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**Datasheet for the decision
of 27 May 2014**

Case Number: T 1558/11 - 3.3.05

Application Number: 01968055.2

Publication Number: 1326697

IPC: B01D46/12, B01D39/00

Language of the proceedings: EN

Title of invention:

FILTER STRUCTURE WITH TWO OR MORE LAYERS OF FINE FIBER HAVING
EXTENDED USEFUL SERVICE LIFE

Patent Proprietor:

DONALDSON COMPANY, INC.

Opponent:

Carl Freudenberg KG

Headword:

FILTER EFFICIENCY/DONALDSON

Relevant legal provisions:

RPBA Art. 12(4), 13(1)
EPC Art. 83

Keyword:

Insufficiency of disclosure (yes) -
lack of information and lack of guidance

Decisions cited:

T 0409/91, T 0435/91, T 0063/06, T 1743/06

Catchword:



**Beschwerdekammern
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Case Number: T 1558/11 - 3.3.05

**D E C I S I O N
of Technical Board of Appeal 3.3.05
of 27 May 2014**

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Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted on 12 May 2011
revoking European patent No. 1326697 pursuant to
Article 101(3) (b) EPC.**

Composition of the Board:

Chairman G. Raths
Members: J.-M. Schwaller
D. Prietzel-Funk

Summary of Facts and Submissions

I. This appeal was lodged by the patentee (hereinafter "the appellant") against the decision of the opposition division revoking European patent 1 326 697 on the grounds of Art. 100(b) EPC, because of non-compliance with the requirements of Article 83 EPC.

II. Claim 1 of the main request underlying the contested decision reads as follows:

"1. A pleatable fine fiber filter medium, in particular for filtering air, consisting of:

(a) a single layer of coarse fibrous media as the woven or non-woven filter substrate, the filter substrate having:

- (i) a first surface and a second surface;*
- (ii) a Frazier permeability of 0.0333.. to $15\text{m}\cdot\text{s}^{-1}$;*
- (iii) an efficiency of between 20% and 80%; and*
- (iv) a thickness of 0.1 to 5 mm;*
- (v) the fibers having an average diameter of at least $10\mu\text{m}$;*

(b) the first surface and second surface each comprising at least one layer of polymeric fine fiber:

- (i) the fine fiber having a diameter of 0.001 to $0.5\mu\text{m}$;*
- (ii) the layer of the fine fiber having a thickness of less than $5\mu\text{m}$;*
- (iii) the layer of fine fiber formed in an amount effective to obtain:*
 - (1) a pore size of 0.001 to $5\mu\text{m}$;*
 - (2) an efficiency of 50% to less than 90% in any one layer and to obtain;*

(c) an overall efficiency of greater than 90% in the layers combined; wherein all efficiencies are measured

under ASTM-1215-89 with monodisperse 0.78µm polystyrene latex particles at 6.1 m/min velocity."

III. In the contested decision, the opposition division concluded that the opposed patent did not disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art, because the absence of information regarding the measurement of the pore size in the fine fiber layer amounted to an undue burden for a skilled person trying to reproduce the invention.

The department of first instance argued in essence that, as evidenced by document

D6: G. Rideal, "*Messung der Filterporengrösse - ein praxisorientierter Ansatz*", *Filtration plus Separation*, Jan./Feb. 2009, obtainable under www.whitehousescientific.com/fap-description.html,

the different methods for measuring a pore size in a filter led to different results. Since claim 1 required that the layer of fine fibers was formed in an amount sufficient to obtain a pore size of 0.001 to 5 µm and an efficiency of 50% to less than 90% in the layer, variations in the pore size resulting from the use of different measurement methods prevented a person skilled in the art from reproducing the invention, since the range of pore size in the layer was correlated to the distribution of the fibers in the layer, which itself was correlated to the efficiency of the fiber layer.

