BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS

BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE

CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

A		B		C	X

File Number: T 579/90 - 3.4.2

Application No.: 84 201 225.4

Publication No.: 0 142 872

Title of invention: Method and apparatus for biological treatment of waste gases

Classification: B01D 51/10, B01D 53/00, C12M 1/16

D E C I S I O N
of 14 July 1992

Proprietor of the patent: Clair Tech B.V.

Opponents:
01) Linde Aktiengesellschaft, Wiesbaden
02) Bayer AG, Leverkusen
03) Herbst Umwelttechnik GmbH
04) Ciba-Geigy AG
05) Comprimo B.V.

Headword:

EPC Art. 56

Keyword: "Inventive step - no"

Case Number : T 579/90 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 14 July 1992

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Decision under appeal :

Decision of Opposition Division of the European Patent Office dated 5 June 1990 revoking European patent No. 0 142 872 pursuant to Article 102(1) EPC.

Composition of the Board :

Chairman : E. Turrini
Members : C. Black
L.C. Mancini

Summary of Facts and Submissions

I. The appeal contests the decision of the Opposition Division to revoke the Appellant's European patent No. EP-B-0 142 872 which was granted on the basis of European application No. 84 201 225.4 and the grant of which was opposed by the following:

01: LINDE AG, Höllriegelskreuth
02: BAYER AG, Leverkusen
03: HERBST UMWELTTECHNIK, Berlin
04: CIBA-GEIGY AG, Basel
05: COMPRIMO BV, Amsterdam.

II. The reason for the revocation was that the subject-matter of Claim 1 then under consideration was not novel having regard to the disclosure in Staub.-Reinhaltung Luft 42 (1982), No. 12, pages 488 to 493 (hereinafter D1). The Opposition Division also referred in its decision to the documents "Untersuchung über Erdfilter usw.", H.D. Zeisig et al., Friesing, Weihenstephan (1977), (hereinafter D2) and Staub.-Reinhaltung Luft 39 (1979, No. 11, pages 397 to 402, (hereinafter D3) mainly to corroborate its interpretation of D1.

A further document cited in the opposition proceedings and which has been taken into account in the appeal proceedings is EP-A-80 747 (hereinafter D4).

III. The identification of the documents as D1 to D4 does not correspond in all respects to what has been used previously, since this was not wholly consistent, mainly because of the number of documents, sometimes duplicated, cited by the various opponents.

IV. Oral proceedings were held, attended by the Appellant and two of the Respondents (03 and 05). The Respondents 01, 02 and 04 had notified the Board that they would not be taking part in the oral proceedings; Respondents 01 and 02 had however responded to the notice of appeal.

V. At the conclusion of the oral proceedings, the Appellant requested that the patent be maintained on the basis of Claims 1 to 20 handed over at the oral proceedings as a main request, or Claims 1 to 20 handed over at the oral proceedings as an auxiliary request.

The Opponents, in the written and oral proceedings, requested that the appeal be dismissed.

VI. Claims 1 and 14 according to the main request read as follows:

"1. Method of biologically filtering gases containing pollutants, in particular waste gases by a bed type filter material containing

- compost/peat which has been provided with appropriate micro-organisms which are stationary on the surface of the carrier material and
- at least one additional material

whereby said pollutants containing gases are humidified and whereby any water soluble substances present in the gases dissolve at least partially, wherein the gases are initially saturated with water to relative humidities of 95-100 % prior to their entrance into the filter material which is of the fixed bed type, said water saturated gases are then directed into the filter material and passed through it and the filtration is carried out under mesophilic conditions at 10-40°C, characterized in that said additional material is an inert particulate material having a diameter of 3-10 mm, which particles counteract

the development of shrink cracks in the carrier material and reduce the flow-resistance of the biological filter, wherein said additional material is present in an amount of 30-70 vol.% and 70-30 vol.% relating to the carrier material.

