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File No.: T 0712/90 - 3.3.3  
Application No.: 85 113 102.9  
Publication No.: 0 204 027  
Classification: C08K 13/02  
Title of invention: Self-extinguishing polymeric product based on polyolefins

**D E C I S I O N**  
of 1 October 1993

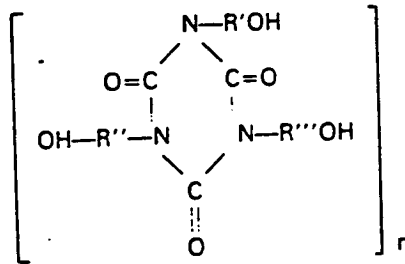
Patentee: V.A.M.P. S.r.l.  
Opponent: Hoechst Aktiengesellschaft, Frankfurt  
Headword:  
EPC: Art. 56  
Keyword: "Inventive step (confirmed)"

**Headnote**  
**Catchwords**

Summary of Facts and Submissions

I. The mention of the grant of the patent No. 204 027 in respect of European patent application No. 85 113 102.9 filed on 16 October 1985 and claiming the priority of 14 May 1985 from an earlier application in Italy, was published on 14 December 1988 on the basis of 9 claims, Claim 1 reading as follows:

"Self-extinguishing polyolefin polymeric materials comprising at least a polyolefin and a flame-retarding composition comprising ammonium polyphosphate, a hydroxyalkyl derivative of isocyanuric acid and a melamine derivative, characterized in that said polyolefin polymeric materials contain (in % by weight): (A) 5-60% of an ammonium polyphosphate; (B) 1-25% of a hydroxyalkyl-derivative of isocyanuric acid having the formula



wherein R', R'', R''' are alkyl radicals, either like or unlike one another, containing from 1 to 6 carbon atoms, and n is an integer ranging from 1 to about 500; (C) 1-25% of melamine cyanurate, said flame-retarding composition which comprises (A), (B) and (C) being contained in said polyolefin materials in an amount of from 7 to 70% by weight."

Claim 4 is a further independent claim directed to a flame-retarding composition to be used in polyolefins, which contains the same combination of additives (A), (B) and (C).

The other Claims 2, 3 and 5 to 9 are dependent claims concerning respectively preferred polyolefin polymeric materials according to Claim 1 and preferred flame-retarding compositions according to Claim 4.

II. On 12 September 1989 the Opponent filed a Notice of Opposition against the grant of the patent and requested revocation thereof in its entirety for the grounds falling under Article 100 EPC, more specifically for lack of novelty and inventive step of the claimed subject-matter. These objections were based essentially on the following documents:

- (2) DE-A-2 839 710,
- (3) US-A-4 180 496.

III. By decision of 13 July 1990 the Opposition Division rejected the opposition. It was first stated in this decision that the requirement of novelty was met, since document (2) did not describe either explicitly or implicitly the use of melamine cyanurate. Although the latter compound was known as a flame-retardant in linear polyester and polyamide compositions, it was used together with antimony oxide and halogen-containing compounds, and nothing suggested its suitability as a flame retardant for polyolefins when combined with other additives, in particular with compounds (A) and (B) according to the patent in suit.

IV. The Appellant (Opponent) thereafter filed a Notice of Appeal against this decision on 4 August 1990 and paid the prescribed fee at the same time. In the Statement of Grounds of Appeal filed on 2 November 1990 the Appellant maintained its previous objections of lack of novelty and inventive step. More specifically, document (2) cited tris-(2-hydroxyethyl)isocyanurate as a possible component of the ternary additive mixture described therein and further mentioned melamine, cyanuric acid as well as "the derivative" therefrom, which for the skilled person could only be melamine cyanurate; it followed that the subject-matter of the patent in suit as defined in Claim 1 was no longer novel. The experimental results in document (3), which showed that excellent flame retardation could be achieved with melamine or cyanuric acid as well as melamine cyanurate, would provide an incentive to use that adduct as the third component of the additive mixture known in document (2); no inventive step was thus involved in the combination of features as required in the patent in suit.

V. The Respondent (Patentee) objected in the first place to the interpretation given by the Appellant of the word "derivatives" in document (2); in particular, that term could not be equated with the reaction product of melamine with cyanuric acid. Regarding the issue of inventive step, melamine cyanurate was disclosed in document (3) in a specific context, i.e. in combination with antimony oxide and halogen-containing compounds as an additive mixture in polycondensation polymers, which was entirely different from the situation occurring in the patent in suit; moreover it could not be expected that melamine cyanurate would have both a synergistic antifiame function and a thermal stabilisation effect when used in polyolefins.

VI. The Appellant requested that the decision under appeal be set aside and the patent revoked entirely.

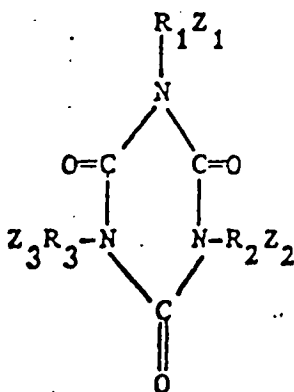
The Respondent requested that the appeal be dismissed.