IV. With its appeal the appellant contested the above decision and filed with the statement setting out the grounds of appeal the following new documents:

- D9: K. Graham et al.; "*Polymeric Nanofibers in Air Filtration Applications*", 15th Annual Technical Conference & Expo of the American Filtration & Separations Society, Galveston, April 9-12, 2002
- D10: Donaldson.com, Technical Reference Guide, pages 249 to 251, undated
- D11: Derek Jones, "*Comparing Media Differences with Pore Size distribution of 10µm SynteqXP/Cellulose Fuel Media and 10µm Meltblown/Cellulose Fuel Media*", Liquid Filtration Technology, April 10, 2010
- D12: Brochure Donaldson Filtration Solutions, "*SynteqTM Media Technology for Fuel Filtration*", 2009
- D13: Donaldson Company Inc., Test specification EN1003041, Version W, Revision 01; undated
- D14: Final thickness measurements on EN 368 lots; undated.

It also filed four sets of claims as a main and auxiliary requests 1 to 3, with claim 1 of the main request being identical with the one underlying the impugned decision (see point I above).

Claim 1 of the first auxiliary request differs from claim 1 of the main request in that the pore size range is restricted to "*0.01 to 5µm*".

Claim 1 of the second auxiliary request differs from claim 1 of the main request in that the pore size range is restricted to "*0.05 to 3µm*".

Claim 1 of the third auxiliary request differs from claim 1 of the main request in that the pore size range of 0.001 to 5µm is supplemented by the following definition: *"wherein a pore is a passage or opening in the layer of polymeric fine fiber formed from a periphery of 2 or more fine fibers."*

V. By letter dated 12 January 2012, the respondent submitted six new documents numbered D16 to D21 and maintained its objection under Article 83 EPC against the claimed subject-matter. It also requested auxiliary requests 1 to 3 and the belated new documents not be admitted into the appeal proceedings.

VI. By letter of 8 March 2013, the appellant filed two new auxiliary requests 4 and 5 accompanied by a set of observations, in which it emphasised that the pore size was not essential for solving the problem underlying the contested patent, since the problem was solved by tailoring the efficiencies of the layers in the filter structure in such a way that the combination of individual layers having moderate efficiencies provided a filter with a high overall efficiency.

Claim 1 of the fifth auxiliary request differs from claim 1 of the main request in particular in that the thickness of the coarse fibrous media is restricted to the range *"0.3 to 1 mm"* and in that *"in the filter structure, three or more layers of fine fiber are provided"*.

VII. By letter dated 2 May 2013, the respondent filed a set of observations along with a new document

D22: Declaration dated 18 June 2003 of Brad Kahlbauch.

VIII. By fax dated 19 May 2014, the board drew the parties' attention to the absence of details in the patent specification, in particular the example, regarding the reproduction of the invention. The question thus arose whether there was sufficient guidance in the contested patent for the skilled person, using in particular common general knowledge, to carry out the claimed invention.

IX. At the oral proceedings, which took place on 27 May 2014, the appellant withdrew the fourth auxiliary request. During the discussion regarding disclosure of the invention, the question arose as to whether the skilled person was able to carry out the claimed invention without undue burden and without having to perform a research programme. The appellant declared that it was common general knowledge to prepare the claimed fine fiber layers and it referred in particular in this respect to documents D9 and

D1: WO 99/16534.

X. At the end of the oral proceedings, the chairman established the parties' requests as follows:

The appellant requested that the decision under appeal be set aside and that the patent be maintained on the basis of the claims according to the main request or, alternatively, one of auxiliary requests 1 to 3, all submitted with the grounds of appeal dated 14 September 2011, or on the basis of the claims according to auxiliary request 5 submitted with the letter dated 8 March 2014.

The respondent requested that the appeal be dismissed.

Reasons for the Decision

1. Admissibility of the newly filed documents

Documents D9 to D14 were submitted with the grounds of appeal in response to the contested decision, thus fulfilling the requirements of Article 12(4) RPBA. The documents are therefore admitted into the appeal proceedings. The same applies to documents D16 to D21 that the respondent filed in response to the grounds of appeal. D22, which was late-filed, is admitted into the proceedings at the board's discretion under (Article 13(1) RPBA) because - as can be seen from points 2.7.1 and 2.7.2 below - its content is particularly relevant for the subject of the present decision.

