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<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top; padding: 5px;"> (21) International Application Number: PCT/EP98/03506 (22) International Filing Date: 12 June 1998 (12.06.98) (30) Priority Data: MI97A01641 10 July 1997 (10.07.97) IT (71) Applicant (for all designated States except US): GREAT LAKES CHEMICAL ITALIA S.R.L. [IT/IT]; Via Cornaggia, 10, I-20123 Mailand (IT). (72) Inventors; and (75) Inventors/Applicants (for US only): NERI, Carlo [IT/IT]; Via Europa, 32, I-20097 San Donato M.se (IT). BROUSSARD, Fabio [IT/IT]; Piazza V. Veneto, 4, I-24060 Brusaporto (IT). CRISCI, Luciana [IT/IT]; Via San Angelo, 75, I-20074 Graffigiana (IT). ADOVASIO, Mauro [IT/IT]; Via G. Mattioli, 16/A, I-Bergamo (IT). (74) Agents: FRANCK, Peter et al.; Uexküll & Stolberg, Beselerstrasse 4, D-22607 Hamburg (DE). </td> <td style="width: 50%; vertical-align: top; padding: 5px;"> (81) Designated States: CA, JP, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published With international search report. </td> </tr> </table>			(21) International Application Number: PCT/EP98/03506 (22) International Filing Date: 12 June 1998 (12.06.98) (30) Priority Data: MI97A01641 10 July 1997 (10.07.97) IT (71) Applicant (for all designated States except US): GREAT LAKES CHEMICAL ITALIA S.R.L. [IT/IT]; Via Cornaggia, 10, I-20123 Mailand (IT). (72) Inventors; and (75) Inventors/Applicants (for US only): NERI, Carlo [IT/IT]; Via Europa, 32, I-20097 San Donato M.se (IT). BROUSSARD, Fabio [IT/IT]; Piazza V. Veneto, 4, I-24060 Brusaporto (IT). CRISCI, Luciana [IT/IT]; Via San Angelo, 75, I-20074 Graffigiana (IT). ADOVASIO, Mauro [IT/IT]; Via G. Mattioli, 16/A, I-Bergamo (IT). (74) Agents: FRANCK, Peter et al.; Uexküll & Stolberg, Beselerstrasse 4, D-22607 Hamburg (DE).	(81) Designated States: CA, JP, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published With international search report.
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(54) Title: LIGHT-STABILIZING SYNERGIC MIXTURES FOR ORGANIC POLYMERS				
(57) Abstract Stabilizing mixtures for organic polymers comprising: (a) one or more compounds belonging to the group of enamines, consisting of derivatives of β-keto-esters, or β-keto-amides or 1,3-diketones with primary or secondary aliphatic or aromatic amines, having general formula (I); (b) one or more compounds belonging to the group of sterically hindered amines.				
$[R_1 - \text{---} (\text{---} \underset{\underset{R_2}{ }}{N} \text{---} \overset{\overset{R_3}{ }}{C} = CH \text{---} \underset{\underset{O}{ }}{C} \text{---})_n \text{---}]_n \text{---} R_4 \quad (I)$				

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LIGHT-STABILIZING SYNERGIC MIXTURES FOR ORGANIC POLYMERS.

The present invention relates to light-stabilizing synergic mixtures for organic polymers.

5 More specifically, the present invention relates to stabilizing mixtures for organic polymers comprising one or more compounds belonging to the group of enamines, consisting of derivatives of β -keto-esters, or β -keto-amides or 1,3-diketones with primary or second-
10 ary aliphatic or aromatic amines and one or more compounds belonging to the group of sterically hindered amines (HALS) known in the art and their use in the light-stabilization of organic polymers.

The present invention also relates to the polymer-
15 ic compositions light-stabilized with the above mixtures and the end-articles obtained from these compositions.

It is known that organic polymers undergo degradation over a period of time as a result of exposure to

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atmospheric agents and mainly to ultraviolet radiation, and they also easily undergo thermoxidative degradation during processing and transformation processes.

This degradation results in a deterioration in the physical characteristics of organic polymers such as, for example, a decrease in the impact strength and flexure, as well as alterations in the optical properties of the end-article.

To prevent this degradation, stabilizing compounds are usually introduced into the organic polymers.

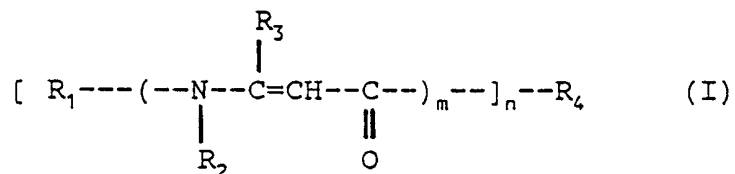
The Applicant has now found that compounds belonging to the group of enamines consisting of derivatives of β -keto-esters, or β -keto-amides or 1,3-diketones with primary or secondary, aliphatic or aromatic amines, have a synergic action when combined with one or more compounds belonging to the group of sterically hindered amines (HALS) known in the art and are therefore capable of stabilizing the organic polymers to which they are added improving their resistance to light, in particular, ultraviolet radiation.

The present invention therefore relates to stabilizing mixtures for organic polymers comprising:

- (a) one or more compounds belonging to the group of enamines, consisting of derivatives of β -keto-esters, or β -keto-amides or 1,3-diketones with

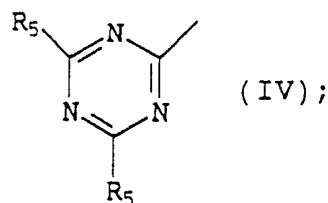
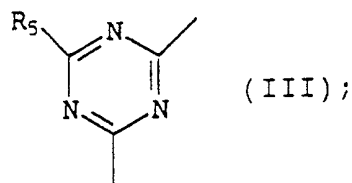
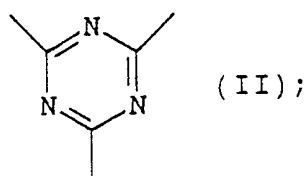
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primary or secondary, aliphatic or aromatic amines, having general formula (I):



wherein:

- m represents an integer from 1 to 3, extremes included;
- n represents an integer from 1 to 4, extremes included;
- R_1 represents a triazine having one of the following general formula (II), (III) or (IV):



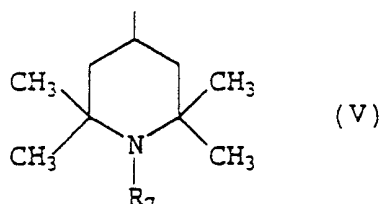
wherein R_5 represents a hydrogen atom; a

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linear or branched C_1 - C_{18} alkyl group; a $-NHR_6$ amine group or a $-SR_6$ group wherein R_6 represents a hydrogen atom or a linear or branched C_1 - C_{18} alkyl group;

- 5 - R_1 and R_2 , the same or different, represent a hydrogen atom; a linear or branched C_1 - C_{18} alkyl group; a linear or branched C_2 - C_8 alkoxyalkyl group; a C_5 - C_8 cycloalkyl group optionally containing a heteroatom selected from oxygen, nitrogen and sulfur; a C_6 - C_{18} aryl group; a C_7 - C_{20} arylalkyl or alkylaryl group; a group having general formula (V):

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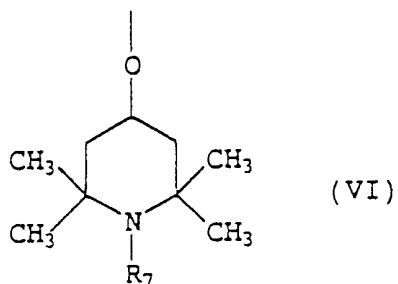
20

wherein R_7 represents a hydrogen atom; a linear or branched C_1 - C_{18} alkyl group, said alkyl group optionally substituted with an $-NHR_8$ group or an $-OR_8$ group wherein R_8 represents a hydrogen atom, a linear or branched C_1 - C_{18} alkyl group, or a C_6 - C_{18} aryl group; an $-OR_9$ group wherein R_9 represents a hydrogen atom, or a linear or branched C_1 - C_{18} alkyl group;

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- 5 -

- 5 or, R_1 and R_2 considered jointly with the nitrogen atom, represent a C_5 - C_8 heterocyclic group optionally containing a second heteroatom selected from oxygen, nitrogen and sulfur;
- 10 R_3 and R_4 , the same or different, represent a linear or branched C_1 - C_{18} alkyl group; a C_6 - C_{18} aryl group; a C_7 - C_{20} alkylaryl or arylalkyl group; a linear or branched C_1 - C_8 alkoxyl group;
- 15 or, R_4 represents a group having general formula (VI):

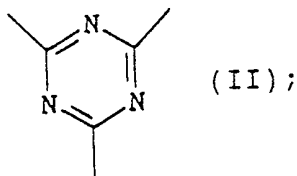


wherein R_7 has the same meanings defined above;

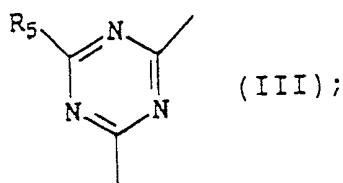
- 20 or, R_4 represents an $NR_{10}R_{11}$ group wherein R_{10} and R_{11} , the same or different, represent a hydrogen atom; a linear or branched C_1 - C_{18} alkyl group; a linear or branched C_2 - C_8 alkoxyalkyl group; a C_5 - C_8 cycloalkyl group optionally containing a heteroatom selected
- 25 from oxygen, nitrogen and sulfur; a C_6 - C_{18}

aryl group; a C₇-C₂₀ arylalkyl or alkylaryl group; a triazine having one of the following general formula (II), (III) or (IV):

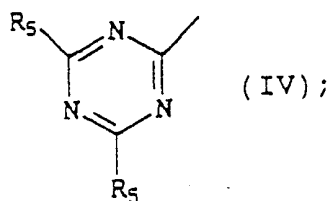
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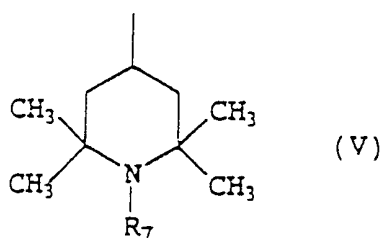


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wherein R₅ has the same meanings defined above; a group having general formula (V):

20



wherein R₇ has the same meanings defined above;

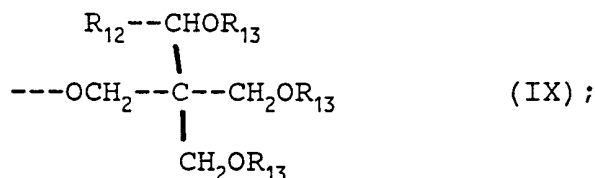
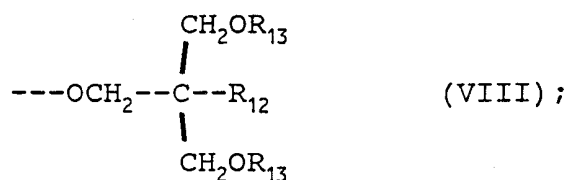
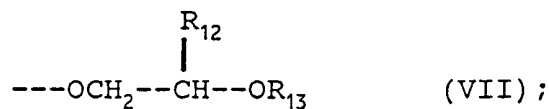
or, R₁₀ and R₁₁ considered jointly with the nitrogen atom, represent a C₅-C₈ heterocyclic group optionally containing a second hetero-

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atom selected from oxygen, nitrogen and sulfur;

or R_4 represents a group having one of the following general formulae (VII), (VIII) or (IX):



wherein:

- R_{12} represents a hydrogen atom; or a linear or branched C_1 - C_{18} alkyl group;
- R_{13} represents a linear or branched C_1 - C_{18} alkyl group; a $-\text{COCH}_2\text{COCH}_3$ group; or a direct bond;

(b) one or more compounds belonging to the group of sterically hindered amines.

Examples of R_1 , R_2 , R_{10} and R_{11} groups, as well as a hydrogen atom are: methyl, ethyl, propyl, isopropyl, butyl, octyl, cyclohexyl, benzyl, phenyl, ethylphenyl, methoxyethyl, 4-(2,2,6,6-tetramethyl)piperidinyl,

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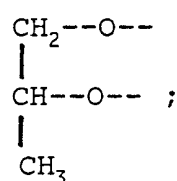
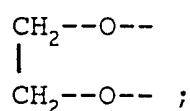
4-(2,2,6,6-tetramethyl)-1-butoxyethylpiperidinyl,
 4-(2,2,6,6-tetramethyl)-1-butoxypiperidinyl,
 4-(2,2,6,6-tetramethyl)-1-methylpiperidinyl,
 3,5-dioctylaminotriazine, 3,5-dibutylaminotriazine,
 5 etc..

Examples of C₅-C₈ heterocyclic groups, when R₁ and R₂ or R₁₀ and R₁₁ are considered jointly with the nitrogen atom, are: morpholine, pyrrolidine, piperidine, piperazine, thiomorpholine, thiazolidine, benzothiazolidine, etc..
 10 idine, etc..

Examples of R₃ and R₄ groups are: methyl, ethyl, propyl, isopropyl, phenyl, oxymethyl, oxyethyl, oxybutyl, etc..

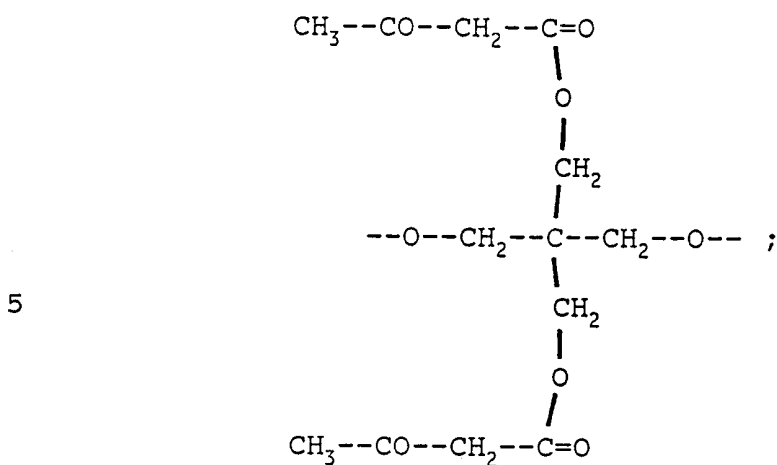
Examples of R₄ groups, when R₄ represents a group
 15 having general formula (VI), are: 4-(2,2,6,6-tetramethyl)piperidinoxy, N-methyl-4-(2,2,6,6-tetramethyl)piperidinoxy, N-methoxyethyl-4-(2,2,6,6-tetramethyl)piperidinoxy, N-methylaminoethyl-4-(2,2,6,6-tetramethyl)piperidinoxy, etc..

20 Examples of R₄ groups, when R₄ represents a group having general formula (VII), (VIII) or (IX) and n is 2, are:



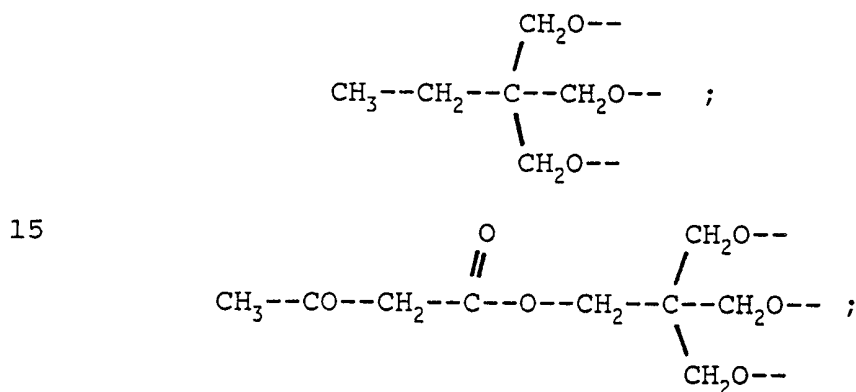
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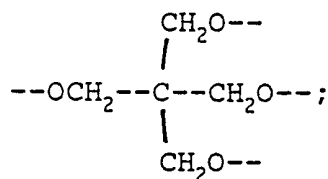
etc..

Examples of R_4 groups, when R_4 represents a group
 10 having general formula (VII), (VIII) or (IX) and n is
 3, are:



etc..

Examples of R_4 groups, when R_4 represents a group
 20 having general formula (VII), (VIII) or (IX) and n is
 4, are:



etc..

25 Examples of R_7 groups are: methyl, ethyl, propyl,

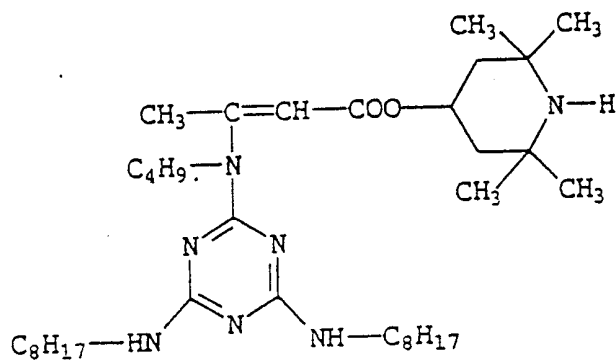
- 10 -

butyl, ethoxy, butoxy, β -hydroxyethyl, β -methoxyethyl, β -butoxyethyl, methylaminoethyl, etc.

Examples of R_5 , R_6 , R_8 , R_9 , R_{12} and R_{13} groups, when said groups represent a linear or branched C_1 - C_{18} alkyl group, are: methyl, ethyl, propyl, isopropyl, butyl, 5 octyl, etc..

Specific examples of compounds (a) having general formula (I), which should in no way be considered as limiting the scope of the present invention, are:

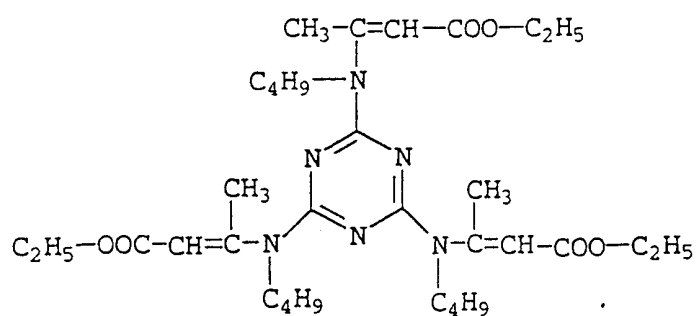
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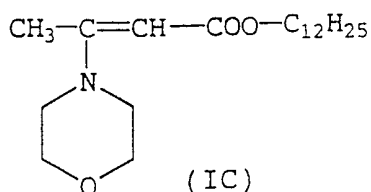
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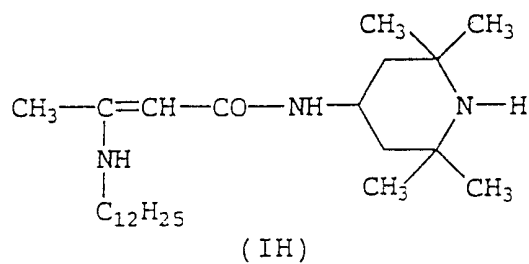
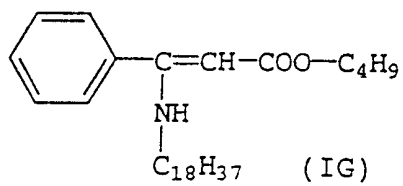
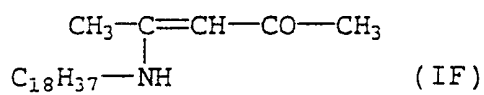
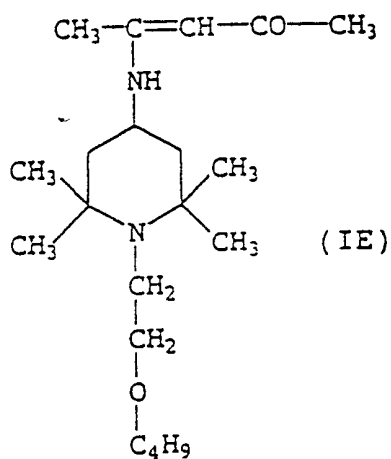
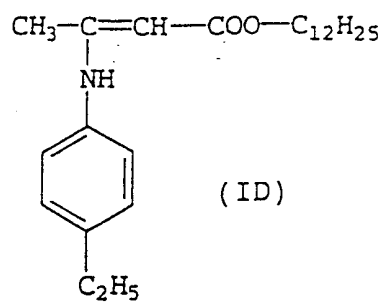
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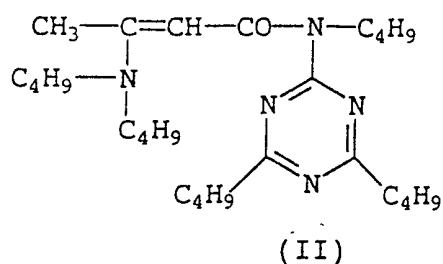
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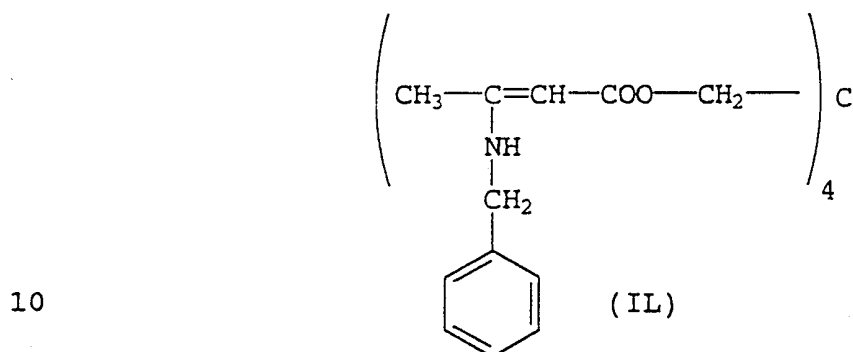
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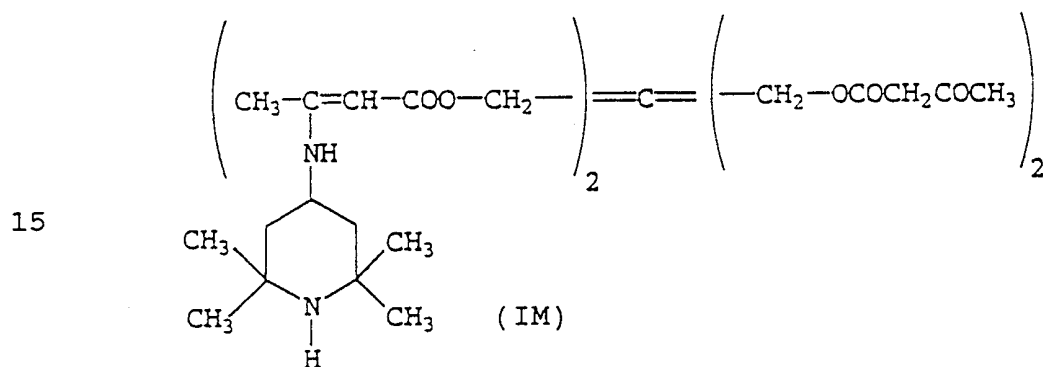




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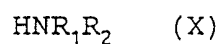
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The compounds having general formula (I) described
20 above, can be obtained by means of various processes.

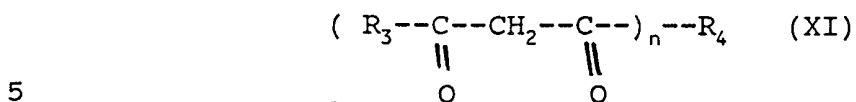
One process for the synthesis of the compounds
having general formula (I) comprises the reaction of
1-4 moles of a primary or secondary, aliphatic or aro-
matic amine, having general formula (X):

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- 13 -

wherein R_1 and R_2 have the same meanings defined above, with 1-3 moles of a β -keto-ester, or a β -keto-amide, or a 1,3-diketone having general formula (XI):



wherein R_3 , R_4 and n have the same meanings defined above.

The above reaction takes place in the presence of an inert organic solvent, preferably a hydrocarbon, in particular toluene, at a temperature ranging from 60°C to 160°C, preferably from 115°C to 150°C, at atmospheric pressure, and for a time ranging from 0.5 to 24 hours, preferably from 3 to 10 hours. Acetic acid can optionally be added as catalyst to this reaction.

During the above reaction, reaction water is released which is separated by azeotropic distillation using an apparatus for azeotropic distillation, whereas the organic solvent is recycled.

At the end of the reaction, the solvent and possible acetic acid present are removed by distillation thus obtaining a raw product. The desired compound having general formula (I) is purified from the raw product thus obtained by fractionated distillation, operating under vacuum, at a pressure ranging from 0.1 mm/Hg to 50 mm/Hg and a temperature ranging from 40°C

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to 200°C. Or, said compound having general formula (I) is separated by crystallization using techniques known in the art.

Examples of primary or secondary, aliphatic or aromatic amines, having general formula (X) which can be used for the purposes of the above reported process are: cyclohexylamine, n-butylamine, tert-butylamine, n-octylamine, tert-octylamine, n-octadecylamine, n-dodecylamine, benzylamine, 2-methoxyethylamine, 2-furfurylamine, pyrrolidine, piperidine, morpholine, dibenzylamine, aniline, diphenylamine, melamine, 4-amino-2,2,6,6-tetramethylpiperidine, 4-amino-2,2,6,6-tetramethyl-1-methylpiperidine, 4-amino-2,2,6,6-tetramethyl-1-butoxyethylpiperidine, 1-amino-3,5-dioctylaminotriazine, etc.

Examples of β -keto-esters or β -keto-amides, or 1,3-diketones having general formula (XI) which can be used for the purposes of the above reported process are: ethyl acetoacetate, ethyl benzoylacetate, acetylacetone, benzoylacetone, p-toluyllacetone, 4-(2,2,6,6-tetramethyl)piperidinyl acetoacetate, N-methyl-4-(2,2,6,6-tetramethyl)piperidinyl acetoacetate, acetoacetamide, acetoacet-4-(2,2,6,6-tetramethylpiperidine)amide, acetoacet-(3,5-dibutyltriazine)-1-amide, etc.

The enaminic function of the compounds having

- 15 -

general formula (I) synthesized by means of the process described above, is confirmed by NMR spectrometry analysis (obtained using a BRUKER AC 200 spectrometer) executed on samples with a high purity (95% confirmed
5 by gas-chromatography).

Other processes which can be used for the preparation of the compounds having general formula (I) of the present invention, however, are described in literature such as, for example, in Houben-Weyl (1957), Vol. 11/1,
10 pages 172-178.

Sterically hindered amines (b) which can be used for the purposes of the present invention can be selected from compounds (b-1)-(b-25) indicated hereunder.

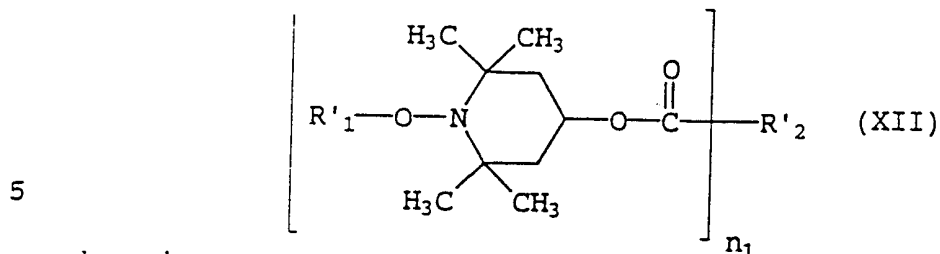
Compounds (b-1) can be selected from:

15 bis(1,2,2,6,6-pentamethyl-4-piperidinyl)-n-butyl-3,5-di-t-butyl-4-hydroxybenzylmalonate, tris(2,2,6,6-tetramethyl-4-piperidinyl)nitrilotriacetate, tetrakis(2,2,6,6-tetramethyl-4-piperidinyl)-1,2,3,4-butanetetracarboxylate, 1,1'-(1,2-ethanediyl)-bis-(3,3,5,5-
20 tetramethylpiperazinone), 4-benzoyl-2,2,6,6-tetramethylpiperidine, 3-n-octyl-7,7,9,9-tetramethyl-1,3,8-triazaspiro[4.5]decano-2,4-dione, 8-acetyl-3-dodecyl-7,7,9,9-tetramethyl-1,3,8-triazaspiro[4.5]decano-2,4-dione.

25 Compounds (b-2) can be selected from the compounds

- 16 -

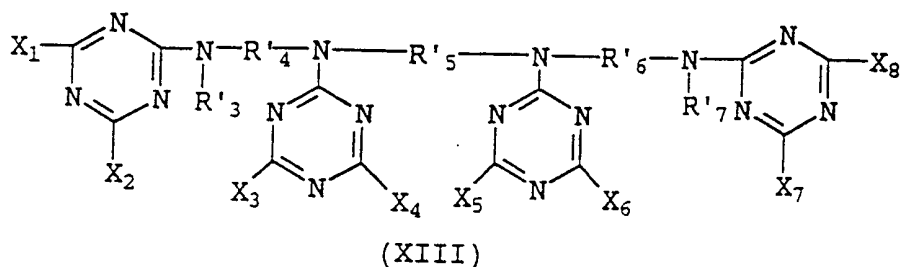
having general formula (XII):



wherein:

- R'_1 represents a hydrogen atom; a $\text{C}_1\text{--C}_{18}$ alkyl group; a $\text{C}_5\text{--C}_{12}$ cycloalkyl group optionally substituted with a $\text{C}_1\text{--C}_4$ alkyl group;
 - 10 - n_1 represents 1, 2, or 4;
 - when n_1 is 1, R'_2 represents a $\text{C}_1\text{--C}_{25}$ alkyl group;
 - when n_1 is 2, R'_2 represents a $\text{C}_1\text{--C}_{14}$ alkylene group;
 - when n_1 is 4, R'_2 represents a $\text{C}_4\text{--C}_{10}$ tetrayl-alkane group.
- 15

Compounds (b-3) can be selected from the compounds having general formula (XIII):



wherein:

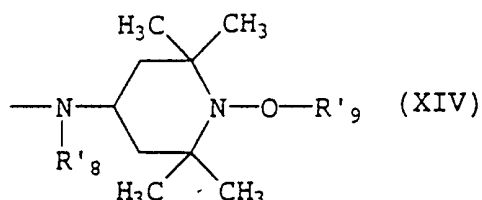
- R'_3 and R'_7 , the same or different, represent a hydrogen atom; or a $\text{C}_1\text{--C}_{12}$ alkyl group;
- 25 - R'_4 , R'_5 and R'_6 , the same or different, represent

- 17 -

a C₂-C₁₀ alkylene group; and

- X₁, X₂, X₃, X₄, X₅, X₆, X₇ and X₈, the same or different, represent a group having general formula (XIV):

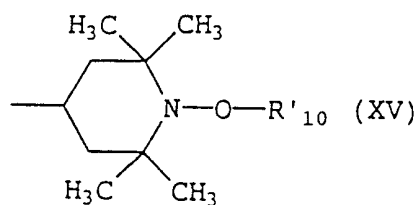
5



wherein:

- R'₈ represents a hydrogen atom; a C₁-C₁₂ alkyl group; a C₅-C₁₂ cycloalkyl group optionally substituted with a C₁-C₄ alkyl group; a phenyl group optionally substituted with an -OH group and/or a C₁-C₁₀ alkyl group; a C₇-C₉ phenylalkyl group optionally substituted in the phenyl group with an -OH group and/or a C₁-C₁₀ alkyl group; or it represents a group having general formula (XV):

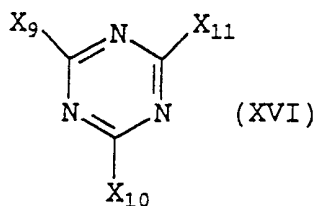
20



and R'₉ and R'₁₀, the same or different, have the same meanings as R'₁.

