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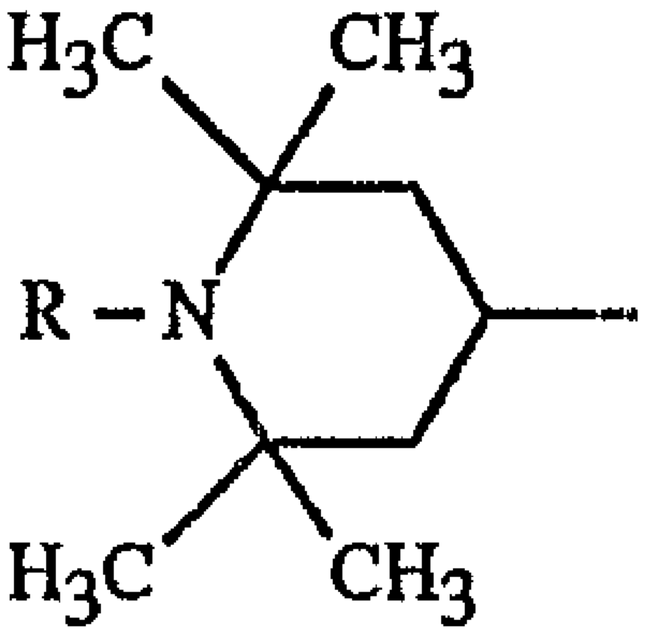
(72) Inventeur/Inventor:
CANOVA, PAOLO, IT

(73) Propriétaire/Owner:
CIBA SPECIALTY CHEMICALS HOLDING INC., CH

(74) Agent: FETHERSTONHAUGH & CO.

(54) Titre : COMPOSITION STABILISATRICE POUR POLYPROPYLENE, RENFERMANT DES COMPOSES A BASE DE TRIAZINE AVEC DES GROUPES PIPERIDINE, ET DES COMPOSES METALLIQUES

(54) Title: STABILISER COMPOSITION FOR POLYPROPYLENE, COMPRISING TRIAZINE COMPOUNDS CONTAINING PIPERIDINE GROUPS, AND METAL COMPOUNDS



(I)

(57) Abrégé/Abstract:
The present invention relates to a stabiliser composition for polypropylene, comprising: A) one or more triazine compounds containing groups of the formula (I) in which R is hydrogen, C_1-C_4alkyl, O•, OH, C_1-C_8alkoxy, C_5-C_8cycloalkoxy, C_3-C_6alkenyl, C_7-C_9phenylalkyl or C_1-C_8acyl, and B) one or more oxides and hydroxides of Mg, Ca, Ba, Zn, Al and Sn, preferably Mg and Zn. (See formula I).

A-18174/A/CHM 50

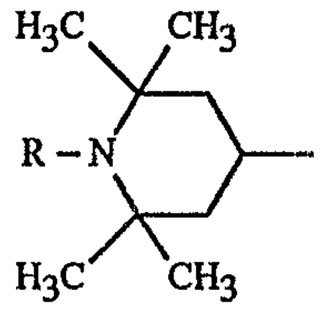
Stabiliser composition for polypropylene, comprising triazine compounds containing piperidine groups, and metal compounds

ABSTRACT

The present invention relates to a stabiliser composition for polypropylene, comprising:

A) one or more triazine compounds containing groups of the formula (I) in which R is hydrogen, C_1-C_4alkyl, O•, OH, C_1-C_8alkoxy, C_5-C_8cycloalkoxy, C_3-C_6alkenyl, C_7-C_9phenylalkyl or C_1-C_8acyl, and

B) one or more oxides and hydroxides of Mg, Ca, Ba, Zn, Al and Sn, preferably Mg and Zn.



(I)

A-18174/A/CHM 50

Stabiliser composition for polypropylene, comprising triazine compounds containing piperidine groups, and metal compounds

The present invention relates to a novel method of stabilising polypropylene against photooxidative degradation by means of mixtures of derivatives of 2,2,6,6-tetramethylpiperidine and particular metal compounds.

It is known that polypropylene is susceptible to considerable changes in physical properties, such as a reduction in mechanical strength and a change in colour, if it is exposed to sunlight, due to photooxidative degradation caused by ultraviolet radiation.

To overcome this disadvantage, it is necessary to add suitable light stabilisers to the polymer, for example certain derivatives of benzophenone and benzotriazole, nickel complexes, esters of substituted benzoic acids, aromatic oxamides and sterically hindered amines.

