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D E C I S I O N
of 2 August 2005

Case Number: T 0539/03 - 3.2.5

Application Number: 95914554.1

Publication Number: 0754531

IPC: B29C 45/00

Language of the proceedings: EN

Title of invention:
High-precision mechanical parts made from flame-retardant resin for office automation equipment

Patentee:
Asahi Kasei Kogyo Kabushiki Kaisha

Opponent:
GENERAL ELECTRIC COMPANY

Headword:
-

Relevant legal provisions:
EPC Art. 84, 56

Keyword:
"Clarity (yes)"
"Inventive step (main request, no; first auxiliary request, yes)"

Decisions cited:
-

Catchword:
-

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Case Number: T 0539/03 - 3.2.5

D E C I S I O N
of the Technical Board of Appeal 3.2.5
of 2 August 2005

Appellant: (Proprietor of the patent)
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Respondent: (Opponent)
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Representative:
-

Decision under appeal:
Decision of the Opposition Division of the European Patent Office posted 10 March 2003 revoking European patent No. 0754531 pursuant to Article 102(1) EPC.

Composition of the Board:

Chairman: W. Moser
Members: P. E. Michel
W. Widmeier

Summary of Facts and Submissions

I. The appellant (patentee) lodged an appeal against the decision of the Opposition Division revoking European Patent no. 0 754 531.

The Opposition Division held that the subject-matter of claim 1 of a main request lacked an inventive step, and claim 1 of first, second and third auxiliary requests were not clear, so that none of the requests of the appellant were allowable.

II. Oral proceedings were held before the Board of Appeal on 2 August 2005.

III. The appellant requested that the decision under appeal be set aside and that the patent be maintained on the basis of the following documents filed on 3 January 2005:

(i) claims 1 to 4 as main request; or
(ii) claims 1 to 3 as first auxiliary request; or
(iii) claims 1 to 4 as second auxiliary request; or
(iv) claims 1 to 4 as third auxiliary request; or
(v) claims 1 to 3 as fourth auxiliary request; or
(vi) claims 1 to 3 as fifth auxiliary request.

The appellant further requested that the documents filed by the respondent (opponent) on 27 July 2005 not be admitted into the proceedings.

The respondent requested that the appeal be dismissed. He further requested that the experimental data submitted by the appellant on 15 June 2005 and 18 July

2005, respectively, not be admitted into the proceedings.

IV. The following documents are referred to in the present decision:

D1: WO-A-93/04119
D2: EP-A-0 611 798
D6: JP-A-4-348157 together with an English translation thereof
D17: "Modulus and Yield Resistance of Glassy Blends Containing Diluents Manifesting Varying Degrees of Mobility: Polyphenylene Ether/Polystyrene/Diluent Mixtures", Kambour et al, J. Polym. Sci., Part B Polym. Phys., 27, pages 1979 to 1992 (1989)
D18: GB-A-2 043 083
D21: Marijnissen Report, "Finite Element analysis (FEA) Calculations"
D22: Declaration No. 2 of Mr. Kaoru Toyouchi (Ref. 5)

V. Claim 1 of the main request reads as follows:

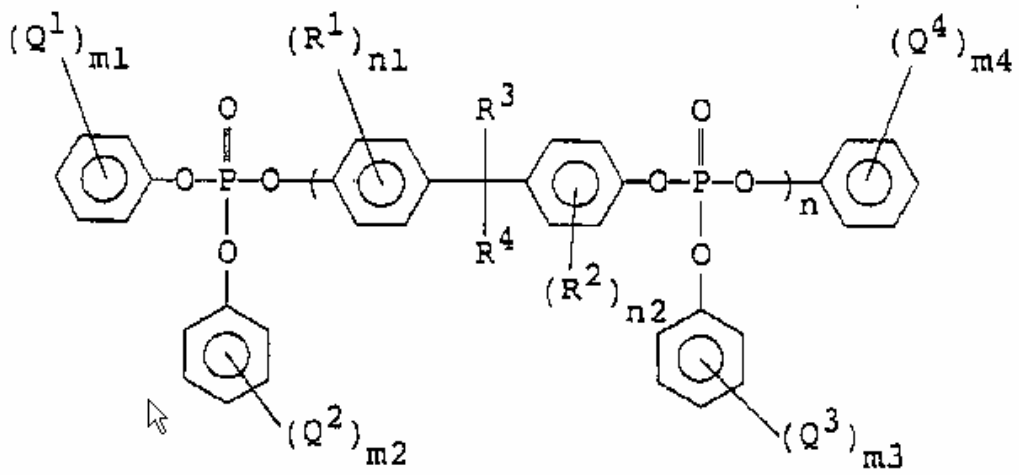
"1. A flame retardant, high precision resin mechanical part which is for use in office automation machines required to function with high accuracy and high precision and which exhibits an improved agreement between its computer-simulated characteristic resonance frequency value and its actually measured characteristic resonance frequency value, wherein said resin mechanical part is prepared by injection molding a thermoplastic resin composition comprising:

