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File Number: T 685/92 - 3.3.3

Application No.: 88 108 749.8

Publication No.: 0 295 496

Title of invention: Method for protecting heat sensitive substrates from fire
and excessive heat

Classification: C09K 21/14

D E C I S I O N
of 21 April 1993

Applicant: PPG INDUSTRIES

Headword:

EPC Article 56

Keyword: "Inventive step (yes, after amendment)"



Case Number : T 685/92 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 21 April 1993

Appellant :

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Representative :

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Decision under appeal :

Decision of the Examining Division of the
European Patent Office dated 26 March 1992
refusing European patent application
No. 88 108 749.8 pursuant to Article 97(1) EPC.

Composition of the Board :

Chairman : F. Antony
Members : C. Gérardin
M. Aúz Castro

Summary of Facts and Submissions

- I. European patent application No. 88 108 749.8 filed on 1 June 1988, claiming the priority of 19 June 1987 from an earlier application in the United States and published under the publication No. 0 295 496, was refused by a decision of the Examining Division dated 26 March 1992.

This decision was based on a set of 12 claims filed on 17 September 1991, of which Claim 1 read as follows:

"Use of char forming intumescent curable coating composition comprising:

- (a) an epoxy resin containing at least 20 weight percent of said material having an oxirane functionality greater than 2;
- (b) a curing agent to cure the epoxy resin;
- (c) an additive component comprising a mixture of materials providing a source of:
 - (i) phosphorous,
 - (ii) zinc,
 - (iii) boron and
 - (iv) an expansion gas upon thermal decomposition,for protecting heat sensitive substrates which are more sensitive to heat than ferrous type substrates from fire and excessive heat."

Claims 2 to 12 were dependent use claims directed to specific embodiments of the use according to the main claim.

- II. The ground for this decision was lack of inventive step of the subject-matter of Claim 1 with regard to the teaching of EP-A3-142 074 (document (1)). More specifically, it was stated in this decision that the use of an identical intumescent curable composition, based however on an

unspecified epoxy resin, to coat a variety of substrates was known from this citation. Even if all the working examples related to the protection of ferrous type substrates, there was an explicit reference in the description to plastic substrates as well. The choice of an at least polyfunctional epoxy resin was obvious, since polyglycidyl ethers of at least difunctional phenols were described as particularly preferred. It was thus at most mere routine work to find the most suitable epoxy resin in order to adapt the composition to a specific use.

III. On 20 May 1992 a Notice of Appeal was lodged against this decision with payment of the prescribed fee.

(i) Together with the Statement of Grounds of Appeal filed on 16 July 1992 the Appellant submitted a new set of seven claims, wherein the main claim had been amended in two respects. First, the component (b) of the coating composition was now defined as "a liquid mixture of curing agents comprising at least 20 weight percent of an aralkyl diamine to cure the epoxy resin". Secondly, the passage following the definition of the additive component (iv) was now reading: "wherein the equivalent ratio of the epoxy resin (a) to curing agents (b) is within the range of 0.01:1 to 10:1, for protecting plastic coated cables". In this passage, the following amendments to the Appellant's wording have been carried out by the Board: 1) correction of the word "wherein"; 2) 0.01 instead of 0,01; and 3) comma between "10:1" and "for". An amended description adapted to the new claims was filed at the same time.

(ii) In support of the patentability of this subject-matter the Appellant put forward that, in order to meet the specific criteria required for an effective

protection of plastic coated cables, it had been necessary to select a particular type of epoxy resin and to use a liquid mixture of curing agents not mentioned in document (1). As demonstrated in the application in suit, a polyvinyl chloride jacketed electrical cable coated with an intumescent composition combining these two features exhibited an excellent flame spread index; this property, whereby potential hazards of cable runs were reduced, could not be expected in view of the teaching of document (1).

- IV. The Appellant requested that the decision under appeal be set aside and a patent be granted on the basis of Claims 1 to 7 and pages 1 to 12 of the amended description, all filed on 16 July 1992.

Reasons for the Decision

1. The appeal complies with Articles 106 to 108 and Rule 64 EPC and is admissible.
2. The wording of the claims does not give rise to any objections under Article 123(2) EPC.