However, the results obtained are greatly affected by the type of application of the polymer, such as mouldings, films, tapes or fibres.

The stabilization of polypropylene in fibre form involves particular difficulties; for this application, it is necessary to use products of relatively high molecular weight, which are resistant to evaporation and extraction.

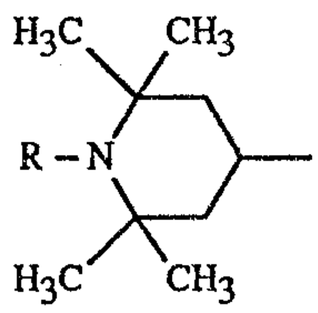
Good results have been obtained with some triazine derivatives of 2,2,6,6-tetramethylpiperidine, such as those reported in US Patents 4,086,204, 4,108,829, 4,288,593, 4,315,859, 4,321,374, 4,331,586, 4,335,242, 4,376,836, 4,433,145, 4,459,395, 4,477,615, 4,533,688, 4,547,548 and 4,740,544, European Patents 94,048, 117,229 and 176,106 and Japanese Patent 61/176,662.

The results obtained so far have, however, not been completely satisfactory, so that a further improvement was desirable.

It has now been found, surprisingly, that the use of mixtures of one or more triazine derivatives of 2,2,6,6-tetramethylpiperidine and one or more particular metal compounds in the light stabilization of polypropylene fibres gives significantly higher values than the use of the piperidine compounds alone.

In particular, the present invention relates to a novel method of stabilizing polypropylene, which comprises using synergistic mixtures consisting of:

A) one or more triazine compounds containing groups of the formula (I)



(I)

in which R is hydrogen, C_1-C_4alkyl, O•, OH, C_1-C_8alkoxy, C_5-C_8cycloalkoxy, C_3-C_6alkenyl, C_7-C_9phenylalkyl or C_1-C_8acyl, preferably hydrogen or methyl, and

B) one or more oxides and hydroxides of Mg, Ca, Ba, Zn, Al and Sn, preferably Mg and Zn.

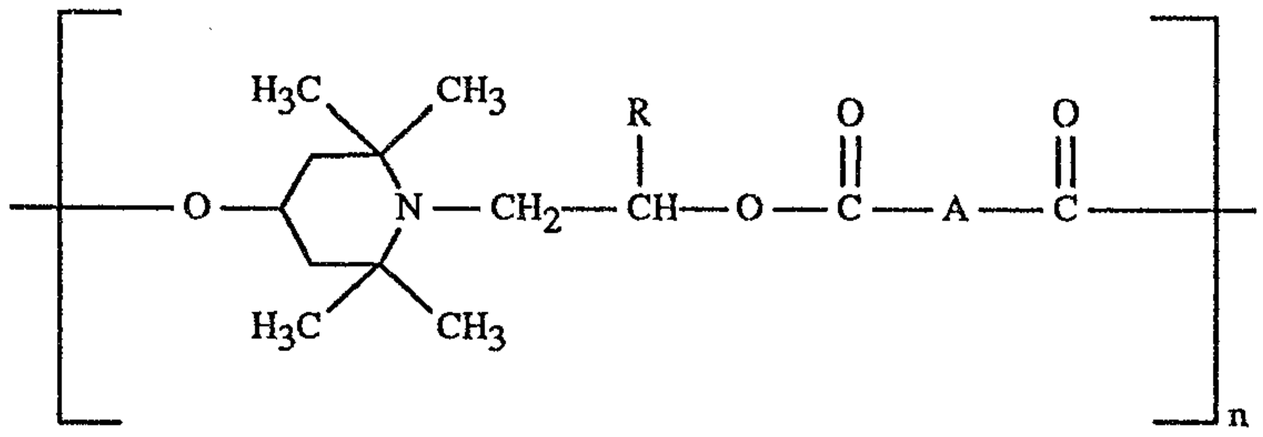
The use of some derivatives of 2,2,6,6-tetramethylpiperidine in a mixture with oxides or hydroxides of Mg or Zn for the stabilization of polyurethanes has been described in Japanese Patent 82/34,155, published on 24.2.1982.

This patent claims in particular the stabilization of polyurethanes with mixtures consisting of esters of 2,2,6,6-tetramethyl-4-piperidinol, oxides or hydroxides of Mg or Zn and organic phosphites.

These mixtures do not give satisfactory results if they are used for the stabilization of polypropylene fibres.

On the other hand, British Patent 2,132,621 has reported the use of mixtures of ZnO and esters of 2,2,6,6-tetramethyl-4-piperidinol as photodegrading agents for polyolefins, in particular polyethylene and polypropylene.