2. Main request - Sufficiency of disclosure of the invention

2.1 It is established jurisprudence of the boards of appeal that the requirements for sufficiency of disclosure are met only if the invention as defined in the claims could be performed at the filing date of the application by a person skilled in the art in the whole area claimed without undue burden, using common general knowledge and having regard to further information given in the patent in suit (see T 0409/91, OJ 1994, 653, point 3.5 of the reasons; T 0435/91, OJ 1995, 188, point 2.2.1 of the reasons; T 1743/06, point 1.1 of the reasons).

2.2 In the case at issue, the claimed invention concerns (see claim 1) a filter medium comprising three fibrous layers (a coarse fibrous layer and two fine fiber layers), with the filter medium and the individual

fibrous layers being defined by a combination of physical features (thickness and porosity of the layers, diameter of the fibers) and desiderata features (Frazier permeability, efficiency according to ASTM-1215-89, as measured with monodisperse 0.78 μ m polystyrene latex particles at 6.1 m/min velocity.)

Specifically, the coarse fibrous layer is defined by having a Frazier permeability of 0.0333.. to 15m-s⁻¹ and an efficiency between 20% and 80%; the fine fiber layers are defined by having an efficiency of 50% to less than 90% in any one layer; and the filter medium is defined by having an overall efficiency of greater than 90%.

- 2.3 As to the question whether the requirements for sufficiency of disclosure were met, the appellant argued in essence as follows.

The opponent did not provide any evidence substantiating that the skilled person faced any difficulty in producing the individual fibrous layers defined in claim 1 at issue.

It was common general knowledge to prepare individual fibrous layers with a Frazier permeability and efficiencies falling within the terms of claim 1 at issue; in the exceptional case of failure in the preparation of said fibrous layers by using common general knowledge, routine experimentation - for instance trial and error - would inevitably lead a skilled practitioner to fibrous layers with the desired permeability and efficiency without undue burden.

The coarse fibrous media as defined in claim 1 at issue was commercially available, as evidenced by paragraph

[0066] of the patent which indicated that the "first structure", i.e the coarse fibrous media, was a "commercial filter cartridge". The claimed Frazier permeability furthermore was an inherent feature of a coarse fibrous layer having the claimed efficiency.

The fine fiber layers were produced and applied to the preselected coarse fibrous media by electrospinning, as indicated in paragraph [0023] of the patent. Further information concerning the fine fiber layers was available from e.g. the passages at page 2, lines 43 to 44 or page 3, lines 27 to 30 of the patent, which disclosed that the fine fibers were deposited in "reduced amounts" so as to produce "larger pores" in the fibrous layer. Critical add-on parameters of the fine fiber layers were furthermore summarised in the table at page 4, lines 15 to 25, of the patent:

Dimensions	Range
Layer thickness (μm)	0.1 to 3
Solidity %	5 to 40
Density ($\text{mg}\cdot\text{cm}^{-3}$)	0.9 to 1.6 (1.2 to 1.4)
Basis wt. ($\text{mg}\cdot\text{cm}^{-2}$)	4.5×10^{-7} to 0.00019
Basis wt. ($\text{mg}\cdot\text{cm}^{-2}$)	0.00045 to 0.19
[Basis wt. ($\text{lb}\cdot 3000 \text{ ft.}^{-2}$)	0.0028 to 1.2]

The appellant further referred to documents D1 and D9 to give evidence that the production of the coarse and fine fiber layers was common general knowledge.

2.4 The respondent contested these statements. It argued that the manufacturing of fibrous layers with the claimed efficiencies and permeability was not common general knowledge. The alleged invention required the optimisation of a multitude of parameters (thickness, diameter, porosity, choice of the polymeric material of the fiber, operating conditions of the electrospinning

device) for each individual fibrous layer in order to obtain the desired efficiencies and permeability; such an optimisation was a new research program on its own, and this could not be achieved by routine experimentation. The respondent further argued that following the reasoning in decision T 0063/06, the patent proprietor had the burden of proof of its allegations in the present case.