Claim 1 differs from the original version of the main claim drafted as a method claim in three respects, namely (1) the category of the claim in combination with the specificity of the application, (2) the definition of the curing agent, and (3) the introduction of the equivalent ratio of the epoxy resin (a) to the curing agents (b). Feature (1) is supported by the passages on page 10, lines 12/13 and 25 to 29 originally filed, which disclose that the coating compositions are particularly suitable for coating cables which are jacketed in heat sensitive

substrates, such as plastics. Feature (2), i.e. the use of a liquid mixture of curing agents comprising at least 20 weight percent of an aralkyl diamine, corresponds to the preferred embodiment mentioned in original Claims 4 and 5 as well as in the original description on page 6, lines 16 to 30. Feature (3), i.e. the range defining the equivalent ratio of epoxy resin to curing agents, is to be found on page 6, lines 31 to 35 of the application as originally filed.

As far as Claims 2 to 7 are concerned, they have been drafted as dependent use claims. The specific application according to Claim 2 was the subject-matter of original Claim 21. The support for the compositional and quantitative features in Claims 3 and 4 is to be found on page 7, lines 17 to 21 for feature (i), page 8, lines 12 to 16 for feature (ii), page 8, lines 25 to 29 for feature (iii), and page 7, line 35 to page 8, line 3 for feature (iv). Claim 5 can be regarded as the combination of original Claim 15 with the passage on page 9, lines 9 to 13 of the original application. Last, the ranges defining the equivalent ratios of epoxy resin to curing agents according to Claims 6 and 7 correspond to the preferred and particularly preferred amounts mentioned on page 6, lines 31 to 35 of the original application.

3. The application in suit concerns the use of a char forming intumescent curable coating composition for protecting plastic coated cables. The use of such intumescent coating compositions to protect a great variety of substrates is known from document (1), which the Board, like the Examining Division, regards as an appropriate starting point for the definition of the technical problem underlying the application in suit. This citation describes an intumescent curable composition comprising (a) an epoxy resin; (b) a suitable curing agent; and (c)

an additive component comprising a mixture of materials providing a source of (i) phosphorus, (ii) zinc, (iii) boron, and (iv) expansion gas upon thermal decomposition; this composition, wherein both the epoxy resin and the curing agent are broadly defined, is said to be capable of forming a carbonaceous char upon exposure to heat or flame (Claim 1 in conjunction with page 4, line 10 to page 8, line 17). Although it can in principle be applied to many substrates, optimal protection is only achieved in practice in the case of steel substrates (page 14, lines 3 to 7; Examples I to VIII).

In the light of this prior art shortcoming the technical problem underlying the application in suit may thus be seen in an efficient protection of plastic coated cables from fire and excessive heat.

According to Claim 1 of the application in suit this problem is solved by using (a) an epoxy resin containing at least 20 weight percent of a polyepoxide having an oxirane functionality greater than 2, and (b) a liquid mixture of curing agents comprising at least 20 weight percent of an aralkyl diamine.

The experiment reported in part B of Example 1 of the application in suit, from which it appears that a PVC jacketed electrical cable coated with such an intumescent curable composition has an excellent Flame Spread Index, provides evidence that the above-defined technical problem is effectively solved.

4. After examination of document (1) the Board has come to the conclusion that this technical teaching is not disclosed therein and that the subject-matter of the application in suit as defined in present Claim 1 is, therefore, novel. Since the issue of novelty has not been

raised in the decision under appeal, it is not necessary to consider this matter in further detail.

5. It still remains to be decided whether the claimed subject-matter involves an inventive step with regard to the teaching of document (1).

5.1 Although, as noted above, the intumescent coating compositions described in this citation may be applied to many substrates, the protection of steel substrates is clearly in the foreground. This appears not only from the examples, where the only substrates tested are steel plates of various dimensions, but from the description as well, where emphasis is laid on specific aspects of the protection of steel substrates (page 1, line 4 to page 2, line 32; page 15, lines 12 to 24). In addition to an outstanding fire and heat protection provided for structural members and assemblies exposed to climatic conditions, the prior art intumescent coating compositions also have to protect these substrates from corrosion and other damage brought about by outdoor exposure, even if a fire never occurs. It is evident that the protection of steel substrates exposed to climatic conditions and the protection of plastic coated cables require coatings having different balances of properties.