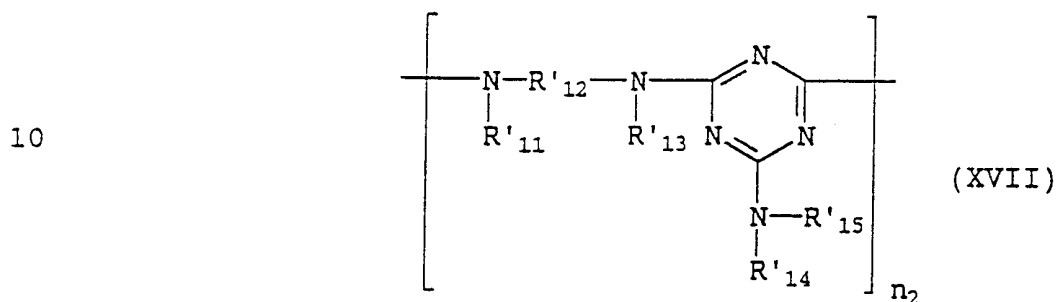
Compounds (b-4) can be selected from the compounds having general formula (XVI):

- 18 -



wherein X_9 , X_{10} and X_{11} , the same or different, represent
 5 a group having general formula (XIV).

Compounds (b-5) can be selected from the compounds
 having general formula (XVII):

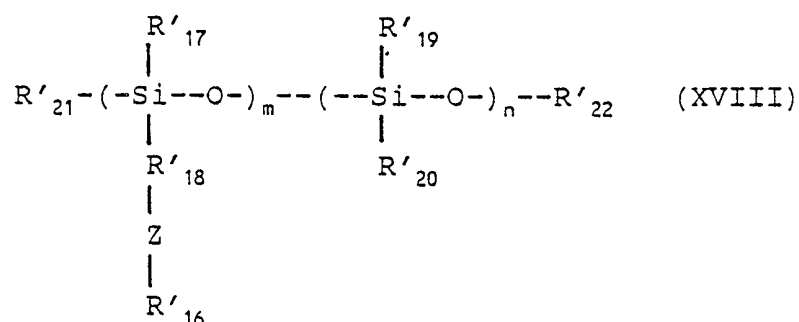


wherein:

- R'_{11} , R'_{13} , R'_{14} and R'_{15} , the same or different,
 15 represent a hydrogen atom; a C_1 - C_{12} alkyl group; a
 C_5 - C_{12} cycloalkyl group optionally substituted with
 a C_1 - C_4 alkyl group; a phenyl group optionally
 substituted with an -OH group and/or a C_1 - C_{10} alkyl
 group; a C_7 - C_9 phenylalkyl group optionally substi-
 20 tuted in the phenyl group with an -OH group and/or
 a C_1 - C_{10} alkyl group; or they represent a group
 having general formula (XV);
- R'_{12} represents a C_2 - C_{18} alkylene group; a C_5 - C_7
 cycloalkylene group; or a C_1 - C_4 alkylene di(C_5 - C_7
 25 cycloalkylene) group;

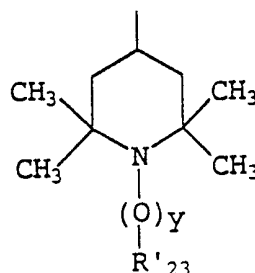
- 19 -

- or R'_{11} , R'_{12} and R'_{13} considered jointly with the nitrogen atom to which they are bound, represent a C_5 - C_{10} heterocyclic ring;
 - or R'_{14} and R'_{15} , considered jointly with the nitrogen atom to which they are bound, represent a C_5 - C_{10} heterocyclic ring;
 - n_2 is a number between 2 and 50 and at least one of the substituents R'_{11} , R'_{13} , R'_{14} and R'_{15} , represents a group having general formula (XV).
- Compounds (b-6) can be selected from the compounds having general formula (XVIII):



wherein:

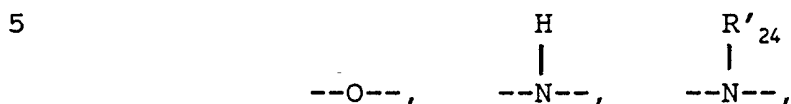
- R'_{16} represents:



- wherein R'_{23} represents a hydrogen atom; O' ; a C_1 - C_{18} alkyl group; a C_5 - C_{12} cycloalkyl group optionally substituted with a C_1 - C_4 alkyl group;

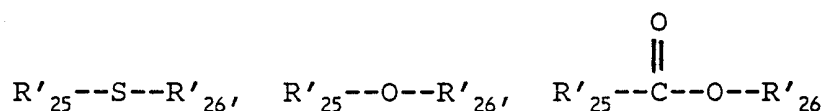
-CH₂CN group; a C₃-C₆ alkenyl group; a C₇-C₉ phenyl-alkyl group optionally substituted in the phenyl group with a C₁-C₄ alkyl group;

- Z represents a group selected from:



wherein R'₂₄ represents a linear or branched C₁-C₅ alkyl group;

- R'₁₇, R'₁₉ and R'₂₀, the same or different, represent a linear or branched C₁-C₁₀ group; a C₅-C₁₀ cycloaliphatic or alkylcycloaliphatic group; an aromatic group with 6 carbon atoms, said aromatic group optionally substituted with linear or branched C₁-C₁₀ alkyl or alkenyl groups;
- 10
- 15 - R'₁₈ represents a linear or branched C₁-C₁₀ alkylene group or one of the following groups:

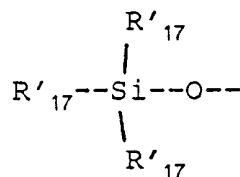


wherein R'₂₅ and R'₂₆ each independently represent a linear or branched C₂-C₁₀ alkylene group;

20

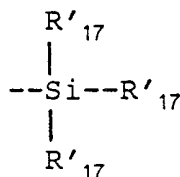
- m and n represent an integer so that 4 ≤ m+n ≤ 60;
0 ≤ n ≤ 15 and, when n is different from 0,
1 ≤ m/n ≤ 10;
- y represents 0 or 1;
- 25 - R'₂₁ represents OH or a

-21-



group wherein R'_{17} has the same meaning defined
 5 above;

- R'_{22} represents a hydrogen atom or a

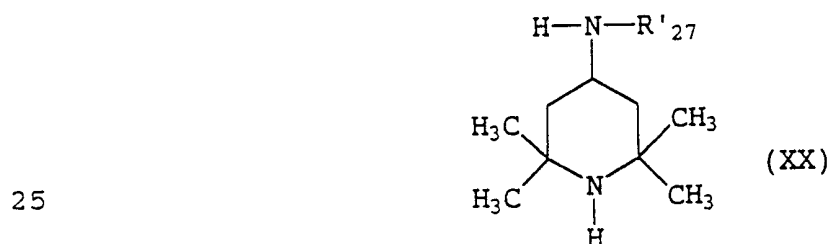
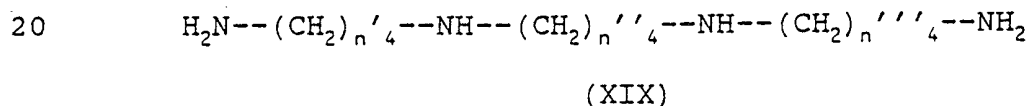


10 group, wherein R'_{17} has the same meaning defined
 above;

- or, R'_{21} and R'_{22} jointly represent a direct bond,
 giving rise to a cyclic structure.

Compounds (b-7) can be selected from the compounds
 15 obtained as follows:

(a) reacting a product obtained by the reaction of a
 polyamine having general formula (XIX) with
 cyanuryl chloride, with a compound having general
 formula (XX):



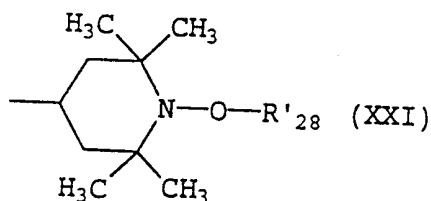
wherein:

- n'_4 , n''_4 and n'''_4 , the same or different, represent a number between 2 and 12; and

- R'_{27} represents a hydrogen atom; a C_1 - C_{12} alkyl group; a C_5 - C_{12} cycloalkyl group; a phenyl group; a C_7 - C_9 phenylalkyl group; and

(b) subsequently reacting the 2,2,6,6-tetramethylpiperid-4-yl groups present in the molecule obtaining a group having general formula (XXI):

10

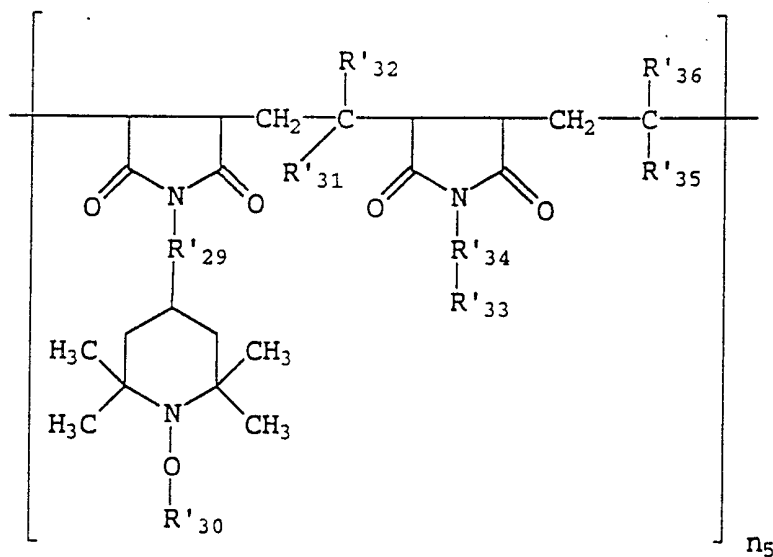


wherein R'_{28} has the same meaning as R'_1 .

Compounds (b-8) can be selected from the compounds

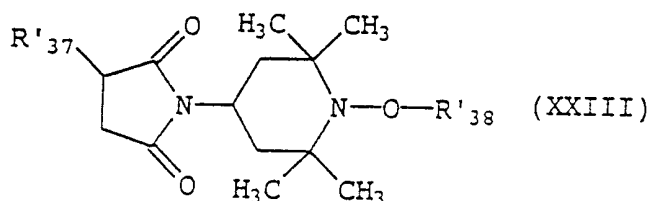
15 having general formula (XXII):

20



25 wherein:

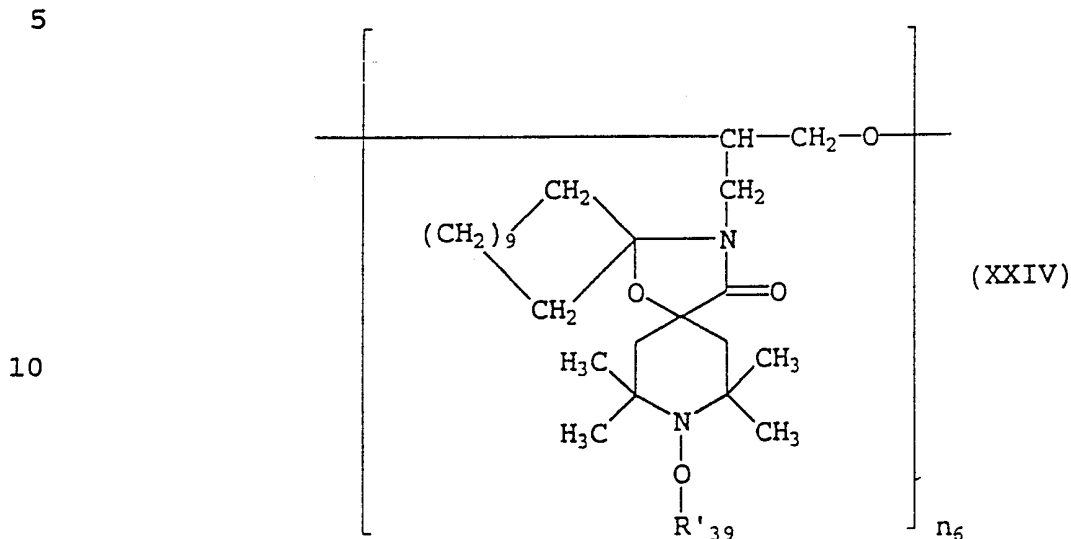
- R'_{29} and R'_{34} , the same or different, represent a direct bond; or a $-N(Y_1)-CO-Y_2-CO-N(Y_3)-$ group wherein:
 - Y_1 and Y_3 , the same or different, represent a hydrogen atom; a C_1-C_8 alkyl group; a C_5-C_{12} cycloalkyl group; a phenyl group; a C_7-C_9 phenylalkyl group; or a group having general formula (XV);
 - Y_2 represents a direct bond; or a C_1-C_4 alkylene group;
 - R'_{30} has the same meaning as R'_1 ;
 - R'_{31} , R'_{32} , R'_{35} and R'_{36} , the same or different, represent a hydrogen atom; a C_1-C_{30} alkyl group; a C_5-C_{12} cycloalkyl group; or a phenyl group;
 - R'_{33} represents a hydrogen atom; a C_1-C_{30} alkyl group; a C_5-C_{12} cycloalkyl group; a phenyl group; a C_7-C_9 phenylalkyl group; or a group having general formula (XV); and
 - n_5 represents a number between 1 and 50.
- Compounds (b-9) can be selected from the compounds having general formula (XXIII):



wherein:

- R'_{37} represents a C_1 - C_{24} alkyl group; and
- R'_{38} has the same meaning as R'_1 .

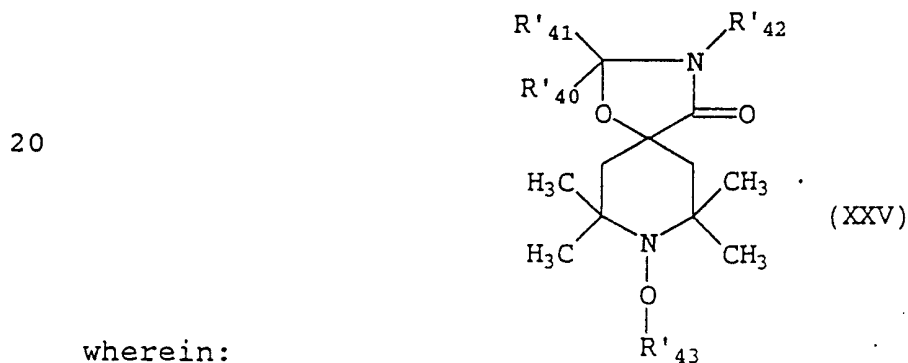
Compounds (b-10) can be selected from the compounds having general formula (XXIV):



wherein:

- R'_{39} has the same meaning as R'_1 ; and
- 15 - n_6 is a number between 2 and 50.

Compounds (b-11) can be selected from the compounds having general formula (XXV):



wherein:

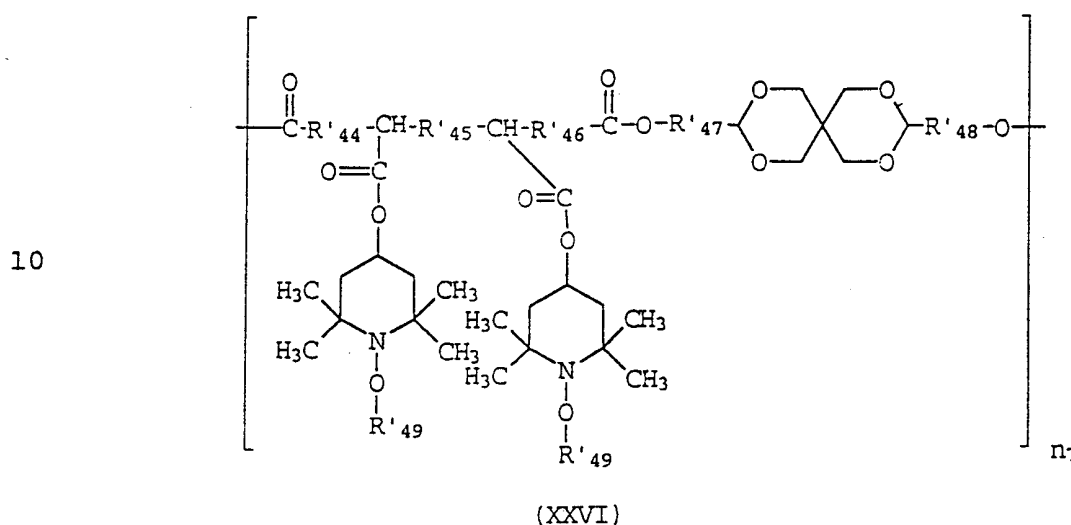
- R'_{40} and R'_{41} together form a C_2 - C_{14} alkylene group;
- 25 - R'_{42} represents a hydrogen atom or a $-Z_1-COO-Z_2$

- 25 -

group wherein Z_1 represents a C_2-C_{14} alkylene group
and Z_2 represents a C_1-C_{24} alkyl group; and

- R'_{43} has the same meaning as R'_1 .

Compounds (b-12) can be selected from the com-
5 pounds having general formula (XXVI):



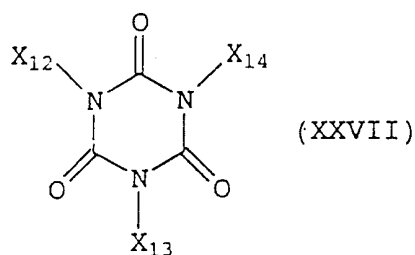
wherein:

15 - R'_{44} , R'_{45} , R'_{46} , R'_{47} and R'_{48} , the same or different,
represent a direct bond; or a C_1-C_{10} alkylene
group;

- R'_{49} has the same meaning as R'_1 ; and

- n_7 is a number between 1 and 50.

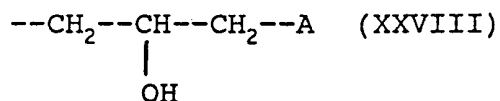
20 Compounds (b-13) can be selected from the com-
pounds having general formula (XXVII):



25

wherein:

- X_{12} , X_{13} and X_{14} , the same or different, represent a group having general formula (XXVIII):

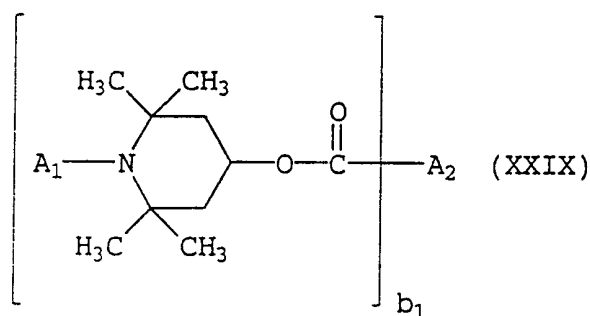


5

wherein A represents a group having general formula (XIV).

Compounds (b-14) can be selected from the compounds having general formula (XXIX):

10



15 wherein:

- A_1 represents a hydrogen atom; a C_1 - C_8 alkyl group; O' , a $-\text{CH}_2\text{CN}$ group; a C_3 - C_6 alkenyl group; a C_7 - C_9 phenylalkyl group optionally substituted in the phenyl group with a C_1 - C_4 alkyl group;

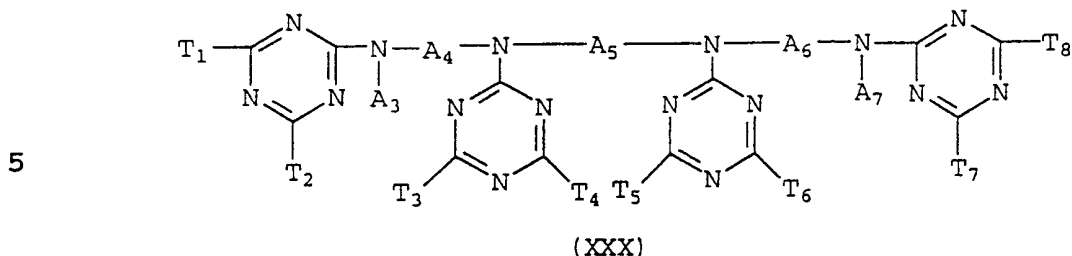
20 - b_1 represents 1, 2 or 4;

- when b_1 is 1, A_2 represents a C_1 - C_{25} alkyl group;
- when b_1 is 2, A_2 represents a C_1 - C_{14} alkylene group;
- and

- when b_1 is 4, A_2 represents a C_4 - C_{10} tetrayl-alkane group.

25

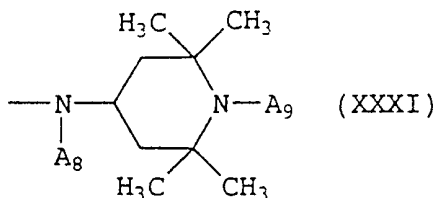
Compounds (b-15) can be selected from the compounds having general formula (XXX):



wherein:

- A_3 and A_7 , the same or different, represent a hydrogen atom; or a C_1 - C_{12} alkyl group;
- 10 - A_4 , A_5 and A_6 , the same or different, represent a C_2 - C_{10} alkylene group; and
- T_1 , T_2 , T_3 , T_4 , T_5 , T_6 , T_7 and T_8 , the same or different, represent a group having general formula (XXXI):

15

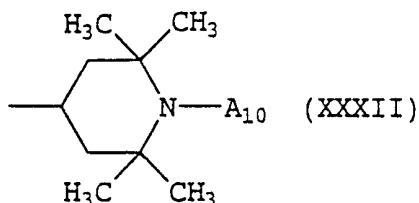


wherein:

- A_8 represents a hydrogen atom; a C_1 - C_{12} alkyl group;
- 20 a C_5 - C_{12} cycloalkyl group optionally substituted with a C_1 - C_4 alkyl group; a phenyl group optionally substituted with an -OH group and/or a C_1 - C_{10} alkyl group; a C_7 - C_9 phenylalkyl group optionally substituted in the phenyl group with an -OH group and/or
- 25 a C_1 - C_{10} alkyl group; or it represents a group

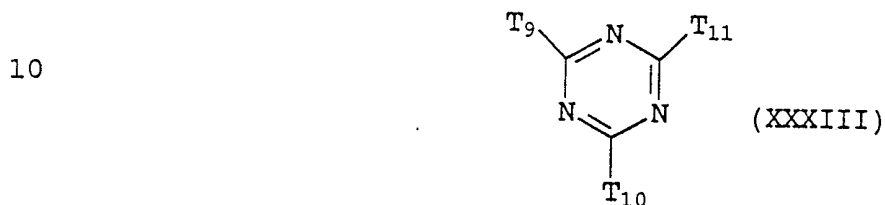
- 28 -

having general formula (XXXII):



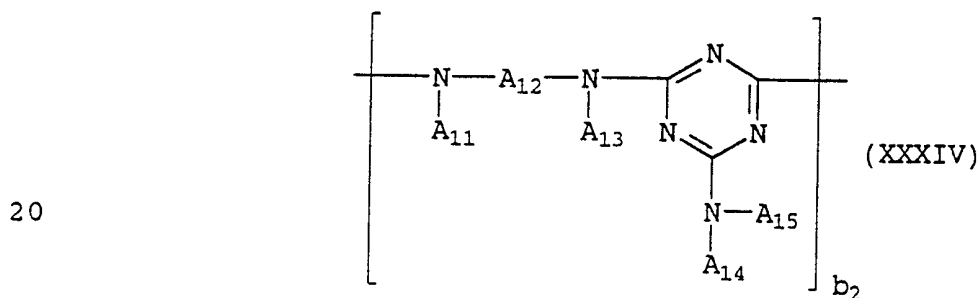
5 and A_9 and A_{10} , the same or different, have the same meanings as A_1 .

Compounds (b-16) can be selected from the compounds having general formula (XXXIII):



wherein T_9 , T_{10} and T_{11} , the same or different, represent a group having general formula (XXXI).

15 Compounds (b-17) can be selected from compounds having general formula (XXXIV):



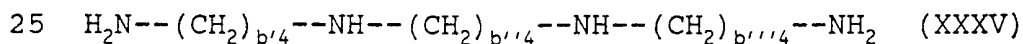
wherein:

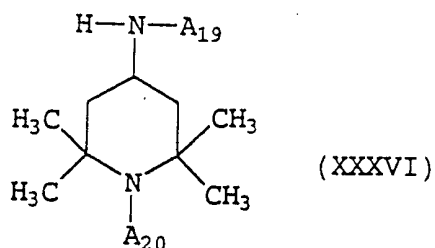
- A_{11} , A_{13} , A_{14} and A_{15} , the same or different, represent a hydrogen atom; a C_1 - C_{12} alkyl group; a C_5 - C_{12} cycloalkyl group optionally substituted with a

- C₁-C₄ alkyl group; a phenyl group optionally substituted with an -OH group and/or a C₁-C₁₀ alkyl group; a C₇-C₉ phenylalkyl group optionally substituted in the phenyl group with an -OH group and/or
- 5 a C₁-C₁₀ alkyl group; or they represent a group having general formula (XXXII);
- A₁₂ represents a C₂-C₁₈ alkylene group; a C₅-C₇ cycloalkylene group; or a C₁-C₄ alkylene di(C₅-C₇ cycloalkylene) group;
 - 10 - or A₁₁, A₁₂ and A₁₃, considered jointly with the nitrogen atom to which they are bound, represent a C₅-C₁₀ heterocyclic ring;
 - or A₁₄ and A₁₅, considered jointly with the nitrogen atom to which they are bound, represent a C₅-C₁₀
 - 15 heterocyclic ring;
 - b₂ is a number between 2 and 50 and at least one of the substituents A₁₁, A₁₃, A₁₄ and A₁₅, represent a group having general formula (XXXII).

Compounds (b-18) can be selected from the compounds obtained as follows:

- (a) reacting a product obtained by the reaction of a polyamine having general formula (XXXV) with cyanuryl chloride, with a compound having general formula (XXXVI):

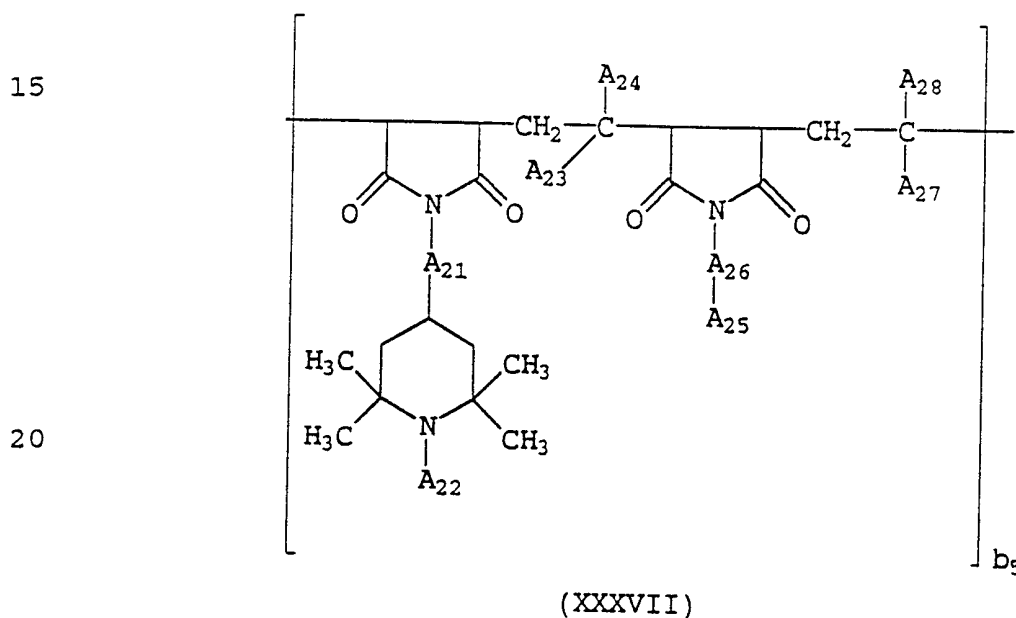




5 wherein:

- b'_4 , b''_4 and b'''_4 , the same or different, represent a number between 2 and 12;
- A_{19} represents a hydrogen atom; a C_1 - C_{12} alkyl group; a C_5 - C_{12} cycloalkyl group; a phenyl group; or a C_7 - C_9 phenylalkyl group; and
- A_{20} has the same meaning as A_1 .

Compounds (b-19) can be selected from the compounds having general formula (XXXVII):



wherein:

- A_{21} and A_{26} , the same or different, represent a direct bond; or a $-N(E_1)-CO-E_2-CO-N(E_3)-$ group

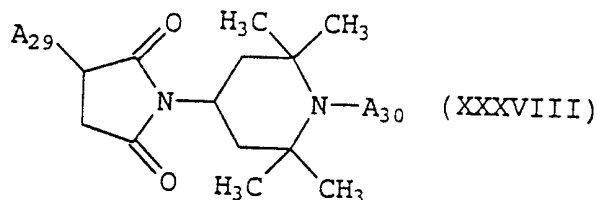
- 31 -

wherein:

- E_1 and E_3 , the same or different, represent a hydrogen atom; a C_1-C_8 alkyl group; a C_5-C_{12} cycloalkyl group; a phenyl group; a C_7-C_9 phenylalkyl group; or a group having general formula (XXXII);
- E_2 represents a direct bond; or a C_1-C_4 alkylene group;
- A_{22} has the same meaning as A_1 ;
- 10 - A_{23} , A_{24} , A_{27} and A_{28} , the same or different, represent a hydrogen atom; a C_1-C_{30} alkyl group; a C_5-C_{12} cycloalkyl group; or a phenyl group;
- A_{25} represents a hydrogen atom; a C_1-C_{30} alkyl group; a C_5-C_{12} cycloalkyl group; a phenyl group; a C_7-C_9 phenylalkyl group; or a group having general formula (XXXII); and
- 15 - b_5 represents a number between 1 and 50.