14. Apparatus for carrying out the method of any one of the preceding claims, comprising a container (1) including at least one biological filter unit (3), a supply conduit (4) for the gases to be treated at the lower side and a discharge (15) for the treated gases at the upper side, characterized in that said apparatus is provided with a pretreatment chamber (2) for the gases to be treated which is disposed beneath the lowermost filter unit, which pretreatment chamber is provided with water spraying means (5), contact bed (8) resting on the gas-permeable support layer (9) above the supply conduit (4) for the gases to be treated, a discharge conduit (20) for spraywater beneath the support layer (9) and said spraying means being connected to the discharge conduit (20) for spraywater via a circulation conduit (19) including a heat exchanger (7) and a circulation pump (6) for circulating the spraywater."

Claims 2 to 13 and 15 to 20 are dependent on Claims 1 and 14 respectively.

The auxiliary request differs in that on the second line of the characterising portion of Claim 1 according to the main request there are inserted after "having" the words "essentially the same", and after "diameter" the words "selected from the range", the word "a" being deleted.

VII. The Appellants' written and oral submissions may be summarised as follows:

D1 contains a single mention of the filter material, namely the fibrous peat brushwood mixture referred to in Table 1. According to D2, the fibrous peat brushwood mixture can comprise spruce brushwood of length 30 to 50 cm, this being superior to brushwood of shorter length. There is therefore created a prejudice against using the additive particles according to the invention which have a diameter in the range 3 to 10 mm. Moreover, the brushwood, in addition to being considerably larger, is neither particulate nor inert. D2 also discloses the use of a 1:1 mixture of humus and Styromull flakes. The latter have an irregular particle size between 5 and 20 mm and are obtained by crushing Styromull (a polystyrene product). Moreover their shape is irregular and not to be compared with that of the additive particles according to the invention, which are substantially spherical, as can be derived from the fact that their sizes are expressed in diameters. Further, dry channels occur with the humus-Styromull filter composition, which the present invention avoids. The requirement in Claim 1 that the additive particles have a diameter of 3 to 10 mm does not mean that they can have diameters which vary over this range but that they have a substantially uniform diameter which falls within the range. This is borne out by the specific examples. The diameter of the particles is matched to that of the carrier material and ideally they should be the same, resulting in a uniform filter bed without finer particles filling spaces between larger ones. The Patentee has found that by using compost from a conventional source and combining it with the additional inert particulate material having a diameter chosen in the range 3 to 10 mm, in combination with presaturation of the gases to be treated, a stable filter bed with a useful flow rate and which does not show shrink cracks after more than three years of use is obtained. In contrast the biological filter disclosed in D4 has additional material of particle

size larger than that of the active material, so that the active material is found in the spaces between the particles of inactive material, leading to a tight bed and less access to the active material by the gases to be treated. Moreover with time the smaller particles will sink to the bottom of the bed, particularly if the bed is submitted to vibration.

In the grounds for the appeal the Appellant also expressed dissatisfaction with some aspects of the way the Opposition Division dealt with the case, and requested that the Board consider this. In its communication accompanying the summons to oral proceedings, the Board gave its view on the subject, and the Appellant did not pursue the matter.

The counter-arguments of the Respondents are, in summary, as follows:

D1 discloses a method of biofiltration in which the gases to be filtered are humidified to a relative humidity greater than 95% and in which the filter material is a fibrous peat and brushwood mixture. From D2 which is referred to in D1 (reference 1), the brushwood is the additive to the fibrous peat which is the biologically active material, the additive material improving the filtration properties of the filter bed by preventing the formation of dry channels, or shrink cracks. D2 also discloses the use of a humus-Styromull mixture wherein Styromull is a polystyrene produced of particle size 5 to 20 mm which serves to decrease the flow resistance of the filter bed. D4 also discloses the addition of inert material of particle size above 10 mm to compost for the same purpose. The particle size ranges 45 to 20 mm and above 10 mm are so close to that required by Claim 1 as to preclude a contribution to inventive step. As regards the

functional feature in Claim 1 "which counteract etc." this either arises automatically or states a problem to be solved whose solution is not sufficiently disclosed. It therefore does not add to the definition of the process, and, all other features of Claim 1 according to the Appellants' main request being known from D1, D2 and D4, the claim lacks inventive step.

As regards the auxiliary request, the additional feature that the particles have essentially the same diameter is not supported by Example I, which states that the average diameter is about 4 mm. It does not follow that the particles have essentially the same diameter.

