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**D E C I S I O N**  
**of 7 October 1998**

**Case Number:** T 0073/96 - 3.3.3

**Application Number:** 89200328.6

**Publication Number:** 0330256

**IPC:** C08K 5/00

**Language of the proceedings:** EN

**Title of invention:**  
Stabilizing composition for organic polymers

**Applicant:**  
Great Lakes Chemical Italia S.r.l.

**Opponent:**  
-

**Headword:**  
-

**Relevant legal provisions:**  
EPC Art. 54, 56, 123(2)

**Keyword:**  
"Amendments - added subject-matter (no - after further amendment)"  
"Inventive step - yes - nonobvious variation outside the scope of the closest prior art"

**Decisions cited:**  
-

**Catchword:**  
-



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Boards of Appeal

Chambres de recours

Case Number: T 0073/96 - 3.3.3

**D E C I S I O N**  
of the Technical Board of Appeal 3.3.3  
of 7 October 1998

**Appellant:**

Great Lakes Chemical Italia S.r.l.  
Via Cornaggia 10  
20123 Milano (IT)

**Representative:**

Fusina, Gerolamo  
Ing. Barzanò & Zandardo Milano S.p.A  
Via Borgonuovo, 10  
20121 Milano (IT)

**Decision under appeal:**

Decision of the Examining Division of the  
European Patent Office posted 20 July 1995  
refusing European patent application  
No. 89 200 328.6 pursuant to Article 97(1) EPC.

**Composition of the Board:**

**Chairman:** C. Gérardin  
**Members:** P. Kitzmantel  
A. Lindqvist

## Summary of Facts and Submissions

I. This appeal, which was filed on 7 September 1995, lies against the decision of the Examining Division dated 20 July 1995, refusing European patent application No. 89 200 328.6 filed on 13 February 1989 in the name of Enichem Synthesis S.p.A., transferred to Great Lakes Chemical Italia on 20 November 1995, claiming an IT priority of 24 February 1988, and published under No. 0 330 256. The appeal fee was paid together with the Notice of Appeal and the Statement of Grounds of Appeal was filed on 13 November 1995.

II. The decision under appeal was based on a set of 9 claims, independent Claim 1 submitted on 27 July 1994 reading as follows:

"1. A stabilizing composition for thermoplastic organic polymers, comprising:

a) a sterically hindered antioxidant phenol chosen from:

pentaerythritol-tetra[3-(3,5-di-tert-butyl-4-hydroxy-phenyl)propionate]; n-octadecyl ester of  $\beta$ -(3,5-di-tert-butyl-4-hydroxyphenyl)propionic acid;

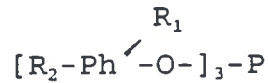
1,3,5-tris(3',5'-di-tert-butyl-4-hydroxybenzyl)isocyanurate;

1,3,5-tris(3,5-di-tert-butyl-4-hydroxybenzyl)-2,4,6-trimethylbenzene;

ethylenglycol-bis(3,3,-bis-3'-tert-butyl-4'-hydroxyphenyl)butyrate; and

hexamethylene-1,6-di[3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate];

b) a triarylphosphite of general formula:



where:  $\text{R}_1$  represents the tert-butyl or 1,1-dimethylpropyl group; and  
 $\text{R}_2$  represents the methyl, tert-butyl or 1,1-dimethyl propyl group; and

c) a dialkylthiodipropionate containing from 10 to 20 carbon atoms in each alkyl portion;

wherein the weight ratio [(b)+(c)]/(a) varies from 50:50 to 80:20 and the weight ratio (b)/(c) varies from 99:1 to 95:5, and the weight ratio of (a)/(b) varies from about 1:1 and 1:2."

The further Claims 2 to 9 were those as originally filed, independent Claim 6 reading as follows:

"6. A stabilized polymer composition, characterised by containing a thermoplastic organic polymer and a quantity of between 0.01 and 5.0% by weight of the stabilizing composition claimed in claims 1 to 4."

Claims 2 to 5 and 7 to 9 were dependent, respectively, on Claims 1 and 6.

III. The decision under appeal held

(i) that the statement introduced into Claim 1 that "the weight ratio of (a)/(b) varies from about 1:1 and 1:2" complied with the requirement of Article 123(2) EPC, and

(ii) that by virtue of that statement the subject-matter of Claim 1 was novel over EP-A-0 227 948 (hereinafter D1), but

(iii) did not involve an inventive step over that citation.

