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D E C I S I O N
of 9 January 2006

Case Number: T 0796/01 - 3.3.05

Application Number: 97942540.2

Publication Number: 930935

IPC: B01J 13/00

Language of the proceedings: EN

Title of invention:

Compositions and insulation bodies having low thermal conductivity

Applicant:

Cabot Corporation

Opponent:

-

Headword:

-

Relevant legal provisions:

EPC Art. 54, 83, 84, 111(1)

EPC R. 29(6)

Keyword:

"Sufficiency of disclosure, clarity, novelty (yes, after amendment)"

"Remittal to first instance"

Decisions cited:

T 1156/01

Catchword:

-



Case Number: T 0796/01 - 3.3.05

D E C I S I O N
of the Technical Board of Appeal 3.3.05
of 9 January 2006

Appellant: CABOT CORPORATION
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Decision under appeal: Decision of the Examining Division of the
European Patent Office posted 5 March 2001
refusing European application No. 97942540.2
pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: M. Eberhard
Members: H. Engl
S. Hoffmann

Summary of Facts and Submissions

- I. This appeal lies from the decision of the Examining Division posted on 5 March 2001 refusing European patent application 97942540.2 on grounds of lack of novelty (Article 54 EPC), lack of clarity and conciseness (Article 84 EPC) and insufficiency of disclosure (Article 83 EPC).
- II. The independent claims of the application which formed the basis of said decision read as follows:

"1. A particulate gel composition comprising a metal oxide gel or a silica gel, which under a 103421 Pa load, at 20 °C, and at a pressure of 133.322 Pa, in Nitrogen, has (a) a packing density of less than or equal to 160 kg/m³ and (b) a Thermal Conductivity of less than or equal to 5.8 milliWatt/meterK."

"2. A particulate gel composition comprising a metal oxide gel or a silica gel, which under a 103421 Pa load, at 20 °C, and at a pressure of 1333.22 Pa, in Nitrogen, has (a) a packing density of less than or equal to 160 kg/m³ and (b) a Thermal Conductivity of less than or equal to 6.4 milliWatt/meterK."

"3. A particulate gel composition comprising a metal oxide gel or a silica gel, which under a 103421 Pa load, at 20 °C, and at a pressure of 13332.2 Pa, in Nitrogen, has (a) a packing density of less than or equal to 160 kg/m³ and (b) a Thermal Conductivity of less than or equal to 9 milliWatt/meterK."

"17. An insulation body comprising a container and the composition of any of claims 1 - 16 disposed therein."

"18. The use of the insulation body of claim 17 as a thermal insulation medium in a refrigeration appliance."

III. The examining division argued that the claims were "*prima facie* objectionable on grounds of lack of clarity" due to the use of unusual parameters. The full range of claimed products were not reproducible without undue experimentation, because the description would not provide information how to select the appropriate process parameters for obtaining the desired particulate gel products.

The examining division held that product claims 1 to 3 lacked novelty having regard to D1: WO A 94 25 149 and D2: WO A 96 18 456. It was noted that the preferred method of producing the gel in accordance with the application was the method disclosed in D1, and that a gel in particulate form was disclosed in example 3 of D1. Since no evidence was produced by the applicant that the claimed products - further characterized by unusual parameters not explicitly disclosed in D1 - would in fact differ from those obtained in accordance with D1, it was held that novelty was missing. With respect to D2, the process of preparation of the gel was again similar and it was argued that the packing density (which should be considerably lower than the bulk density indicated in D2) of the products fell within the claimed ranges, depriving the product claims of novelty.

IV. The applicant appealed against said decision with letter of 4 May 2001 and filed a reasoned statement with letter dated 5 July 2001.

As regards the clarity of the claims, the appellant essentially argued that the parameters used in the claims (packing density and thermal conductivity) were commonly used in the art, supporting his argument by quotations from reference books, literature articles and patent documents. The fact that these parameters were not to be found in D1 or D2 was mainly due to their being remote from the field of the application in question, not because said parameters as such were unusual.

With respect to sufficiency of disclosure and support by the description, it was submitted that the description contained numerous examples and comparative examples varying the relevant process parameters, such as concentration of the gel precursor, particle size of the composition, presence and type of opacifying agent, and its amount. The description would clearly indicate the effect of each of these parameters on the relevant properties of the end product. Therefore, the skilled person had the information necessary to work the invention.