- 2.5 The board observes that the definition of the three fibrous layers by means of extremely broad ranges of features comprises an indefinite and innumerable host of possible alternatives, which is acceptable as long as all these alternatives are available to the skilled person. Therefore, it has to be established whether or not the patent in suit discloses sufficient information and provides sufficient guidance for the skilled person to prepare the host of variants encompassed by the claimed definition. If the answer to this question were to be negative, it furthermore would have to be assessed whether or not the identification of this host of variants is common general knowledge.
- 2.6 Regarding the question as to whether or not the patent in suit discloses sufficient information and/or provides sufficient guidance for the skilled person to identify the host of variants encompassed by the definition of the claimed invention, the following is to be observed.
- 2.6.1 The inventive idea underlying the contested patent allegedly lies in the fact that the application of two layers of fine fibers of reduced efficiency on opposite sides of a planar media layer provided a filtering medium with a substantially high efficiency. In the patent, this idea is illustrated in a single example

(paragraphs [0072] to [0074]), whereby two fine fiber layers with an individual efficiency of 66% (called "66% LEFS" in the example) were applied to a fibrous substrate having an efficiency of 65% ("65% LEFS" in the example), so as to achieve a filter medium with an overall efficiency of from about 95 to about 98%.

2.6.2 The above example however neither discloses the physical characteristics - such as the material, the diameter and/or the density - of the individual fibers, nor the manner and the thickness in which the fibrous layers were obtained and/or applied one on top of the other. Moreover, the example is silent on the porosity and Frazier permeability of the individual fibrous layers. Due to this blatant lack of information, the skilled person has no possibility to put into practice the sole specific embodiment of the invention disclosed in the patent.

2.6.3 The patent specification also does not provide any concrete information as to how the individual fibrous layers can be manufactured so as to systematically obtain a specific efficiency and, if necessary, a specific Frazier permeability falling within the claimed ranges, nor does the patent provide any guidance of how the desired efficiency and permeability can be obtained in case of failure during manufacturing of these layers.

The patent simply discloses that the "first structure" (i.e. the coarse fibrous media) is "a commercial filter cartridge" (see paragraph [0066]) and that the fine fiber layers can be produced and applied to the preselected coarse fibrous media by a "variety of methods" (paragraph [0012]) or by electrospinning using "conventional techniques" (paragraph [0023]).

Neither the contested patent nor the US patents referred to in paragraph [0012] however provide any information of how a fine fiber layer with a desired efficiency falling within the claimed range can be achieved in a reliable manner. The same applies to the coarse fibrous layer for which no manufacturing information can be found in the patent.

2.7 Regarding the appellant's arguments in point 2.3 above, these cannot be accepted for the following reasons.

2.7.1 It is correct that the burden of proof generally lies upon an opponent to establish insufficiency of disclosure and that, in the present case, the opponent - now respondent - did not provide any technical evidence that the invention could not be reproduced without undue burden. However, as explained in decision T 0063/06 (Headnote) the burden of proof can be shifted to the patent proprietor when the patent does not give any information of how a feature of the invention can be put into practice. In the present case, this concerns the porosity and efficiency of the fine fiber layer and the Frazier permeability and efficiency of the coarse fibrous layer. Further, the opponent plausibly argued that common general knowledge would not enable the skilled person to put this feature into practice. This is precisely the situation in the present case and, therefore, the burden of proof has been shifted to the appellant.

2.7.2 Concerning the coarse fibrous media, it might well be that the one used in the example was a commercial one. However, there is no basis in the patent specification for concluding that other coarse fibrous media having a Frazier permeability of $0.0333..$ to 15 m-s^{-1} and an

efficiency between 20% and 80% were commonly known and/or commercial, too.

Document D1, cited by the appellant in this respect, is limited to coarse fibrous layers having another efficiency than those claimed, namely an efficiency of no greater than 10%, preferably no greater than 5% (D1: page 6, lines 20 to 35). Thus D1 cannot serve as evidence that the coarse fibrous layers defined in claim 1 were commonly known or commercially available.