Compounds (b-20) can be selected from the compounds having general formula (XXXVIII):

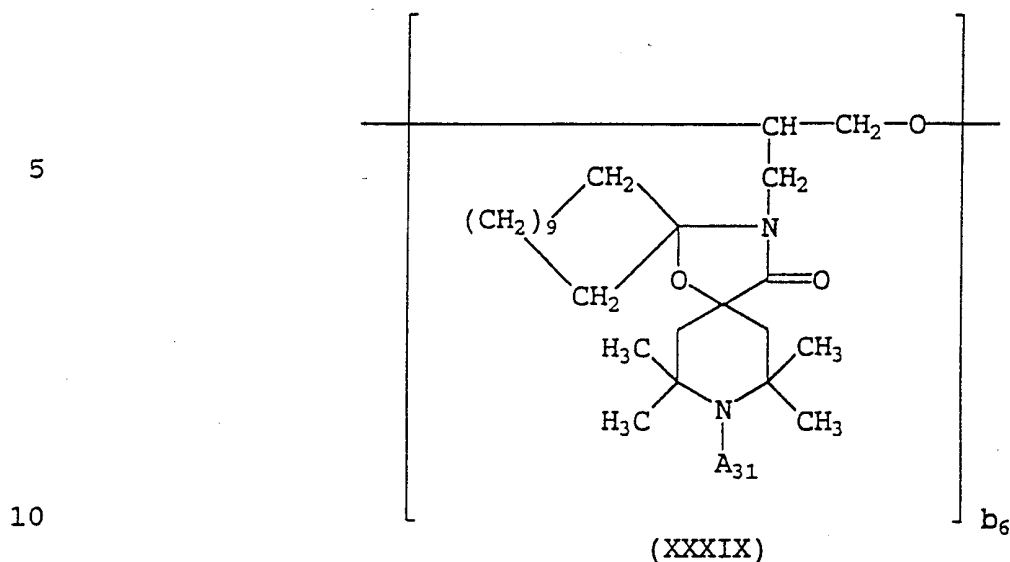
20



wherein:

- A_{29} represents a C_1-C_{24} alkyl group; and
- 25 - A_{30} has the same meaning as A_1 .

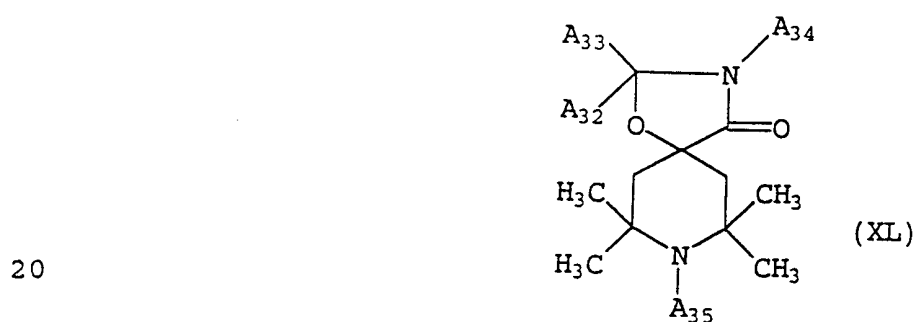
Compounds (b-21) can be selected from the compounds having general formula (XXXIX):



wherein:

- A_{31} has the same meaning as A_1 ; and
- b_6 is a number between 2 and 50.

Compounds (b-22) can be selected from the compounds having general formula (XL):



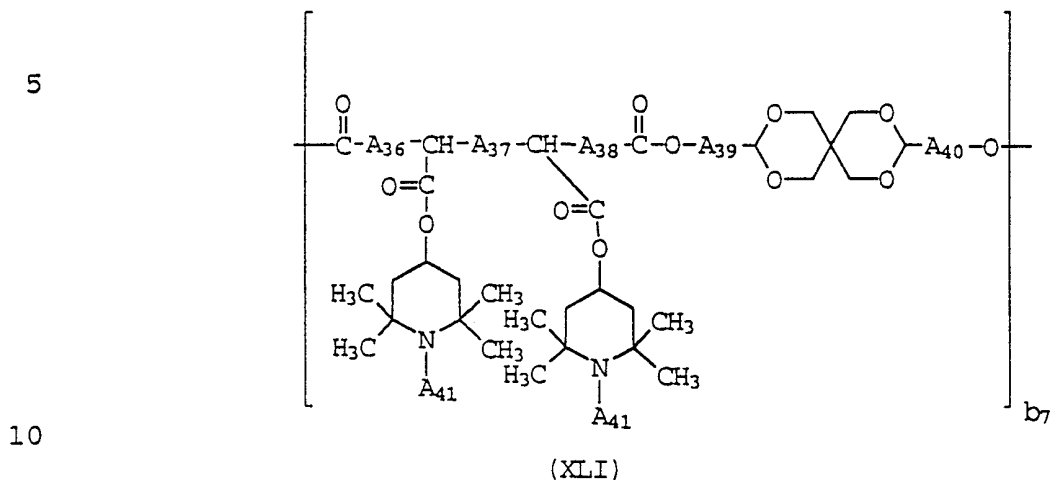
wherein:

- A_{32} and A_{33} together form a C_2-C_{14} alkylene group;
- A_{34} represents a hydrogen atom; or a $-G_1-COO-G_2$ group wherein G_1 represents a C_2-C_{14} alkylene group and G_2 represents a C_1-C_{24} alkyl group; and

- 33 -

- A_{35} has the same meaning as A_1 .

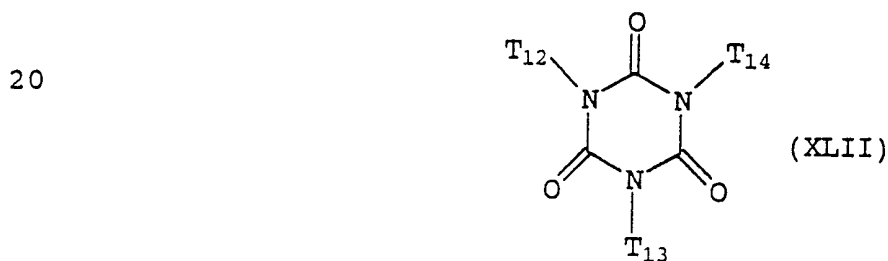
Compounds (b-23) can be selected from the compounds having general formula (XLI):



wherein:

- A_{36} , A_{37} , A_{38} , A_{39} and A_{40} , the same or different, represent a direct bond; or a C_1 - C_{10} alkylene group;
- 15 - A_{41} has the same meaning as A_1 ; and
- b_7 is a number between 1 and 50.

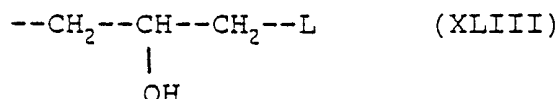
Compounds (b-24) can be selected from the compounds having general formula (XLII):



wherein:

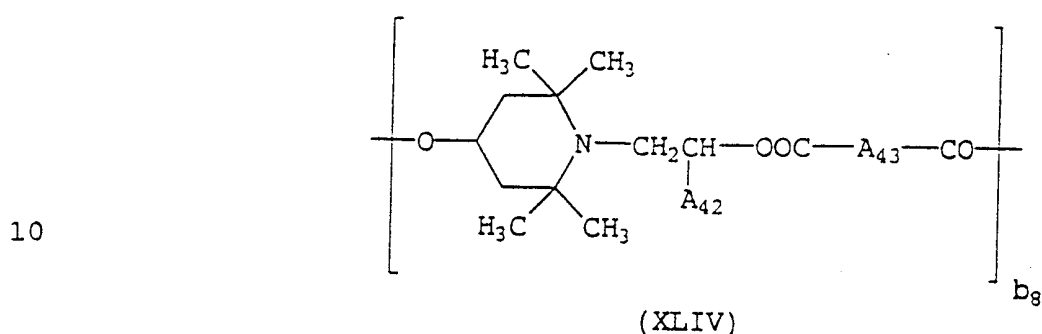
- T_{12} , T_{13} and T_{14} , the same or different, represent a
- 25 group having general formula (XLIII):

- 34 -



wherein L represents a group having formula (XXXI).

5 Compounds (b-25) can be selected from the compounds having general formula (XLIV):



wherein:

- A_{42} represents a hydrogen atom; or a methyl group;
 - A_{43} represents a direct bond; or a C_1 - C_{10} alkylene group; and
 - b_3 represents a number between 2 and 50.
- 15

Examples of alkyl groups having up to 30 carbon atoms are: methyl, ethyl, propyl, isopropyl, n-butyl, s-butyl, isobutyl, t-butyl, 2-ethylbutyl, n-pentyl, isopentyl, 1-methylpentyl, 1,3-dimethylbutyl, n-hexyl, 1-methylhexyl, n-heptyl, isoheptyl, 1,1,3,3-tetramethylbutyl, 1-methylheptyl, 3-methylheptyl, n-octyl, 2-ethylhexyl, 1,1,3-trimethylhexyl, 1,1,3,3-tetramethylpentyl, nonyl, decyl, undecyl, 1-methylundecyl, dodecyl, 1,1,3,3,5,5-hexamethylhexyl, tridecyl, tetradecyl,

20

25

pentadecyl, hexadecyl, heptadecyl, octadecyl, eicosyl, docosyl, triacontyl, etc. The substituents A_1 , A_9 , A_{10} , A_{18} , A_{20} , A_{22} , A_{30} , A_{31} , A_{35} and A_{41} , preferably represent a C_1 - C_4 alkyl group, even more preferably a methyl group.

5 The substituents R'_{31} , R'_{35} , A_{23} and A_{27} preferably represent a C_1 - C_{25} alkyl group, even more preferably a C_{15} - C_{25} alkyl group such as, for example, hexadecyl and C_{18} - C_{22} alkyl group. The substituents R'_{33} and A_{25} preferably represent a C_1 - C_{25} alkyl group, even more

10 preferably an octadecyl group. The substituents R'_8 , R'_{27} , A_8 and A_{19} , represent a C_1 - C_4 alkyl group, even more preferably an n-butyl group.

Examples of C_5 - C_{12} cycloalkyl groups are: cyclopentyl, cyclohexyl, cycloheptyl, cyclo-octyl, cyclododecyl, etc. C_5 - C_8 cycloalkyl groups are preferred, cyclohexyl is even more preferred.

15

Examples of C_5 - C_{12} cycloalkyl groups substituted with a C_1 - C_4 alkyl group are: methylcyclohexyl, dimethylcyclohexyl, etc.

20 Examples of phenyl groups substituted with an -OH group and/or a C_1 - C_{10} alkyl group are: methylphenyl, dimethylphenyl, trimethylphenyl, t-butylphenyl, 3,5-di-t-butyl-4-hydroxyphenyl, etc.

Examples of C_7 - C_9 phenylalkyl groups are: benzyl, 25 phenylethyl, etc.

Examples of C_7 - C_9 phenylalkyl groups optionally substituted in the phenyl group with an -OH group and/or a C_1 - C_{10} alkyl group are: methylbenzyl, dimethylbenzyl, trimethylbenzyl, t-butylbenzyl, 3,5-di-t-butyl-
5 4-hydroxybenzyl, etc.

Examples of C_3 - C_6 alkenyl groups are: allyl, 2-methallyl, butenyl, pentenyl, hexenyl, etc. Allyl is the preferred group. The carbon in position 1 is preferably saturated.

10 Examples of alkylene groups having up to 18 carbon atoms are: methylene, ethylene, propylene, trimethylene, tetramethylene, pentamethylene, 2,2-dimethyltrimethylene, hexamethylene, trimethylhexamethylene, octamethylene, decamethylene, etc. The substituents R'_{12} and
15 A_{12} are preferably hexamethylene; the substituent A_{43} is preferably ethylene; the substituents R'_{44} , R'_{46} , R'_{12} , A_{36} and A_{38} are preferably methylene; the substituents R'_{47} and A_{39} are preferably 2,2-dimethylethylene; and the substituents R'_{48} and A_{40} are preferably 1,1-dimethyle-
20 thylene.

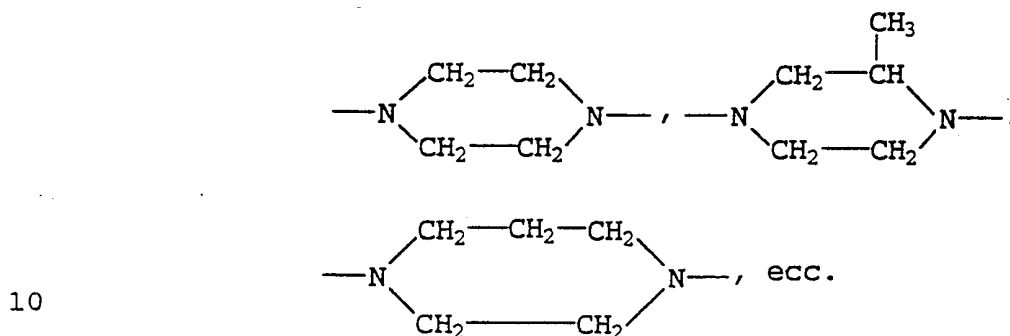
An example of a C_4 - C_{10} tetrayl-alkane group is 1,2,3,4-tetrayl-butane.

An example of a C_5 - C_7 cycloalkylene group is cyclohexylene.

25 An example of a C_1 - C_4 alkylene di(C_5 - C_7 -cycloalkyle-

ne) group is methylenedicyclohexylene.

When the substituents R'_{11} , R'_{12} , R'_{13} or A_{11} , A_{12} and A_{13} , form, together with the nitrogen atom to which they are bound, a C_5 - C_{10} heterocyclic ring, examples of this
5 ring are:



Heterocyclic rings with 6 carbon atoms are preferred.

When the substituents R'_{14} and R'_{15} or A_{14} and A_{15} ,
15 form, together with the nitrogen atom to which they are bound, a C_5 - C_{10} heterocyclic ring, examples of this ring are: 1-pyrrolidine, piperidine, morpholine, 1-piperazinyl, 4-methyl-1-piperazinyl, 1-hexahydroazepinyl, 5,5,7-trimethyl-1-homopiperazinyl, 4,5,5,7-tetramethyl-
20 1-homopiperazinyl, etc. The morpholine group is preferred.

The substituents R'_{31} , R'_{35} , A_{23} and A_{27} preferably represent a phenyl group.

The substituents Y_2 , E_2 , R'_{45} and A_{37} preferably
25 represent a direct bond.

The substituents Y_1 , Y_3 , E_1 , E_3 , A_1 , A_9 , A_{10} , A_{18} , A_{20} , A_{22} , A_{30} , A_{31} , A_{35} , A_{41} and A_{42} preferably represent hydrogen.

n_2 and b_2 are preferably between 2 and 25.

5 n_3 and b_3 are preferably between 1 and 25, even more preferably between 2 and 20 or between 2 and 10.

n'_4 , n''_4 , n'''_4 , b'_4 , b''_4 , and b'''_4 , are preferably between 2 and 4.

n_5 and b_5 are preferably between 1 and 25, even
10 more preferably between 2 and 20 or between 1 and 10.

n_6 and b_6 are preferably between 2 and 25, even more preferably between 2 and 20 or between 2 and 10.

n_7 and b_7 are preferably between 1 and 25, even more preferably between 1 and 20 or between 1 and 10.

15 b_8 is preferably between 2 and 25, even more preferably between 2 and 20 or between 2 and 10.

Compounds (b-14) to (b-25) are known compounds, in some cases commercially available, and can be prepared with known processes as described, for example, in
20 US 3.640.928, US 4.108.829, US 3.925.376, US 4.086.204, US 4.331.586, US 5.051.458, US 4.477.615 and in "Chemical Abstract" - CAS Nr. 136 504-96-6, US 4.857.595, DD 262.439 (Derwent 89-122 983/17, "Chemical Abstract" 111:58 964u), WO 94/12 544 (Derwent 94-177 274/22),
25 US 4.356.307, US 4.340.534, US 4.408.051, US 4.689.416

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US 4.110.334, US 4.529.760, US 5.182.890 ("Chemical Abstract" - CAS Nr. 144 923-25-1) and US 4.233.412.

Compounds (b-18) can be prepared analogously to known processes, for example, by the reaction of a polyamine having general formula (XXXV) with cyanuryl chloride, in a molar ratio ranging from 1:2 to 1:4, in the presence of anhydrous lithium carbonate, sodium carbonate or potassium carbonate, in an organic solvent such as, for example, 1,2-dichloroethane, toluene, xylene, benzene, dioxane or t-amyl alcohol, at a temperature ranging from -20°C to +10°C, preferably between -10°C and +10°C, even more preferably between 0°C and +10°C, for a time ranging from 2 to 8 hours, followed by the reaction of the resulting product with a 2,2,6,6-tetramethyl-4-piperidylamine having general formula (XXXVI). The molar ratio between 2,2,6,6-tetramethyl-4-piperidylamine and the polyamine having general formula (XXXV) used is, for example, between 4:1 and 8:1. The quantity of 2,2,6,6-tetramethyl-4-piperidylamine can be added in a single portion or in various portions at intervals of a few hours.

The ratio between the polyamine having general formula (XXXV), the cyanuryl chloride and 2,2,6,6-tetramethyl-4-piperidylamine having general formula (XXXVI) is preferably between 1:3:5 and 1:3:6.

- 40 -

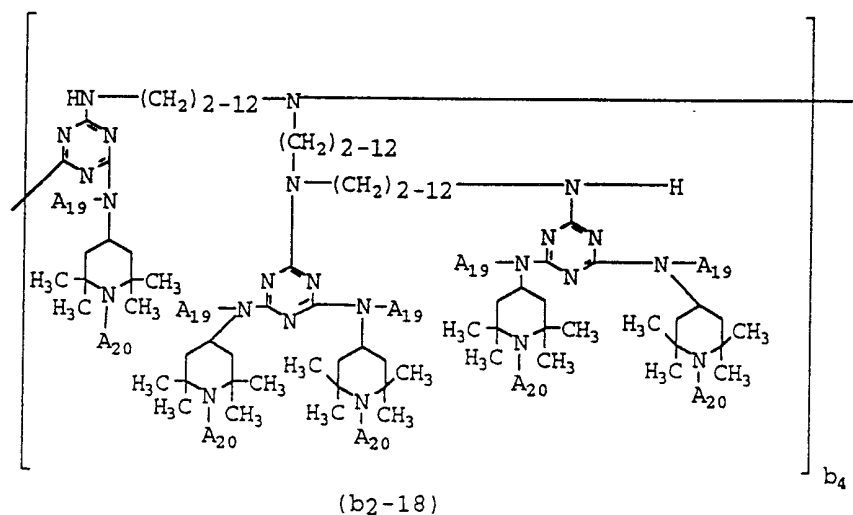
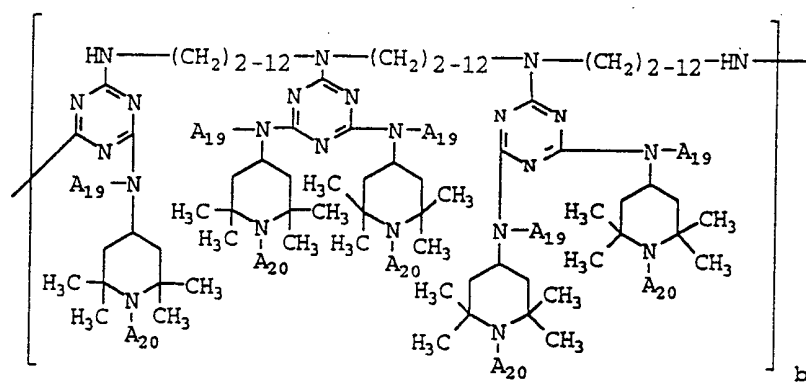
The following example illustrates a method for preparing a (b-18) compound.

Example

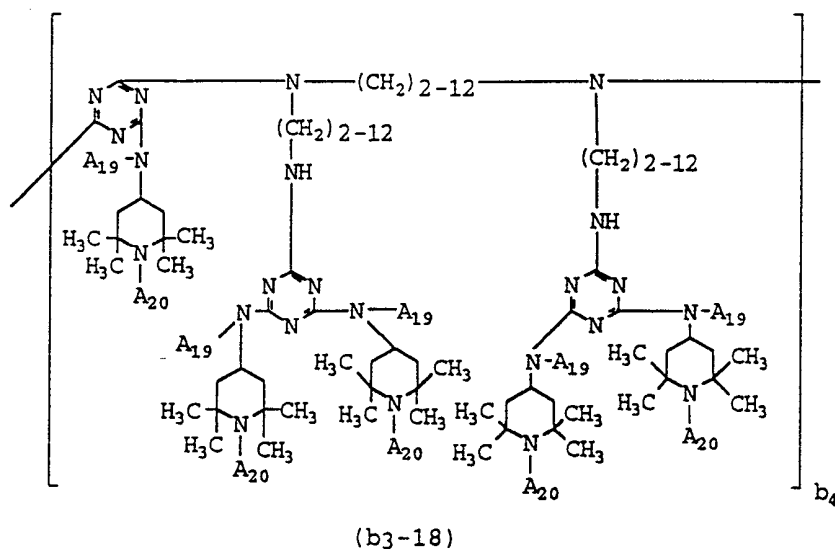
23.6 g (0.128 moles) of cyanuryl chloride, 7.43 g
5 (0.0426 moles) of N,N'-bis[3-amino-propyl]ethylene-
diamine and 18 g (0.13 moles) of anhydrous potassium
carbonate are reacted at a temperature of 5°C, for 3
hours, under stirring, in 250 ml of 1,2-dichloroethane.
The mixture obtained is heated to room temperature for
10 a further 4 hours. 27.2 g (0.128 moles) of N-(2,2,6,6-
tetramethyl-4-piperidyl)butylamine are added and the
resulting mixture is heated to 60°C for 2 hours. A
further 18 g (0.13 moles) of anhydrous potassium
carbonate are added and the resulting mixture is heated
15 to 60°C for a further 6 hours. The solvent is eliminat-
ed by distillation, under a light vacuum (200 mbars)
and replaced with xylene. 18.2 g (0.085 moles) of N-
(2,2,6,6-tetramethyl-4-piperidyl)butylamine and 5.2 g
(0.13 moles) of sodium hydroxide in granules are added,
20 the mixture is heated to reflux temperature for 2 hours
and, for a further 12 hours, and the water formed
during the reaction is removed by azeotropic distilla-
tion. The mixture is filtered. The solution obtained is
washed with water and dried on sodium sulfate. The
25 solvent is evaporated and the residue is dried, under

vacuum (0.1 mbars), at 120°C-130°C. The compound obtained, which is among the (b-18) compounds, is a colourless resin.

A (b-18) compound can generally be represented,
 5 for example, by one of the compounds having the formula (b₁-18), (b₂-18) or (b₃-18), or a mixture of the three compounds:



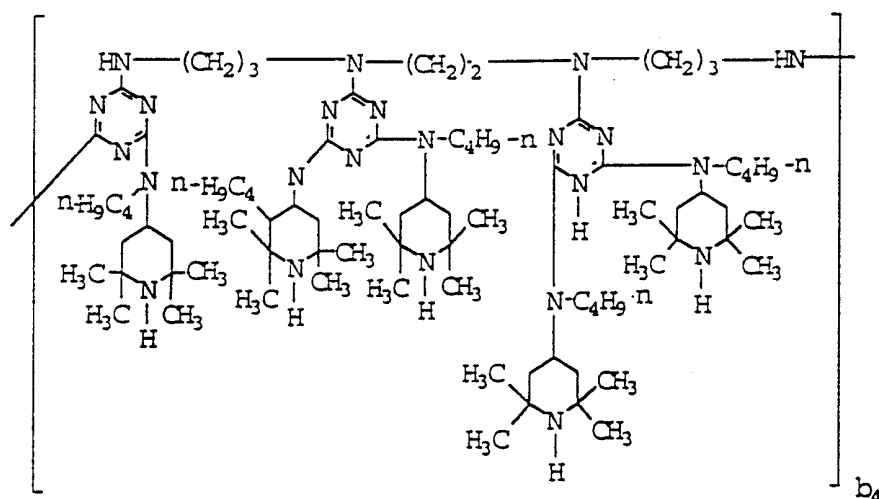
5



The preferred (b₁-18) compound is the following:

10

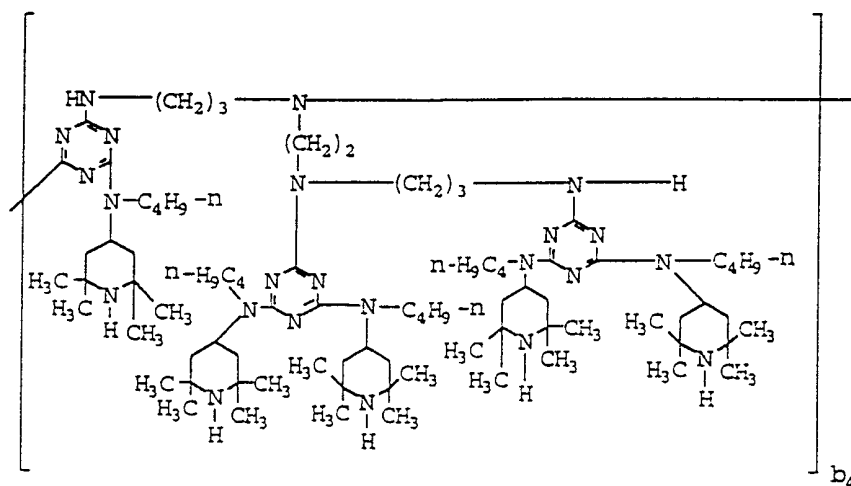
15



The preferred (b₂-18) compound is the following:

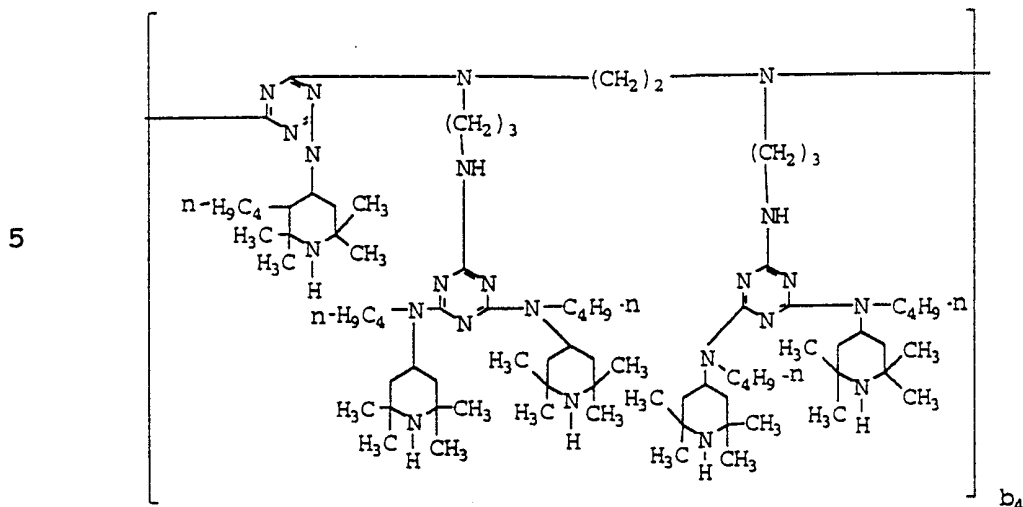
20

25



- 43 -

The preferred (b₁-18) compound is the following:



10 In the formulae (b₁-18), (b₂-18) and (b₃-18) described above, b₄ is preferably between 1 and 20.

Compounds (b-1) are known compounds and, in some cases, are commercially available.

Compounds (b-2) to (b-13) can be prepared starting
 15 from the compounds described from (b-14) to (b-24) whose nitrogen atom of the 2,2,6,6-tetramethylpiperid-4-yl group is not substituted, operating analogously to known processes, for example, in U.S. patent 5.204.473, by oxidation of the corresponding 2,2,6,6-tetramethyl-
 20 piperidine derivative with a suitable peroxide such as, for example, hydrogen peroxide or t-butyl hydroperoxide, in the presence of a metal carbonyl or a metal oxide as catalyst, followed by the reduction of the oxyl intermediate to the desired N-hydroxyl derivative,
 25 preferably by catalytic hydrogenation.

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In addition to the above process, O-alkyl derivatives can be synthesized in various ways. For example, N-hydroxyl derivatives can be alkylated with sodium hydride and halogenated hydrocarbons such as, for example, ethyl iodide. N-methoxyl variants can be prepared by thermolysis of a chlorobenzene solution of the nitroxyl radical and di-t-butyl peroxide.

The product is formed by "coupling" reaction between the nitroxyl radical and the methyl radical which is formed by breakage in β position of the t-butoxyl radical.

Other N-alkoxyl variants can be synthesized by a "coupling" reaction of the nitroxyl radicals with the hydrocarbon radicals, which are formed during the thermal decomposition of di-t-butyl peroxide in the presence of a hydrocarbon solvent such as, for example, cyclohexane, toluene and ethylbenzene.

Although the above processes have been described with reference to N-alkoxyl substituents, they can be equally used in the case of all OR' groups.

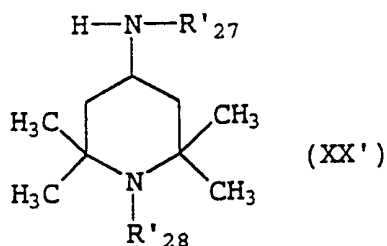
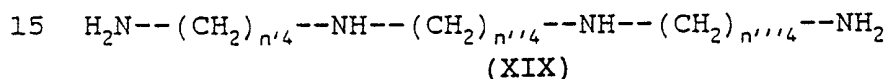
For example, 1-cycloalkyloxy-2,2,6,6-tetramethylpiperid-4-yl derivatives can be prepared by the reaction of the corresponding 2,2,6,6-tetramethylpiperid-4-yl derivative with t-butyl hydroperoxide in the presence of molybdenum oxide (MoO_3) and a cycloalkane.

- 45 -

In addition, some (b-6) compounds are known compounds and, in some cases, are commercially available and can be prepared with known processes as described, for example, in European patent EP 162.524
 5 and in U.S. patent 4.946.880.

Generally, the compound (b-7) can, for example, also be represented by one of the compounds (b₁-18), (b₂-18) or (b₃-18), in which the A₂₀ radical is an -OR'₂₈ group, or a mixture of the three.