As explained in the introductory section of the application in suit (page 2, lines 23 to 31), because heat sensitive substrates are damaged at a much lower temperature than steel substrates, they need a different level of protection. For this reason, the protection compositions for heat sensitive substrates must meet stringent test criteria, such as the ability to protect the substrate for a specified time period from the rapid rise in temperature experienced during a hydrocarbon fire. In view of this specificity, it is far from evident that

the whole teaching concerning fire protective coating compositions tailored for steel substrates should be relevant for the solution of a technical problem related to the protection of plastic coated cables.

- 5.2 Neither the epoxy resins, which are regarded as particularly suitable, nor those actually used in document (1) provide an incentive for the skilled person to choose a component (a) as specified in Claim 1 of the application in suit.

The epoxy resins quoted in the citation (page 4, line 10 to page 6, line 22) encompass well-known classes of oxirane group-containing materials, i.e. polyglycidyl ethers of at least dihydric phenols and polyhydric alcohols, polyglycidyl esters of polycarboxylic acids, polyepoxides obtained by epoxidation of olefinically unsaturated alicyclic compounds, epoxy novolac resins, epoxy resins containing ether units either as side-chains or as part of the backbone, as well as mixtures thereof. Even if compounds containing an oxirane functionality greater than two, such as polyglycidyl ethers of aliphatic triols and novolac resins, are explicitly mentioned in this list, the functionality of the resin appears overall as less important than its structure; in this respect, aromatic epoxy resins obtained from epichlorohydrin and bisphenol A are said to be preferred, especially in the form of the commercial product EPON 828 (Examples I to VIII).

The choice of an epoxy resin of unspecified structure, but containing at least 20 weight percent of a polyepoxide having an oxirane functionality greater than 2 in order to solve the above-defined technical problem underlying the application in suit, must thus be regarded as a non-obvious selection within the broad prior art teaching.

- 5.3 In the same way, the specific definition of the curing agent (b) in the application in suit is not suggested in the prior art document.

In principle, the curing agent in document (1) can be any conventional material, in particular an aliphatic or aromatic amine, a polyaminoamide, a polycarboxylic acid or anhydride thereof, as well as a condensation product of aldehyde with phenol, urea or melamine (page 7, line 1 to page 8, line 17). Even though m-xylylene diamine is explicitly mentioned among the suitable diamines, preference is given in the description to a polyaminoamide material sold under the trademark VERSAMID, which is actually used in Examples I to VIII.

There is thus nothing in this citation inviting the skilled man to choose as component (b) xylylene diamine or, more generally, aralkyl diamines, let alone liquid curing agents containing at least 20 weight percent of such hardening agent. It follows that the selection of a curing agent (b) as defined in the application in suit is a further non-obvious feature.

- 5.4 This means that, even if one regarded the teaching of document (1) as relevant in all respects for the solution of the above-defined technical problem, there is no incentive for the skilled man to choose precisely a composition combining an epoxy resin and a curing agent as defined in Claim 1 of the application in suit. For this reason, the claimed subject-matter involves an inventive step.

6. Claim 1 being allowable, the same applies to dependent Claims 2 to 7, which are directed to preferred embodiments of the subject-matter of Claim 1 and whose inventiveness is supported by that of the main claim.

7. Since the claims now meet the requirements of Article 56 EPC and a description adapted to these claims was also filed, there are no obstacles to the grant of a patent. It seems, however, that the epoxy resins obtained from epichlorohydrin and polycarboxylic acids should be properly referred to as polyglycidyl esters, not ethers (cf. new page 4, lines 27 to 32).

Order

For these reasons, it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the Examining Division with the order to grant a patent on the basis of Claims 1 to 7 and the description, pages 1 to 12, amended according to the remark made in point 7, all filed on 16 July 1992.

The Registrar:


E. Görgmaier

The Chairman:


F. Antony