The appellant also refuted the novelty objections based on D1 and D2. In particular, the appellant denied that D1 would disclose in its example 3 a **particulate** gel composition. Rather, D1 would use a particulate silica as a starting material, which is then acidified and gelled to form a coherent mass. Even if this coherent mass would be hypothetically broken into particles to

form a particulate composition, it would not exhibit both the claimed packing density and thermal conductivity, as was indicated in the first declaration of Mr Douglas M. Smith, dated 12 January 2001 and further indicated in his declaration dated 25 June 2001.

With respect to D2, the appellant maintained that the products disclosed in said document would also not exhibit the claimed packing density and thermal conductivity, in spite of a certain similarity in the methods of preparation. The bulk density reported in D2 (examples 23 to 28) would not necessarily be higher than the packing density measured under load. It could be inferred from Comparative Example G of the application in suit that particulate compositions prepared from gels disclosed in D2 would not exhibit the claimed packing density and thermal conductivity.

- V. The Board issued a first communication in which it found the disclosure sufficient as regards reproducibility and selection of the appropriate process parameters, as far as gel compositions based on silica gel are concerned. However, while the description formally supports the claims in disclosing the use of not only silica gel, but all kinds of metal oxide gels (page 10, line 37), the Board saw a lack of experimental evidence showing that the desired properties in terms of thermal conductivity and packing density under load can be obtained with all the materials claimed. The Board also found it necessary for reasons of clarity (Article 84 EPC) to include - as an allowable exception to Rule 29(6) EPC - a reference

to the test methods for thermal conductivity and packing density under load described in the description.

In the communication, the Board accepted the arguments put forward by the appellant regarding novelty over documents D1 and D2. Since the other prior art documents had not been examined so far, the Board's intention was expressed to remit the case to the department of first instance for further prosecution, provided that a positive conclusion on the issue of Article 83 EPC could be reached.

VI. In response thereto, the appellant filed new claims in accordance with a main and auxiliary request (facsimile of 5 October 2005) which were restricted to silica gels compositions. The appellant argued that it was unnecessary to include the test procedures in the claims, as they were clearly detailed in the description.

VII. The Board issued another communication dated 24 October 2005 in which the objection under Article 84 EPC against claims 1 to 3 of the main request was maintained.

VIII. The appellant replied by facsimile of 4 November 2005, filing new claims 1 to 17 as the new main request.

The independent claims of said main request read as follows:

"1. A particulate gel composition comprising a silica gel, which under a 103421 Pa load, at 20 °C, and at a pressure of 133.322 Pa, in Nitrogen, has (a) a packing

density of less than or equal to 160 kg/m^3 and (b) a Thermal Conductivity of less than or equal to 5.8 milliWatt/meterK, wherein packing density under load is determined utilizing the method described in the description and wherein thermal conductivity under load is measured according to ASTM Test Procedure C1114-92 utilizing the procedures and equipment as described in the description."

"2. A particulate gel composition comprising a silica gel, which under a 103421 Pa load, at 20 °C, and at a pressure of 1333.22 Pa, in Nitrogen, has (a) a packing density of less than or equal to 160 kg/m^3 and (b) a Thermal Conductivity of less than or equal to 6.4 milliWatt/meterK, wherein packing density under load is determined utilizing the method described in the description and wherein thermal conductivity under load is measured according to ASTM Test Procedure C1114-92 utilizing the procedures and equipment as described in the description."

"3. A particulate gel composition comprising a silica gel, which under a 103421 Pa load, at 20 °C, and at a pressure of 13332.2 Pa, in Nitrogen, has (a) a packing density of less than or equal to 160 kg/m^3 and (b) a Thermal Conductivity of less than or equal to 9 milliWatt/meterK, wherein packing density under load is determined utilizing the method described in the description and wherein thermal conductivity under load is measured according to ASTM Test Procedure C1114-92 utilizing the procedures and equipment as described in the description."

"16. An insulation body comprising a container and the composition of any of claims 1 - 15 disposed therein."

"17. The use of the insulation body of claim 16 as a thermal insulation medium in a refrigeration appliance."

The appellant also stated with telefax of 11 November 2005 that the request for oral proceedings was withdrawn on the condition that the main request filed on 4 November 2005 be allowed and the case remitted to the first instance for further prosecution.

IX. The appellant requested that the decision of the first instance be set aside and a patent be granted on the basis of the claims 1 to 17 in accordance with the main request filed with facsimile of 4 November 2005, or, alternatively, on the basis of the auxiliary request filed on 5 October 2005.