10 The compounds described in (b-7) can, for example, also be obtained by the reaction of the product obtained by the reaction of a polyamine having general formula (XIX) and cyanuryl chloride, with a compound having general formula (XX'):



20 wherein:

- n'_4 , n''_4 and n'''_4 , the same or different, represent a number between 2 and 12;
- R'_{27} represents a hydrogen atom; a C₁-C₁₂ alkyl group; a C₅-C₁₂ cycloalkyl group; a phenyl group;
 25 or a C₇-C₉ phenylalkyl group; and

- R'₂₈ has the same meaning as R'₁.

The above reaction can take place, for example, analogously to the process described in U.S. patent 4.477.615.

5 Examples of sterically hindered amines (b) which can be used for the purposes of the present invention are: TINUVIN 123® among compounds (b-2); MARK LA 52® or MARK LA 57® among compounds (b-14); CHIMASSORB 119® among compounds (b-15); CHIMASSORB 944®, CYASORB UV
10 3346® and DASTIB 1082® among compounds (b-17); UVASIL 299® corresponding to poly-methylpropyl-3-oxy[4-(2,2,6,6-tetramethyl)piperidinyl]siloxane, among compounds (b-6); UVASORB HA 88® among compounds (b-18); UVINUL 5050 H®, LICHTSCHUTZSTOFF UV 31® or LUCHEM HA-B 18®
15 among compounds (b-19); HOSTAVIN N 30® among compounds (b-21); MARK LA 63® or MARK LA 68® among compounds (b-23); and LOWILITE 62® among compounds (b-25).

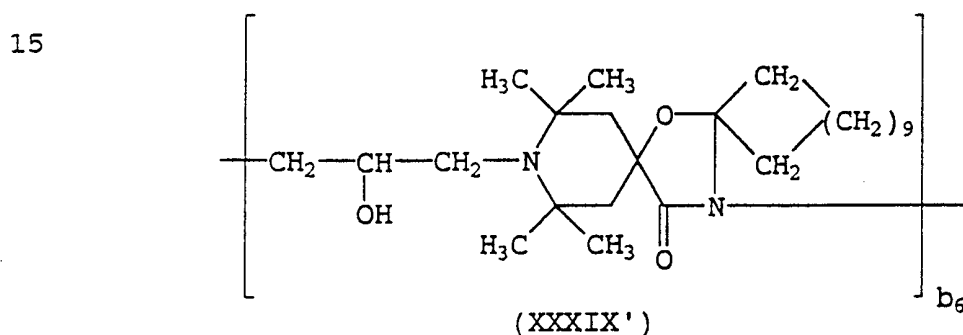
Other sterically hindered amines (b) which can be used for the purposes of the present invention are
20 selected from compounds (b-14): TINUVIN 770® corresponding to bis(2,2,6,6-tetramethyl-4-piperidinyl)sebacate, LOWILITE 76® corresponding to bis(1,2,2,6,6-pentamethyl-4-piperidinyl)sebacate; or among compounds (b-25): LOWILITE 62® corresponding to the condensate of
25 1-(2-hydroxyethyl)-2,2,6,6-tetramethyl-4-hydroxypiperi-

dine with succinic acid.

Other products which can be used for the purposes of the present invention are, for example, DASTIB 845® among compounds (b-14); LICHTSCHUTZMITTEL S 95® among
 5 compounds (b-20); HOSTAVIN N20® or SANDUVOR 3050® among compounds (b-22).

Compound (b-7) which can be used for the purposes of the present invention is UVASORB HA 88®, in which the 2,2,6,6-tetramethylpiperidin-4-yl radical is
 10 substituted with a group having general formula (XXI).

When the radical A_3 , in the compound having general formula (XXXIX) represents a hydrogen atom, said compound can be in the form of a mixture with a compound having formula (XXXIX'):



20 and can also be used like said mixture, as compound (b-21) for the purposes of the present invention. The ratio compound having general formula (XXXIX)/compound having formula (XXXIX') is between, for example, 20:1 and 1:20 or between 1:10 and 10:1.

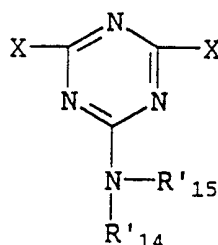
25 The definitions of the end groups which saturate

- 48 -

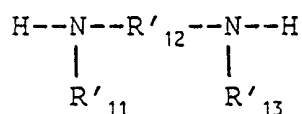
the free valences in the compounds having general formula (XVII), (XXXIV), XVIII), (b_1 -18), (b_2 -18), (b_3 -18), (XXII), (XXXVII), (XXIV), (XXXIX), (XXXIX'), (XXVI), (XLI) and (XLIV), depend on the processes used for their preparation. The end groups can also be modified after the preparation of the above compounds.

When the compounds having general formula (XVII) are prepared by the reaction of a compound having general formula:

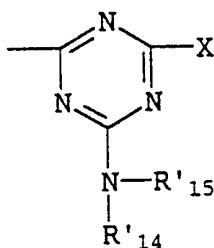
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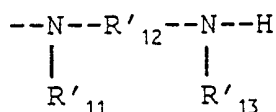
wherein X represents, for example, a halogen atom, preferably chlorine, and R'_{14} and R'_{15} have the same meanings described above, with a compound having general formula:



wherein R'_{11} , R'_{12} , and R'_{13} have the same meanings described above, the end group bound to the diamine radical is a hydrogen atom, or a group having general formula:



5 and the end group bound to the triazine radical is X,
or a group having general formula:

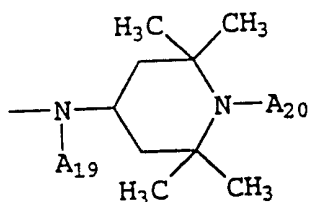


When X represents a halogen atom, it is advanta-
10 geous to substitute it, for example, with an -OH group,
or with an amine group at the end of the reaction.
Examples of amine groups which can be used for the
purposes of the present invention are: pyrrolidin-1-yl;
morpholine; -NH₂; -N(C₁-C₃-alkyl); -NR(C₁-C₈-alkyl)
15 wherein R represents a hydrogen atom, or a group having
general formula (XV).

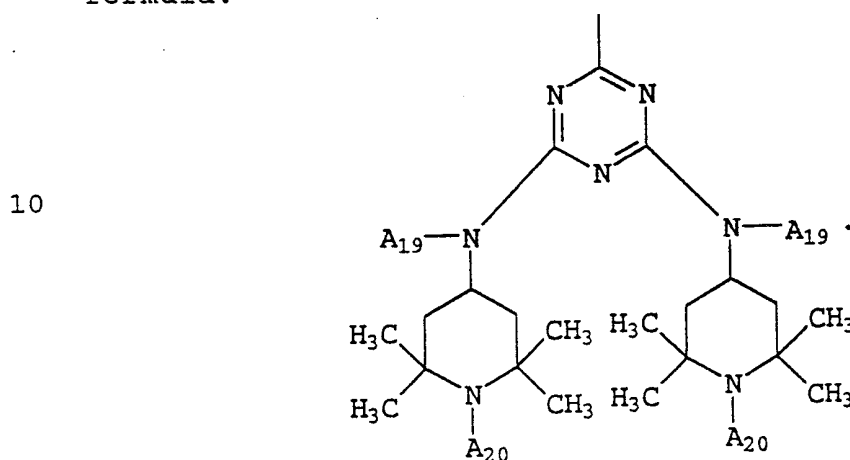
What is specified above for compounds having
general formula (XVII), also applies to compounds
having general formula (XXXIV) wherein the radicals A₁₁,
20 A₁₂, A₁₃ and A₁₄ correspond to the radicals R'₁₁, R'₁₂, R'₁₃
and R'₁₄, and the group having general formula (XXXII)
corresponds to the group having general formula (XV).

In the compounds having formula (b₁-18), (b₂-18),
(b₃-18), the end group bound to the triazine radical is,
25 for example, a chlorine atom, or a group having general

formula:

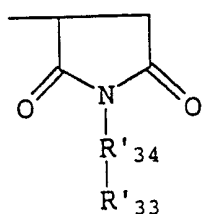


5 and the end group bound to the amine radical is, for example, a hydrogen atom, or a group having general formula:

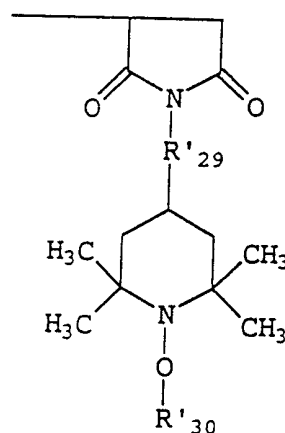


15 In the compounds having general formula (XXII), the end group bound to the 2,5-dioxopyrrolidine ring is, for example, a hydrogen atom and the end group bound to the radical $-C(R'_{35})(R'_{36})-$ is, for example, one of the following groups having general formula:

20

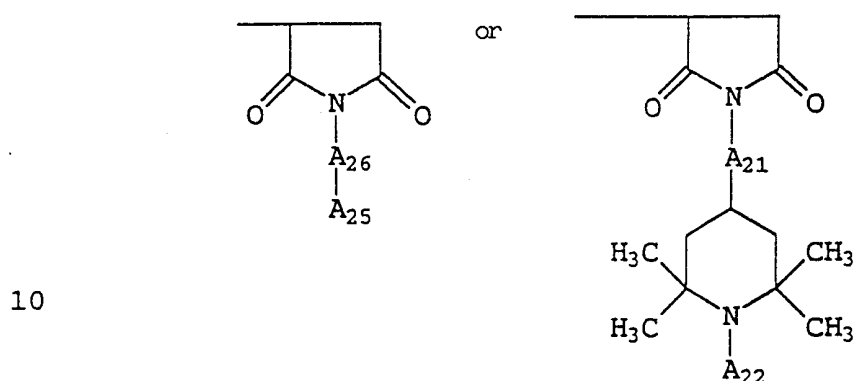


or



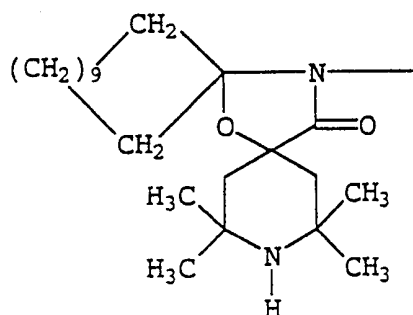
25

In the compounds having general formula (XXXVII), the end group bound to the 2,5-dioxopyrrolidine ring is, for example, a hydrogen atom and the end group bound to the $-C(A_{27})(A_{28})-$ radical is, for example, one
 5 of the following groups having general formula:



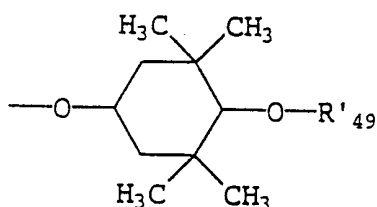
In the compounds having general formula (XXIV) and (XXXIX), the end group bound to the dimethylene radical can be, for example, an -OH group and the end group
 15 bound to the oxygen atom can be, for example, a hydrogen atom. The end groups can also be polyether radicals.

In the compounds having general formula (XXXIX'), the end group bound to the nitrogen atom can be, for
 20 example, a hydrogen atom and the end group bound to the 2-hydroxypropylene radical can be, for example, a group having formula:



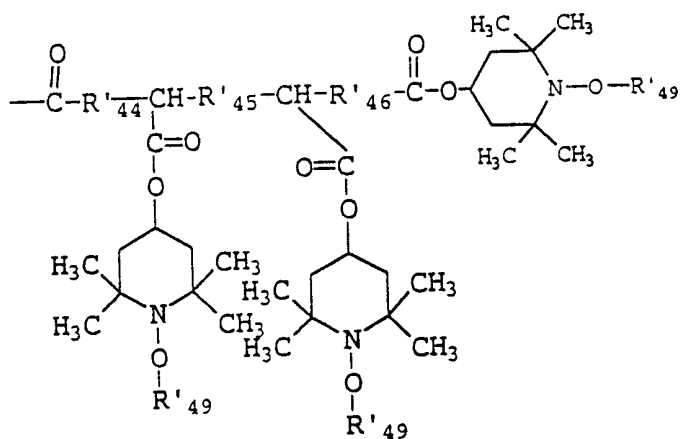
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In the compounds having general formula (XXVI), the end group bound to the carbonyl radical is, for example, a group having general formula:



10

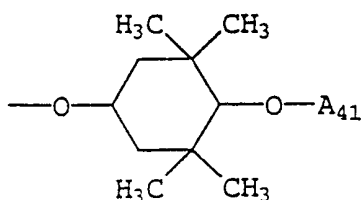
and the end group bound to the oxygen is, for example, a group having general formula:



15

20

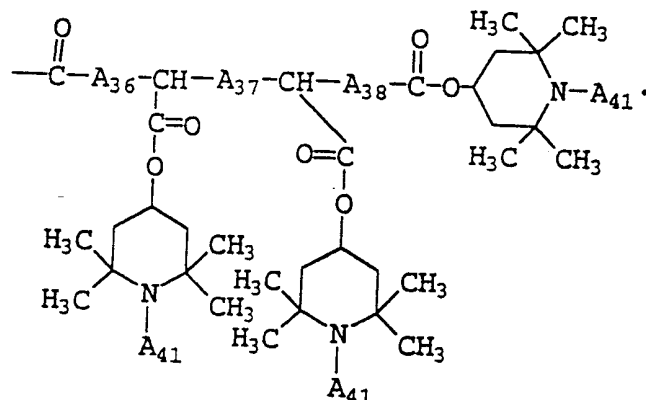
In the compounds having general formula (XLI), the end group bound to the carbonyl radical is, for example, a group having general formula:



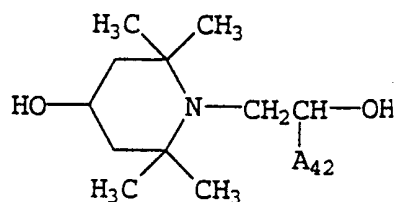
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and the end group bound to the oxygen is, for example,
a group having general formula:

5

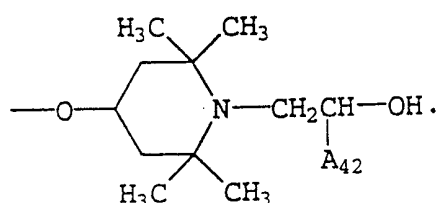


When the preparation of the compounds having
10 general formula (XLIV) is carried out, for example, by
the reaction of a compound having general formula:



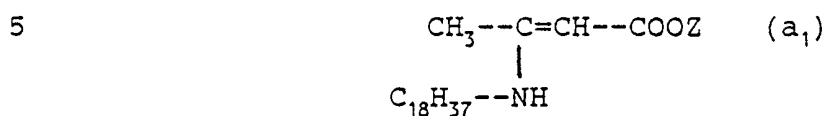
15 wherein A_{42} has the same meanings defined above, with a
dicarboxyl diester having general formula
 $Q-OOC-A_{43}-COO-Q$ wherein Q is, for example, methyl, ethyl
or propyl and A_{43} has the same meanings described above,
the end group bound to the 2,2,6,6-tetramethyl-4-oxypi-
20 perid-1-yl radical is a hydrogen atom, or a
 $-CO-A_{43}-COO-Q$ group and the end group bound to the
diacyl radical is an $-O-Q$ group, or a group having
general formula:

25



Preferred compounds belonging to the group of enamines (a) for the purposes of the present invention are:

- enamine having general formula (a₁):



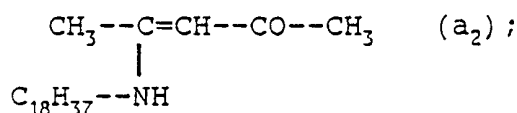
wherein Z represents one of the following groups:

-C₂H₅; -t-C₄H₉; -n-C₈H₁₇; -n-C₁₂H₂₅; -n-C₁₈H₃₇; or a group having general formula:

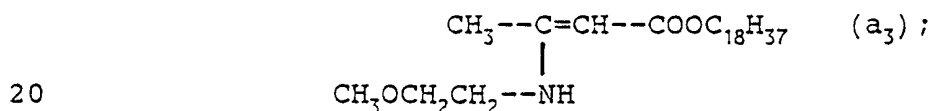


wherein R'_a represents a hydrogen atom or a methyl;

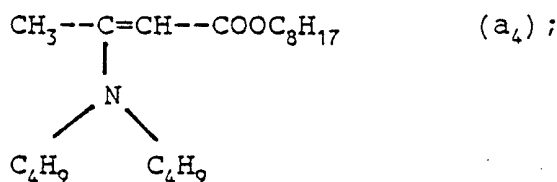
- 15 - enamine having formula (a₂):



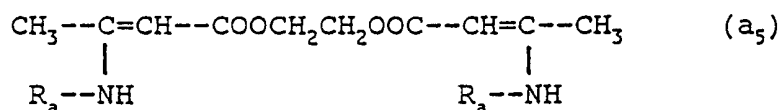
- enamine having formula (a₃):



- enamine having formula (a₄):



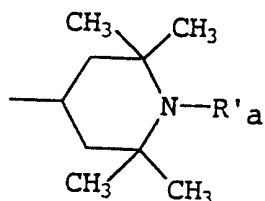
- 25 - enamine having general formula (a₅):



wherein R_a represents one of the following groups:

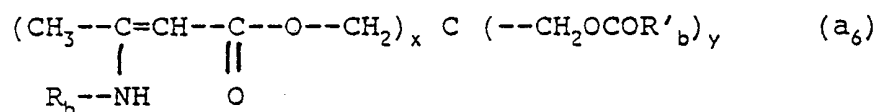
$C_4H_9\text{---}$; $CH_3OCH_2CH_2\text{---}$; $C_8H_{17}\text{---}$; $C_{12}H_{25}\text{---}$; $C_{18}H_{37}\text{---}$; or a

5 group having general formula:



wherein R'_a represents a hydrogen atom or a meth-
 10 yl;

- enamine consisting of a mixture of derivatives of pentaerythrite having general formula (a_6):



15 wherein:

- R_b represents one of the following groups:

$\text{---C}_2\text{H}_5$; $\text{---C}_4\text{H}_9$; $\text{---C}_8\text{H}_{17}$; $\text{---C}_{12}\text{H}_{25}$; and

- R'_b represents one of the following groups:

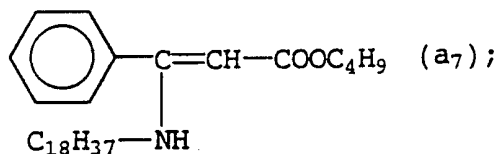
$\text{---CH}_2\text{---CO---CH}_3$; ---CH_3 ; $\text{---C}_2\text{H}_5$; $\text{---C}_4\text{H}_9$;

- 20 - x represents an integer between 1 and 4, extremes included;

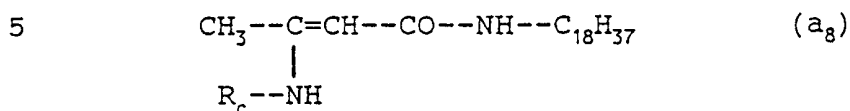
- y represents an integer between 0 and 3, extremes included;

- enamine having formula (a_7):

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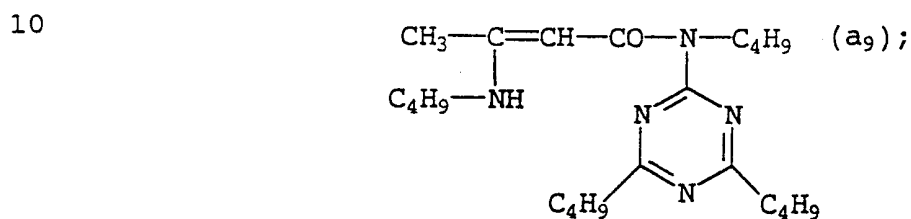
- enamine having general formula (a_8):



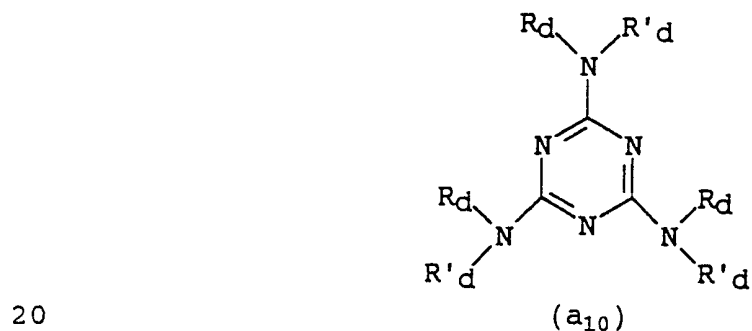
wherein R_c represents one of the following groups:

C_4H_9- ; $\text{CH}_3\text{OCH}_2\text{CH}_2-$; $\text{C}_8\text{H}_{17}-$;

- enamine having formula (a_9):

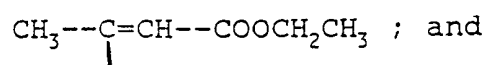


- enamine consisting of a mixture of triazine compounds having general formula (a_{10}):



wherein:

- R_d represents a group having formula:



- R'_d represents one of the following groups:

$-\text{CH}_3$; $-\text{C}_2\text{H}_5$; $-\text{C}_4\text{H}_9$.

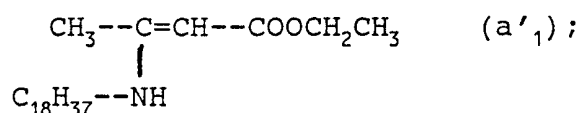
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Sterically hindered amines (b) which are preferred for the purposes of the present invention are: LOWILITE 76® corresponding to bis(1,2,2,6,6-pentamethyl-4-piperidiny)sebacate; LOWILITE 62® corresponding to the
 5 condensate of 1-(2-hydroxyethyl)-2,2,6,6-tetramethyl-4-hydroxypiperidine with succinic acid; UVASIL 299® corresponding to poly-methylpropyl-3-oxy[4-(2,2,6,6-tetramethyl)piperidiny]siloxane; TINUVIN 770® corresponding to bis(2,2,6,6-tetramethyl-4-piperidiny)seba-
 10 cate.

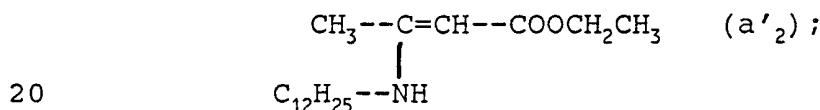
Preferred stabilizing mixtures for the purposes of the present invention are those in which:

- the compound belonging to the group of enamines (a) is selected from the following compounds:

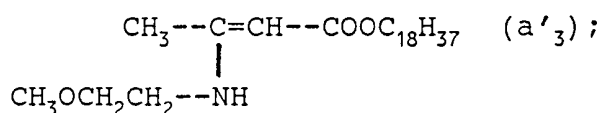
- 15 - enamine having formula (a'₁):



- enamine having formula (a'₂):

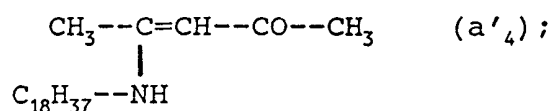


- enamine having formula (a'₃):

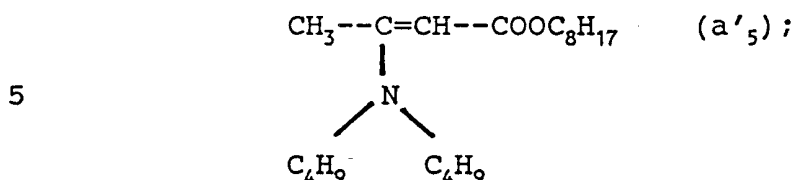


- enamine having formula (a'₄):

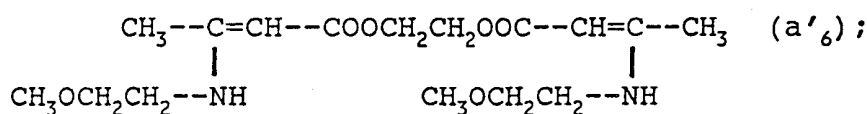
25



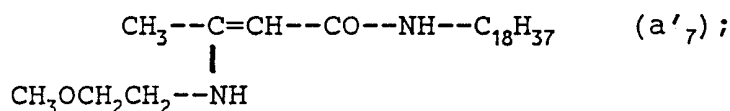
- enamine having formula (a'₅):



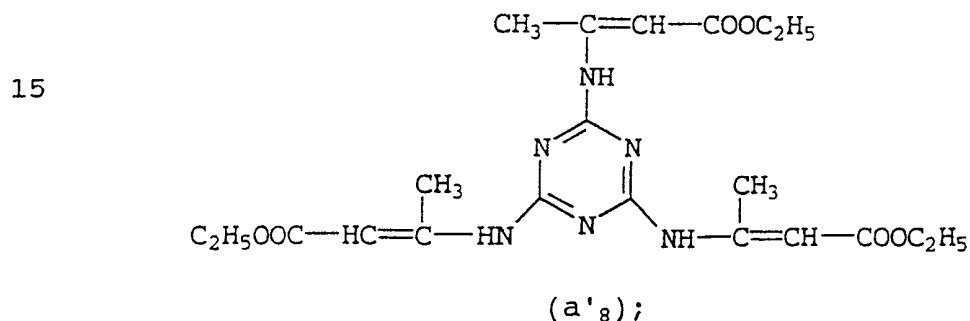
- enamine having formula (a'₆):



- enamine having formula (a'₇):



- enamine having formula (a'₈):



- the sterically hindered amine (b) is selected from the following compounds:

(b'₁) LOWILITE 76® corresponding to bis
(1,2,2,6,6-pentamethyl-4-piperidiny)sebacate;

(b'₂) LOWILITE 62® corresponding to the condensate of 1-(2-hydroxyethyl)-2,2,6,6-

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tetramethyl-4-hydroxypiperidine with succinic acid;

(b'₃) UVASIL 299® corresponding to polymethylpropyl-3-oxy[4-(2,2,6,6-tetramethyl)piperidinyl]siloxane;

(b'₄) TINUVIN 770® corresponding to bis-(2,2,6,6-tetramethyl-4-piperidinyl)sebacate.

In the stabilizing mixtures of the present invention, the two components (a) and (b) are used in a weight ratio ranging from 1:10 to 10:1, preferably from 1:4 to 1:1.

Organic polymers capable of being light-stabilized by the addition of the stabilizing mixtures of the present invention are:

- (1) polymers of mono-olefins and diolefins such as, for example, polypropylene, polyisobutylene, polybut-1-ene, poly-4-methylpent-1-ene, polyisoprene or polybutadiene; as well as polymers of cyclo-olefins such as, for example, cyclopentene or norbornene; polyethylene (which can be optionally cross-linked) such as, for example, high density polyethylene (HDPE), high density polyethylene and polyethylene with a high molecular weight (HDPE-HMW), high density polyethylene and

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polyethylene with an "ultra-high" molecular weight (HDPE-UHMW), medium density polyethylene (MDPE), low density polyethylene (LDPE), linear low density polyethylene (LLDPE), branched low density polyethylene (BLDPE).

The polyolefins such as, for example the mono-olefins cited in the previous paragraph, preferably polyethylene and polypropylene, can be prepared with various methods known in literature, preferably using the following methods:

- (a) radicalic polymerization (generally carried out at a high pressure and high temperature;
- (b) catalytic polymerization using a catalyst which normally contains one or more metals of groups IVb, Vb, VIb or VIII of the Periodic Table. These metals generally have one or more ligands such as, for example, oxides, halides, alcoholates, ethers, amines, alkyls, alkenyls and/or aryls which can be π - or σ -co-ordinated. These metal complexes can be in free form or supported in substrates such as, for example activated magnesium chloride, titanium (III) chloride, alumina or silicon oxide. These catalysts can be soluble or insoluble in the reaction medium. The catalysts can be used alone or in the presence of other activators such as,

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for example, metal alkyls, metal hydrides, halides of metal alkyls, oxides of metal alkyls or metal alkyloxanes, these metals being elements belonging to groups Ia, IIa and/or IIIa of the Periodic Table. The activators can be conveniently modified with other ester, ether, amine or silyl-ether groups. These catalytic systems are usually called Phillips, Standard Oil Indiana, Ziegler (-Natta), TNZ (DuPont), metallocene or "single site catalyst" (SSC).

(2) Mixtures of the polymers described under point (1) such as, for example, mixtures of polypropylene with polyisobutylene; mixtures of polypropylene with polyethylene (for example, PP/HDPE, PP/LDPE); mixtures of different types of polyethylene (for example, LDPE/HDPE).

(3) Copolymers of mono-olefins and diolefins with each other or with other vinyl monomers such as, for example, ethylene-propylene copolymers, linear low density polyethylene (LLDPE) and its mixtures with low density polyethylene (LDPE), propylene/but-1-ene copolymers, propylene/isobutylene copolymers, ethylene/but-1-ene copolymers, ethylene/hexene copolymers, ethylene/methylpentene copolymers, ethylene/heptene copolymers, ethylene/octene

- copolymers, propylene/butadiene copolymers, isobutylene/isoprene copolymers, ethylene/alkyl acrylate copolymers, ethylene/alkyl methacrylate copolymers, ethylene/vinyl acetate copolymers and
5 their copolymers with carbon monoxide or ethylene/acrylic acid copolymers and their salts (ionomers) as well as terpolymers of ethylene with polypropylene and a diene such as, for example, hexadiene, dicyclopentadiene or ethylidene-norbornene;
10 and mixtures of these copolymers with each other or with the polymers cited in paragraph (1) such as, for example, polypropylene/ethylene-propylene copolymers, LDPE/ethylene-vinylacetate (EVA) copolymers, LDPE/ethylene-acrylic acid (EAA)
15 copolymers, LLDPE/EVA, LLDPE/EAA, and alternating or "random" polyalkylene/carbon monoxide copolymers and their mixtures with other polymers such as, for example, polyamides.
- (4) Hydrocarbon resins (for example, C₅-C₉) comprising
20 their hydrogenated modifications (for example, tackifiers) and mixtures with polyalkylene and starch.
- (5) Polystyrene, poly(p-methylstyrene), poly(α -methylstyrene).
- 25 (6) Copolymers of styrene or α -methylstyrene with

- dienes or acrylic derivatives such as, for example, styrene/butadiene, styrene/acrylonitrile, styrene/alkyl methacrylate, styrene/butadiene/alkyl acrylate, styrene/butadiene/alkyl methacrylate, styrene/maleic anhydride, styrene/acrylonitrile/methylacrylate; mixtures, having a high impact strength, between copolymers of styrene and another polymer such as, for example, a polyacrylate, a polymer of a diene or an ethylene/propylene/diene terpolymer, block polymers of styrene such as, for example, styrene/butadiene/styrene, styrene/isoprene/styrene, styrene/ethylene/butylene/styrene or styrene/ethylene/propylene/styrene.
- (7) Grafted copolymers of styrene or α -methylstyrene such as, for example, styrene on polybutadiene, styrene on polybutadiene or polybutadiene-acrylonitrile copolymers; styrene and acrylonitrile (or methacrylonitrile) on polybutadiene; styrene, acrylonitrile and methylmethacrylate on polybutadiene; styrene and maleic anhydride on polybutadiene; styrene, acrylonitrile and maleic anhydride or maleimide on polybutadiene; styrene and maleimide on polybutadiene; styrene and alkylacrylates or methacrylates on polybutadiene; styrene and

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- acrylonitrile on ethylene/propylene/diene terpolymers, styrene and acrylonitrile on polyalkyl acrylates or polyalkyl methacrylates, styrene and acrylonitrile on acrylate/butadiene copolymers, as well as mixtures of the copolymers listed above with the copolymers cited under point (6) such as, for example, mixtures of known copolymers such as ABS, MBS, ASA or AES;
- (8) Polymers containing halogens such as, for example, polychloroprene, chlorinated rubbers, chlorinated or sulfochlorinated polyethylene, ethylene and chlorinated ethylene copolymers, homopolymers and copolymers of epichlorohydrin, in particular polymers of vinyl compounds containing halogens such as, for example, polyvinyl chloride, polyvinylidenechloride, polyvinyl fluoride or polyvinylidenefluoride; and also their copolymers such as, for example, vinyl chloride/vinylidenechloride, vinyl chloride/vinyl acetate or vinylidenechloride/vinyl acetate.
- (9) Polymers deriving from α,β -unsaturated acids and their derivatives such as, for example, polyacrylates and polymethacrylates, polymethyl methacrylates, polyacrylamides and polyacrylonitriles, modified with butyl acrylate.

