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D E C I S I O N
of 10 May 1995

Case Number: T 0375/92 - 3.3.2

Application Number: 87906505.0

Publication Number: 0332616

IPC: C03C 25/02

Language of the proceedings: EN

Title of invention:

Size composition

Applicant:

OWENS-CORNING FIBERGLAS CORPORATION

Opponent:

-

Headword:

Size/OCF

Relevant legal provisions:

EPC Art. 56

Keyword:

"Inventive step (yes) after amendment of the claims"

Decisions cited:

-

Catchword:

-



Case Number: T 0375/92 - 3.3.2

D E C I S I O N
of the Technical Board of Appeal 3.3.2
of 10 May 1995

Appellant: OWENS-CORNING FIBERGLAS CORPORATION
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Representative: Kedinger, Jean-Paul
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Decision under appeal: Decision of the Examining Division of the European
Patent Office dated 29 November 1991 refusing
European patent application No. 87 906 505.0
pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: P. A. M. Lançon
Members: M. M. Eberhard
C. Holtz

Summary of Facts and Submissions

- I. European patent application No. 87 906 505.0 was refused by a decision of the Examining Division. The decision was based upon Claims 1 to 7 and Claim 10 as originally filed and Claims 8 and 9 submitted on 27 May 1991.
- II. The ground for the refusal was that the sizing composition of Claim 1 did not involve an inventive step. The Examining Division held that the problem to be solved with respect to the closest prior art US-A-4 473 618 (hereinafter D1) was to further improve the sizing composition of D1 by reducing the degree of fuzz and fly. The claimed solution to this problem was considered to be obvious to the skilled person in view of the teaching of document US-A-4 555 447 (D2). According to the decision the skilled person, whose aim was to decrease static charge and dust of glass fibres, would have obviously incorporated an antistatic agent into the sizing composition of D1. In view of D2 the skilled person would have chosen quaternary salts of ammonium ethosulphate as antistatic agent since these compounds had already been found useful in a similar technical field and were readily available.
- III. The Appellant lodged an appeal against this decision. In reply to a communication of the Board, the Appellant submitted three sets of amended claims. Oral proceedings took place on 10 May 1995. At the beginning of these proceedings the Appellant was asked whether the main claims of each set of amended claims encompassed the exemplified sizing composition. In reply thereto the Appellant submitted an amended sets of claims as main request and abandoned the previously filed sets of claims. Claim 1 of the main request reads as follows:

"1. A substantial chrome-free aqueous sizing composition for glass fiber gun roving which comprises (A) a mixture of emulsified film-forming polymers comprising a polymer of vinyl acetate and ethylene, a polymer of vinyl acetate and an epoxy-functional vinyl monomer, and an unsaturated polyester resin; (B) titanium acetyl acetonate; (C) quaternary salt of ammonium ethosulfate; (D) a cationic lubricant; and (E) 3-methacryloxypropyl-trimethoxysilane or hydrolysate thereof; said composition containing no silylated polyaminopolyamide hydrochloride or hydrolysate thereof."

IV. The Appellant's arguments insofar as they concern the set of amended claims submitted at the oral proceedings can be summarised as follows:

The purpose of the invention was to solve several problems, in particular to reduce the formation of fuzz, to reduce the amount of fly and to improve the stiffness of the fibres. Although the author of D1 was aware of the possibility of adding an antistatic agent to a sizing composition, he did not incorporate such an agent, presumably because he did not find an appropriate antistatic agent which would have not impaired the properties to the sizing composition. Therefore, it was not obvious to add an antistatic agent to the size of D1. Furthermore, even if the skilled person had contemplated said addition, he would have tried the antistatic agents usually used in sizing compositions for glass fibre rovings and not the antistatic agent of D2, this document concerning wool insulation glass fibres and not reinforcement glass fibres. It could not be expected that the addition of an antistatic agent to the size of D1 would have solved the problems of reduction of fuzz and improvement of stiffness and would not have impaired the remaining properties of the size.

The statement of column 4 of D1 warning against modifying the sizing composition would have discouraged the skilled person to add a component thereto or to replace one of the five components (A) to (E) by another component, all the more so because the quaternary salt of ammonium ethosulfate had a structure and a function which were completely different from those of component (C) of the size according to D1. Even assuming that the skilled person would have contemplated substituting the antistatic agent of D2 for one of the components of D1, he would have been faced with at least six options on how to proceed. In particular he could have replaced only a part of component (A) of the known size by the antistatic agent, or only a part of one of the other components present in the composition. Picking and choosing elements from non-analogous art was an improper hindsight, and no logical reason justified the combination of D1 and D2.