Reasons for the Decision

1. The appeal is admissible.
2. *Amendments*

Claims 1 to 3 of the main request are based on original claims 25, 13 and 37, respectively, of the PCT application WO 98/13135 as published and on the description, page 9, lines 23 to 25 and page 28, lines 3 to 6 of said application. The feature "silica gel" is disclosed in the description at page 10,

line 37. The passages relating to the test methods are taken from page 25, lines 23 to 28.

The requirement of Article 123(2) EPC is thus met.

3. *Article 84 EPC*

- 3.1 The claims on which the decision under appeal is based were rejected on the ground of lack of clarity because of the presence of unusual parameters defining the thermal conductivity (TC) and the packing density (see Section II, item 2a, of the decision). However, it was admitted that these parameters can be determined in a reliable fashion by the methods identified in the description.

The written evidence provided by the appellant in the form of dictionary entries and patent documents (P.W. Thrush, "A Dictionary of Mining, Mineral and Related Terms", U.S. Dept. of the Interior, 1968, U.S. Govt. Printing Office, Wash. D.C., page 787; INSPEC abstract no. A91044058; INSPEC abstract no. A83002898; COMPENDEX abstract no EI7712092598; EP 0 661 094 B1 [claim 9] (corresponding to EP A 661 094 published on 5 July 1995); EP 0 581 080 B1 [page 2] (published on 2 February 1994); EP 0 423 490 B1 [page 6]; US 5 480 696 A [col.2] (published on 2 January 1996); and EP 0 705 299 B1 [claims] (corresponding to WO 95/00580 A, published on 5 January 1995) clearly show that both packing density and thermal conductivity were commonly used to characterize physical properties of particulate compositions before the priority date. The Board observes that the claimed gel compositions are indeed defined by the thermal conductivity under load and the

packing density under load and that ASTM C1114-92 test procedure is not designed or adapted for obtaining the required TC data **under load**. However, further modifications to said standard tests have been made by the applicant to enable measurement under load, as described at pages 25 to 28 and Figures 3 and 4. The same applies to the method for determining the packing density.

Claims 1 to 3 in accordance with the main request which contain specific ranges of values relating to packing density under load and thermal conductivity (TC) under load have been so amended as to contain the required precise indication of the test method used for determining the said parameters. The requirement of Article 84 (clarity) is thus met.

- 3.2 As stated in Rule 29(6) EPC, "claims shall not, except where absolutely necessary, rely, in respect of the technical features of the invention, on references to the description or drawings. In particular, they shall not rely on such references as: "as described in part ... of the description", or "as illustrated in figure ... of the drawings"". In accordance with decision T 1156/01 of 21 June 2005 (see Reasons, point 2.3), "... if the invention is characterised by parameters, the method of and means for measurement should appear completely in the claim itself, whenever this is reasonable, or by reference to the description in accordance with Rule 29(6) EPC, if the method is so long that it would impair the conciseness of the claim." The Board considers claims 1 to 3 of the main request to be an allowable exception referred to in said Rule 29(6) EPC, because conciseness and

readability would suffer from a complete recitation of the methods of and means for measurement in the claims.

4. *Objections under Article 83*

- 4.1 The contested decision is *inter alia* based on the objection that the description would not sufficiently disclose the processes needed to prepare the various particulate materials having the desired thermal conductivity and packing density. More specifically, the methods were found to be lacking in reproducibility and the selection of the appropriate process parameters would require undue experimental burden and the exercise of inventive skill, giving rise to an objection under Article 84 EPC (clarity and conciseness) (see Section II of the decision, page 4, item 2b).

The Board is not convinced that the objections raised should in fact be treated under the provisions of Article 84 EPC, because they appear to relate essentially to the question of sufficiency of disclosure (Article 83 EPC).

Under section III of the contested decision, the examining division furthermore announced its intention to raise objections under Article 83 EPC, should the applicant be able to establish novelty over D1 and D2 during a possible appeal procedure. It was in particular pointed out that the large number of parameters which should simultaneously be varied requires the skilled person to carry out more than normal tests and trials in order to obtain the products according to claims 1 to 3 then on file.

4.2 According to the description, it is - *inter alia* -the following factors which primarily influence the properties of the end products:

- (a) The concentration of the solution before gelling;
- (b) Presence, amount and type of opacifying agent;
- (c) Particle size (after grinding and/or sieving);

(see description, e.g. page 10, lines 9 to 16; page 16, lines 20 to 27; page 18, lines 13 to 18; page 24, line 33 to page 25, line 18; examples).

In the view of the Board, the effect of each of factors (a) to (c) above is adequately disclosed and discussed in the description and the examples.