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- (10) Copolymers of monomers according to point (9) with each other or with other unsaturated monomers such as, for example, acrylonitrile/butadiene copolymers, acrylonitrile/alkylacrylate copolymers, 5 acrylonitrile/alkoxyalkyl acrylate copolymers or acrylonitrile/vinyl halide copolymers or acrylonitrile/alkyl methacrylate/butadiene terpolymers.
- (11) Polymers deriving from unsaturated alcohols and amines, or their acyl or acetal derivatives such 10 as, for example, polyvinyl alcohol, polyvinyl acetate, polyvinyl stearate, polyvinyl benzoate, polyvinyl maleate, polyvinyl butyrral, polyallyl phthalate or polyallyl melamine; and also their copolymers with the olefins listed under point 15 (1).
- (12) Homopolymers and copolymers of cyclic ethers such as, for example, polyalkylene glycols, polyethylene oxide, polypropylene oxide, or copolymers of the compounds described above with bis-glycidyl 20 ethers.
- (13) Polyacetals such as, for example, polyoxymethylene and polyoxymethylenes which contain ethylene oxide as comonomer; polyacetals modified with thermoplastic polyurethanes, acrylates or MBS.
- 25 (14) Polyphenylene oxides and sulfides and mixtures of

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polyphenylene oxides with styrene or polyamide polymers.

- (15) Polyurethanes deriving from hydroxyl-terminated polyethers, polyesters or polybutadienes on the one hand and aliphatic or aromatic polyisocyanates on the other, as well as the precursors of the above compounds.
- (16) Polyamides and copolyamides deriving from diamines and dicarboxylic acids and/or aminocarboxylic acids or from the corresponding lactams such as, for example, polyamide 4, polyamide 6, polyamide 6/6, 6/10, 6/9, 6/12, 4/6, 12/12, polyamide 11, polyamide 12, aromatic polyamides obtained starting from m-xylene diamine and adipic acid; polyamides prepared from hexamethylenediamine and isophthalic and/or terephthalic acid and with or without an elastomer as modifier, for example, poly-2,4,4-trimethylhexamethylene terephthalamide or poly-m-phenylene isophthalamide; and also block copolymers of the above polyamides with polyolefins, olefinic copolymers, ionomers or elastomers chemically bound or grafted; or with polyethers such as, for example, polyethylene glycol, polypropylene glycol or polytetramethylene glycol; as well as polyamides or copolyamides modified with

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EPDM or ABS; and polyamides condensed during processing ("RIM polyamide system").

(17) Polyureas, polyimides, polyamide-imides and polybenzimidazoles.

5 (18) Polyesters deriving from dicarboxylic acids and diols and/or from hydroxycarboxylic acids or from the corresponding lactones such as, for example, polyethylene terephthalate, polybutylene terephthalate, poly-1,4-dimethylolcyclohexaneterephthalate and polyhydroxybenzoates, as well as block
10 copolyether esters deriving from polyethers with hydroxyl-terminated groups; and also polyesters modified with polycarbonates or MBS.

(19) Polycarbonates and polyester carbonates.

15 (20) Polysulfones, polyethersulfones and polyetherketones.

(21) Cross-linked polymers deriving from aldehydes on the one hand and from phenols, urea and melamines on the other, such as, for example, phenol/formaldehyde resins, urea/formaldehyde resins and melamine/formaldehyde resins.
20

(22) Drying or non-drying alkyd resins.

(23) Resins based on unsaturated polyesters deriving from copolyesters of dicarboxyl acids saturated and unsaturated with polyhydric alcohols and vinyl
25

compounds as cross-linking agents, and also the above resins containing halogens and having a good flame-resistance.

- (24) Cross-linkable acrylic resins deriving from substituted acrylates such as, for example, epoxy acrylates, urethane acrylates or polyester acrylates.
- (25) Alkyd resins, resins based on polyesters or acrylated resins cross-linked with melamine resins, urea resins, resins based on polyisocyanates or epoxy resins.
- (26) Cross-linked epoxy resins deriving from aliphatic, cycloaliphatic, heterocyclic or aromatic glycidic compounds such as, for example, di-glycidylethers of bisphenol A and bisphenol F, which are cross-linked with the usual hardeners such as, for example, anhydrides or amines, in the presence of or without accelerating agents.
- (27) Natural polymers such as, for example, cellulose, rubber, gelatine, and their derivatives chemically modified to give homologous polymers such as, for example, cellulose acetates, propionates and butyrates, or cellulose ethers such as, for example, methyl-cellulose; as well as hydrocarbon resins ("rosins") and their derivatives.

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- (28) Mixtures of the above polymers ("polyblends") such as, for example, PP/EPDM, polyamides/EPDM or ABS, PVC/EVA, PVC/ABS, PVC/MBS, PC/ABS, PBTP/ABS, PC/ASA, PC/PBT, PVC/CPE, PVC/acrylates, POM/ther-
5 moplastics PUR, PC/thermoplastics PUR, POM/acrylates, POM/MBS, PPO/HIPS, PPO/PA 6.6 and copolymers, PA/HDPE, PA/PP, PA/PPO, PBT/PC/ABS, or PBT/PET/PC.
- (29) Natural or synthetic organic materials which are pure monomeric compounds or mixtures of these
10 compounds such as, for example, mineral oils, animal and vegetable fats, oils and waxes, or oils, fats and waxes based on synthetic esters (for example, phthalates, adipates, phosphates or trimellitates) and also mixtures of synthetic
15 esters with mineral oils in any weight ratio, typically those used as compositions for spinning and also aqueous emulsions of these materials.
- (30) Aqueous emulsions of natural or synthetic rubbers, for example, natural latex or latexes of carboxyl-
20 ated styrene-butadiene copolymers.

In particular, organic polymers which can be light-stabilized by the addition of the mixtures of the present invention, are polyolefins, preferably polypropylene and polyethylene.

25 The addition of the stabilizing mixtures of the

present invention to the above organic polymers, is carried out according to methods known in the art.

For example, the stabilizing mixtures of the present invention can be added as such or in their
5 single components [compound (a) and compound (b)], to the organic polymers, optionally in the presence of other additives, in the step following their preparation, or immediately before the transformation process.

For the above purposes, the stabilizing mixtures
10 of the present invention are added to the polymer to be stabilized in a quantity ranging from 0.05% to 5% by weight, preferably between 0.1% and 2%. Also when the single components are added, the total quantity is the same as that described above.

15 The polymers stabilized as described above have a high resistance to degradation caused by light, in particular, ultraviolet radiation. They are therefore capable of maintaining their colour and brightness for a long period even when exposed to external agents.

20 The stabilizing mixtures described above can also be used in the light-stabilization of compositions for coating or painting ("coating compositions") such as, for example, paints, lacquers, plastic-based compositions.

25 For the purposes of the present invention, coating

or painting compositions are preferred in which the organic polymer is selected from:

- (a) a thermoplastic polymer selected from thermoplastic polymers containing heteroatoms, in particular
5 nitrogen, sulfur and/or oxygen, in the main chain, styrene copolymers, grafted styrene polymers and polymethyl methacrylates (PMMA); or
- (b) a paint ligand.

Specific examples of thermoplastic polymers (a)
10 containing heteroatoms, in particular nitrogen, sulfur and/or oxygen, in the main chain, are listed above under points 13 to 20. Among these, polycarbonates, polyesters, polyamides, polyacetals, polyphenylene oxides and polyphenylene sulfides are preferred;
15 particularly preferred are polycarbonates, polyesters such as, for example, polyethylene terephthalate (PET), and polyamides (PA) such as, for example, PA 6 and PA 6/6; polycarbonates are even more preferred.

Specific examples of styrene copolymers and
20 grafted styrene polymers (a) are listed above under points 6 and 7.

Paint ligands (b) can comprise at least one of the organic polymers specified above. Specific examples of paints containing specific ligands are:

- 25 1. paints based on alkyd resins, acrylic resins,

polyester resins, epoxy resins or melamine resins, which can be cross-linked at a low or high temperature, or mixtures of these resins, to which a cross-linking agent is optionally added;

- 5 2. polyurethane paints with two components based on acrylic resins containing hydroxyl groups, polyester resins or polyether resins and aliphatic or aromatic isocyanates, isocyanurates or polyisocyanates;
- 10 3. polyurethane paints with one component based on block isocyanates, isocyanurates or polyisocyanates which are unblocked during oven treatment;
4. paints with two components based on (poly)ketoidimines and aliphatic or aromatic isocyanates, isocyanurates or polyisocyanates;
- 15 5. paints with two components based on (poly)ketoidimines and an unsaturated acrylic resin or a polyacetoacetate resin or a methyl metacrylamidoglycolate;
- 20 6. paints with two components based on polyacrylates containing a carboxylic group or an amine group and polyepoxides;
7. paints with two components based on acrylic resins containing an anhydride group and a polyhydroxyl or polyamine compound;
- 25

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8. paints with two components based on (poly)oxazoline and acrylic resins containing an anhydride group or unsaturated acrylic resins or aliphatic or aromatic isocyanates, or isocyanurates or polyisocyanates;
5 isocyanates;
9. paints with two components based on unsaturated polyacrylates and polymalonates;
10. thermoplastic polyacrylic paints based on thermoplastic acrylic resins or non-self-crosslinking
10 acrylic resins combined with etherified melamine resins;
11. systems for paints based on siloxane-modified acrylic resins;
12. systems for paints based on fluoro-modified
15 acrylic resins; and
13. systems for paints based on allyl glycidyl ethers.

The paints can be applied as one or two layers ("one- or two-coat") of coating and the stabilizing mixtures of the present invention are preferably added
20 to the upper colourless coating.

The paints can be applied to the substrate (metal, plastic, wood, etc.) using the conventional methods such as, for example, brushing, spraying, pouring, dipping or electrophoresis.

25 A preferred embodiment of the present invention

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consists in paints or coatings (for example car coatings) comprising at least one stabilizing mixture of the present invention. Ligands which can be used for the purpose are, for example, those listed above.

5 For the purposes of the present invention, the above stabilizing mixtures can be combined, as already mentioned above, with other conventional additives or their mixtures. These additives are added in a quantity ranging from about 0.1% to about 5% by weight with
10 respect to the weight of the polymeric compositions to be stabilized, preferably from about 0.5% to about 3% by weight. Some of the additives used are listed below as an example.

1. Antioxidants

15 1.1 Alkylated monophenols such as, for example:

2,6-di-t-butyl-4-methylphenol;

2-t-butyl-4,6-dimethylphenol;

2,6-di-t-butyl-4-ethylphenol;

2,6-di-t-butyl-4-n-butylphenol;

20 2,6-di-t-butyl-4-isobutylphenol;

2,6-di-cyclopentyl-4-methylphenol;

2-(α -methylcyclohexyl)-4,6-dimethylphenol;

2,6-dioctadecyl-4-methylphenol;

2,4,6-tricyclohexylphenol;

25 2,6-di-t-butyl-4-methoxymethylphenol;

2,6-di-nonyl-4-methylphenol;
2,4-dimethyl-6-(1'-methylundec-1'-yl)phenol;
2,4-dimethyl-6-(1'-methylhectadec-1'-yl)phenol;
2,4-dimethyl-6-(1'-methyltridec-1'-yl)phenol; and
5 their mixtures.

1.2 Alkylthiomethylphenols such as, for example:

2,4-dioctylthiomethyl-6-t-butylphenol;
2,4-dioctylthiomethyl-6-methylphenol;
2,4-dioctylthiomethyl-6-ethylphenol;
10 2,6-didodecylthiomethyl-4-nonylphenol.

1.3 Hydroquinones and alkylated hydroquinones such as,
for example:

2,6-di-t-butyl-4-methoxyphenol;
2,5-di-t-butylhydroquinone;
15 2,5-di-t-amylhydroquinone;
2,6-diphenyl-4-octadecyloxyphenol;
2,6-di-t-butylhydroquinone;
2,5-di-t-butyl-4-hydroxyanisol;
3,5-di-t-butyl-4-hydroxyanisol;
20 3,5-di-t-butyl-4-hydroxyphenyl stearate;
bis(3,5-di-t-butyl-4-hydroxyphenyl)adipate.

1.4 Tocopherols such as, for example:

α -tocopherol, β -tocopherol, γ -tocopherol,
 δ -tocopherol and their mixtures (Vitamin E).

25 1.5 Hydroxylated thiodiphenyl ethers such as, for

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example:

2,2'-thiobis-(6-t-butyl-4-methylphenol);

2,2'-thiobis-(4-octylphenol);

4,4'-thiobis-(6-t-butyl-3-methylphenol);

5 4,4'-thiobis-(6-t-butyl-2-methylphenol);

4,4'-thiobis-(3,6-di-sec-amylphenol);

4,4'-bis-(2,6-dimethyl-4-hydroxyphenyl)disulfide.

1.6 Alkylidene-bisphenols such as, for example:

2,2'-methylenebis-(6-t-butyl-4-methylphenol);

10 2,2'-methylenebis-(6-t-butyl-4-ethylphenol);

2,2'-methylenebis[4-methyl-6-(α -methylcyclohexyl)phenol];

2,2'-methylenebis(4-methyl-6-cyclohexylphenol);

2,2'-methylenebis(6-nonyl-4-methylphenol);

15 2,2'-methylenebis(4,6-di-t-butylphenol);

2,2'-ethylidenebis(4,6-di-t-butylphenol);

2,2'-ethylidenebis(6-t-butyl-4-isobutylphenol);

2,2'-methylenebis[6-(α -methylbenzyl)-4-nonylphenol];20 2,2'-methylenebis[6-(α,α -dimethylbenzyl)-4-nonylphenol];

4,4'-methylenebis(2,6-di-t-butylphenol);

4,4'-methylenebis(6-t-butyl-2-methylphenol);

1,1-bis-(5-t-butyl-4-hydroxy-2-methylphenyl)-

25 butane;

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2,6-bis-(3-t-butyl-5-methyl-2-hydroxybenzyl)-4-methylphenol;

1,1,3-tris-(5-t-butyl-4-hydroxy-2-methylphenyl)-butane;

5 1,1-bis-(5-t-butyl-4-hydroxy-2-methyl-phenyl)-3-n-dodecylmercaptobutane;

ethyleneglycol bis[3,3-bis(3'-t-butyl-4'-hydroxy-phenyl)butyrate];

10 bis(3-t-butyl-4-hydroxy-5-methylphenyl)dicyclopentadiene;

bis[2-(3'-t-butyl-2'-hydroxy-5'-methylbenzyl)-6-t-butyl-4-methylphenyl]terephthalate;

1,1-bis(3,5-dimethyl-2-hydroxyphenyl)butane;

2,2-bis(3,5-di-t-butyl-4-hydroxyphenyl)propane;

15 2,2-bis(5-t-butyl-4-hydroxy-2-methylphenyl)-4-n-dodecylmercaptobutane;

1,1,5,5-tetra(5-t-butyl-4-hydroxy-2-methylphenyl)-pentane.

1.7 Benzyl compounds containing O, N or S such as, for
20 example:

3,5,3',5'-tetra-t-butyl-4,4'-dihydroxydibenzyl ether;

octadecyl-4-hydroxy-3,5-dimethylbenzylmercaptoacetate;

25 tris(3,5-di-t-butyl-4-hydroxybenzyl)amine;

bis(4-t-butyl-3-hydroxy-2,6-dimethylbenzyl)dithio-
terephthalate;

bis(3,5-di-t-butyl-4-hydroxybenzyl)sulfide;

iso-octyl-3,5-di-t-butyl-4-hydroxybenzylmercapto-
acetate.

5

1.8 Hydroxybenzylated malonates such as, for example:

dioctadecyl-2,2-bis(3,5-di-t-butyl-2-hydroxyben-
zyl)malonate;

dioctadecyl-2-(3-t-butyl-4-hydroxy-5-methylben-
zyl)malonate;

10

didodecylmercaptoethyl-2,2-bis(3,5-di-t-butyl-4-
hydroxybenzyl)malonate;

bis[4-(1,1,3,3-tetramethylbutyl)phenyl]-2,2-
bis(3,5-di-t-butyl-4-hydroxybenzyl)malonate.

15 1.9 Aromatic hydroxybenzyl compounds such as, for
example:

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

1,4-bis-(3,5-di-t-butyl-4-hydroxybenzyl)-2,3,5,6-
tetramethylbenzene;

20

2,4,6-tris(3,5-di-t-butyl-4-hydroxybenzyl)phenol.

1.10 Triazine compounds such as, for example:

2,4-bis(octylmercapto)-6-(3,5-di-t-butyl-4-hydro-
xyaniline)-1,3,5-triazine;

25

2-octylmercapto-4,6-bis(3,5-di-t-butyl-4-hydro-

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xyaniline)-1,3,5-triazine;
2-octylmercapto-4,6-bis(3,5-di-t-butyl-4-hydroxyphenoxy)-1,3,5-triazine;
2,4,6-tris-(3,5-di-t-butyl-4-hydroxyphenoxy)-
5 1,2,3-triazine;
1,3,5-tris(3,5-di-t-butyl-4-hydroxybenzyl)isocyanurate;
1,3,5-tris(4-t-butyl-3-hydroxy-2,6-dimethylbenzyl)isocyanurate;
10 2,4,6-tris-(3,5-di-t-butyl-4-hydroxyphenylethyl)-1,3,5-triazine;
1,3,5-tris(3,5-di-t-butyl-4-hydroxyphenylpropionyl)hexahydro-1,3,5-triazine;
1,3,5-tris-(3,5-dicyclohexyl-4-hydroxybenzyl)isocyanurate.
15

1.11 Benzylphosphonates such as, for example:

dimethyl-2,5-di-t-butyl-4-hydroxybenzylphosphonate;
diethyl-3,5-di-t-butyl-4-hydroxybenzylphosphonate;
20 dioctadecyl-3,5-di-t-butyl-4-hydroxybenzylphosphonate;
dioctadecyl-5-t-butyl-4-hydroxy-3-methylbenzylphosphonate;
calcium salts of monoethyl ester of 3,5-di-t-butyl-4-hydroxybenzylphosphonic acid.
25

- 80 -

1.12 Acylaminophenols such as, for example:

4-hydroxylauranilide;

4-hydroxystearanilide;

octyl-N-(3,5-di-t-butyl-4-hydroxyphenyl) carbamate.

5 1.13 Esters of β -(3,5-di-t-butyl-4-hydroxyphenyl)propionic acid with monohydric or polyhydric alcohols such as, for example:

methanol, ethanol, octanol, octadecanol, 1,6-

hexandiol, 1,9-nonandiol, ethylene glycol, 1,2-

10 propanediol, neopentyl glycol, thiodiethylene

glycol, diethylene glycol, triethylene glycol,

pentaerythritol, tris(hydroxyethyl) isocyanurate,

N,N'-bis(hydroxyethyl)oxamide, 3-thioundecanol, 3-

thiopentadecanol, trimethylhexandiol, trimethyl-

15 olpropane, 4-hydroxymethyl-1-phospho-2,6,7-trioxa-

bicyclo[2.2. 2]octane.

1.14 Esters of β -(5-t-butyl-4-hydroxy-3-methylphenyl)propionic acid with monohydric or polyhydric alcohols such as, for example:

20 methanol, ethanol, octanol, octadecanol, 1,6-

hexandiol, 1,9-nonandiol, ethylene glycol, 1,2-

propanediol, neopentyl glycol, thiodiethylene

glycol, diethylene glycol, triethylene glycol,

pentaerythritol, tris(hydroxyethyl) isocyanurate,

25 N,N'-bis(hydroxyethyl)oxamide, 3-thioundecanol,

- 81 -

3-thiopentadecanol, trimethylhexandiol, trimethylpropane, 4-hydroxymethyl-1-phospho-2,6,7-trioxabicyclo[2.2.2]octane.

1.15 Esters of β -(3,5-dicyclohexyl-4-hydroxyphenyl)propionic acid with monohydric or polyhydric alcohols such as, for example:

methanol, ethanol, octanol, octadecanol, 1,6-hexandiol, 1,9-nonandiol, ethylene glycol, 1,2-propanediol, neopentyl glycol, thiodiethylene glycol, diethylene glycol, triethylene glycol, pentaerythritol, tris(hydroxyethyl) isocyanurate, N,N'-bis (hydroxyethyl) oxamide, 3-thioundecanol, 3-thiopentadecanol, trimethylhexandiol, trimethylpropane, 4-hydroxymethyl-1-phospho-2,6,7-trioxabicyclo[2.2.2]octane.

1.16 Esters of (3,5-di-t-butyl-4-hydroxyphenyl)acetic acid with monohydric or polyhydric alcohols such as, for example:

methanol, ethanol, octanol, octadecanol, 1,6-hexandiol, 1,9-nonandiol, ethylene glycol, 1,2-propanediol, neopentyl glycol, thiodiethylene glycol, diethylene glycol, triethylene glycol, pentaerythritol, tris(hydroxyethyl) isocyanurate, N,N'-bis(hydroxyethyl) oxamide, 3-thioundecanol, 3-thiopentadecanol, trimethylhexandiol, trimethyl-

- 82 -

lolpropane, 4-hydroxymethyl-1-phospho-2,6,7-trioxabicyclo[2.2.2]octane.

1.17 Amides of β -(3,5-di-t-butyl-4-hydroxyphenyl)-propionic acid such as, for example:

5 N,N'-bis(3,5-di-t-butyl-4-hydroxyphenylpropionyl)hexamethylenediamine;
N,N'-bis(3,5-di-t-butyl-4-hydroxyphenylpropionyl)trimethylenediamine;
N,N'-bis(3,5-di-t-butyl-4-hydroxyphenylpropionyl)hydrazine.
10

1.18 Ascorbic acid (Vitamin C).

1.19 Amine antioxidants such as, for example, N,N'-di-isopropyl-p-phenylenediamine, N,N'-di-s-butyl-p-phenylenediamine, N,N'-bis(1,4-dimethylpentyl)-p-phenylenediamine, N,N'-bis(1-ethyl-3-methylpentyl)-p-phenylene-diamine, N,N'-bis(1-methylheptyl)-p-phenylenediamine, N,N'-dicyclohexyl-p-phenylenediamine, N,N'-diphenyl-p-phenylenediamine, N,N'-bis(2-naphthyl)-p-phenylenediamine, N-isopropyl-N'-phenyl-p-phenylenediamine, N-(1,3-dimethylbutyl)-N'-phenyl-p-phenylenediamine, N-(1-methylheptyl)-N'-phenyl-p-phenylenediamine, N-cyclohexyl-N'-phenyl-p-phenylenediamine, 4-(p-toluenesulfamoyl)diphenylamine, N,N'-dimethyl-
20 N,N'-di-s-butyl-p-phenylenediamine, diphenylamine,
25

N-allyldiphenylamine, 4-isopropoxydiphenylamine, N-phenyl-1-naphthylamine, N-(4-t-octylphenyl)-1-naphthylamine, N-phenyl-2-naphthylamine, octylated diphenylamine such as, for example, p,p'-di-t-octyldiphenylamine, 4-n-butylaminophenol, 4-butylaminophenol, 4-nonanoylaminophenol, 4-dodecanoylaminophenol, 4-octadecanoylaminophenol, bis(4-methoxyphenylamine), 2,6-di-t-butyl-4-dimethylaminomethylphenol, 2,4'-diaminodiphenylmethane, 4,4'-diaminodiphenylmethane, N,N,N',N'-tetramethyl-4,4'-diaminodiphenylmethane, 1,2-bis[(2-methylphenyl)amino]ethane, 1,2-bis(phenylamino)propane, (o-tolyl)biguanide, bis[4-(1',3'-dimethylbutyl)phenyl]amine, t-octylated N-phenyl-1-naphthylamine, mixtures of mono- and di-alkylated t-butyl/t-octyldiphenylamines, mixtures of mono- and di-alkylated nonyldiphenylamines, mixtures of mono- and di-alkylated dodecyldiphenylamines, mixtures of mono- and di-alkylated isopropyl/isohexyldiphenylamines, mixtures of mono- and di-alkylated t-butyl/t-octyldiphenylamines, 2,3-dihydro-3,3-dimethyl-4H-1,4-benzothiazine, phenothiazine, mixtures of mono- and di-alkylated t-butyl/t-octylphenothiazines, mixtures of mono- and di-alkylated t-octylphenothiazines, N-allylpheno-

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thiazine, N,N,N',N'-tetraphenyl,1,4-diaminobut-2-ene, N,N-bis(2,2,6,6-tetramethylpiperid-4-yl)hexamethylenediamine, bis(2,2,6,6-tetramethylpiperid-4-yl)sebacate, 2,2,6,6-tetramethylpiperidin-4-one,
5 2,2,6,6-tetramethylpiperidin-4-ol.

2. Ultra-violet ray and light-stabilizers.

2.1 Derivatives of 2-(2'-hydroxyphenyl)benzotriazoles
such as, for example:

2-(2'-hydroxy-5'-methylphenyl)benzotriazole;

10 2-(3',5'-di-t-butyl-2'-hydroxyphenyl)benzotriazole;
le;

2-(5'-t-butyl-2'-hydroxyphenyl)benzotriazole;

2-[2'-hydroxy-5'-(1,1,3,3-tetramethylbutyl)phenyl]benzotriazole;

15 2-(3',5'-di-t-butyl-2'-hydroxyphenyl)-5-chlorobenzotriazole;

2-(3'-t-butyl-2'-hydroxy-5'-methylphenyl)-5-chlorobenzotriazole;

20 2-(3'-sec-butyl-5'-t-butyl-2'-hydroxyphenyl)benzotriazole;

2-(2'-hydroxy-4'-octyloxyphenyl)benzotriazole;

2-(3',5'-di-t-amyl-2'-hydroxyphenyl)benzotriazole;

2-[3',5'-bis(α , α -dimethylbenzyl)-2'-hydroxyphenyl]benzotriazole;

25 mixtures of 2-[3'-t-butyl-2'-hydroxy-5'-(2-octylo-

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xycarbonylethyl)phenyl)-5-chlorobenzotriazole, 2-[3'-t-butyl-5'-(2-(2-ethylhexyloxy)carbonylethyl)-2'-hydroxyphenyl]-5-chlorobenzotriazole, 2-[3'-t-butyl-2'-hydroxy-5'-(2-methoxycarbonylethyl)phenyl]-5-chlorobenzotriazole, 2-[3'-t-butyl-2'-hydroxy-5'-(2-methoxycarbonylethyl)phenyl]benzotriazole, 2-[3'-t-butyl-2'-hydroxy-5'-(2-octyloxy)carbonylethyl)phenyl]benzotriazole, 2-[3'-t-butyl-5'-(2-(2-ethylhexyloxy)carbonylethyl)-2'-hydroxyphenyl]benzotriazole, 2-(3'-dodecyl-2'-hydroxy-5'-methylphenyl)benzotriazole and 2-[3'-t-butyl-2'-hydroxy-5'-(2-iso-octyloxy)carbonylethyl)phenyl]benzotriazole, 2,2'-methylene-bis[4-(1,1,3,3-tetramethylbutyl)-6-benzotriazol-2-yl-phenol]; esterification product of 2-[3'-t-butyl-5'-(2-methoxycarbonylethyl)-2'-hydroxyphenyl]-2H-benzotriazole with polyethylene glycol 300; $[R-CH_2CH_2-COO(CH_2)_3]_2$ wherein $R = 3'-t-butyl-4-hydroxy-5'-2H-benzotriazol-2-yl-phenyl$.

2.2 Derivatives of 2-hydroxybenzophenones such as, for example: 4-hydroxy-; 4-methoxy-; 4-octyloxy-; 4-decyloxy-; 4-dodecyloxy-; 4-benzyloxy-; 4,2',4'-trihydroxy-; 2'-hydroxy-4,4'-dimethoxy.

2.3 Esters of benzoic acids, optionally substituted, such as, for example: phenyl salicylate, 4-t-

butylphenyl salicylate, octylphenyl salicylate, benzoyl-resorcinol, bis(4-t-butylbenzoyl)-resorcinol, dibenzoyl-resorcinol, 2,4-di-t-butylphenyl-3,5-di-t-butyl-4-hydroxybenzoate, hexadecyl-3,5-di-t-butyl-4-hydroxybenzoate, octadecyl-3,5-di-t-butyl-4-hydroxybenzoate, 2-methyl-4,6-di-t-butylphenyl-3,5-di-t-butyl-4-hydroxybenzoate.

2.4 Acrylates such as, for example, ethyl or isoctyl α -cyano- β,β -diphenylacrylate; methyl α -carbomethoxycinnamate, methyl or butyl α -cyano- β -methyl-p-methoxycinnamate, methyl α -carbomethoxy-p-methoxycinnamate, N-(β -carbomethoxy- β -cyanovinyl)-2-methylindoline.

2.5 Nickel compounds such as, for example, complexes of 2,2'-thio-bis-[4-(1,1,3,3-tetramethylbutyl)phenol], for example 1:1 or 1:2 complexes, with or without additional ligands such as n-butylamine, triethanolamine or N-cyclohexyldiethanolamine, nickel dibutyldithiocarbamate, nickel salts of monoalkyl esters of 4-hydroxy-3,5-di-t-butylbenzyl-phosphonic acid, such as methyl or ethyl esters, nickel complexes with ketoximes such as 2-hydroxy-4-methylphenyl undecyl ketoxime, nickel complexes of 1-phenyl-4-lauroyl-5-hydroxypyrazol with or without additional ligands.