(A) 100 parts by weight of an amorphous thermoplastic resin comprising at least one resin selected from the group consisting of (a) a

polyphenylene ether resin, (b) a polycarbonate resin and (c) a styrene resin;

(B) 5 to 150 parts by weight of an inorganic filler in a scale form comprising at least one member selected from the group consisting of glass flakes and mica flakes; and

(C) 3 to 50 parts by weight of a phosphoric acid ester represented by the following formula (I):



wherein each of Q^1, Q^2, Q^3 and Q^4 independently represents a hydrogen atom or an alkyl group having 1 to 6 carbon atoms; each of R^1, R^2, R^3 and R^4 independently represents a methyl group or a hydrogen atom; n represents an integer of 1 or more; each of n1 and n2 independently represents an integer of from 0 to 2; and each of m1, m2, m3 and m4 independently represents an integer of from 1 to 3; said composition optionally containing a fibrous filler provided that said fibrous filler consists only of glass fibers such that the total amount of inorganic filler in a scale form and glass fibers does not exceed 150 parts by weight."

Claim 1 of the first auxiliary request differs from claim 1 of the main request in that it is additionally specified that:

"wherein said resin mechanical part is selected from the group consisting of a resin mechanical part for use in a driving device for an optical disk and a resin mechanical part for use in an office automation machine having a laser beam type printing mechanism".

In addition, component (A) cannot be a polycarbonate resin, and component (B) is limited to mica flakes.

VI. The appellant has argued substantially as follows in the written and oral procedure:

The experimental data submitted on 15 June 2005 were filed in response to the preliminary opinion of the Board before the date set by the Board for further submissions. The experimental data submitted on 18 July 2005 do not raise any new issues and are considered to be relevant insofar as they show that the omission of carbon fibres has a technical significance.

There had not been sufficient time to consider the documents filed by the respondent on 27 July 2005, so that they should not be admitted into the proceedings.

The reference in claim 1 to "an improved agreement" would cause no difficulty to the skilled reader and is defined in paragraph [0055] of the description of the patent in suit.

In the decision under appeal, the Opposition Division applied the problem and solution approach wrongly and was wrong to focus on flame retardancy.

It is not appropriate to apply the problem and solution approach in the present case. The fact that the combination of features of claim 1 of the main request results in new and unexpected properties indicates that an inventive step has been made.

If the Board were to be of the opinion that the problem and solution approach was appropriate, the closest prior art document would be document D6.

The problem to be solved should be expressed in terms of the technical effect achieved by the distinguishing features of the claim. In the present case, these are that the vibration characteristics of the part are in agreement with the computer simulated properties, improved vibration damping and stiffness.

This effect is achieved by the use of a specific fire retardant as defined in the claim.

The prior art does not contain a pointer to the solution of this problem.

As set out in section II-2-3 of the counterstatement filed on 3 January 2005, it is not accepted that the computer model is flawed, as alleged in document D21. In particular, samples are moulded using two gates to eliminate anisotropy.

It is noted that not all the phosphates discussed in document D17 are flame retardants. Moreover, data concerning the glass transition temperatures of flame retardants are not available.

Document D18 gives no indication of the substituent groups of the phosphates. In addition, the values set out in Table 1 are of tensile strength at yield and break and are thus not relevant. It is not possible to derive Young's modulus from these values.

The cited prior art thus does not suggest the subject-matter of claim 1 of the main request.