The concentration effect (a) can for instance be studied comparing compositions F (using a 5% by wt. solution) and G (8% solution) of example 2. The data show that the use of precursors having a higher solids concentration result in particulate compositions having higher packing densities and higher thermal conductivity (TC), consistent with the description, page 16, lines 20 to 27.

Factor (b) is investigated in example 4 (samples K through N) which supports the finding that the presence of an opacifying agent reduces thermal conductivity and that modified carbon black A (CB-A) gives lowest thermal conductivity (see pages 45 to 48, example 5). The influence of varying amounts of opacifier is studied in example 5 (compositions O, P, Q).

The influence of factor (c) (grinding / sieving) is demonstrated by example 3 (compositions H, I, J), showing that a decrease in particle size leads to an increase in packing density; TC decreases or increases depending on the particle size range.

In the contested decision, the examining division compared compositions G and K to other compositions disclosed in the application and concluded that not all compositions having the claimed packing density necessarily exhibit the claimed thermal conductivity. The examining division concluded from page 18, lines 9 to 18 that packing densities are controlled by the concentration of the precursor solution; and implied that the description would not explain why the TC of compositions G and K are different from the other compositions although they were prepared similarly to compositions D - F, H - J, L - N, P and Q. The Board observes that the application does not state that the concentration of the precursor solution is the only factor controlling packing density and thermal conductivity. As pointed out above, other factors influence the properties of the end product. The description at page 18, lines 9 to 18, only suggests solids concentrations of less than or equal to 8%, preferably less than or equal to 7% to achieve the desired packing densities. As indicated by the appellant, it can be derived from examples 2 and 4 as read in view of the complete disclosure of the application why compositions G and K are outside the claims. In composition G the precursor solution had a solids concentration of 8%, thus above the recommended preferred range. On the other hand, composition K,

derived from a 5% solids precursor solution, had a higher TC because it did not contain an opacifier.

Concerning compositions D and M, the examining division has noted that the packing densities would be different in spite of the same concentration of gel precursor. However, it is apparent in the context of the entire description that these differences can be attributed to different particle size distributions due to the sieving step in the preparation of composition D (see the appellant's arguments in the grounds of appeal, page 8, point 3.7).

Compositions F and M have been prepared from the same starting materials and are both unsieved samples having the same packing density. Their thermal conductivities differ because composition F contains non - modified carbon black CB-A as an opacifier (page 35, lines 21, 22), whereas the carbon black CB-A used in composition M is modified (page 43, lines 12 to 13). Modified carbon blacks are disclosed at page 11 to page 15 of the description as preferred opacifiers; compositions M and N (page 45, Table) show the reduced TC obtained with modified CB-A. Compositions F and M are therefore compatible with the disclosure of the application read as a whole.

Regarding composition F, the question arises whether the TC measured at 1333.22 Pa can be considered to fall outside the range stated in claim 1 (current claim 2), taking into account that the TC values are defined in the claim using only one decimal place. Even if it fell slightly outside the claimed range, this alone would not be sufficient to call into doubt the sufficiency of

disclosure. In any case, regarding TC at higher and lower pressures (103421 Pa and 133.322 Pa, respectively), the composition satisfies the requirements of current independent claims 1 and 3. The reason why composition G exhibits a higher TC and a higher packing density can be explained by the higher solids concentration of the precursor solution (8% vs. 5%) (see page 37, line 8; page 35, line 23). This is consistent with the description, page 16, lines 20 to 27 and page 18, lines 14 to 16).

Finally, the examining division questioned the reproducibility of the claimed method on the basis of a comparison of compositions Q and M, and D and I, respectively. In fact, compositions Q and M have been prepared by the same methods, but show slight differences in packing density and TC, namely less than 5% for the packing densities and less than 3% for TC. For compositions D and I, which were also prepared by the same methods, the differences are less than 6% and less than 5% for packing density and TC, respectively. The appellant has attributed these differences in the grounds of appeal (pages 10, 11, point 3.11) to normal experimental error. In view of the degree of the variations, which does not exceed a few percent, the Board can accept this explanation.

The Board is thus satisfied that the skilled person is provided with sufficient information as to how to practise the invention, without having to resort to undue trial and error. The requirements of Article 83 EPC are thus met.