D22 - a declaration made by a technical expert of the appellant during the examination procedure before the USPTO of one of the priority documents of the contested patent (USSN 09/871,156) - furthermore gives evidence to the contrary since this document discloses that *"considerable investment of resources is required to make a single material suitable for use as a substrate for electro-spun fibers in filtration applications. Further, the know-how to do this is more than that of one with ordinary skill in the art of filtration"*.

So, there are strong doubts that the production of such coarse fibrous media was common general knowledge, at least for each individual efficiency falling in the claimed range between "20% and 80%".

- 2.7.3 Concerning the fine fibers, paragraph [0023] of the patent indicates that these fibers are produced and applied to the preselected coarse fibrous media by electro-spinning, but document D22 (page 2, first paragraph) discloses that *"filter media performance and characteristics are highly dependent upon how media components are arranged and combined"*.

So, it is questionable whether a specific filtration performance (in other words a specific filtration efficiency) can be obtained simply by routine experimentation, as alleged by the appellant.

The passages of the patent disclosing that the fine fibers were deposited in "reduced amounts" to produce "larger pores" do not provide such an information to the reader, because it is unclear what "reduced" means. The sole information concerning the amount of fibers can be found in the table at page 4, lines 15 to 25, of the patent, but the range defined therein is so broad (0.00045 to 0.19 mg-cm⁻²) that the skilled person has again a further optimisation to make in order to achieve an efficiency falling within the claimed range.

- 2.7.4 Document D1 provides some information concerning fine fiber layers with an efficiency of up to 90%, but the fine fibers are not the same as those defined in claim 1 at issue ("diameter not greater than about 5 microns" in D1, claim 1, vs. "diameter of 0.001 to 0.5 micron" in the patent), since they can be up to 10 times thicker than those of the patent. D1 moreover is a patent specification, and so this document cannot be considered as common general knowledge.

Document D9 discloses the use of fibers with a diameter less than 1 micron in air filtration applications (abstract), however there is no evidence in this document that the preparation of a fibrous layer with an efficiency of from 50% to less than 90% and a pore size of from 0.001 to 5 µm was common general knowledge at the priority date for fine fibers having a diameter of from 0.001 to 0.5 µm. Figure 1 in D9, referred to by the appellant, simply discloses the "collection efficiency" in % of fibers having a diameter of 0.5

microns in comparison to larger ones (diameter of 2 and 10 microns), but there there is no evidence that the "collection efficiency" corresponds to the "efficiency" defined in the patent. Furthermore, there is no information in D9 concerning the porosity of the fibrous layers produced with this particular fine fiber, nor is there any information in the patent regarding the efficiency of filtering layers produced with fine fibers with a diameter of less than 0.5 microns.

The other documents cited by the appellant do not provide any information concerning the manufacturing of fine fiber layers having an efficiency of from 50% to less than 90% and a pore size of from 0.001 to 5 μm from fibers having a diameter of from 0.001 to 0.5 μm nor that the manufacturing of such layers was common general knowledge at the priority date of the contested patent.

2.8 From the above considerations, the board concludes that the skilled person cannot carry out the claimed invention without undue burden within the entire scope, so that the requirements of Article 83 EPC are not met.

3. Auxiliary requests 1, 2, 3 and 5

The invention defined in the respective claims 1 of the auxiliary requests on file contains the same critical features - namely the "*Frazier permeability of 0.0333.. to 15m-s⁻¹*" and "*efficiency of between 20% and 80%*" as regards the coarse fibrous media; the broad range of "*pore size*" and "*efficiency of 50% to less than 90%*" as regards the fine fiber layer - as those which lead to the conclusion that the main request is not allowable. It follows that, for the same reasons, the respective

claim 1 of these requests does not meet the requirements of Article 83 EPC.

4. In view of the foregoing, none of the requests on file is allowable.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



I. Aperribay

G. Rath

Decision electronically authenticated