In the Examining Division's opinion the enhancement of the weight ratio (a)/(b) of the composition according to D1, Example 8, Table III from 3/8 to the claimed range of from 1:1 to 1:2 was obvious to one skilled in the art seeking to solve the existing technical problem, namely the provision of further stabilizer compositions, because similar compositions having such weight ratios have been known from D1, Example 7, Table II and Examples 9 to 15, Tables IV and V. The Applicant's further argument that it was not obvious to combine the selected (a)/(b) ratio with a low content of dialkylthiodipropionate (= component (b)) was dismissed by the Examining Division by pointing to examples in D1 having ratios (b)/(c) and [(b)+(c)]/(a) which would be perfectly within the range of Claim 1.

IV. In his Statement of Grounds of Appeal the Appellant emphasized that, contrary to the claimed subject-matter, according to D1, Examples 8 to 10 of Table III, an improvement of the YI (Yellowness Index) was connected with an enhancement of the amount of dialkylthiodipropionate. Furthermore, neither Example 7 in Table II nor Examples 9 to 15 in Tables IV and V could prove the effectivity for low YI values of an (a)/(b) weight ratio of 1:2; the reasons being that according to said Example 7 a further very effective diphosphite stabilizer component was present in the composition and that according to the latter mentioned examples a weight ratio (b)/(c) of 70/30 was used which was far off the range of 99/1 to 95/5 defined in Claim 1.

V. The Board, in a letter dated 30 July 1998, expressed doubts concerning the admissibility under Article 123(2) EPC of the feature in Claim 1 "the weight ratio of (a)/(b) varies from about 1:1 and 1:2", but conveyed a favourable view on the issue of inventive step if the afore-mentioned problem of support could be sorted out.

VI. With his letter dated 24 September 1998 the Appellant submitted an amended set of five claims, Claim 1 reading as follows:

"1. A polymer composition characterised by containing a thermoplastic organic polymer chosen from high and low density polyethylene, low density linear polyethylene, polypropylene, and copolymers or terpolymers of ethylene with alpha-olefins containing three or more carbon atoms, and a stabilizing composition comprising:

- a) pentaerythritol-tetra[3-(3,5-di-tert-butyl-4-hydroxy-phenyl)propionate];
- b) tris(2,4-di-tert-butyl-phenyl)phosphite and
- c) a distearyl thiodipropionate

wherein the weight ratio [(b) + (c)]/(a) varies from 50:50 to 80:20, the weight ratio (b)/(c) varies from 99:1 to 95:5, and the weight ratio of (a)/(b) varies from about 1:1 and 1:2, with the proviso that the amount of (a) + (b) contained in the polymer composition ranges from 0.01 to 0.25 weight %."

Claims 2 to 5 are dependent upon Claim 1.

VII. The Appellant requested that the decision under appeal be set aside and a patent be granted on the basis of the following version:

Claims 1 to 5, filed with the submission dated 24 September 1998,

description pages 1 to 4, 7 to 10 and 13 (pages 11 and 12 have been cancelled) filed with the submission dated 24 September 1998, and

description pages 5 and 6 as originally filed.

**Reasons for the Decision**

- 1. The appeal is admissible.
- 2. Amendments (Article 123(2) EPC)
  - 2.1 Claim 1 is fairly based on the original disclosure:

<u>portion of Claim 1</u>	<u>basis in the original disclosure</u>
definition of polymer components	Claim 8
definition of components (a), (b) and (c) of the stabilizing composition	selection from Claims 3 to 5 on the basis of Examples 1 to 6
weight ratio [(b)+(c)]/(a)	Claim 1
weight ratio (b)/(c)	Claim 1 (ratio 99:1), Claim 2 (ratio 95:5)
weight ratio (a)/(b)	Tests 4 in Tables 1 and 3 (ratio 1:1) Tests 4 in Tables 2 and 4 (ratio 1:2)
proviso: amount (a)+(b)	Table 1, Test 4 (0.01%), Table 5 *, Tests 3, 5 (0.25%)

\* these tests use a ratio (b)/(c) = 100/1.00 marginally outside the scope of Claim 1, which requires a minimum ratio of 100/1.01; since they otherwise fully conform with the requirements of Claim 1 they nevertheless provide an enabling disclosure for the limiting weight proportions of the claimed subject-matter

The amendment in Claim 1 of the weight ratio  $[(b)+(c)]/(d)$  to the weight ratio  $[(b)+(c)]/(a)$  amounts to an obvious correction of an error because nothing else could have been meant; thus, this amendment is admissible under Rule 88 EPC (cf. point 2.1 of the decision under appeal).