5. *Novelty*

5.1 Document D1 discloses the formation of surface - modified porous xerogels from metal oxide precursor solutions, preferably from silica (see examples 1 to 3; claims 1, 11). The porosity ranges from 0.60 to 0.95, the bulk density from 0.1 to 0.3 g/cm³ (see page 9, lines 29 to 33), experimentally from 0.18 (example 4) to 0.32 g/cm³ (example 5). The examining division assumed a TC within the claimed range in view of the similar methods of preparation and argued on implicit lack of novelty, assuming a bulk density of 0.1 to 0.3 reported in D1 to correspond to a particulate packing density under pressure within the claimed range. More specifically, the examining division referred to example 3, mentioning the surface modification of a particulate silica gel, as evidence that a particulate composition was prepared from said gel composition. However, the dried gels in accordance with D1 are apparently not ground or comminuted. The document is also silent on the packing density under load, as defined in the instant application, and on thermal conductivity under load.

According to the experimental report submitted by the appellant (see second Declaration of Mr Douglas M Smith, dated 25 June 2001, points 6 and 7), particulate composition obtained in accordance with D1 and incorporating an opacifier, exhibit a packing density under load of 130 kg/m³, as presently claimed. However, the report also indicates that a particulate composition formed by grinding a gel prepared in accordance with D1 (except for the presence of an opacifier) exhibits substantially higher thermal

conductivities of 7, 8.5 and 15 mW/mK under the respective pressure conditions stipulated in claims 1 to 3. Since the opacifier generally reduces the TC (see examples 4 and 5, compositions K - N and O, P and Q; and Mr Smith's second declaration, point 6), these results indicate that the gels obtained in accordance with D1, even if ground to form a particulate composition, would not fall under the scope of any of claim 1 to 3 in terms of thermal conductivity. Therefore, the claimed compositions are novel over the disclosure of D1.

- 5.2 Document D2 discloses in examples 23 to 28 sodium silicate precursor gels optionally containing a carbon black opacifier and having a bulk density of between 0.19 and 0.22 g/cm³. In example 29, which involves the use of an alkoxide precursor, a product was obtained consisting of "incoherent bodies largely comprising fines" and having a bulk density of 0.53 g/cm³. In examples 30 to 35, pellets were obtained having a bulk density of 0.54 to 0.66 g/cm³. Values for thermal conductivity are not reported. The Board cannot accept the hypothesis that bulk density and packing density under load are necessarily comparable or convertible and that the latter is necessarily lower than the former. According to the arguments presented in the statement of the grounds of appeal, item 5.2, the packing density when measured under load (in the instant case at a load of 103421 Pa) causes the composition to be compressed and thus becoming denser. The Board sees no reason not to accept these arguments.

Regarding thermal conductivity (TC), the Board can accept the conclusion drawn in Douglas M. Smith's second declaration, dated 25 June 2001, from the comparison between composition G of the application and examples 23 to 28 of D2. Said particulate composition G differs from the examples obtained in accordance with D2 (examples 23 to 28) in that:

- (i) The starting gel in G contained 8 wt.-% solids (page 37, line 8), instead of 10 wt.-% in D2;
- (ii) The gel was treated with TMCS (trimethylchlorosilane) prior to drying (page 38, lines 14 to 16);
- (iii) Composition G contained an unmodified carbon black, whereas some of the prior art compositions contained a modified carbon black.

It is shown in the application that reducing the concentration of solids in a gel (factor (i)) decreases the thermal conductivity, as does factor (ii) (second declaration, point 12). Use of an unmodified carbon black instead of a modified one (factor (iii)) tends to increase the thermal conductivity, but its effect would not be able to compensate for the effect of factor (i) going into the opposite direction, as can be inferred from examples F, G, M and N of the application. Since factor (ii) (treatment with trimethylchlorosilane) also reduces TC, the overall conclusion is that comparative example G would be expected to exhibit a TC as least as low as any particulate composition prepared from a gel produced in accordance with examples 23 to 28 of D2, for a given particle size. Comparative example G

exhibits TC values which are higher than the claimed ranges. By consequence, the said examples of D2 can also be expected to fall outside claims 1 to 3 of the main request and cannot be considered to deprive them of novelty.

Independent claims 16 and 17 refer back to the compositions of claims 1 to 3. Dependent claims 4 to 15 describe preferred embodiments of the claimed composition. Claims 1 to 17 are therefore novel with respect to documents D1 and D2.

6. *Remittal*

The decision under appeal dealt with objections under Article 84, Article 83 and Article 54 EPC only. For novelty, only documents D1 and D2 have so far been considered. Under these circumstances the Board, in exercising its discretionary power pursuant to Article 111(1) EPC, finds it appropriate to remit the case to the first instance for further prosecution.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the department of the first instance for further prosecution on the basis of claims 1 to 17 of the main request filed with telefax of 4 November 2005.

The Registrar:

The Chairman:

A. Wallrodt

M. Eberhard