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2.6 Oxamides such as, for example:

4,4'-dioctyloxyoxanilide;

2,2'-diethoxyoxanilide;

2,2'-dioctyloxy-5,5'-di-t-butoxanilide;

5 2,2'-didodecyloxy-5,5'-di-t-butoxanilide;

2-ethoxy-2'-ethyloxanilide;

N,N'-bis(3-dimethylaminopropyl)oxamide;

2-ethoxy-5-t-butyl-2'-ethoxanilide and its mix-
tures with 2-ethoxy-2'-ethyl-5,4'-di-t-butoxanili-
10 de; and mixtures of disubstituted ortho- and para-
methoxy anilides and mixtures of disubstituted
ortho and para-ethoxy anilides.

2.7 2-(2-hydroxyphenyl)-1,3,5-triazines such as, for
example:

15 2,4,6-tris(2-hydroxy-4-octyloxyphenyl)-1,3,5-tri-
azine;

2-(2-hydroxy-4-octyloxyphenyl)-4,6-bis(2,4-dime-
thylphenyl)-1,3,5-triazine;

20 2-(2,4-dihydroxyphenyl)-4,6-bis(2,4-dimethylphe-
nyl)-1,3,5-triazine;

2,4-bis-(2-hydroxy-4-propyloxyphenyl)-6-(2,4-
dimethylphenyl)-1,3,5-triazine;

2-(2-hydroxy)-4-octylphenyl)-4,6-bis(4-methylphe-
nyl)-1,3,5-triazine;

25 2-(2-hydroxy-4-dodecyloxyphenyl)-4,6-bis(2,4-

- dimethylphenyl)-1,3,5-triazine;
2-[2-hydroxy-4-(2-hydroxy-3-butyloxy-propoxy)phenyl]-4,6-bis(2,4-dimethyl)-1,3,5-triazine;
2-[2-hydroxy-4-(2-hydroxy-3-octyloxy-propyloxy)-phenyl]-4,6-bis(2,4-dimethyl)-1,3,5-triazine.
5 2-[4-(dodecyloxy/tridecyloxy-2-hydroxypropoxy)-2-hydroxyphenyl]-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine;
2-[2-hydroxy-4-(2-hydroxy-3-dodecyloxypropoxy)phenyl]-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine;
10 2-(2-hydroxy-4-hexyloxy)phenyl-4,6-diphenyl-1,3,5-triazine;
2-(2-hydroxy-4-methoxy)phenyl-4,6-diphenyl-1,3,5-triazine;
2,4,6-tris[2-hydroxy-4-(3-butoxy-2-hydroxy-propoxy)phenyl]-1,3,5-triazine;
15 2-(2-hydroxyphenyl)-4-(4-methoxyphenyl)-6-phenyl-1,3,5-triazine.
3. "Metal-deactivators" such as, for example: N,N-diphenyloxamide, N-salicylal-N'-salicyloyl-hydrazine, N,N'-bis(salicyloyl)hydrazine; N,N'-bis(3,5-di-t-butyl-4-hydroxyphenylpropionyl)hydrazine, 3-salicyloylamino-1,2,4-triazole, bis(benzylidene)oxalyl dihydrazide, oxanilide, isophthaloyl dihydrazide,
20 25 sebacoyl bisphenylhydrazide, N,N'-diace-

tyladipoyl dihydrazide, N,N'-bis(salicyloyl)oxal-
lyl dihydrazide, N,N'-bis(salicyloyl)thiopropionyl
dihydrazide.

4. Phosphites and phosphonites such as, for example:
- 5 triphenyl phosphite, diphenyl alkyl phosphites,
phenyl dialkyl phosphites, tris(nonylphenyl)phos-
phite, trilauryl phosphite, trioctadecyl phos-
phite, distearyl pentaerythritol diphosphite,
tris(2,4-di-t-butylphenyl)phosphite, diisodecyl
10 pentaerythritol diphosphite, bis(2,4-di-t-butyl-
phenyl)pentaerythritol diphosphite, bis(2,5-di-t-
butyl-4-methylphenyl)pentaerythritol diphosphite,
diisodecyloxypentaerythritol diphosphite, bis(2,4-
di-t-butyl-6-methylphenyl)pentaerythritol diphos-
15 phite, bis[2,4,5-tris(t-butylphenyl)]pentaerythri-
tol diphosphite, tristearyl sorbitol triphosphite,
tetrakis-(2,4-di-t-butyl-phenyl)-4,4'-diphenylile-
nediphosphonite, 5-iso-octyloxy-2,4,8,10-tetra-t-
butyl-12H-di-benzo[d,g]-1,3,2-dioxaphosphocine, 6-
20 fluoro-2,4,8,10-tetra-t-butyl-12-methyl-diben-
zo[d,g]-1,3,2-dioxaphosphocine, bis(2,4-di-t-
butyl-6-methylphenyl)methylphosphite, bis(2,4-di-
t-butyl-6-methylphenyl)ethylphosphite.
5. Hydroxylamines such as, for example: N,N-dibenzyl-
25 hydroxylamine, N,N-diethylhydroxylamine, N,N-

- dioctylhydroxylamine, N,N-dilaurylhydroxylamine, N,N-ditetradecylhydroxylamine, N,N-dihexadecylhydroxylamine, N,N-dioctadecylhydroxylamine, N-hexadecyl-N-octadecylhydroxylamine, N-heptadecyl-N-octadecylhydroxylamine, N,N-dialkylhydroxylamine deriving from the amine from hydrogenated tallow.
- 5
6. Nitrons such as, for example: N-benzyl- α -phenyl-nitron, N-ethyl- α -methyl-nitron, N-octyl- α -heptyl-nitron, N-lauryl- α -undecyl-nitron, N-tetradecyl- α -tridecyl-nitron, N-hexadecyl- α -pentadecyl-nitron, N-octadecyl- α -heptadecyl-nitron, N-hexadecyl- α -heptadecyl-nitron, N-octadecyl- α -pentadecyl-nitron, N-heptadecyl- α -heptadecyl-nitron, N-octadecyl- α -hexadecyl-nitron, nitron deriving from
- 10
- 15 N,N-dialkylhydroxylamine deriving from the hydrogenated amine from tallow.
7. Agents which are capable of destroying peroxides such as, for example, esters of β -thiodipropionic acid such as lauryl, stearyl, myristyl or tridecyl
- 20
- esters, mercaptobenzimidazole or zinc salt of 2-mercaptobenzimidazole, zinc dibutyldithiocarbamate, dioctadecyldisulfide pentaerythritol tetrakis (β -dodecylmercapto)propionate.
8. Stabilizers of polyamides such as, for example,
- 25
- copper salts combined with compounds of iodine

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and/or phosphorous, divalent manganese salts.

9. Basic co-stabilizers such as, for example: melamine, polyvinylpyrrolidone, dicyanodiamide, triallyl cyanurate, derivatives of urea, derivatives of hydrazine, amines, polyamides, polyurethanes, salts of alkaline metals and salts of earth-alkaline metals of fatty acids such as, for example, Ca-stearate, Zn-stearate, Mg-stearate, Mg-behenate, Na-ricinoleate, K-palmitate, antimony-pyrocatecholate, tin-pyrocatecholate.
10. Nucleating agents such as, for example: inorganic substances such as talc, metal oxides such as titanium dioxide or manganese oxide, phosphates, carbonates or sulphates preferably of earth-alkaline metals; organic compounds such as, for example: mono- or poly-carboxylic acids and their salts, for example, 4-t-butylbenzoic acid, adipic acid, diphenylacetic acid, sodium succinate or sodium benzoate; polymeric compounds such as ionic copolymers ("ionomers").
11. Fillers and reinforcing agents such as, for example: calcium carbonate, silicates, glass fibres, "glass bulbs", asbestos, talc, kaolin, mica, barium sulfate, metal oxides and hydroxides, carbon black, graphite, wood flour and flours or

fibres of other natural products, synthetic fibres.

12. Other additives such as, for example: plasticizers, lubricants, emulsifying agents, pigments, rheological additives, catalysts, "flow-control" agents, optical brighteners, flame-retardants (for example, bromides, chlorurates, phosphorates and phosphorous/halogen mixtures), antistatic agents, blowing agents, thiosynergizing agents such as, for example, dilauryl thiodipropionate or distearyl thiodipropionate.

13. Benzofuranones and indolinones such as, for example:

3-[4-(2-acetoxyethoxy)phenyl]-5,7-di-t-butylbenzofuran-2-one;

5,7-di-t-butyl-3-[4-(2-stearoyloxyethoxy)phenyl]benzofuran-2-one;

3,3'-bis[5,7-di-t-butyl-3-[4-(2-hydroxyethoxy)phenyl]benzofuran-2-one];

5,7-di-t-butyl-3-(4-ethoxyphenyl)benzofuran-2-one;
3-(4-acetoxy-3,5-dimethylphenyl)-5,7-di-t-butylbenzofuran-2-one;

3-(3,5-dimethyl-4-pivaloyloxyphenyl)-5,7-di-t-butylbenzofuran-2-one;

or those described in U.S. patents 4.325.863,

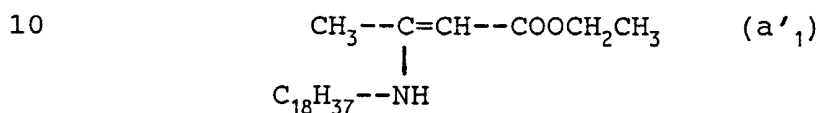
- 93 -

4.338.244, 5.175.312, 5.216.052, 5.252.643,
4.316.611, 4.316.622, 4.316.876 or in European
patent applications 589.839 and 591.102.

Some illustrative but non-limiting examples are
5 provided for a better understanding of the present
invention and for its embodiment.

EXAMPLE 1

Preparation of β -octadecylamino ethyl crotonate (com-
pound Nr. 1) having formula (a'₁):



26.03 g (0.2 moles) of ethyl acetoacetate, 50 g of
toluene, 53.9 g (0.2 moles) of octadecylamine and 0.3
g of glacial acetic acid, are charged into a 500 ml
15 four-necked reactor, equipped with a stirrer, thermome-
ter and reflux condenser with a water separator.

The reaction mass is maintained under stirring and
reflux heated for 1 hour and 45 minutes, to a tempera-
ture ranging from 118°C to 130°C. During this period
20 there is the formation of reaction water which is
separated by azeotropic distillation: 3.5 g of reaction
water are separated.

The product is isolated as boiler residue, after
distillation under vacuum of the solvent and acetic
25 acid.

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- Product obtained: 75 g.
- GC purity: 98.2%.
- Yield: 98.3%.
- Melting point: 40.5°C.

5 Compound Nr. 1 is characterized by NMR analysis which confirms its enamine structure.

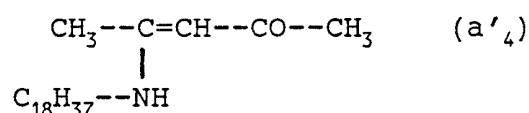
- ^1H -NMR (200 MHz, CDCl_3 -TMS) δ (ppm): NH (broad) 8.53 ppm; C=CH (s) 4.40 ppm; the other signals are in accordance with the structure.

10 Compounds Nr. 2 and Nr. 3 are prepared analogously to Example 1, of which only the reaction conditions and characteristics are specified.

EXAMPLE 2

Preparation of 2-n-octadecylamino-2-pentene-4-one

15 (Compound Nr. 2) having formula (a'₄):



- Amine: n-octadecylamine; 53.9 g (0.2 moles).
- Carbonyl compound: acetyl acetone;
- 20 20.02 g (0.2 moles).
- Solvent: toluene; 50 g.
- Catalyst: acetic acid; 0.46 g
- Reaction water separated: 3.41 g
- Duration and reaction temperature: 4.5 hours at
- 25 118°C-132°C.

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The product is isolated as boiler residue, after distillation under vacuum of the solvent and acetic acid.

- Product obtained: 66.33 g.
- 5 - GC purity: 99.1%.
- Yield: 94.3%.
- Melting point: 38°C-39°C.

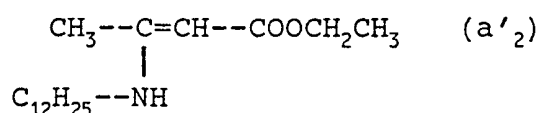
Compound Nr. 2 is characterized by NMR analysis which confirms its enamine structure.

- 10 - ¹H-NMR (200 MHz, CDCl₃-TMS) δ (ppm): NH (broad) 10.85 ppm; C=CH (s) 4.92 ppm; the other signals are in accordance with the structure.

EXAMPLE 3

Preparation of β-dodecylamino ethyl crotonate (Compound

- 15 Nr. 3) having formula (a'₂):



- Amine: dodecylamine; 37.07 g (0.2 moles).
- Carbonyl compound: ethyl acetoacetate;
- 20 26.03 g (0.2 moles).
- Solvent: toluene; 50 g.
- Catalyst: acetic acid; 0.3 g
- Reaction water separated: 3.8 g
- Duration and reaction temperature: 3 hours at
- 25 85°C-126°C.

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After removing the solvent and acetic acid by distillation, the raw residue thus obtained is subjected to fractionated distillation and a central fraction is collected at the following distillation range:

5 154°C-164°C (head); 166°C-180°C (boiler); 0.10 mm/Hg (vacuum).

- Product obtained: 51.2 g.
- GC purity: 99.2%.
- Yield: 86.0%.
- 10 - ¹H-NMR (200 MHz, CDCl₃-TMS) δ (ppm): NH (broad) 8.48 ppm; C=CH (s) 4.34 ppm; the other signals are in accordance with the structure.

EXAMPLE 4

Light stabilization of polypropylene.

15 Polypropylene of the type Moplen FLF 20 produced and sold by Montell is used for the purpose (MFI, at 230°C and 21.6 kg = 9.2).

100 g of the above polypropylene in powder form, are mixed with 0.25 g of the following compounds:

- 20 (A): Compound Nr. 1 obtained as described above;
- (B): Compound Nr. 2 obtained as described above;
- (C): Compound Nr. 3 obtained as described above.
- (D): TINUVIN 770® corresponding to bis-(2,2,6,6-tetramethyl-4-piperidiny)sebacate, produced and sold
- 25 by Ciba Geigy.

In addition, 100 g of the above polypropylene in powder form are mixed with 0.125 g of an enamine compound (a) and 0.125 g of a sterically hindered amine (b). The mixtures with the two components [(a) + (b)]
5 used, are the following:

(E): Mixture of:

(a) corresponding to Compound Nr. 1 obtained as described above; and

(b) corresponding to TINUVIN 770;

10 (F) Mixture of:

(a) corresponding to Compound Nr. 2 obtained as described above; and

(b) corresponding to TINUVIN 770;

(G) Mixture of:

15 (a) corresponding to Compound Nr. 3 obtained as described above; and

(b) corresponding to TINUVIN 770.

The homogeneous mixtures, from (A) to (G), thus obtained is subjected to extrusion in a Brabender
20 extruder having a diameter of 19 mm and a length about 25 times the diameter, equipped with a screw and nozzle of 2 mm, with a compression ratio of 1:4 and with a temperature profile of 190°C, 210°C, 215°C, 215°C.

The extruder is activated at 50 rpm and the
25 filament leaving the extruder is cut into granules

which are subsequently transformed into films with a "Plasticizer" operating at a temperature of 220°C. The films are then subjected to compression until films with a thickness of 60 μm are obtained, operating under
5 the following conditions: 2 minutes of preheating and 2 minutes of compression 100 Kg/cm^2 at 200°C.

The films thus obtained are subjected to ultraviolet radiation in UV-CON under the following conditions:

- 8 h, with light, at 60°C;
 - 10 - 4 h, in the dark, with condensation, at 40°C;
- and to accelerated aging in an Atlas CI 65 Weatherometer under the following conditions (WOM):
- temperature of the black panel: 63°C;
 - radiation: 0.40 W/m^2 at 340 nm;
 - 15 - relative humidity: 50%;
 - rain cycle: (102'-18') 18' of rain every 102';

For comparative purposes, a film obtained from polypropylene without light-stabilizers is prepared.

The breaking time (h) of the films is analyzed and
20 the data are shown in Table 1.

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TABLE 1

Stabilizer	Breaking Time (hrs)	
	UV - CON	WOM
---	90	181
(A)	90	181
(B)	90	181
(C)	90	181
(D)	182	342
(E)	248	548
(F)	200	390
(G)	248	490

The data in Table 1, show the synergic effect of the mixtures of the present invention, (E), (F) and (G).

EXAMPLE 5

Polyethylene of the type Riblene FC20 produced and sold by Polimeri Europa, is used for the purpose.

100 g of the above polyethylene in the form of granules are mixed with 0.25 g of the following com-

pounds:

(A): Compound Nr. 1 obtained as described above;

(B): Compound Nr. 2 obtained as described above;

(C): Compound Nr. 3 obtained as described above.

- 5 (D): TINUVIN 770® corresponding to bis-(2,2,6,6-tetramethyl-4-piperidinyl)sebacate, produced and sold by Ciba Geigy.

In addition, 100 g of the above polyethylene in the form of granules are mixed with 0.125 g of an enamine compound (a) and 0.125 g of a sterically hindered amine (b). The mixtures with the two components [(a) + (b)] used, are the following:

(E): Mixture of:

- 15 (a) corresponding to Compound Nr. 1 obtained as described above; and

(b) corresponding to TINUVIN 770;

(F) Mixture of:

(a) corresponding to Compound Nr. 2 obtained as described above; and

- 20 (b) corresponding to TINUVIN 770;

(G) Mixture of:

(a) corresponding to Compound Nr. 3 obtained as described above; and

(b) corresponding to TINUVIN 770.

- 25 The homogeneous mixtures, from (A) to (G), thus

obtained is subjected to extrusion in a Brabender extruder having a diameter of 19 mm and a length about 25 times the diameter, equipped with a screw and nozzle of 2 mm, with a compression ratio of 1:4 and with a temperature profile of 190°C, 210°C, 215°C, 215°C. The extruder is activated at 50 rpm and the filament leaving the extruder is cut into granules which are subsequently transformed into films with a "Plasticizer" operating at a temperature of 220°C. The films are then subjected to compression until films with a thickness of 100 μm are obtained, operating under the following conditions: 2 minutes of preheating and 2 minutes of compression 100 Kg/cm² at 200°C.

The films thus obtained are subjected to ultraviolet radiation in UV-CON under the following conditions:

- 8 h, with light, at 60°C;
- 4 h, in the dark, with condensation, at 40°C;

For comparative purposes, a film obtained from polyethylene without light-stabilizers is prepared.

The breaking time (h) of the films is analyzed and the data are shown in Table 2.

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TABLE 2

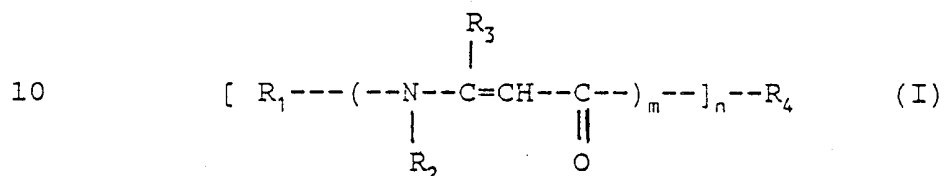
	Stabilizer	Breaking Time (hrs)
		UV-CON
5	---	180
	(A)	180
	(B)	180
	(C)	180
10	(D)	346
	(E)	400
	(F)	346
	(G)	400

The data shown in Table 2 show the synergic effect
 15 of the mixtures of the present invention, (E), (F) and
 (G).

CLAIMS

1. Stabilizing mixtures for organic polymers comprising:

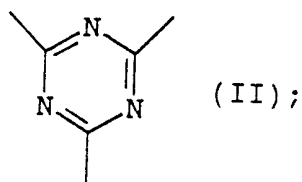
- (a) one or more compounds belonging to the group
 5 of enamines, consisting of derivatives of β -keto-esters, or β -keto-amides or 1,3-diketones with primary or secondary, aliphatic or aromatic amines, having general formula (I):



wherein:

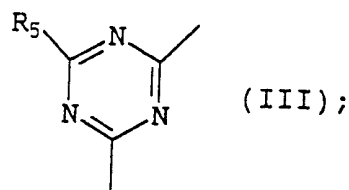
- m represents an integer from 1 to 3, extremes included;
- 15 - n represents an integer from 1 to 4, extremes included;
- R_1 represents a triazine having one of the following general formulae (II), (III) or (IV):

20

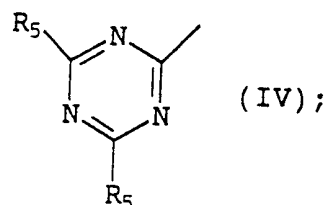


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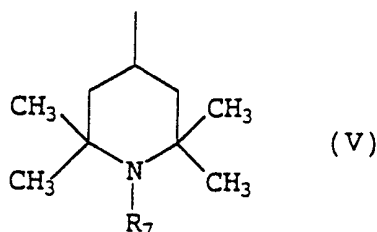
10

wherein R_5 represents a hydrogen atom; a linear or branched C_1 - C_{18} alkyl group; a $-NHR_6$ amine group or a $-SR_6$ group wherein R_6 represents a hydrogen atom or a linear or branched C_1 - C_{18} alkyl group;

15

- R_1 and R_2 , the same or different, represent a hydrogen atom; a linear or branched C_1 - C_{18} alkyl group; a linear or branched C_2 - C_8 alkoxyalkyl group; a C_5 - C_8 cycloalkyl group optionally containing a heteroatom selected from oxygen, nitrogen and sulfur; a C_6 - C_{18} aryl group; a C_7 - C_{20} arylalkyl or alkylaryl group; a group having general formula (V):

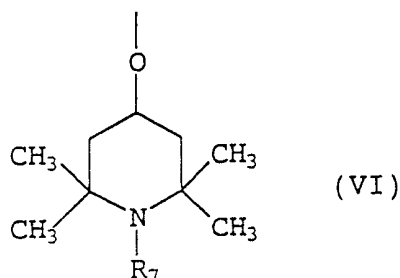
20



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-105-

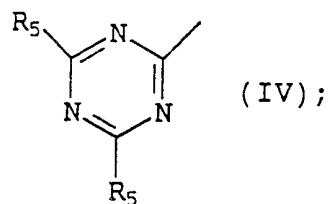
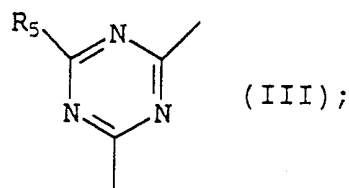
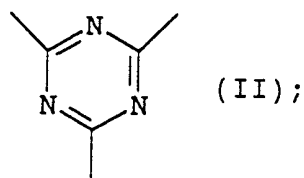
- wherein R_7 represents a hydrogen atom; a linear or branched C_1 - C_{18} alkyl group, said alkyl group optionally substituted with an $-NHR_8$ group or an $-OR_8$ group
- 5 wherein R_8 represents a hydrogen atom, a linear or branched C_1 - C_{18} alkyl group, or a C_6 - C_{18} aryl group; an $-OR_9$ group wherein R_9 represents a hydrogen atom, or a linear or branched C_1 - C_{18} alkyl group;
- 10 - or, R_1 and R_2 considered jointly with the nitrogen atom, represent a C_5 - C_8 heterocyclic group optionally containing a second heteratom selected from oxygen, nitrogen and sulfur;
- 15 - R_3 and R_4 , the same or different, represent a linear or branched C_1 - C_{18} alkyl group; a C_6 - C_{18} aryl group; a C_7 - C_{20} alkylaryl or arylalkyl group; a linear or branched C_1 - C_8 alkoxyl group;
- 20 - or, R_4 represents a group having general formula (VI):



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wherein R_7 has the same meanings defined above;

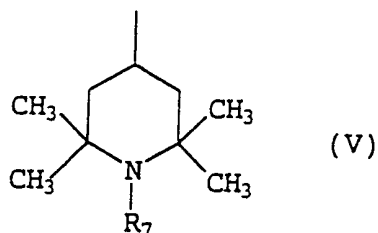
- or, R_4 represents an $NR_{10}R_{11}$ group wherein R_{10} and R_{11} , the same or different, represent a hydrogen atom; a linear or branched C_1 - C_{18} alkyl group; a linear or branched C_2 - C_8 alkoxyalkyl group; a C_5 - C_8 cycloalkyl group optionally containing a heteroatom selected from oxygen, nitrogen and sulfur; a C_6 - C_{18} aryl group; a C_7 - C_{20} arylalkyl or alkylaryl group; a triazine having one of the following general formulae (II), (III) or (IV):



wherein R_5 has the same meanings defined

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above; a group having general formula
(V):



5

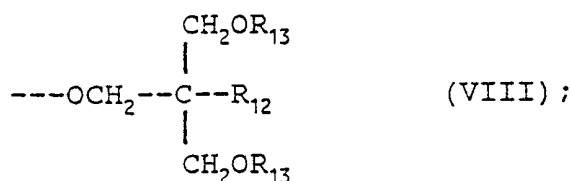
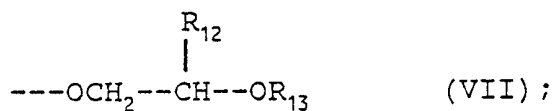
wherein R_7 has the same meanings defined
above;

10

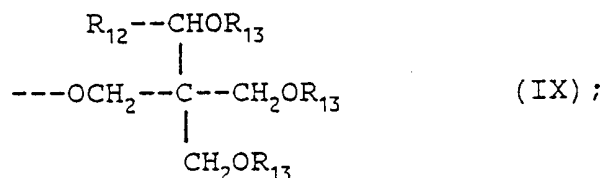
- or, R_{10} and R_{11} considered jointly with
the nitrogen atom, represent a C_5-C_8
heterocyclic group optionally containing
a second heteroatom selected from oxy-
gen, nitrogen and sulfur;

15

- or R_4 represents a group having one of
the following general formulae (VII),
(VIII) or (IX):



20



wherein:

25

- R_{12} represents a hydrogen atom; or

- 108 -

a linear or branched C₁-C₁₈ alkyl group;

- R₁₃ represents a linear or branched C₁-C₁₈ alkyl group; a -COCH₂COCH₃ group; or a direct bond;

5

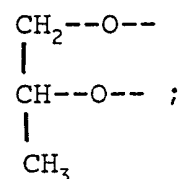
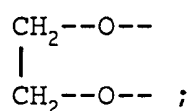
(b) one or more compounds belonging to the group of sterically hindered amines.

2. The stabilizing mixtures for organic polymers according to claim 1, wherein in the compounds having general formula (I), the R₁, R₂, R₁₀ and R₁₁ groups, as well as a hydrogen atom are: methyl, ethyl, propyl, isopropyl, butyl, octyl, cyclohexyl, benzyl, phenyl, ethylphenyl, methoxyethyl, 4-(2,2,6,6-tetramethyl)piperidiny, 4-(2,2,6,6-tetramethyl)-1-butoxyethylpiperidiny, 4-(2,2,6,6-tetramethyl)-1-butoxypiperidiny, 4-(2,2,6,6-tetramethyl)-1-methylpiperidiny, 3,5-dioctylaminotriazine, 3,5-dibutylaminotriazine.
- 10
- 15
- 20 3. The stabilizing mixtures for organic polymers according to claim 1, wherein in the compounds having general formula (I), the C₅-C₈ heterocyclic groups, when R₁ and R₂ or R₁₀ and R₁₁ are considered jointly with the nitrogen atom, are: morpholine, pyrrolidine, piperidine, piperazine, thiomorph-
- 25

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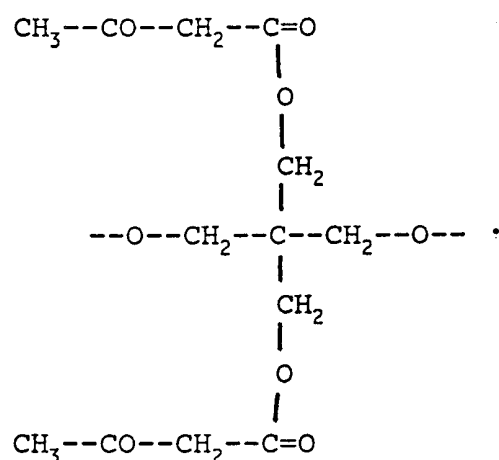
oline, thiazolidine, benzothiazolidine.