Reasons for the Decision

1. The appeal is admissible.

2. Main request

2.1 Claim 1 according to the main request is derived from a combination of Claims 1, 2, 8, 10 and 11 of the patent as granted, which claims do not differ in substance from the corresponding original claims, with the further amendments specifying that the additional material is inert and that the carrier material is compost/peat. The said claim combination is allowable from the appendancies of the claims involved, and a basis for "inert" is to be found on page 6, line 12 of the original description and for compost/peat in the examples, though here it is called peat compost. As will be seen, nothing of significance for the decision hinges on this differing nomenclature, so that the requirements of Article 123(2) and (3) EPC can be considered to be met.

2.2 Novelty

3. Each of the documents D1 to D4 disclose some but not all of the features of Claim 1 according to either request, so that novelty can be recognised. This is in any case no longer an issue between the parties.

2.3 Inventive step

2.3.1 Any of these documents could provide a starting point for the investigation of inventive step of the subject-matter of the patent in suit. However the Board proposes to start from the basic biological filter which uses compost as the carrier material and is therefore known as a compost filter, because Claim 1 according to both requests is now restricted to a filter using compost/peat as carrier material. Such filters are known from D2, which concerns an investigation comparing other possible carrier materials with compost, D3 (third paragraph of summary, page 399, paragraph 2.3 and the table on page 400) and D4 (page 1, paragraphs 1 and 2). The patent in suit moreover acknowledges in its introduction that biological filtration is known as compost filtration because of the material generally used.

It should be noted that in this decision the compost is referred to as the carrier material, rather than active material because it is only active in the sense that it supports, and sustains the growth of, the microorganisms which are responsible for the decomposition of the gases which have to be removed. This is consistent with the terminology in the patent in suit.

The requirements for biological filters are well documented, for example in the cited documents D1 to D4. In particular the flow resistance of the filter bed should

be low since a high resistance results in high energy costs. This aspect is investigated in D2, for example pages 9 et seq. under "Aufgabenstellung". This requirement conflicts with that of high biological activity, since the finest particles having the highest biological activity because of the high specific surface area presented to the gases to be treated also contribute most to the flow resistance - cf. D4. Another requirement is a sufficient humidity of the filter bed. Further, the bed should be such that shrink cracks do not develop. These requirements can be considered together since they are in part associated with one another. D1, page 489, left column, refers to the necessary humidity of the filter bed. D2 on page 22 mentions the malfunction of a filter bed when it is insufficiently moist or when dry channels develop, and on page 23 refers to dry channels resulting from non-uniformity of the filter bed. D3, page 398, left column, indicates that for proper functioning of the filter bed a particular humidity is required, which should be constant (see also page 399, left column). Again on page 401, left column it is stated that the bed should be uniformly moist, with no dry zones, and on page 402, middle column, that excessive humidification is to be avoided. D4, page 3, lines 30 to 33 also refers to the necessary humidity of the filter bed, with the indication that this should not be excessive.

2.3.2 With the foregoing in mind, the problem which is the basis of the patent in suit can be seen as providing a method for biofiltration of gases containing pollutents using compost/peat as active material, which takes into account the known requirements of the filter bed and which is different from, possibly an improvement on, the known methods.

2.3.3 As noted above, Claim 1 refers to compost/peat whereas the examples refer to peat compost. The introductory part of the description, page 2, line 12 mentions peat as an alternative to compost and page 3, line 57 to compost without qualification. The Board is of the opinion that if the term compost/peat is intended to cover materials other than peat compost, then these will be equivalents to peat compost. It is noted that D3, page 399, paragraph 2.3, in discussing suitable materials mentions compost, for example compost from waste material, so that other kinds of compost, and therefore peat compost, are materials which would suggest themselves to the skilled person. Therefore no inventive step is seen in choosing peat compost from composts in general as the active material.

