters adapted to the very specific needs of and delivered to a customer could actually be considered to belong to the common general knowledge. Moreover, as explained under point 3. above, it is not established that these filters actually had a wrap meeting the condition specified in claim 1 as regards the "opening ratio". Therefore, the board is not convinced that it belonged to the common general knowledge to use wrappers having the claimed "opening ratio" for obtaining a more uniform flow distribution. Since on the basis of the evidence on file, the prior use cannot be considered to illustrate or prove such a common

general knowledge, it cannot lead in an obvious manner, in combination with the teaching of E1, to a filter falling under the terms of claim 1 with respect to the "opening ratio".

7.4 The appellant did not submit any evidence supporting its allegation in connection with E1 that, in view of its common general knowledge, the skilled person would consider wrappers with an "opening ratio" of more than 50% to be unsuitable because of their insufficient strength, and would therefore obviously select wrappers with an "opening ratio" of less than 50%. Considering that claim 1 is not restricted to wrappers of a specific material and thickness, and that it has not been shown that a wrapper with an "opening ratio" of more than 50% and sufficient strength could in no case be formed, the board cannot accept this general allegation.

7.5 Document E7 discloses filters comprising a diamond-shaped pattern of fibre rovings (1000) over an inner metal filter core (10X). The metal core is a tube obtained by a method comprising the steps of helically-winding a strip of thin perforated sheet metal (10) having raised edges (10A, 10B) and welding the adjacent raised edges, see claim 1 and Figures 5a to 5g. This method is said to be suitable for producing helically wound perforate tubes of relatively small diameters from relatively thin metal sheets at high speeds, see page 2, lines 48 to 53, and page 5, lines 43 to 49. The raised helical welds of the core tubing aid the rovings wound onto it to grip and eliminate relative movements of the rovings and the core, see column 5, lines 79 to 89 and lines 104 to 111.

7.5.1 E7 neither mentions pleated filter media and the problems associated therewith nor the use of an outer filter wrap, let alone the use of the helical perforated tubing as outer wrap. The issues of dirt capacity and flow distribution along the filter element are not addressed. In view of these differences, and although E7 generally belongs to the field of filters, the board is convinced that a skilled person, trying to solve the stated technical problem, would not even consider this document.

7.5.2 Moreover, E7 is silent about the size of the perforations of the inner tube and their total relative area. As in the case of E1, Figures 5a, 5b, 5d and 5f are only of a schematic nature as far as the amount and arrangement of the perforations shown therein are concerned. Hence, E7 cannot be considered to disclose a specific teaching concerning the total relative area of the openings in the core tube (10X).

7.5.3 Consequently, even assuming for the sake of argument that a skilled person would envisage the replacement of the wrapper disclosed in E1 by a prefabricated spirally-welded perforate tube prepared according to the technology taught in E7, this combination would still not lead in an obvious manner to a filter falling under the terms of claim 1 with respect to the "opening ratio".

7.6 E5 discloses a filter comprising an annular corrugated filter element with longitudinal pleats, see claim 1 and Figures 1 to 3. To avoid the distortion, displacement or collapse of the pleats, and the

consequential reduction in dirt capacity, a narrow strip of tape is spirally wound around the filter element to span the peaks of the pleats. See page 1, first paragraph, and page 4, second paragraph.

7.6.1 The description of E5 is silent about the actual "opening ratio" to be provided by the gaps between the turns of the strip of tape. The figures of E5 are also of a schematic nature and cannot, therefore, be considered to disclose a particular "opening ratio" of the spiral wrap.

7.6.2 Furthermore, it is emphasised in E5 that the tape material should have a high modulus and should be relatively narrow (in the range of 3 to 8 mm) such as "to block off as little as possible of the filter surface area", see page 5, second paragraph. The board therefore takes the view that the skilled person would also understand from this passage that as little tape as possible should be used, provided the required stability of the pleats is achieved. Since the issue of flow distribution is not addressed in connection with the spiral wrap, E5 directs the skilled person towards wraps as "open" as possible, rather than towards wraps with an "opening ratio" of less than about 50%. Moreover, although the tape imparts a high rigidity to the filter elements so that they do not require any kind of external support, E5 nevertheless mentions the possibility of providing an additional outer foraminous tube or sheath, if desired, see paragraph bridging pages 4 and 5. In the board's view, the skilled person would be directed by this passage to provide an additional foraminous tube, rather than to modify the spiral wrap. However, E5 neither discloses further

information concerning the openings of this additional tube nor suggests that a particular "opening ratio" might improve the dirt capacity of the filter.