- V. The Appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of Claims 1 to 10 as submitted during the oral proceedings and the description as originally filed, but with the pages 2, 4 and 7 as submitted during the oral proceedings.

Reasons for the Decision

1. The appeal is admissible
2. Amendments

Claim 1 differs from claim 1 as originally filed in that the sizing composition contains no silylated polyaminopolyamide hydrochloride. This feature can be

directly and unambiguously derived from the original description. In the paragraph bridging pages 1 and 2, reference is made to the sizing composition of US-A-4 473 618 (D1) which comprises the components (A) (B) (C) (D) and (E) wherein (C) is a silylated polyaminopolyamide hydrochloride or a hydrolysate thereof and it is stated at page 2, lines 8 to 9, that this known composition has been improved. It clearly derives from Example 1 and control Example 2 read in connection with the information at pages 3 and 4 of the description and with the analysis of D1 at page 2 that the sizing compositions of the present invention contain the same components (A) (B) (D) and (E) as the sizing compositions of D1 and that component (C) of D1, i.e. the silylated polyaminopolyamide hydrochloride or a hydrolysate thereof, has been **wholly replaced** by the quaternary salt of ammonium ethosulphate, i.e. component (C) of the claimed sizing composition. Therefore the incorporation of said feature into Claim 1 does not contravene the requirements of Article 123(2) EPC.

There are also no objections on the basis of Article 123(2) to the amendments in the dependent Claims 2, 3, 8 and 9 and in the description. In particular the amount of 0.28% of the quaternary salt of ammonium ethosulfate is disclosed in Example 1 which is an example according to the invention. The amendments in Claims 2 and 9 and at page 4, line 25, of the description represent corrections of obvious mistakes in the sense of Rule 88 EPC.

3. *Novelty*

The sizing composition, the glass fibre and the glass fibre gun roving as claimed in Claims 1, 5 and 7 respectively are novel since none of the cited documents discloses a sizing composition comprising the combination of features recited in Claim 1.

4. *Inventive step*

4.1 Of the documents cited in the Search Report, D1 represents the closest prior art. This document relates, like the present application, to substantially chrome-free aqueous sizing compositions for glass fibre gun rovings. These compositions comprise (A) a mixture of emulsified film-forming polymers comprising a polymer of vinyl acetate and ethylene, a polymer of vinyl acetate and an epoxy-functional vinyl monomer, and an unsaturated polyester resin; (B) a titanium acetyl acetonate; (C) a silylated polyaminopolyamide hydrochloride or hydrolysate thereof; (D) a cationic lubricant; and (E) gamma-methacryloxypropyl-trimethoxysilane or hydrolysate thereof (cf. Claim 1). According to D1 these sizing compositions lead to glass fibre rovings exhibiting exceptionally advantageous combinations of properties which are listed at column 5, lines 34 to 51. In particular they chop easily and cleanly and produce advantageously low levels of fuzz and fly. The unsaturated polyester resin laminates formed with these rovings exhibit excellent tensile strength and modulus, flexural strength, and impact strength (cf. column 5, lines 52 to 56).

4.2 Starting from this closest prior art, the technical problem underlying the present application can be seen in providing a sizing composition for glass fibre gun

roving, which reduces the amount of fuzz and fly to lower levels and leads to rovings with an improved stiffness without impairing the other properties.

As indicated at page 2 of the present application fuzz results from fibres breaking during processing and fly is static-dispersed pieces of chopped strands.

The present application proposes to solve this problem by the sizing composition as defined in Claim 1, i.e., in other words, by replacing component (C) of the sizing composition of D1 (the silylated polyaminopolyamide hydrochloride) by a quaternary salt of ammonium ethosulfate. The results reported in Example III of the description as regards static reduction and stiffness of the rovings with respect to those of D1 and the additional results in the test on reduced fuzz submitted on 28 March 1995 show that the improvements were obtained for the amount of fuzz and fly and for the stiffness. It is also derivable from the description, page 7 line 21 to page 8 line 5, that the other properties were not impaired. Therefore, it is credible that the technical problem stated above has been really solved by the claimed solution.