Reasons for the Decision

1. The appeal complies with Articles 106 to 108 and Rule 64 EPC and is therefore admissible.

2. The first issue to be decided is whether the claimed subject-matter as defined in the independent Claims 1 and 4 is novel with regard to the teaching of document (2).

2.1 This document describes self-extinguishing compositions comprising a thermoplastic polymer, in particular a polyolefin, and a ternary flame-retarding additive combination containing (a) an ammonium phosphorus-containing derivative; (b) an isocyanuric acid derivative of formula



wherein R<sub>1</sub> to R<sub>3</sub> are alkylene groups having 1 to 6 carbon atoms and Z<sub>1</sub> to Z<sub>3</sub> are hydroxy or epoxy groups, and (c) one or several organic compounds which upon decomposition yield inert gases and carbon residues. The

relative amounts of the three components are such that the weight ratio (b): (c) varies between 10:1 and 1:10, and (a) as well as (b) + (c) represent each 5 to 30% by weight of the composition (Claim 1 in conjunction with page 3, paragraph 5 and all examples, except Example 22).

For the purpose of comparison with the composition according to the patent in suit the meaning of compounds (b) and (c) have been interchanged with regard to the actual disclosure of document (2).

2.2 Although the description regards ammonium phosphorus-containing organic derivatives as suitable components (a), ammonium polyphosphates are clearly preferred (page 2, paragraph 4 to page 3, paragraph 4; all examples). Since these compounds correspond to the definition of component (A) in the patent in suit, there is virtual identity between component (a) in the prior art citation and component (A) in the patent in suit.

2.3 From the general definition of component (b) above ("C" in document (2)) and its more specific definitions in the description, it appears that this compound can be (i) a tris-hydroxyl isocyanurate, optionally reacted with formaldehyde or with an organic polyisocyanate, or (ii) triglycidyl-isocyanurate, optionally reacted with a curing agent for epoxy resins, such as a polyamine (Claims 4 and 5; page 4, paragraph 1; page 5, paragraph 2, last sentence). The definition of component (B) in Claim 1 of the patent in suit corresponds thus to a selection among these various isocyanurate derivatives.

2.4 Component (c) ("B" in document (2)) with intumescent properties is either a polyol, optionally reacted with an organic polyisocyanate, or a nitrogen-containing

compound, including melamine and cyanuric acid, as well as their derivatives and condensation products, in particular with formaldehyde (Claims 2 and 3; page 3, paragraph 5; page 5, paragraph 2, third sentence). The reaction product of melamine and cyanuric acid is not mentioned; moreover, Table III on page 11 clearly shows that cyanuric acid is to be used as a single nitrogen-containing compound (cf. Examples 13 and 14), i.e. as an alternative to melamine (cf. Examples 5 to 8), not as a modifier thereof, as contended by the Appellant. It follows that component (C) as defined in Claim 1 of the patent in suit is clearly different from the corresponding components (c) in document (2).

2.5. Even if, for the sake of argument, one followed the Appellant's interpretation and regarded melamine cyanurate as being implicitly disclosed as component (c) in document (2), this compound would then be a further member of a large group of compounds, and component (C) according to Claim 1 of the patent in suit would be a selection from that large group of compounds. In that case the claimed compositions would result from the selection of two specific compounds, i.e. component (B) and component (C), from two separate lists of compounds.

In the decision T 12/81 "Diastereoisomers" published in OJ EPO 1982, 296 the Board decided that in the case of a process if "two classes of starting substances are required to prepare the end products and examples of individual entities in each class are given in two lists of some length, then a substance resulting from the reaction of a specific pair from the two lists can nevertheless be regarded for patent purposes as a selection and hence as new". This new element is not "attributable to the absence of a reference to the end product but to the fact that the combination actually selected from the wide range of possibilities has not



been disclosed to the public" (Grounds for the decision, points 13 and 14.2).

The same approach was followed in the decision T 7/86 "Xanthines" published in OJ EPO 1988, 381, which deals with polysubstituted chemical substances, where the individual substituents have to be selected from two or more lists of some length (Grounds for the decision, point 5.1).

Although the present claims concern a composition, and not a specific product of a reaction as was the case in T 12/81 or a polysubstituted compound as in T 7/86, the same novelty criteria should be applied, since in all three cases the definition of the final entity requires the selection of two specific elements from two groups of elements, these elements being the components of the claimed composition in the present case, the starting compounds in T 12/81 and the substituents in T 7/86.

- 2.6 For these reasons the Board concludes that the self-extinguishing polyolefin polymeric materials according to Claim 1 are novel with regard to the teaching of document (2). The same conclusion applies self-evidently to the flame retarding compositions according to independent Claim 4, since they contain the same ingredients.
  