7.6.3 Even assuming, in favour of the appellant, that the skilled person confronted with the stated technical problem would envisage a combination of the teachings of E1 and E5, despite the fact that none of them addresses the issue of flow distribution, the board considers for the foregoing reasons that such a combination could not, without hindsight, lead in an obvious manner to a filter having the claimed "opening ratio".

7.7 E13 does not concern pleated filter media and the problems associated therewith. The fluid treatment materials mentioned in E13 are not usually available in a form that could be considered as pleated. The only filter material actually exemplified in E13 is a mass of microfibres laid in cylindrical form around a perforated core, as disclosed in E14.

7.7.1 Considering the differences between a pleated filter element and a cylindrical fibre mass, the board takes the view that the skilled person, trying to improve the filters according to E1, would not even consider document E13, despite the general reference to other filter media on page 3, lines 36 to 37.

7.7.2 As already pointed out above, E13 is not concerned with the total area of any openings in the wrap materials to be used. It does not address the importance of a good flow distribution over the length of the filter element and the consequential impact on dirt capacity of the

filter. The quality of said flow distribution not being a consideration underlying the selection of the type of wrap material to be used, E13 cannot possibly point towards or suggest a particular "opening ratio", let alone an "opening ratio" of less than 50%. On the contrary, as pointed out by the respondent at the oral proceedings, the wrap assembly according to E13, while providing structural support for the cartridge and strengthening it, should provide as little additional pressure drop as possible, see page 3, lines 11 to 20. Therefore, even accepting, for the sake of argument, that the skilled person would not ignore E13 when trying to improve the filter according to E1, and accepting further that he would consider the spiral winding of a wrap tape onto the peaks of the pleats as an advantageous and feasible alternative (e.g. in view of E5), he would select a wrap material as "open" as possible, provided the desired mechanical stability (i.e. pleat fixation) was achieved.

7.7.3 In view of the above, the board takes the view that even a combination of E1 with E13 could not, without hindsight, lead in an obvious manner to a filter meeting the definition given in claim 1 with respect to the "opening ratio".

8. As shown above, documents E1, E5, E7 and E13 do not address the issue of flow distribution along the filter length, and do not disclose or suggest an "opening ratio" of less than about 50%. Nor do they mention an interdependence between this parameter and the flow distribution along the filter length or the dirt capacity of the filters. The filters according to the prior use have not been convincingly shown to have an

"opening ratio" of less than about 50%. Furthermore, as also indicated above, the appellant has not provided sufficient evidence in support of its contested allegations concerning the common general knowledge. In these circumstances, alternative approaches concerning inventive step starting from E13, from E5, or from the prior use (as far as established, see point 3. above) as the closest prior art, cannot possibly lead to a different conclusion. Hence, irrespective of the chosen starting point, the board is not convinced that the provision of a filter with a pleated filter element, wherein the peaks of the pleats are joined to a surrounding spiral wrapper having an "opening ratio" of less than about 50%, in order to obtain a better flow distribution and hence an improved dirt capacity, can be considered to be obvious in view of the cited prior art.

9. The appellant did not specifically rely on any of the other documents cited during the opposition and appeal proceedings, taken alone or in combination. The board is also convinced, and it was not disputed, that these documents are of less relevance than the ones discussed above.

10. The subject-matter of claim 1 and, consequently, of dependent claims 2 to 27 is thus based on an inventive step.

11. Since the board, in reaching the above conclusion, did not question the credibility of the witness, the auxiliary request of the appellant need not be considered further.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

A. Wallrodt M. Eberhard