As regards claim 1 of the first auxiliary request, document D1 cannot be regarded as the closest prior art. The presence of carbon fibres is the basis of the invention which is the subject of this document.

Tables A and C of document D22 indicate the advantages of mica flakes over glass flakes.

The cited prior art thus does not suggest the subject-matter of claim 1 of the first auxiliary request.

VII. The respondent has argued substantially as follows in the written and oral procedure:

In the grounds of appeal, the appellant relied upon arguments concerning the resonance frequency of the mechanical part. The late filed experimental data therefore relate to fresh issues.

The documents filed on 27 July 2005 were filed in response to the new experimental data filed by the appellant and were filed as soon as possible, so that, if the Board intends to admit the late filed experimental data, the new documents should also be admitted into the proceedings.

Claim 1 of the main and first auxiliary requests, respectively, does not satisfy the requirements of Article 84 EPC, since the expression "which exhibits an improved agreement between its computer-simulated characteristic resonance frequency value and its actually measured characteristic resonance frequency value" is indefinite and unclear. In particular, it is not clear with respect to what the "improvement" should be measured.

The closest prior art document is document D6.

The computer model used by the appellant is only one of many models that exist. The alleged improvement only occurs by virtue of the use of the wrong model in the case of anisotropic fillers such as glass fibres. It is always the case that isotropic fillers give rise to a better match between the simulated and actual properties. This is demonstrated by document D21.

No comparison between the product of the invention and that of document D6 has been provided. It has merely been shown that one composition containing a flame retardant has a higher stiffness than other compositions using different flame retardants. In fact, as demonstrated by document D17, most flame retardants have the effect of decreasing stiffness.

Document D17 further indicates in Figure 2 that, in general, whilst the modulus of elasticity decreases with increasing concentration of a phosphate diluent, for a given concentration of the phosphate diluent, the modulus of elasticity of a composition containing the phosphate increases with the glass transition temperature of the phosphate.

It is thus a simple matter to predict which phosphate will result in a composition having a higher modulus and to choose a phosphate accordingly. In general, glass transition temperature increases for larger molecular moieties and is therefore predictable. Document D1 provides a list of phosphate flame retardants at pages 12 and 13.

Document D18 also demonstrates that compositions containing a bisphenol-A bi- or polyphosphate have a higher tensile strength than a composition containing triphenyl phosphate (see Table 1, page 4).

The subject-matter of claim 1 of the main request thus does not involve an inventive step.

As regards claim 1 of the first auxiliary request, the use of mica flakes as opposed to glass flakes is an arbitrary choice which does not contribute to an inventive step.

Document D1 is the closest prior art. As stated at page 9, second paragraph, mica flakes are a preferred component of the composition. The subject-matter of claim 1 is only distinguished over the disclosure of

this document by the omission of carbon fibres. If it is not required for the composition to be electrically conductive, it is an obvious measure to omit the carbon fibres, which are comparatively expensive.

There is only indirect evidence of the advantages of mica flakes. In addition, the experiments are flawed by the failure to take the effects of anisotropy properly into account.

The subject-matter of claim 1 of the first auxiliary request thus does not involve an inventive step.

Reasons for the Decision

1. *Late filed submissions*

The experimental data submitted on 15 June 2005 by the appellant was in response to the preliminary opinion of the Board and was filed before the date set by the Board for further submissions. In addition, the experimental data submitted on 18 July 2005 do not raise any issues not previously raised in the present proceedings and are considered to be relevant insofar as they show that the omission of carbon fibres from the composition has a technical significance.

Whilst the data relate to matters which go beyond those raised in the grounds of appeal, the appellant is entitled to respond to arguments raised by the respondent and the Board.

Both sets of experimental data are accordingly admitted into the proceedings.

The documents filed on 27 July 2005 by the respondent were filed in response to the new experimental data filed by the appellant. It is accepted by the Board that these documents were filed by the respondent as soon as possible and without any intention to obtain a procedural tactical advantage, and, in view of their relevance, they are also admitted into the proceedings.