4. The stabilizing mixtures for organic polymers according to claim 1, wherein in the compounds having general formula (I), the R_3 and R_4 groups are: methyl, ethyl, propyl, isopropyl, phenyl, oxymethyl, oxyethyl, oxybutyl.
5. The stabilizing mixtures for organic polymers according to claim 1, wherein in the compounds having general formula (I), the R_4 groups, when R_4 represents a group having general formula (VI), are: 4-(2,2,6,6-tetramethyl)piperidinoxy, N-methyl-4-(2,2,6,6-tetramethyl)piperidinoxy, N-methoxyethyl-4-(2,2,6,6-tetramethyl)piperidinoxy, N-methylaminoethyl-4-(2,2,6,6-tetramethyl)piperidinoxy.
6. The stabilizing mixtures for organic polymers according to claim 1, wherein in the compounds having general formula (I), the R_4 groups, when R_4 represents a group having general formula (VII), (VIII) or (IX) and n is 2, are:



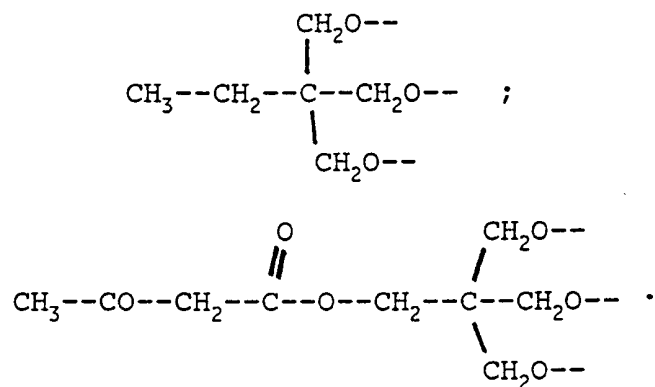
- 110 -

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7. The stabilizing mixtures for organic polymers according to claim 1, wherein in the compounds having general formula (I), the R_4 groups, when R_4 represents a group having general formula (VII), (VIII) or (IX) and n is 3, are:

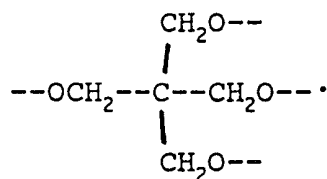
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8. The stabilizing mixtures for organic polymers according to claim 1, wherein in the compounds having general formula (I), the R_4 groups, when R_4 represents a group having general formula (VII), (VIII) or (IX) and n is 4, are:

25

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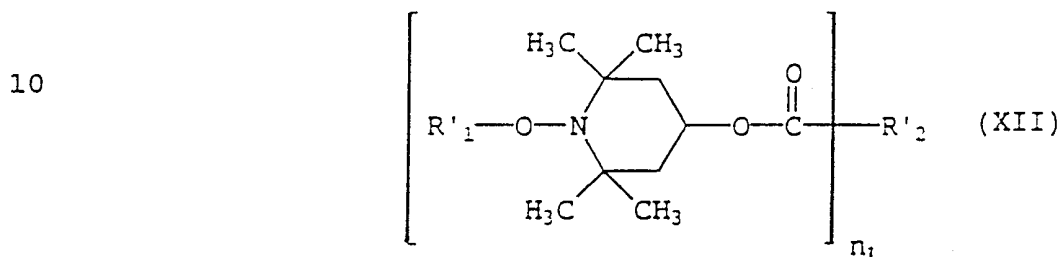


9. The stabilizing mixtures for organic polymers
 5 according to claim 1, wherein in the compounds having general formula (I), the R₇ groups are: methyl, ethyl, propyl, butyl, ethoxy, butoxy, β-hydroxyethyl, β-methoxyethyl, β-butoxyethyl, methylaminoethyl.
- 10 10. The stabilizing mixtures for organic polymers according to claim 1, wherein in the compounds having general formula (I), the R₅, R₆, R₈, R₉, R₁₂ and R₁₃ groups, when said groups represent a linear or branched C₁-C₁₈ alkyl group, are: methyl, ethyl,
 15 propyl, isopropyl, butyl, octyl.
11. The stabilizing mixtures for organic polymers according to claim 1, wherein the sterically hindered amines (b) are selected from the compounds (b-1): bis(1,2,2,6,6-pentamethyl-4-piperi-
 20 danyl)-n-butyl-3,5-di-t-butyl-4-hydroxybenzylmalonate, tris(2,2,6,6-tetramethyl-4-piperidinylnitrilotriacetate, tetrakis-(2,2,6,6-tetramethyl-4-piperidinylnitrilotriacetate, 1,1'-(1,2-ethanediyl)-bis-(3,3,5,5-tetramethylpiperazine), 4-benzoyl-2,2,6,6-tetramethylpiperidine,
 25

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3-n-octyl-7,7,9,9-tetramethyl-1,3,8-triazaspiro[4.5]decano-2,4-dione, 8-acetyl-3-dodecyl-7,7,9,9-tetramethyl-1,3,8-triazaspiro[4.5]decano-2,4-dione.

- 5 12. The stabilizing mixtures for organic polymers according to claim 1, wherein the sterically hindered amines (b) are selected from the compounds (b-2) having general formula (XII):



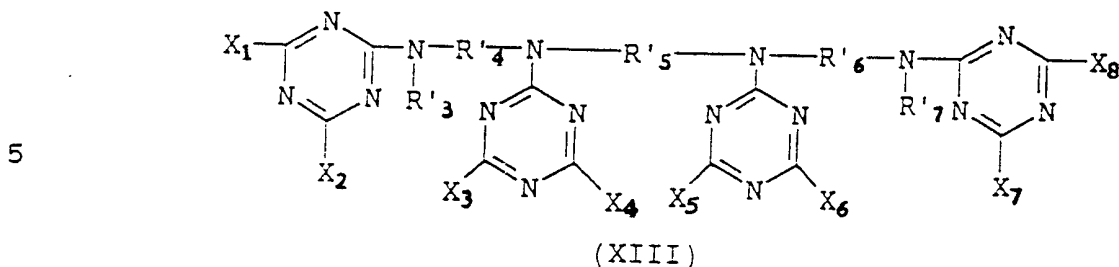
wherein:

- R'₁ represents a hydrogen atom; a C₁-C₁₈ alkyl group; a C₅-C₁₂ cycloalkyl group optionally substituted with a C₁-C₄ alkyl group;
- n₁ represents 1, 2, or 4;
- when n₁ is 1, R'₂ represents a C₁-C₂₅ alkyl group;
- 20 - when n₁ is 2, R'₂ represents a C₁-C₁₄ alkylene group;
- when n₁ is 4, R'₂ represents a C₄-C₁₀ tetrayl-alkane group.

13. The stabilizing mixtures for organic polymers according to claim 1, wherein the sterically
- 25

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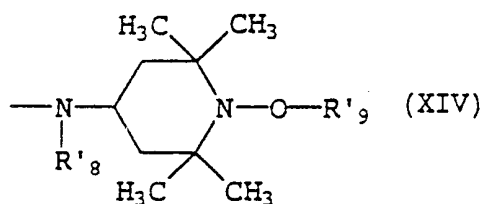
hindered amines (b) are selected from the compounds (b-3) having general formula (XIII):



wherein:

- R'₃ and R'₇, the same or different, represent a hydrogen atom; or a C₁-C₁₂ alkyl group;
- 10 - R'₄, R'₅ and R'₆, the same or different, represent a C₂-C₁₀ alkylene group; and
- X₁, X₂, X₃, X₄, X₅, X₆, X₇ and X₈, the same or different, represent a group having general formula (XIV):

15

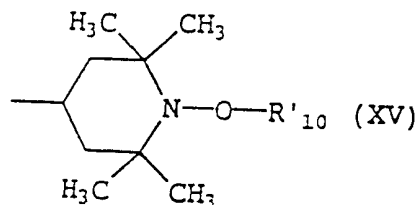


wherein:

- R'₈ represents a hydrogen atom; a C₁-C₁₂ alkyl group; a C₅-C₁₂ cycloalkyl group optionally substituted with a C₁-C₄ alkyl group; a phenyl group optionally substituted with an -OH group and/or a C₁-C₁₀ alkyl group; a C₇-C₉ phenylalkyl group optionally substituted in the
- 20
- 25

phenyl group with an -OH group and/or a C₁-C₁₀ alkyl group; or it represents a group having general formula (XV):

5

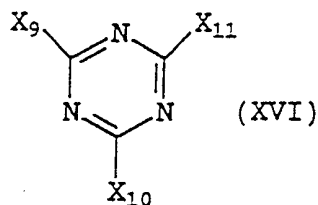


and R'₉ and R'₁₀, the same or different, have the same meanings as R'₁.

14. The stabilizing mixtures for organic polymers according to claim 1, wherein the sterically hindered amines (b) are selected from the compounds (b-4) having general formula (XVI):

10

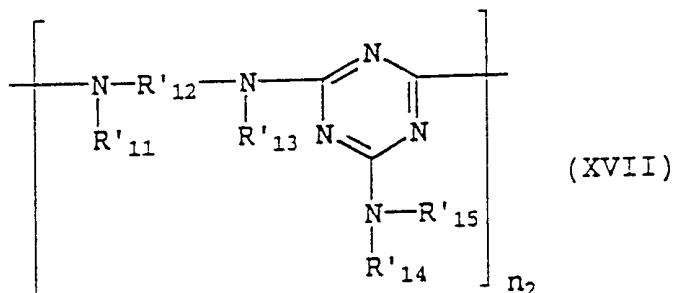
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wherein X₉, X₁₀ and X₁₁, the same or different, represent a group having general formula (XIV).

15. The stabilizing mixtures for organic polymers according to claim 1, wherein the sterically hindered amines (b) are selected from the compounds (b-5) having general formula (XVII):

20



5

wherein:

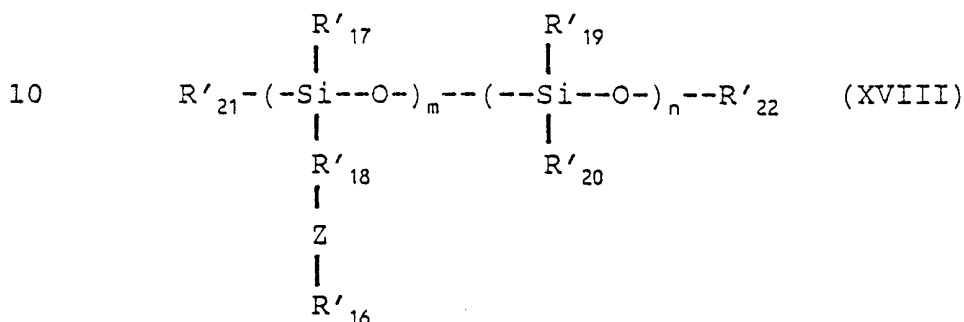
- R'_{11} , R'_{13} , R'_{14} and R'_{15} , the same or different, represent a hydrogen atom; a C_1 - C_{12} alkyl group; a C_5 - C_{12} cycloalkyl group optionally substituted with a C_1 - C_4 alkyl group; a phenyl group optionally substituted with an -OH group and/or a C_1 - C_{10} alkyl group; a C_7 - C_9 phenylalkyl group optionally substituted in the phenyl group with an -OH group and/or a C_1 - C_{10} alkyl group; or they represent a group having general formula (XV);
- R'_{12} represents a C_2 - C_{18} alkylene group; a C_5 - C_7 cycloalkylene group; or a C_1 - C_4 alkylene di(C_5 - C_7 cycloalkylene) group;
- or R'_{11} , R'_{12} and R'_{13} considered jointly with the nitrogen atom to which they are bound, represent a C_5 - C_{10} heterocyclic ring;
- or R'_{14} and R'_{15} , considered jointly with the nitrogen atom to which they are bound, represent a C_5 - C_{10} heterocyclic ring;

25

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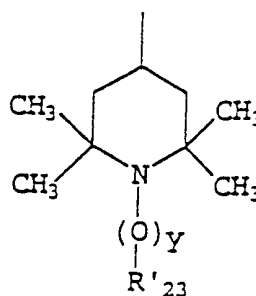
- n_2 is a number between 2 and 50 and at least one of the substituents R'_{11} , R'_{13} , R'_{14} and R'_{15} , represents a group having general formula (XV).

- 5 16. The stabilizing mixtures for organic polymers according to claim 1, wherein the sterically hindered amines (b) are selected from the compounds (b-6) having general formula (XVIII):



wherein:

- 15 - R'_{16} represents:

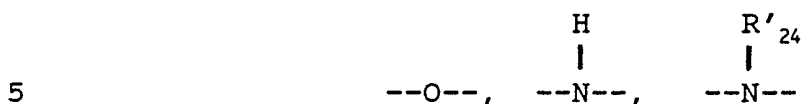


20

- wherein R'_{23} represents a hydrogen atom; O' ; a C_1 - C_{18} alkyl group; a C_5 - C_{12} cycloalkyl group optionally substituted with a C_1 - C_4 alkyl group; a $-CH_2CN$ group; a C_3 - C_6 alkenyl group; a C_7 - C_9 phenylalkyl group optionally substi-
- 25

tuted in the phenyl group with a C₁-C₄ alkyl group;

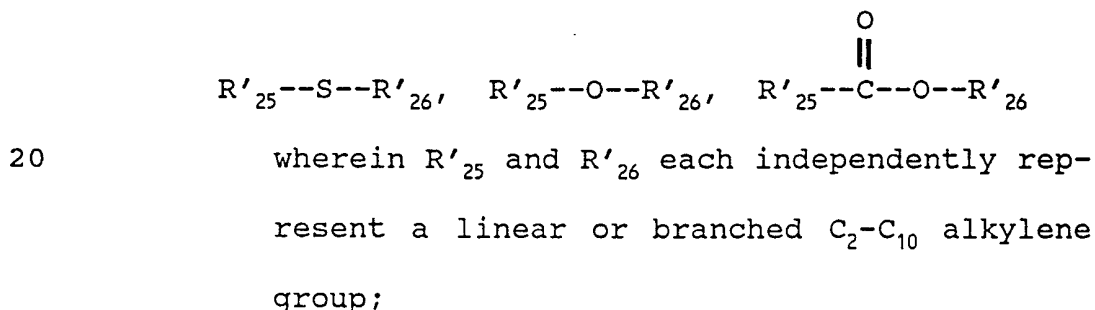
- Z represents a group selected from:



wherein R'_{24} represents a linear or branched C_1 - C_5 alkyl group;

10 - R'₁₇, R'₁₉ and R'₂₀, the same or different, represent a linear or branched C₁-C₁₀ group; a C₅-C₁₀ cycloaliphatic or alkylcycloaliphatic group; an aromatic group with 6 carbon atoms, said aromatic group optionally substituted with linear or branched C₁-C₁₀ alkyl or alkenyl groups;

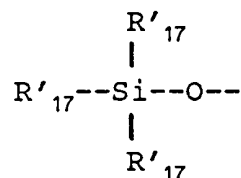
15 - R' ₁₈ represents a linear or branched C₁-C₁₀
alkylene group or one of the following
groups:



25 - m and n represent an integer which is such
 that $4 \leq m+n \leq 60$; $0 \leq n \leq 15$ and, when n is
 different from 0, $1 \leq m/n \leq 10$;

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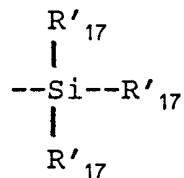
- y represents 0 or 1;
- R'₂₁ represents OH or a



5

group wherein R'₁₇ has the same meaning defined above;

- R'₂₂ represents a hydrogen atom or a



10

group wherein R'₁₇ has the same meaning defined above;

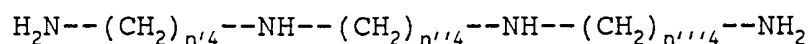
- or, R'₂₁ and R'₂₂ jointly represent a direct

15

bond, giving rise to a cyclic structure.

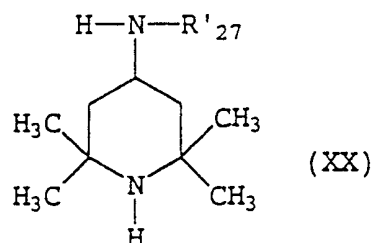
17. The stabilizing mixtures for organic polymers according to claim 1, wherein the sterically hindered amines (b) are selected from the compounds (b-7) obtained as follows:

- 20 (a) reacting a product obtained by the reaction of a polyamine having general formula (XIX) with cyanuryl chloride, with a compound having general formula (XX):



25

(XIX)

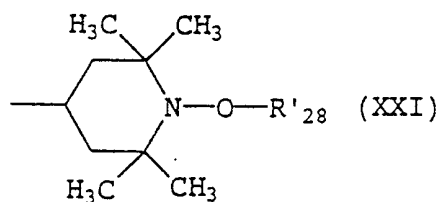


wherein:

- 5 - n'_4 , n''_4 and n'''_4 , the same or different, represent a number between 2 and 12; and
- 10 - R'_{27} represents a hydrogen atom; a C_1 - C_{12} alkyl group; a C_5 - C_{12} cycloalkyl group; a phenyl group; a C_7 - C_9 phenylalkyl group; and

(b) subsequently reacting the 2,2,6,6-tetramethylpiperid-4-yl groups present in the molecule obtaining a group having general formula

15 (XXI):

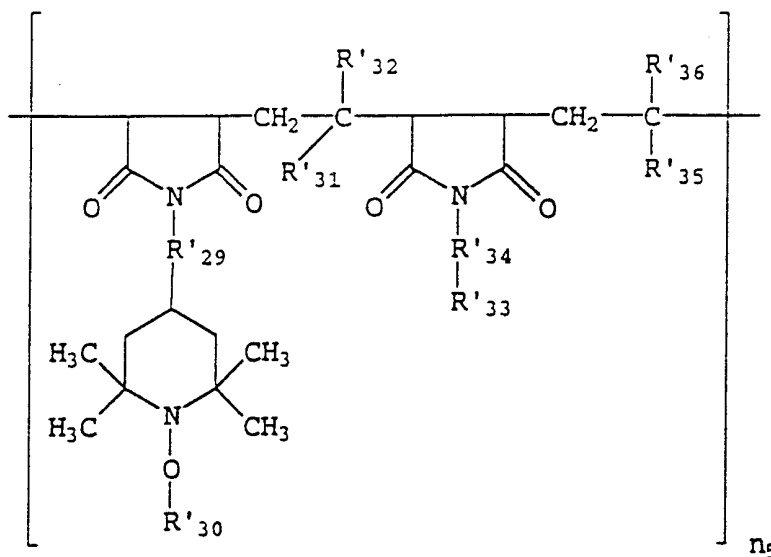


wherein R'_{28} has the same meaning as R'_1 .

- 20 18. The stabilizing mixtures for organic polymers according to claim 1, wherein the sterically hindered amines (b) are selected from the compounds (b-8) having general formula (XXII):

-120-

5



(XXII)

10

wherein:

- R'_{29} and R'_{34} , the same or different, represent a direct bond; or a

-N(Y_1)-CO- Y_2 -CO-N(Y_3)- group wherein:

15

- Y_1 and Y_3 , the same or different, represent a hydrogen atom; a C_1 - C_8 alkyl group; a C_5 - C_{12} cycloalkyl group; a phenyl group; a C_7 - C_9 phenylalkyl group; or a group having general formula (XV);

20

- Y_2 represents a direct bond; or a C_1 - C_4 alkylene group;

25

- R'_{30} has the same meaning as R'_1 ;
- R'_{31} , R'_{32} , R'_{35} and R'_{36} , the same or different, represent a hydrogen atom; a C_1 - C_{30} alkyl group; a C_5 - C_{12} cycloalkyl group; or a phenyl group;

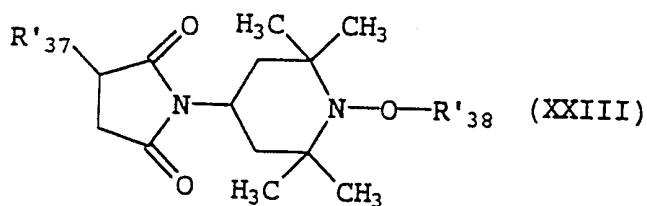
- 121 -

- R'_{33} represents a hydrogen atom; a C_1 - C_{30} alkyl group; a C_5 - C_{12} cycloalkyl group; a phenyl group; a C_7 - C_9 phenylalkyl group; or a group having general formula (XV); and

- 5 - n_5 represents a number between 1 and 50.

19. The stabilizing mixtures for organic polymers according to claim 1, wherein the sterically hindered amines (b) are selected from the compounds (b-9) having general formula (XXIII):

10



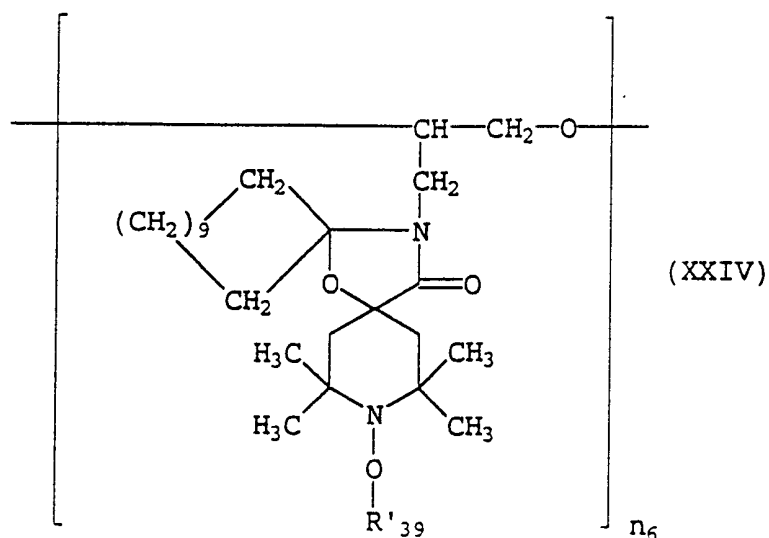
wherein:

- R'_{37} represents a C_1 - C_{24} alkyl group; and
- 15 - R'_{38} has the same meaning as R'_1 .

20. The stabilizing mixtures for organic polymers according to claim 1, wherein the sterically hindered amines (b) are selected from the compounds (b-10) having general formula (XXIV):

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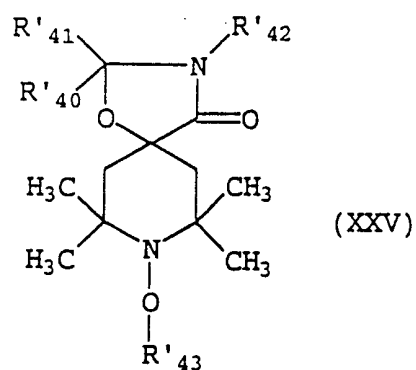
wherein:

- 10 - R'₃₉ has the same meaning as R'₁; and
- n₆ is a number between 2 and 50.

21. The stabilizing mixtures for organic polymers according to claim 1, wherein the sterically hindered amines (b) are selected from the compounds (b-11) having general formula (XXV):

15

20



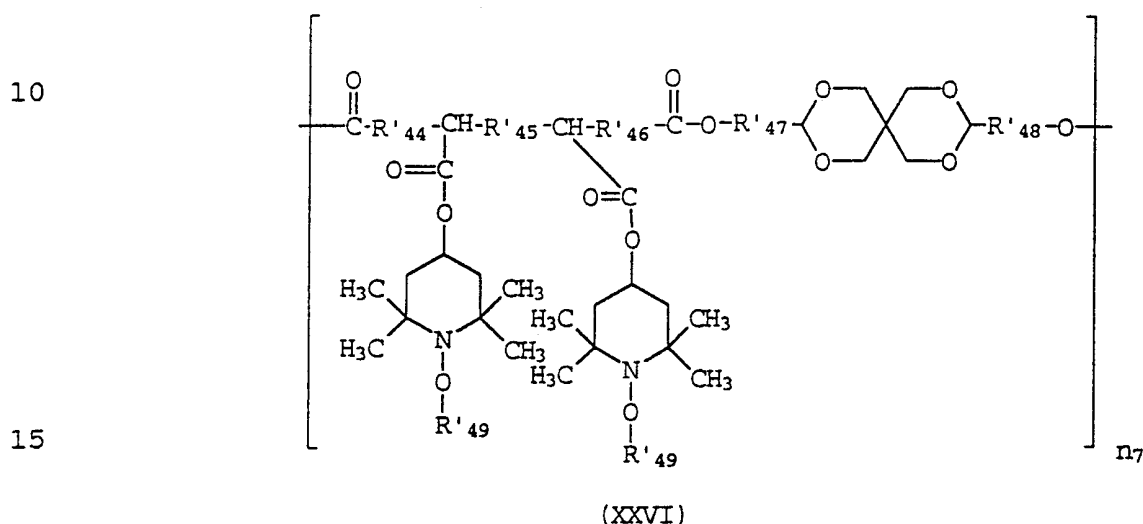
wherein:

- R'₄₀ and R'₄₁ together form a C₂-C₁₄ alkylene group;
- 25 - R'₄₂ represents a hydrogen atom or a

-Z₁-COO-Z₂ group wherein Z₁ represents a C₂-C₁₄ alkylene group and Z₂ represents a C₁-C₂₄ alkyl group; and

- R'₄₃ has the same meaning as R'₁.

22. The stabilizing mixtures for organic polymers according to claim 1, wherein the sterically hindered amines (b) are selected from the compounds (b-12) having general formula (XXVI):



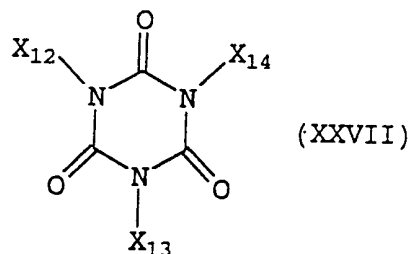
wherein:

- R'₄₄, R'₄₅, R'₄₆, R'₄₇ and R'₄₈, the same or different, represent a direct bond; or a C₁-C₁₀ alkylene group;
- R'₄₉ has the same meaning as R'₁; and
- n₇ is a number between 1 and 50.

23. The stabilizing mixtures for organic polymers according to claim 1, wherein the sterically hindered amines (b) are selected from the com-

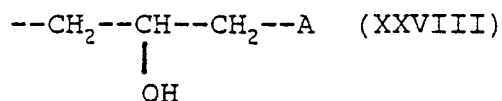
-124-

pounds (b-13) having general formula (XXVII):



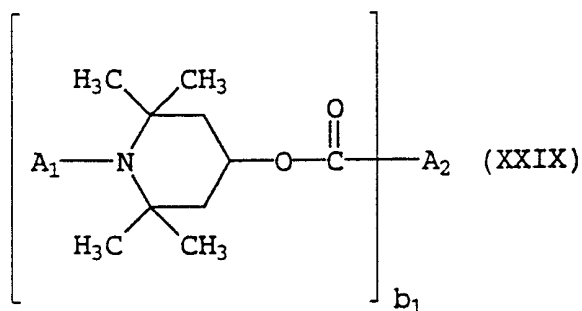
wherein:

- X_{12} , X_{13} and X_{14} , the same or different, represent a group having general formula (XXVIII):



wherein A represents a group having general formula (XIV).

24. The stabilizing mixtures for organic polymers according to claim 1, wherein the sterically hindered amines (b) are selected from the compounds (b-14) having general formula (XXIX):



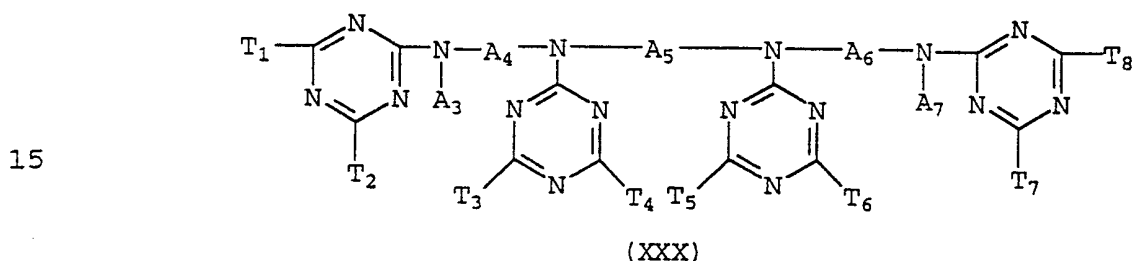
wherein:

- A_1 represents a hydrogen atom; a C_1 - C_8 alkyl group; O' , a $-\text{CH}_2\text{CN}$ group; a C_3 - C_6 alkenyl group; a C_7 - C_9 phenylalkyl group optionally substituted in the phenyl group with a C_1 - C_4

alkyl group;

- b_1 represents 1, 2 or 4;
- when b_1 is 1, A_2 represents a C_1 - C_{25} alkyl group;
- 5 - when b_1 is 2, A_2 represents a C_1 - C_{14} alkylene group; and
- when b_1 is 4, A_2 represents a C_4 - C_{10} tetrayl-alkane group.

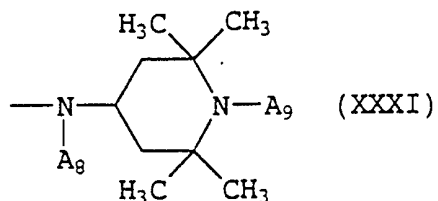
25. The stabilizing mixtures for organic polymers
 10 according to claim 1, wherein the sterically hindered amines (b) are selected from the compounds (b-15) having general formula (XXX):



wherein:

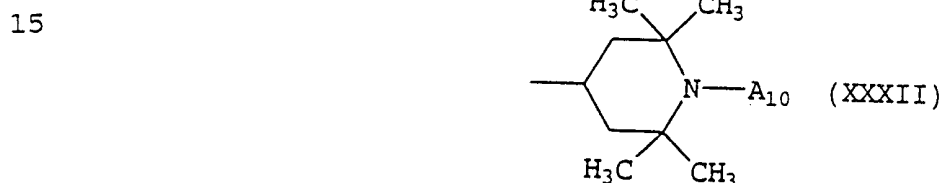
- A_3 and A_7 , the same or different, represent a hydrogen atom; or a C_1 - C_{12} alkyl group;
- 20 - A_4 , A_5 and A_6 , the same or different, represent a C_2 - C_{10} alkylene group; and
- T_1 , T_2 , T_3 , T_4 , T_5 , T_6 , T_7 and T_8 , the same or different, represent a group having general formula (XXXI):

25



5 wherein:

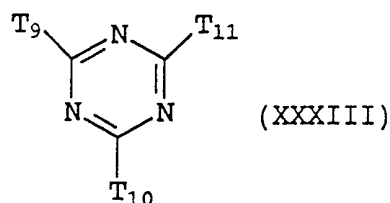
- A_8 represents a hydrogen atom; a C_1 - C_{12} alkyl group; a C_5 - C_{12} cycloalkyl group optionally substituted with a C_1 - C_4 alkyl group; a phenyl group optionally substituted with an -OH group and/or a C_1 - C_{10} alkyl group; a C_7 - C_9 phenylalkyl group optionally substituted in the phenyl group with an -OH group and/or a C_1 - C_{10} alkyl group; or it represents a group having general formula (XXXII):



and A_9 and A_{10} , the same or different, have the same meanings as A_1 .

- 20 26. The stabilizing mixtures for organic polymers according to claim 1, wherein the sterically hindered amines (b) are selected from the compounds (b-16) having general formula (XXXIII):

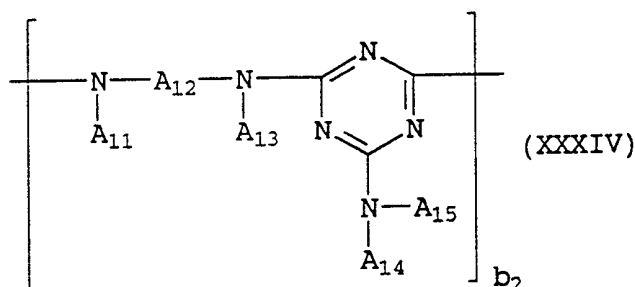
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5 wherein T_9 , T_{10} and T_{11} , the same or different, represent a group having general formula (XXXI).