2.2 Claims 2, 3, 4 and 5 correspond to original Claims 2, 6, 7 and 9.

2.3 The requirement of Article 123(2) EPC is therefore complied with by all claims.

3. *Novelty (Article 54 EPC)*

3.1 Document D1

3.1.1 This document relates to stabilizer compositions for polyolefins comprising a tris-alkylphenyl phosphite, a dialkyl thiodipropionate and possibly a hindered phenolic stabilizer compound (Claims 1 and 8; page 3, lines 13 to 16).

3.1.2 Tables II and III on pages 5 and 6 report the melt flow and the colour stability characteristics (YI) of a number of linear low density polyethylene compositions comprising various amounts of the following stabilizer compounds:

a) U-276 = octadecyl ester of 3(3,5-di-tert-butyl-4-hydroxyphenyl)propionic acid (cf. footnote to Table I on page 4),

- b) W-447 = tris(2,4-di-tert-butylphenyl)phosphite  
(cf. page 3, Examples 1 to 2, lines 23 to 25) and
- c) DLTPD = dilauryl thiodipropionate (cf. page 3,  
Examples 1 to 2, lines 23 to 25).

While the stabilizer compound b) is that used according to present Claim 1 and while D1 also discloses the use as stabilizer compound c) of distearyl thiodipropionate (used according to present Claim 1) instead of dilauryl thiodipropionate (cf. D1, page 2, lines 34 to 37), there is no disclosure in D1 of the use of the sterically hindered phenolic stabilizer compound a) pentaerythritol-tetra[3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate] which is specifically required by present Claim 1.

- 3.1.3 The amounts of the afore-mentioned stabilizers a), b) and c) used according to D1, Example No. 8 in Table III (respectively 300, 784 and 16 ppm) differ from those according to present Claim 1 (1/1-2) only by a higher weight ratio (a)/(b) of 1/2,61, while the weight ratios (b)/(c) (= 100/2,04) and [(b)+(c)]/(a) (= 2,67/1) are within the ranges specified in present Claim 1 (i.e. (b)/(c) = 100/1-5,26 and [(b)+(c)]/(a) = 1-4/1).

The weight ratio situation of Examples No. 3 and 4 in Table II of D1 is analogous, i.e. only the ratio (a)/(b) is beyond that specified in present Claim 1.

- 3.2 In view of the differences discussed above, the subject-matter of Claim 1 of the application in suit is novel over document D1.

4. *Inventive step (Article 56 EPC)*

4.1 Problem and solution

It may be concluded from page 2, lines 14 to 21 of the application in suit that the problem it set out to solve was the provision of a stabilizing system able to improve the colour characteristics of thermoplastic organic polymers while at the same time maintaining the melt flow index and long-term thermal stability at optimum levels.

On the basis of the melt flow (MFI) and yellowness (YI) data reported in Tables 1, 2, 3 and 4 the Board is satisfied that this problem has effectively been solved.

4.2 Obviousness

In addition to the different weight ratios (a)/(b) the polymer compositions of D1 coming closest to those according to present Claim 1 are also different by the use of different stabilizer components a) and c) (cf. point 3.1 supra).

Even surmising that it was obvious to replace the stabilizer components a) and c) used according to D1, by the corresponding ones to be used according to present Claim 1 (an assumption that could be based on the conventional character of all these stabilizers), the subject-matter of this claim was not suggested by D1, for the following reasons:

4.2.1 Contrary to the conclusion drawn in the decision under appeal, one skilled in the art seeking to maintain satisfactory YI-values could not derive any incentive from D1 to reduce the weight ratio (a)/(b) of the compositions according to Table II, Examples 3, 4 and Table III, Example 8 to that of the claimed range of 1/1-2, **while maintaining** the other weight proportions within the limits specified in Claim 1: Examples 8 to 11 of Table III clearly teach that with lower (a)/(b) weight ratios better YI-values can only be achieved when concomitantly the weight ratio (b)/(c) is increased far beyond the upper limit of 100/5.26 set by the present Claim 1:

	D1, Table III, Ex. 8	D1, Table III, Ex. 11
a) U-276*	300 ppm	300 ppm
b) W-447*	784 ppm	600 ppm
c) DLTDP*	16 ppm	200 ppm
(a)/(b)	1/2,61	1/2,0
(b)/(c)	100/2.04	100/33,3
[(b)+(c)]/(a)	2,67/1	2,67/1

\*see point 3.1.2 supra

4.2.2 Examples 9 to 15 of Tables IV and V, which describe compositions with the respective weight ratios 300:560:240, provide the same teaching, because there again the weight ratio (b)/(c) of 100/42,9 is considerably below the upper limit of 100/5,26 of Claim 1, while the ratios (a)/(b) = 1/1,87 and (b+c)/a = 2,67/1 are within the ranges specified in present Claim 1.