2.3.4 The features of Claim 1 which require to be taken into account are therefore:

(a) the filter bed contains an additional material which is inert and particulate, of diameter 3 to 10 mm,

(b) the mixture of the additional material and carrier material contains 30 to 70 volume percent of the additional material (see Claim 11 of the patent specification for this interpretation),

(c) the particles (i.e. the particulate material) counteract the development of shrink cracks in the carrier material and reduce the flow resistance of the filter,

(d) the gases to be treated are saturated with water to relative humidities of 95 to 100% prior to their entrance into the filter material,

(e) the filter bed is of the fixed bed type, and

(f) the filtration takes place under mesophilic conditions at 10 to 40°C.

2.3.5 Of these features, (e) and (f) can be readily dismissed as not contributing to inventive step. From the cited documents, for example D3, summary, last paragraph, it is apparent that both fixed and moving beds are known, so that the choice of a fixed bed filter is one of two options open to the average skilled person. It clearly has the advantage of a simpler construction. As regards operation under mesophilic conditions this is known from D1, page 489, Table 1 and in any case would appear to be an obvious choice for the average skilled person as being more practical than operation under thermophilic or psychrophilic conditions.

2.3.6 Each of the documents D1 to D4 disclose a process wherein the filter material includes an additive material which is inactive in the sense that its function is not to support the microorganisms. Of these, D1 and D3 only mention the fibrous peat and spruce brushwood mixture which is discussed in more detail in D2. Here (see in particular pages 32 and 33) the chopped-up brushwood is the additive which is added to the carrier material (fibrous peat) in order to remedy felting. Felting ("Verfilzen") results in dry regions or channels between the felted regions and therefore reduces the efficiency of the filter bed. The reason for incorporating the additive was that one naturally occurring sample of fibrous peat which did not exhibit felting already contained coarse root residues, so that the addition of a comparable material was indicated for peat which did exhibit felting. However the additive is not particulate and its size is an order of magnitude greater than that required in the patent in suit. This disclosure accordingly only indicates that it is known to improve the long-term filter properties of a biological filter by means of additive material.

D2 also discloses a 1:1 by volume mixture of humus and Styromull flakes as material for a biological filter, the Styromull being intended to improve the structure of the filter and having a particle size between 5 and 20 mm. Styromull flakes are apparently obtained by crushing Styromull, a polystyrene product, polystyrene being an example of the additive material in the patent in suit. The Patentee has argued that Styromull flakes cannot be compared with the additive material according to the patent in suit, which material is particulate and, since its particle size is expressed as a diameter, must comprise spherical particles. In the Board's view, the particle size of particles which are not necessarily spherical is often expressed as a diameter. In any case the ground Styromull would appear to be no less likely to be spherical, or substantially so, than the particles of ground automobile tyres, ground lava bits and ground coal cinder particles which may be used in the patent in suit (page 3, lines 59 to 63).

It is true that with humus-Styromull, dry channels can occur (D2, page 22). However the Styromull was clearly added to the humus with a view to improving its filtration properties, and for the average skilled person there is nothing here to deter him from investigating if the properties of a compost filter might also be improved by incorporating additive material. The particle size of the additive material moreover largely overlaps that required by Claim 1.

In any case D4 does disclose that the filtration properties of compost filter material can be improved by an additive. Here the additive is inert and of particle size greater than 10 mm. However this is only an example of particle size range for the additive particles, and the range is so close to that required by Claim 1 that,

taking account also of the range disclosed in D2 for the Styromull particles, no contribution to inventive step can be seen in the particle size range of 3 to 10 mm itself - feature (a) in paragraph 2.3.4 above.

The Patentee has argued that the particle size of the inert material should be matched to that of the carrier material and that ideally these should preferably be the same. However this is nowhere disclosed in the patent specification, nor is there any indication of the particle size of the peat compost. As is clear from D4, compost may have a particle size ranging from less than 4 mm (45%) to more than 10 mm (10%).