27. The stabilizing mixtures for organic polymers according to claim 1, wherein the sterically hindered amines (b) are selected from the compounds (b-17) having general formula (XXXIV):

10



15 wherein:

- A_{11} , A_{13} , A_{14} and A_{15} , the same or different, represent a hydrogen atom; a C_1 - C_{12} alkyl group; a C_5 - C_{12} cycloalkyl group optionally substituted with a C_1 - C_4 alkyl group; a phenyl group optionally substituted with an -OH group and/or a C_1 - C_{10} alkyl group; a C_7 - C_9 phenylalkyl group optionally substituted in the phenyl group with an -OH group and/or a C_1 - C_{10} alkyl group; or they represent a group having general formula (XXXII);

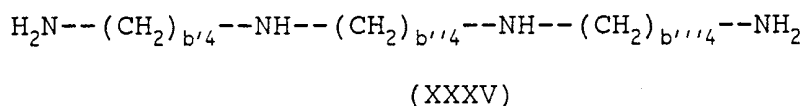
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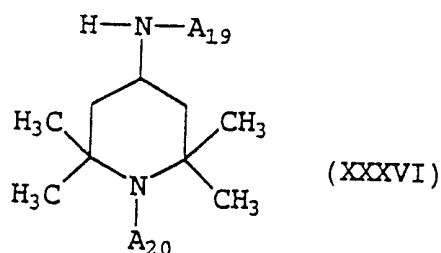
- A_{12} represents a C_2-C_{18} alkylene group; a C_5-C_7 cycloalkylene group; or a C_1-C_4 alkylene di(C_5-C_7 cycloalkylene) group;
- or A_{11} , A_{12} and A_{13} , considered jointly with
5 the nitrogen atom to which they are bound, represent a C_5-C_{10} heterocyclic ring;
- or A_{14} and A_{15} , considered jointly with the nitrogen atom to which they are bound, represent a C_5-C_{10} heterocyclic ring;
- 10 - b_2 is a number between 2 and 50 and at least one of the substituents A_{11} , A_{13} , A_{14} and A_{15} , represent a group having general formula (XXXII).

28. The stabilizing mixtures for organic polymers
15 according to claim 1, wherein the sterically hindered amines (b) are selected from the compounds (b-18) obtained as follows

- (a) reacting a product obtained by the reaction
of a polyamine having general formula (XXXV)
20 with cyanuryl chloride, with a compound having general formula (XXXVI):



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5

wherein:

- b'_4 , b''_4 and b'''_4 , the same or different, represent a number between 2 and 12;
- A_{19} represents a hydrogen atom; a C_1 - C_{12} alkyl group; a C_5 - C_{12} cycloalkyl group; a phenyl group; or a C_7 - C_9 phenylalkyl group; and
- A_{20} has the same meaning as A_1 .

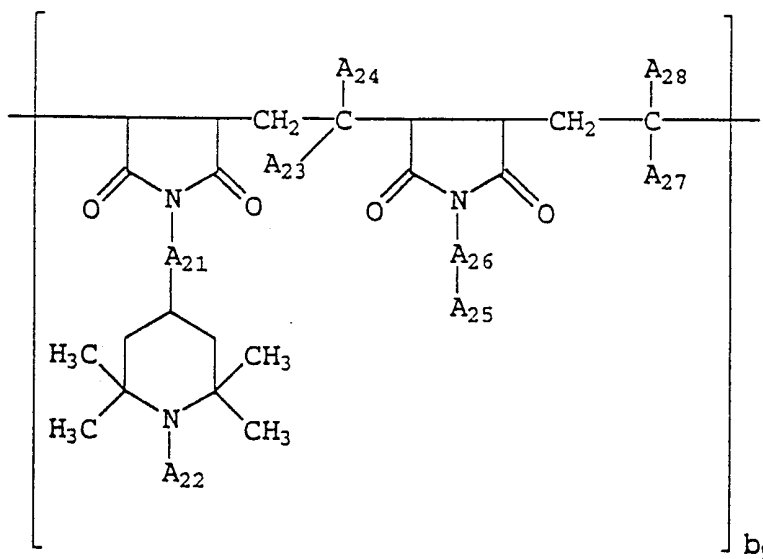
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29. The stabilizing mixtures for organic polymers according to claim 1, wherein the sterically hindered amines (b) are selected from the compounds (b-19) having general formula (XXXVII):

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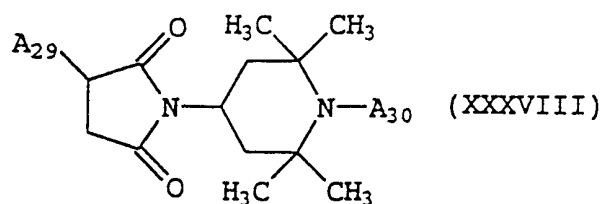


(XXXVII)

wherein:

- A_{21} and A_{26} , the same or different, represent a direct bond; or a $-N(E_1)-CO-E_2-CO-N(E_3)-$ group wherein:
 - 5 - E_1 and E_3 , the same or different, represent a hydrogen atom; a C_1-C_8 alkyl group; a C_5-C_{12} cycloalkyl group; a phenyl group; a C_7-C_9 phenylalkyl group; or a group having general formula (XXXII);
 - 10 - E_2 represents a direct bond; or a C_1-C_4 alkylene group;
 - A_{22} has the same meaning as A_1 ;
 - A_{23} , A_{24} , A_{27} and A_{28} , the same or different, represent a hydrogen atom; a C_1-C_{30} alkyl group; a C_5-C_{12} cycloalkyl group; or a phenyl group;
 - 15 - A_{25} represents a hydrogen atom; a C_1-C_{30} alkyl group; a C_5-C_{12} cycloalkyl group; a phenyl group; a C_7-C_9 phenylalkyl group; or a group having general formula (XXXII); and
 - 20 - b_5 represents a number between 1 and 50.
- 30. The stabilizing mixtures for organic polymers according to claim 1, wherein the sterically hindered amines (b) are selected from the compounds (b-20) having general formula (XXXVIII):
- 25

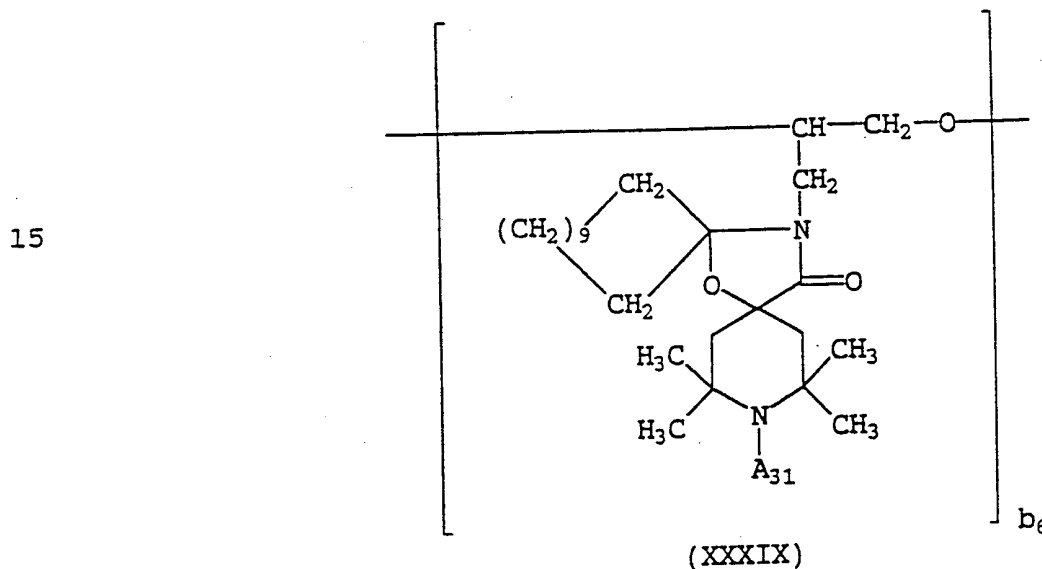
- 131 -



5 wherein:

- A_{29} represents a C_1 - C_{24} alkyl group; and
- A_{30} has the same meaning as A_1 .

31. The stabilizing mixtures for organic polymers according to claim 1, wherein the sterically hindered amines (b) are selected from the compounds (b-21) having general formula (XXXIX):



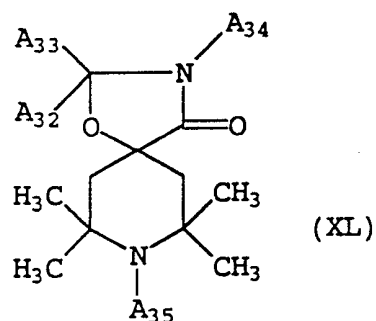
20 wherein:

- A_{31} has the same meaning as A_1 ; and
- b_6 is a number between 2 and 50.

32. The stabilizing mixtures for organic polymers according to claim 1, wherein the sterically hindered amines (b) are selected from the com-

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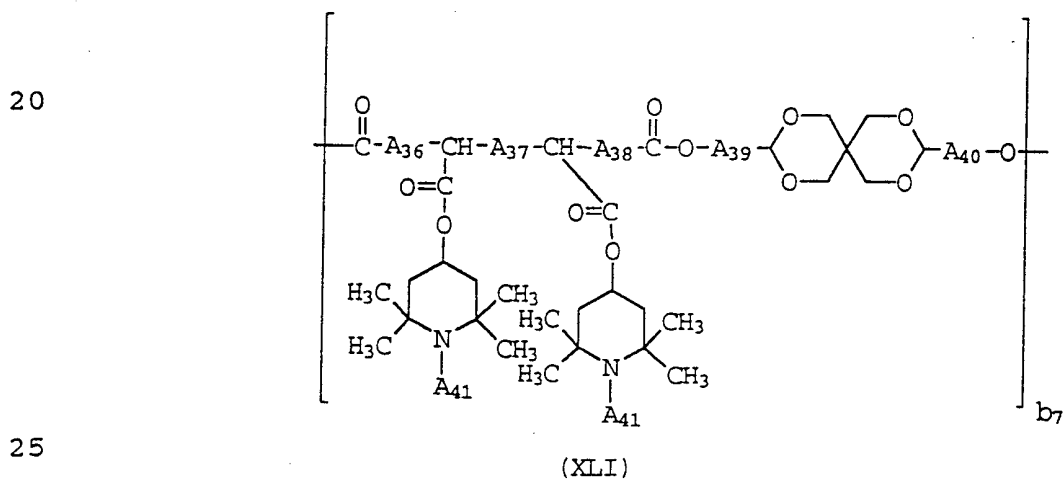
pounds (b-22) having general formula (XL):



wherein:

- A₃₂ and A₃₃ together form a C₂-C₁₄ alkylene group;
- 10 - A₃₄ represents a hydrogen atom; or a -G₁-COO-G₂ group wherein G₁ represents a C₂-C₁₄ alkylene group and G₂ represents a C₁-C₂₄ alkyl group; and
- A₃₅ has the same meaning as A₁.

15 33. The stabilizing mixtures for organic polymers according to claim 1, wherein the sterically hindered amines (b) are selected from the compounds (b-23) having general formula (XLI):



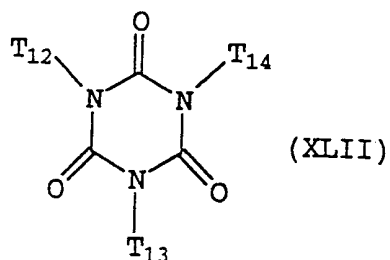
wherein:

- A_{36} , A_{37} , A_{38} , A_{39} and A_{40} , the same or different, represent a direct bond; or a C_1 - C_{10} alkylene group;

5 - A_{41} has the same meaning as A_1 ; and

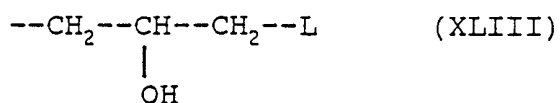
- b_7 is a number between 1 and 50.

34. The stabilizing mixtures for organic polymers according to claim 1, wherein the sterically hindered amines (b) are selected from the compounds (b-24) having general formula (XLII):



15 wherein:

- T_{12} , T_{13} and T_{14} , the same or different, represent a group having general formula (XLIII):

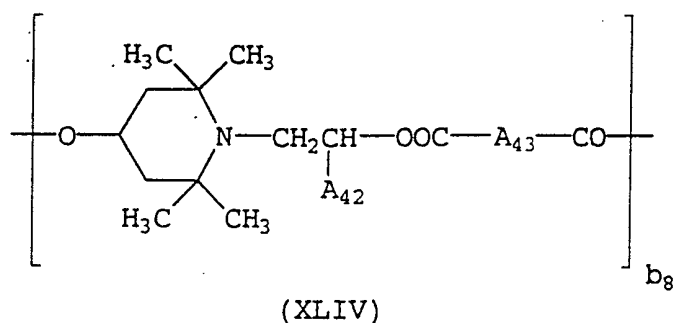


20 wherein L represents a group having formula (XXXI).

35. The stabilizing mixtures for organic polymers according to claim 1, wherein the sterically hindered amines (b) are selected from the compounds (b-25) having general formula (XLIV):

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5

wherein:

- A_{42} represents a hydrogen atom; or a methyl group;
- A_{43} represents a direct bond; or a C_1 - C_{10} alkylene group; and
- b_8 represents a number between 2 and 50.

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36. The stabilizing mixtures for organic polymers according to any of the claims from 11 to 35, wherein in the compounds from (b-1) to (b-25), the alkyl groups having up to 30 carbon atoms are: methyl, ethyl, propyl, isopropyl, n-butyl, s-butyl, isobutyl, t-butyl, 2-ethylbutyl, n-pentyl, isopentyl, 1-methylpentyl, 1,3-dimethylbutyl, n-hexyl, 1-methylhexyl, n-heptyl, isoheptyl, 1,1,3,3-tetramethylbutyl, 1-methylheptyl, 3-methylheptyl, n-octyl, 2-ethylhexyl, 1,1,3-trimethylhexyl, 1,1,3,3-tetramethylpentyl, nonyl, decyl, undecyl, 1-methylundecyl, dodecyl, 1,1,3,3,5,5-hexamethylhexyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl,

eicosyl, docosyl, triacontyl.

37. The stabilizing mixtures for organic polymers according to any of the claims from 11 to 35, wherein in the compounds from (b-1) to (b-25), the
5 C₅-C₁₂ cycloalkyl groups are: cyclopentyl, cyclohexyl, cycloheptyl, cyclo-octyl, cyclododecyl.
38. The stabilizing mixtures for organic polymers according to any of the claims from 11 to 35, wherein in the compounds from (b-1) to (b-25), the
10 C₅-C₁₂ cycloalkyl groups substituted with a C₁-C₄ alkyl group are: methylcyclohexyl, dimethylcyclohexyl.
39. The stabilizing mixtures for organic polymers according to any of the claims from 11 to 35, wherein in the compounds from (b-1) to (b-25), the
15 phenyl groups substituted with an -OH group and/or a C₁-C₁₀ alkyl group are: methylphenyl, dimethylphenyl, trimethylphenyl, t-butylphenyl, 3,5-di-t-butyl-4-hydroxyphenyl.
- 20 40. The stabilizing mixtures for organic polymers according to any of the claims from 11 to 35, wherein in the compounds from (b-1) to (b-25), the C₇-C₉ phenylalkyl groups are: benzyl, phenylethyl.
41. The stabilizing mixtures for organic polymers
25 according to any of the claims from 11 to 35,

- 136 -

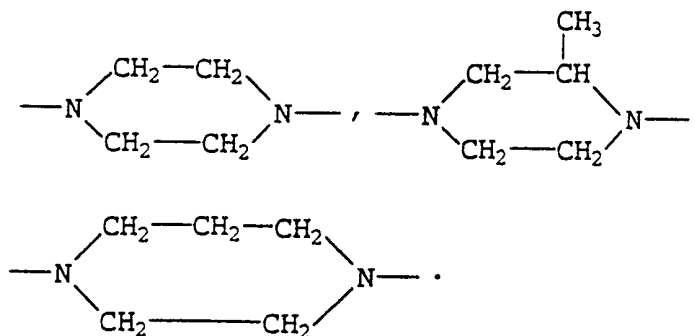
- wherein in the compounds from (b-1) to (b-25), the C₇-C₉ phenylalkyl groups optionally substituted in the phenyl group with an -OH group and/or a C₁-C₁₀ alkyl group are: methylbenzyl, dimethylbenzyl, trimethylbenzyl, t-butylbenzyl, 3,5-di-t-butyl-4-hydroxybenzyl.
- 5
42. The stabilizing mixtures for organic polymers according to any of the claims from 11 to 35, wherein in the compounds from (b-1) to (b-25), the C₃-C₆ alkenyl groups are: allyl, 2-metallyl, butenyl, pentenyl, hexenyl.
- 10
43. The stabilizing mixtures for organic polymers according to any of the claims from 11 to 35, wherein in the compounds from (b-1) to (b-25), the alkylene groups having up to 18 carbon atoms are: methylene, ethylene, propylene, trimethylene, tetramethylene, pentamethylene, 2,2-dimethyltrimethylene, hexamethylene, trimethylhexamethylene, octamethylene, decamethylene.
- 15
- 20 44. The stabilizing mixtures for organic polymers according to any of the claims from 11 to 35, wherein in the compounds from (b-1) to (b-25), the C₄-C₁₀ tetrayl-alkane group is 1,2,3,4-tetraylbutane.
- 25 45. The stabilizing mixtures for organic polymers

according to any of the claims from 11 to 35,
wherein in the compounds from (b-1) to (b-25), the
C₅-C₇ cycloalkylene group is cyclohexylene.

46. The stabilizing mixtures for organic polymers
5 according to any of the claims from 11 to 35,
wherein in the compounds from (b-1) to (b-25), the
C₁-C₄ alkylene di(C₅-C₇-cycloalkylene) group is
methylenedicyclohexylene.

47. The stabilizing mixtures for organic polymers
10 according to claims 15 or 27, wherein, when the
substituents R'₁₁, R'₁₂, R'₁₃ or A₁₁, A₁₂ and A₁₃,
form, together with the nitrogen atom to which
they are bound, a C₅-C₁₀ heterocyclic ring, this
ring is selected from the following:

15



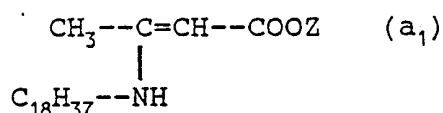
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48. The stabilizing mixtures for organic polymers
according to claims 15 or 27, wherein, when the
substituents R'₁₄ and R'₁₅ or A₁₄ and A₁₅, form,
together with the nitrogen atom to which they are
25 bound, a C₅-C₁₀ heterocyclic ring, this ring is

selected from the following: 1-pyrrolidine, piperidine, morpholine, 1-piperaziny1, 4-methyl-1-piperaziny1, 1-hexahydroazepiny1, 5,5,7-trimethyl-1-homopiperaziny1, 4,5,5,7-tetramethyl-1-homopiperaziny1.

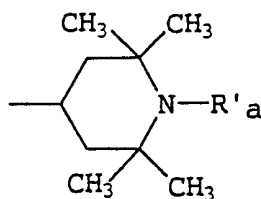
49. The stabilizing mixtures for organic polymers according to claim 1, wherein the compounds belonging to the group of enamines are selected from:

- enamine having general formula (a₁):



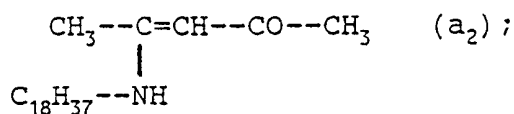
wherein Z represents one of the following groups:

-C₂H₅; -t-C₄H₉; -n-C₈H₁₇; -n-C₁₂H₂₅; -n-C₁₈H₃₇; or a group having general formula:

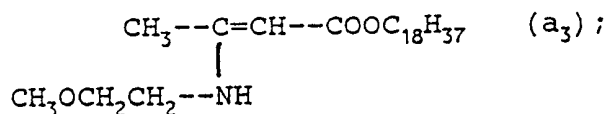


wherein R'_a represents a hydrogen atom or a methyl;

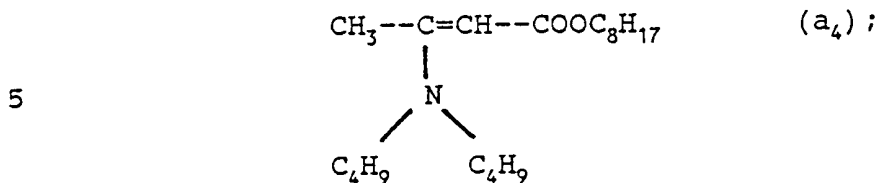
- enamine having formula (a₂):



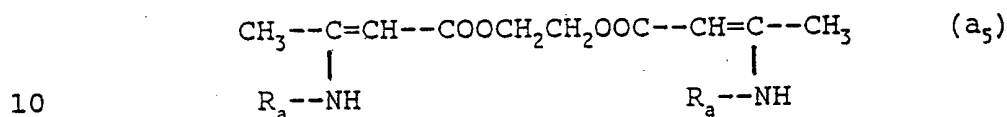
- enamine having formula (a₃):



- enamine having formula (a₄):



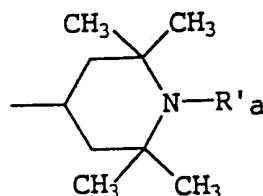
- enamine having general formula (a₅):



wherein R_a represents one of the following groups:

C₄H₉-; CH₃OCH₂CH₂-; C₈H₁₇-; C₁₂H₂₅-; C₁₈H₃₇-; or a group having general formula:

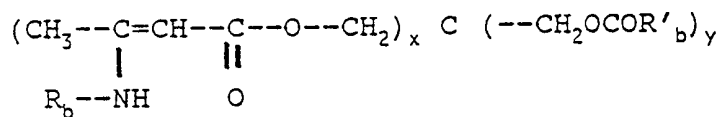
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wherein R'_a represents a hydrogen atom or a methyl;

20

- enamine consisting of a mixture of derivatives of pentaerythrite having general formula (a₆):



25

(a₆)

wherein:

- R_b represents one of the following groups:

$-C_2H_5$; $-C_4H_9$; $-C_8H_{17}$; $-C_{12}H_{25}$; and

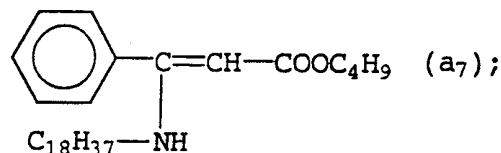
- 5 - R'_b represents one of the following groups:

$-CH_2-CO-CH_3$; $-CH_3$; $-C_2H_5$; $-C_4H_9$;

- x represents an integer between 1 and 4, extremes included;

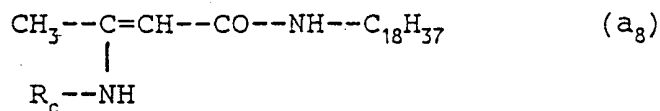
- 10 - y represents an integer between 0 and 3, extremes included;

- enamine having formula (a_7):



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- enamine having general formula (a_8):

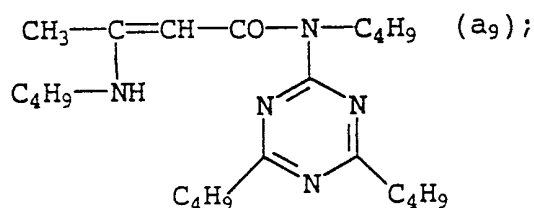


wherein R_c represents one of the following groups:

20

C_4H_9- ; $CH_3OCH_2CH_2-$; $C_8H_{17}-$;

- enamine having formula (a_9):

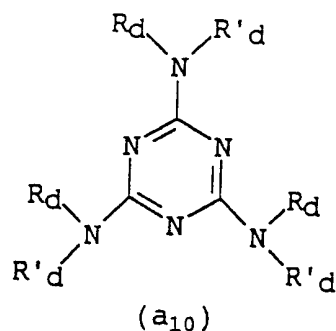


25

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- enamine consisting of a mixture of triazine compounds having general formula (a₁₀):

5



wherein:

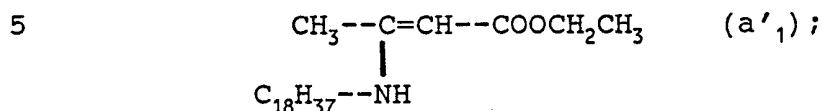
- R_d represents a group having formula:
- 10 $\text{CH}_3\text{--C=CH--COOCH}_2\text{CH}_3$; and
- R'_d represents one of the following groups:
- --CH_3 ; $\text{--C}_2\text{H}_5$; $\text{--C}_4\text{H}_9$.

50. The stabilizing mixtures for organic polymers according to claim 1, wherein the sterically hindered amines (b) are selected from: LOWILITE 76® corresponding to bis(1,2,2,6,6-pentamethyl-4-piperidiny)sebacate; LOWILITE 62® corresponding to the condensate of 1-(2-hydroxyethyl)-2,2,6,6-tetramethyl-4-hydroxypiperidine with succinic acid; UVASIL 299® corresponding to poly-methyl-propyl-3-oxy[4-(2,2,6,6-tetramethyl)piperidiny]siloxane; TINUVIN 770® corresponding to bis(2,2,6,6-tetramethyl-4-piperidiny)sebacate.

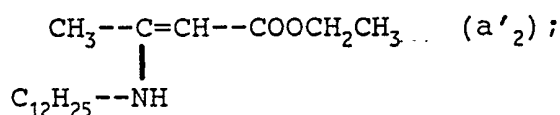
25 51. The stabilizing mixtures for organic polymers

according to claim 1, wherein the compound belonging to the group of enamines (a) is selected from the following compounds:

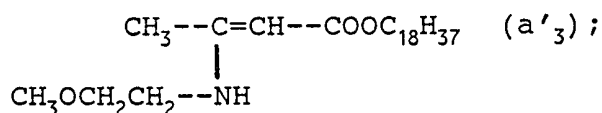
- enamine having formula (a'₁):



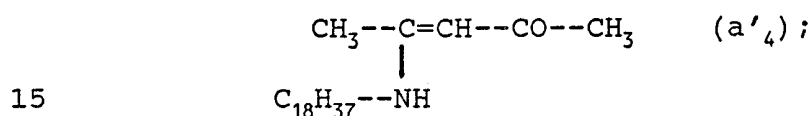
- enamine having formula (a'₂):



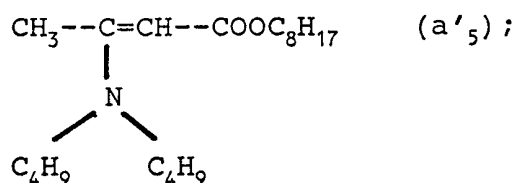
10 - enamine having formula (a'₃):



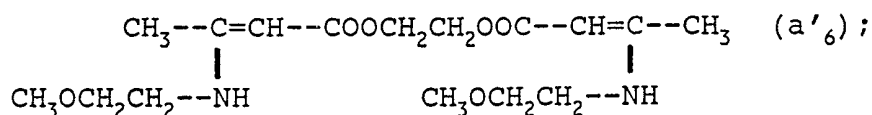
- enamine having formula (a'₄):



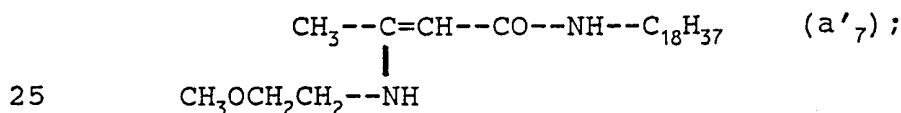
- enamine having formula (a'₅):



20 - enamine having formula (a'₆):

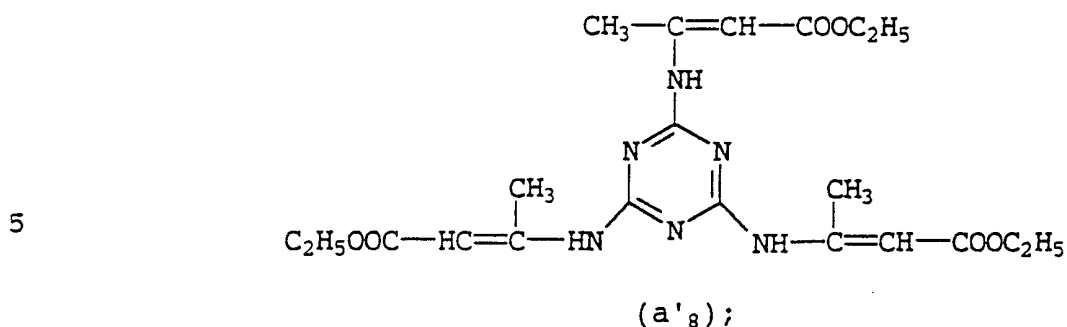


- enamine having formula (a'₇):



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- enamine having formula (a'₈):



- the sterically hindered amine (b) is selected from the following compounds:

- 10 (b'₁) LOWILITE 76® corresponding to bis-(1,2,2,6,6-pentamethyl-4-piperidinyl)sebacate;
- (b'₂) LOWILITE 62® corresponding to the condensate of 1-(2-hydroxyethyl)-2,2,6,6-tetramethyl-4-hydroxypiperidine with succinic acid;
- 15 (b'₃) UVASIL 299® corresponding to polymethylpropyl-3-oxy[4-(2,2,6,6-tetramethyl)piperidinyl]siloxane;
- (b'₄) TINUVIN 770® corresponding to bis-(2,2,6,6-tetramethyl-4-piperidinyl)sebacate.
- 20

52. Light-stabilized polymeric compositions comprising an organic polymer and an effective quantity of stabilizing mixture according to any of the
- 25 previous claims.

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53. The polymeric compositions according to claim 52, wherein the organic polymer is selected from polyolefins.
54. The polymeric compositions according to claim 53,
5 wherein the polyolefins are selected from polypropylene and polyethylene.
55. End-articles obtained from the processing of the polymeric compositions according to any of the claims from 52 to 54.
- 10 56. Compositions for coating or painting light-stabilized by the addition of an effective quantity of the stabilizing mixture according to any of the claims from 1 to 51.

INTERNATIONAL SEARCH REPORT

Inte il Application No
PCT/EP 98/03506

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 C07D211/46 C07D211/58 C07D401/12 C08K5/3435 C08K5/3492
C09D7/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 C07D C08K C09D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 855 434 A (CANTATORE GIUSEPPE ET AL) 8 August 1989 see column 7, line 39-48 see column 12, line 26-38 see claim 1 ---	1-22
A	EP 0 345 221 A (CIBA GEIGY AG ;CIBA GEIGY SPA (IT)) 6 December 1989 see page 10, line 39-45; claim 1; examples 18-21 ---	1-22
A	DE 28 49 444 A (HOECHST AG) 29 May 1980 see page 9, line 6-21; claim 1 ---	1-22
A	DE 35 33 451 A (PARAMONOV VLADIMIR IVANOVIC;POPOVA GEB SEMINA; FILINA GEB KARTAVYCH; P) 26 March 1987 see claims 1-4; example 16; tables 2,5 -----	1-22

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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"P" document published prior to the international filing date but later than the priority date claimed

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"&" document member of the same patent family

Date of the actual completion of the international search

22 September 1998

Date of mailing of the international search report

05/10/1998

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INTERNATIONAL SEARCH REPORT

Information on patent family members

Inte Application No

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