2. *Main Request*

2.1 Amendments

Claim 1 is amended as compared with claim 1 as granted in particular by the introduction of the feature specified in the last five lines of the claim, which refers to the optional presence of "a fibrous filler provided that said fibrous filler consists only of glass fibers such that the total amount of inorganic filler in a scale form and glass fibers does not exceed 150 parts by weight". This feature is disclosed in the application as filed (published version) at page 6, lines 37 to 49, and the amendment accordingly satisfies the requirement of Article 123(2) EPC.

The amendments restrict the scope of protection conferred and are made in order to overcome the grounds of opposition of Article 100(a) EPC.

The amendments thus comply with the requirements of Article 123(2) and (3) EPC as well as Rule 57a EPC. This was not disputed by the respondent.

2.2 Clarity

The expression "an improved agreement between its computer-simulated characteristic resonance frequency value and its actually measured characteristic resonance frequency value" as used in claim 1 is to be understood in the light of paragraph [0055] of the description of the patent in suit, where it is indicated that mechanical parts according to the invention do not suffer from the drawback of similar parts formed by moulding a resin composition containing only a fibrous inorganic filler, which exhibit complicated resonance characteristics. For such parts, it is difficult to predict the resonance frequency characteristics.

Claim 1 is thus clear and satisfies the requirements of Article 84 EPC.

2.3 Inventive step

2.3.1 The closest prior art is represented by document D6.

This document discloses a high precision mechanical part made by injection moulding a thermoplastic resin composition comprising

(A) 100 parts by weight of an amorphous thermoplastic resin comprising at least one resin selected from the group consisting of (a) a polyphenylene ether resin, (b) a polycarbonate resin and (c) a styrene resin; and

(B) 5 to 150 parts by weight of an inorganic filler in a scale form comprising at least one member

selected from the group consisting of glass flakes and mica flakes (page 5, second paragraph).

Among the various additives disclosed in the paragraph common to pages 30 and 31 of document D6 are mentioned flame retardant agents (page 31, line 3). There is, however, no disclosure of suitable flame retardants.

The subject-matter of claim 1 is thus distinguished over the disclosure of this document by the presence of 3 to 50 parts by weight of a phosphoric acid ester having the formula specified in the claim.

2.3.2 The problem to be solved is regarded as being to provide a flame retardant, high precision resin mechanical part having "good mechanical properties (e.g. rigidity and strength), heat resistance, flame retardancy, dimensional precision and dimensional stability" (patent in suit, paragraphs [0003], [0004] and [0013].

According to the invention, such properties are obtained by the use of the specified phosphate flame retardant.

It cannot be accepted that the problem should be drafted as narrowly as proposed by the appellant, that is as being to provide an improved agreement between the computer simulated characteristic resonance frequency value and the actually measured characteristic resonance frequency value. The person skilled in the art would not ignore improvements in other desirable physical properties. This effect is merely an aspect of an improvement in rigidity and

dimensional stability. It is accordingly not necessary to depart from the problem as defined in the patent in suit.

2.3.3 The person skilled in the art, seeking to improve the physical properties of moulded parts formed of the composition disclosed in document D6, would, inter alia, need to select a suitable flame retardant which, whilst providing the necessary flame retardancy, would nevertheless at least avoid impairing the physical properties of the moulded part as far as possible. Thus, whilst it is accepted that the problem to be solved is not the selection of a suitable flame retardant, nevertheless, at least a part of any solution to the problem set out above does involve the selection of a suitable flame retardant. In order to carry out the teaching of document D6 whilst rendering the part flame retardant, in the absence of any pointers in document D6 towards a suitable flame retardant, the person skilled in the art is left to choose a flame retardant.

Document D17 describes the effects of the use of various phosphate additives in blends of polyphenylene ethers and polystyrenes. Figure 2 shows that, for a particular concentration of phosphate, the modulus of elasticity is higher for phosphates with a higher glass transition temperature (T_g). Whilst not all the phosphates discussed in document D17 are flame retardants, this conclusion applies to phosphate flame retardant additives.

In addition, document D18 relates to flame retardant polyphenylene ether compositions containing di- and

polyfunctional phosphorus compounds. As discussed in general at page 1, lines 5 to 11, such high molecular weight fire retardant agents possess improved properties not related to flame retardancy, such as tensile strength when compared with low molecular weight fire retardant agents, such as triphenyl phosphate.