- 4.3 D1 itself does not contain information which could give the skilled person an incentive to replace the silylated polyamino-polyamide hydrochloride by a quaternary salt of ammonium ethosulfate in order to obtain the desired improvements without impairing the other properties.

The skilled person faced with the technical problem indicated above would have first of all looked for suggestions in the prior art dealing with the treatment of continuous glass fibres, in particular with the sizing compositions for such glass fibres. However, in the absence of any suggestions in the same technical

field, the skilled person would obviously have also considered the prior art in the neighbouring field concerning the fibrous glass wool for insulation. Therefore, the skilled person would have come upon D2.

- 4.4 D2 concerns the use of an antistatic agent in the production of blowing wool. According to this document the glass wool or loose-fill insulation can be pneumatically applied over large horizontal surfaces, but often the distribution of the blowing wool through the application nozzle and air creates a static charge on the glass fibre surfaces. These electric charges repel each other causing small fibre particles to spread out causing a "cloud of dust" (cf. column 1, lines 35 to 40). This problem is solved by coating the glass wool with an aqueous mixture consisting essentially of 1 to 5 wt% of a quaternary salt of ammonium ethosulfate as antistatic agent and water. The use of this component reduces the static charge of the fibres and thus cuts down or reduces the tendency of the small fibre particles to disperse (cf. column 1, lines 41 to 60, Claims 1 and 2).

This problem of static charge causing fibre particles to disperse is indeed related to the problem of generation of "fly" in the case of chopped strands (cf. the definition of fly given in the present application and in D1). However, D2 does not concern sizing compositions for continuous strands or rovings so that it is completely silent about the problems of fuzz formation and of stiffness of the glass fibres as well as about the other properties which are necessary for reinforcement fibres.

It is questionable whether the skilled person would, on this basis, have contemplated adding the antistatic agent of D2 to the sizing composition of D1 or not. This

question can remain open since even if the skilled person had done so, he would not have arrived at the claimed solution.

In view of the teaching of D2 the skilled person whose aim was not only to reduce the generation of fly but also to reduce the amount of fuzz and to improve the stiffness of the sized strands or rovings without impairing the other advantageous properties thereof would not have been encouraged to replace component (C) of the sizing compositions of D1 by the antistatic agent of D2 for the following reasons: Firstly the five components (A) to (E) of the known size are considered to be compulsory for obtaining the combination of properties indicated in D1 and the skilled person would have expected that the omission of one of the component would impair the properties of the rovings unless this component is replaced by a component having the same function in the sizing composition and/or a similar structure. However, the quaternary salt of ammonium ethosulfate used in D2 has not only a totally different structure from that of the components (A) to (E) present in the size of D1 but also a different function. In particular according to D2 said quaternary salt is an antistatic agent whereas component (C) of D1 is known as a coupling agent for glass fibres: cf. US-A-3 746 738 referred to in column 3 of D1. Furthermore the skilled person could not expect that the replacement of one of the components (A) to (E) and in particular of component (C) of D1 by the antistatic agent of D2 might improve the stiffness of the rovings and reduce the amount of fuzz. Therefore, even if the skilled person could have replaced component (C) of D1 by the antistatic agent of D2, he would not have done so since he could not expect this substitution to solve the technical problem stated above.

- 4.5 The third document cited in the search report, i.e. US-A-4 536 447, discloses an aqueous sizing composition for glass fibre strands containing (a) a nonionic surfactant, (b) a cationic quaternary ammonium salt surfactant, in particular a fatty methosulfate quaternary ammonium salt, (c) a polar functional coupling agent (organo-metallic or organo-silane coupling agents having polar organic functionalities), (d) water and (e) optionally a polyol protecting material (cf. Claim 1). The purpose of this document is completely different from the problem stated above and neither the problem of formation of fuzz and fly nor the problem of stiffness of the fibres are dealt with therein. This document even in combination with D1 and D2 could not suggest the claimed solution to the skilled person.
5. It follows from the above that it was not obvious to arrive at the sizing composition as defined in the amended Claim 1 in view of the cited prior art. Therefore, the subject-matter of Claim 1 is considered to meet the requirements of inventive step set out in Article 52(1) and 56 EPC.
6. Claim 1 being allowable, the same applies to the dependent Claims 2, 3, 4 and 8 to 10 as well as to the product Claims 5, 6 and 7 whose patentability is supported by that of Claim 1.

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 grant a patent in the requested version.

The Registrar:

The Chairman:

P. Martorana

P. A. M. Lançon