4.2.3 As to Example No. 7 of Table II, which describes a composition with the respective weight ratios a:b:c of 0.03:0.04:0.0024, there again the lower weight ratio (a)/(b) of 1/1,33 is at the expense of a ratio (b)/(c) = 100/6 below the upper limit of 100/5,26 according to present Claim 1. Moreover, the relevance of the weight proportions of the stabilizer components (a), (b) and (c) is affected to an unknown degree by the presence of a fourth stabilizer (W-618 = distearyl pentaerythritol diphosphite).

4.2.4 Consequently, the conclusion drawn in paragraph 2.2.2 of the decision under appeal that the solution of the existing problem only required the carrying out of routine variations within the disclosure of D1 is not supported by the facts. Rather the formulation of compositions meeting the weight proportions of the stabilizer components (a), (b) and (c) specified in Claim 1 runs counter to the teaching of D1.

4.2.5 Further support for this interpretation of D1 is derived from a comparison of the polymer compositions of D1, Table III, Example No. 11 and Patentee's Examples No. 11 and 15 (from the Memorandum attached to his letter dated 26 July 1994). Although the composition according to D1 and those according to the Memorandum use different polymers and different stabilizers (a) and (c) this comparison is legitimate, because the respective constituents of each entity (polymer, stabilizers a) and c)) are closely related, allowing the assumption that the differences are not such as to essentially change the trend in the discolouration behaviour of the respective compositions.

D1, Tab.III, Ex. 11	Memo. Example No.11	Memo. Example No.15
linear low density polyethylene	polypropylene	polypropylene
a) U-276 = octadecyl ester of 3(3,5-di-tert-butyl-4-hydroxyphenyl) propionic acid	a) Anox 20 = pentaerythritol-tetra[3-(3,5-di-tert-butyl-4-hydroxy-phenyl)propionate]	a) Anox 20 = pentaerythritol-tetra[3-(3,5-di-tert-butyl-4-hydroxy-phenyl)propionate]
b) W-447 = tris(2,4-di-tert-butyl-phenyl)phosphite	b) Alkanox 240 = tris(2,4-di-tert-butyl-phenyl)phosphite	b) Alkanox 240 = tris(2,4-di-tert-butyl-phenyl)phosphite
c) DLTDP = dilauryl thiodipropionate	c) DSTDP = distearyl thiodipropionate	DSTDP = distearyl thiodipropionate
(a)/(b) = 1/2	(a)/(b) = 1/2	(a)/(b) = 1/2
(b)/(c) = 100/33,3	(b)/(c) = 100/30	(b)/(c) = 100/3
[(b)+(c)]/(a) = 2,67/1	[(b)+(c)]/(a) = 2,6/1	[(b)+(c)]/(a) = 2,06/1
YI unavailable	YI (after 1st/2nd/3rd extrusion): 4,0/4,9/6,0	YI (after 1st/2nd/3rd extrusion): 0,9/1,5/2,0

The above compositional data allow the conclusion that the (unavailable) YI values of the composition according to Example 11 in Table III of D1 will be similar to those of the composition according to Example No. 11 of the Memorandum. However, these YI values are inferior to those of the composition according to Example No. 15 of the Memorandum which differs from that of said Example No. 11 mainly by the larger ratio (b)/(c) = 100/3. Therefore, it may be

concluded that the better YI values of Example No. 15 are related to the adherence of this stabilizer composition to the weight ratios a:b:c as specified in present Claim 1, in particular to the ratio (b)/(c) being within the required range of from 100/1-5,26.

This was not foreshadowed in D1 and, thus, constitutes a further argument against the obviousness of the combination of the weight ratio ranges specified in present Claim 1.

4.2.6 The subject-matter of claim thus complies with the requirements of Article 56 EPC.

4.2.7 By virtue of their appendance to Claim 1 the same conclusion applies to Claims 2 to 5.

5. The claims and the amended description also meet the further requirements of the EPC, especially those of Article 84 EPC.

**Order**

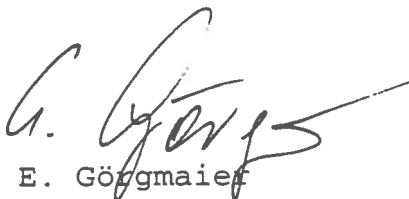
**For these reasons it is decided that:**

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 the following version:

Claims 1 to 5 and description pages 1 to 4, 7 to 10 and 13 filed with the submission dated 24 September 1998 (there are no pages 11 and 12),  
and

description pages 5 and 6 as originally filed.

The Registrar:

  
E. Göggmaier

The Chairman:

  
C. Gérardin