3. As correctly stated by the Opposition Division, the closest state of the art is represented by those compositions in document (2) which contain an ammonium polyphosphate as component (a), tris-(2-hydroxyethyl)-isocyanurate as component (b), and an organic compound having intumescent properties as component (c). Such compositions are disclosed in Examples 2, 4 to 16, and 19. Although the flame retardation of these compositions can be regarded as satisfactory, as evident from the

flameproof rate V-O according to the UL-94 test method reported in Tables I to IV, thermal stability and surface migration properties of injection moulded specimens leave to be desired.

In the light of this shortcoming, the technical problem underlying the patent in suit can thus be seen to be the provision of self-extinguishing polymeric products based on polyolefins having an improved thermal stability and a lower tendency to blooming.

According to Claim 1 of the patent in suit this problem is to be solved by using melamine cyanurate as the third component of the additive system.

In view of the experimental data provided by the Respondent on 5 September 1987, which show that both optimal thermal stability and absence of blooming are achieved with compositions containing melamine cyanurate, but not with compositions containing melamine and/or cyanuric acid, the Board is satisfied that the above-defined technical problem is effectively solved.

4. The documents relied upon by the Appellant do not render obvious the choice of melamine cyanurate as component (C) for solving the above-defined problem.

4.1 Apart from the fact that document (2) does not deal with the two properties considered above for the definition of the technical problem underlying the patent in suit, the preferred embodiments described in this citation do not suggest the solution adopted in the patent in suit.

From the definitions given of components (b) and (c) (page 5, paragraph 2), it appears that both can be used as such (Examples 2, 4 to 14, and 20), or preferably in the form of an adduct, for instance with a

polyisocyanate or with formaldehyde, whereby a water insoluble, cross-linked product is obtained (Examples 15, 16, 19, 21 and 23). An even more preferred embodiment consists in reacting components (b) and (c) together, whereby a macromolecular structure is obtained (page 6, paragraph 1; Examples 17 and 18). It is evident that neither the reaction of components (b) and (c) with suitable reactants, nor the preparation of a high molecular weight product from these two components, can be interpreted as an equimolar adduct of the type melamine-cyanuric acid.

A further point to consider is the synergistic effect arising from the simultaneous presence of the isocyanurate compound and the compounds quoted as having intumescent properties, whereby the fire retardation properties of the polymer composition are enhanced (page 6, paragraph 3). In the Board's view, the skilled person, who is faced with the problem of improving two particular properties of a known composition without impairing the fire retardation properties thereof, would not be inclined to modify the definition of the compound with intumescent properties and, thereby, forego the advantages due to synergism.

4.2 Flameproof resin compositions containing an adduct of melamine and cyanuric acid in the molar ratio 1:1, thus a compound within the terms of component (C) in the patent in suit, are described in document (3). However, the other compositional features of these compositions as well as the purpose of the incorporation of melamine cyanurate not being the same as in the patent in suit, the skilled person would have no reason to follow that teaching for the solution of the above-defined technical problem.

According to document (3) melamine cyanurate is incorporated as single additive or in combination with other flameproofing agents into polyamides and polyesters to impart flameproofing characteristics to these polymers (Claim 1 in conjunction with column 2, lines 59 to 61 and examples). Emphasis is laid, on the one hand, on the shortcomings of melamine and cyanuric acid, namely sublimation of melamine and thermal decomposition of cyanuric acid at the high temperatures required for fabricating polyamides and polyesters, poor miscibility to these polymers and high hydrophilic property (column 1, lines 25 to 45), and, on the other hand, on the advantages conferred by the adduct, namely reduction of bubbles and improved colour properties of the resins (column 2, lines 30 to 34).

The mention of improved colour properties, which are closely related to thermal stability of the polymer has in fact to be interpreted in its proper context. Firstly, the stability of condensation polymers, like polyamides and polyesters, and of addition polymers, like polyolefins, is different and the stabilisation of these two kinds of polymers does not call for identical solutions. Secondly, even if the adduct compares advantageously with the components it is made from, nothing is said about the behaviour and the efficiency of the adduct in the presence of specific flameproofing agents like components (A) and (B) according to the patent in suit; in particular, nothing suggests that the adduct may improve the mechanical properties of polypropylene while using lower amounts of component (B) (cf. patent in suit, page 3, lines 8 to 14). In the Board's view, this effect must be regarded as surprising.

Moreover, the reference to improved colour properties is at most an indication how one aspect of the above-

defined technical problem can be solved. For the solution of the other aspect of that problem, i.e. reduction of blooming, the teaching of document (3) does not assist the skilled person in the least.

4.3 From the foregoing it follows that the compositional features of Claims 1 and 4 of the patent in suit must be regarded as non-obvious and that, consequently, the subject-matter of these claims involves an inventive step.

5. Claims 1 and 4 being allowable, the same applies to Claims 2 and 3 as well as to Claims 5 to 9, which are directed respectively to preferred self-extinguishing polyolefin polymeric materials and to preferred flame-retarding compositions, and whose inventiveness is supported by that of these two claims.

**Order**

**For these reasons, it is decided that:**

The appeal is dismissed.

The Registrar:

The Chairman:

E. Görgmaier

F. Antony