2.3.7 As regards the required ratio of additive material to carrier material - feature (b) in paragraph 2.3.4 above - the Board observes the following: In the granted patent, any additional materials were optional and were of three different kinds, namely those preventing shrink cracks and reducing flow resistance (page 3, lines 51 to 53), those counteracting acidification (page 3, lines 53, 54) and active carbon (page 4, lines 25, 26). Active carbon, if present in sufficient quantity, can apparently fulfil the role of the material preventing shrink cracks etc. (page 4, lines 43, 44, where "inert carrier material" is clearly a misprint for "inert additional material"). It is the first of these which is now an essential feature of Claim 1, and the necessary proportion of which is expressed in volume percent. Examples I to IV express the amounts of additive material, whatever its role, by weight; nevertheless on any interpretation at least Examples II and III are clearly not in accordance with Claim 1 so that the significance of the claimed ratio becomes dubious. Be that as it may, the claimed ratio is covered by the 1:1 ratio of additive to carrier material disclosed in D2 (for humus-Styromull) and D4 (Claim 4) so

that this feature too does not in itself contribute to an inventive step.

2.3.8 As regards the presaturation of the gases to be treated - feature (d) in paragraph 2.3.4 above - this is disclosed in D1, page 489, left column. The said gases are washed with water to remove certain impurities, as a result of which the gases become humidified to a relative humidity of more than 95%. The filter material hereby acquires the necessary humidity for the microorganisms and additional irrigation of the filter surface becomes unnecessary. For the average skilled person, even though D1 does not disclose a compost filter, presaturation is one of two options to be investigated by him, the more so as, if it proves to be adequate, it is more likely to prevent overmoistening, which as indicated in paragraph 5 above, is to be avoided. No inventive contribution is therefore seen in this step in itself.

2.3.9 As to feature (c) (paragraph 2.3.4 above), this states the function of the additional particles and can be interpreted as indicating that they should be suitable for the said function. However the Board has considered whether this feature can be seen as constituting a limitation on the claim as a whole, and therefore serving to define the compost particles to the extent that they must be such that, in combination with all the other features, the functional features (e) are achieved. This interpretation might have overcome the lack of disclosure of the particle size of the compost, since the Appellant's argumentation is largely based on a relationship between the particle sizes of the additional material and the compost particles. However, such an interpretation cannot be extracted from the wording of the claim or from the description and in the Board's view is not tenable.

2.3.10 None of the features of Claim 1 therefore contribute to an inventive step, nor can one be seen in their combination. The Appellant has stated that a filtration process according to the patent in suit has departed for more than three years without the development of shrink cracks. However, as pointed out by the Respondents, the specification contains no comparative examples which might indicate a surprising or synergistic effect of the combination of features. The absence of shrink cracks might just as well have resulted from a careful operation of the process, in which respect it is noted that in the patent in suit, sprayers are provided above the biologically active zone to secure the moistening of the said zone in case of emergency, and this must play some role in the proper functioning of the filter.

2.3.11 The apparatus features of Claim 14 correspond to the process features of Claim 1, so that this claim falls for substantially the same reasons.

3. Auxiliary request

Claim 1 according to the auxiliary request, as compared with that according to the main request, requires that the inert particulate material has essentially the same diameter, by which is intended that the particles have essentially the same diameter, this diameter being within the range of 3 to 10 mm. The fact that the particles have essentially, or better substantially, the same diameter is consistent with the description, page 4, line 10 (about 4 mm) and Example II (about 3 mm) and the Board can accept that this interpretation is also consistent with Example I (average particle diameter about 4 mm). However, Claim 1 according to the auxiliary request falls for the same reasons as that of the main request, in particular in the absence of any indication of particle size of the compost

material as compared with that of the carrier material. Nor would a restriction to the particle size of the additional material actually disclosed (3 and 4 mm) avail, even though these are lower than those disclosed in D2 and D4, because no effect which can be particularly ascribed to the said particle sizes, as compared with particle sizes below 3 mm or above 10 mm, can be derived from the patent or the argumentation of the Appellant. As previously stated, this argumentation relies on a relationship between the particle sizes of the additive and the carrier material.

4. The dependent claims fall with the claims to which they are appended (both requests). Moreover no feature of these claims was made the basis of an auxiliary request.

5. Thus, the grounds for opposition mentioned in Article 100(a) EPC prejudice the maintenance of the European patent in amended form (see main and auxilary requests).

Order

For these reasons, it is decided that:

The appeal is dismissed.

The Registrar: **The Chairman:**

P. Martorana **E. Turrini**