In the light of these documents, the person skilled in the art who needs to select a suitable flame retardant is encouraged to use a bi- or polyfunctional phosphorus compound. Whilst document D18 does not disclose limits on the substituent groups corresponding to those of claim 1, there is no suggestion that the substituent groups specified in claim 1 give rise to any particular advantages either in terms of the physical properties of the composition or otherwise.

The subject-matter of claim 1 according to the main request thus does not involve an inventive step.

3. *First auxiliary request*

3.1 Amendments

Claim 1 is amended as compared with claim 1 according to the main request by the introduction of the feature "wherein said resin mechanical part is selected from the group consisting of a resin mechanical part for use in a driving device for an optical disk and a resin mechanical part for use in an office automation machine having a laser beam type printing mechanism". This feature is disclosed in the application as filed (published version) at page 10, line 45 to page 11,

line 5, and the amendment accordingly satisfies the requirement of Article 123(2) EPC.

The remaining amendments involve deletions from the lists of component (A) and component (B) respectively.

The amendments restrict the scope of protection conferred and are made in order to overcome the grounds of opposition of Article 100(a) EPC.

The amendments thus comply with the requirements of Article 123(2) and (3) EPC as well as Rule 57a EPC. This was not disputed by the respondent.

3.2 Inventive step

3.2.1 It is suggested on behalf of the respondent that document D1, rather than document D6, is the closest prior art document.

This cannot, however, be accepted. Document D1 is concerned with the problem of the build up of electrostatic charges on the surface of moulded articles (see, for example, page 1, third paragraph). This problem is solved by the use of a thermoplastic composition incorporating carbon fibres and/or metal-coated graphite fibres, in order to render the material electrically conductive. To omit such fibres would be to ignore the central teaching of the document.

The presence of such fibres is, however, excluded by claim 1 of the first auxiliary request, according to which, if a fibrous filler is present, it consists solely of glass fibres.

The Board is accordingly of the opinion that, as in the case of claim 1 of the main request, document D6 represents the closest prior art.

The subject-matter of claim 1 is distinguished over the disclosure of this document, inter alia, by the fact that the flake filler consists only of mica flakes. The composition of document D6, on the other hand, contains glass flakes.

Table A of document D22 sets out four resin compositions. Composition 1 contains 30 parts by weight of glass flake. Composition 2 contains 15 parts by weight of mica flake and 15 parts by weight of glass fibre. Composition 3 contains 30 parts by weight of glass fibre. According to Table C of the document, a mechanical part made of composition 2 has a better agreement between computer predicted resonance frequencies and actual resonance frequencies than a mechanical part made of composition 1 for four out of five modes of vibration. This is in spite of the fact that composition 2 contains glass fibres which, according to the values for agreement between computer predicted resonance frequencies and actual resonance frequencies given for a mechanical part made of composition 3, give rise to significantly worse agreement.

Whilst it is accepted that this only represents indirect evidence of an improvement obtained by virtue of the use of mica as opposed to glass flakes, there is nothing to suggest that the conclusion that an improved agreement between computer predicted resonance

frequencies and actual resonance frequencies results from the use of mica flakes is incorrect.

3.2.2 The problem to be solved is regarded as being the same as that as discussed above in respect of the main request (cf. point 2.3.2 above).

3.2.3 Whilst document D1 refers to the use of mica flakes (see page 9, last paragraph), there is nothing in this document to suggest that the use of mica as opposed to glass flakes would give rise to any advantages in terms of improved physical properties of a component made from the composition. Similarly, none of the remaining documents cited in the present proceedings point towards any advantages which could be obtained by the use of mica as opposed to glass flakes in the composition of document D6.

The subject-matter of claim 1 according to the first auxiliary request thus involves an inventive step.

Claims 2 and 3 relate to preferred embodiments of the mechanical part according to claim 1. The subject-matter of these claims thus similarly involves an inventive step.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the first instance with the order to maintain the patent on the basis of the following documents:

(a) claims 1 to 3 filed as first auxiliary request on 3 January 2005; and
(b) description, pages 2 to 22, presented during oral proceedings;
(c) drawings, Figures 1(a) and 1(b) as granted.

The Registrar: The Chairman:

M. Dainese W. Moser