European Patent 290,386 relates to the stabilisation of organic polymers by means of mixtures of salts and oxides of Zn/Mg with polyesters of the formula



in which R is hydrogen or methyl, A is a direct bond or C_2-C_{10}alkylene and n is an integer from 2 to 50.

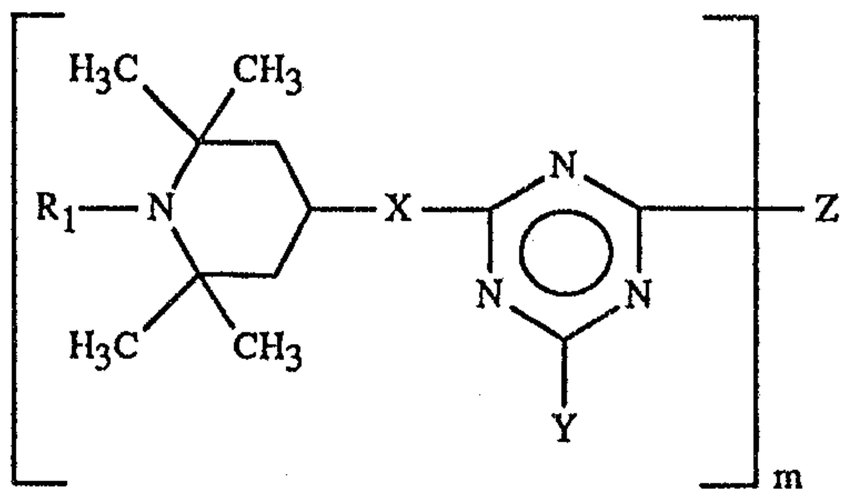
These mixtures do not show any synergistic effect on polypropylene in fibre form.

In European Patent 290,388, the use of oxides and hydroxides of Al, Mg and Zn in a mixture with compounds containing groups of the formula (I) for the light stabilisation of polyethylene is claimed.

It has now been found, surprisingly, that mixtures analogous to those above are highly effective also in the light stabilisation of polypropylene, particularly in fibre form.

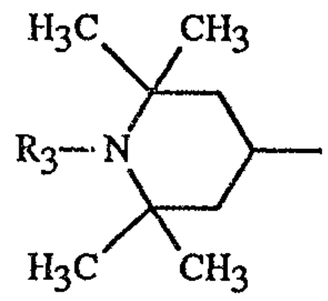
The compounds containing groups of the formula (I), which can be used according to the present invention, are:

a) compounds of the general formula (II)



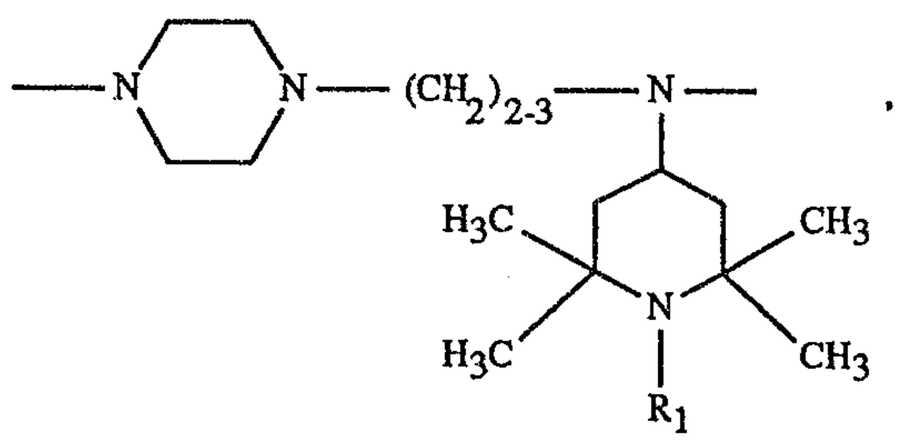
(II)

in which R_1 is as defined above for R, X is -O- or >N-R_2 where R_2 is hydrogen, C_1-C_{18}alkyl, C_2-C_4alkyl substituted in the 2-, 3- or 4-position by OH, by C_1-C_8alkoxy, by di-(C_1-C_4alkyl)amino or by a 5- to 7-membered nitrogenous heterocyclic group with the free valency on the nitrogen atom, C_5-C_{12}cycloalkyl, C_7-C_9phenylalkyl, tetrahydrofurfuryl or a group of the formula (III)

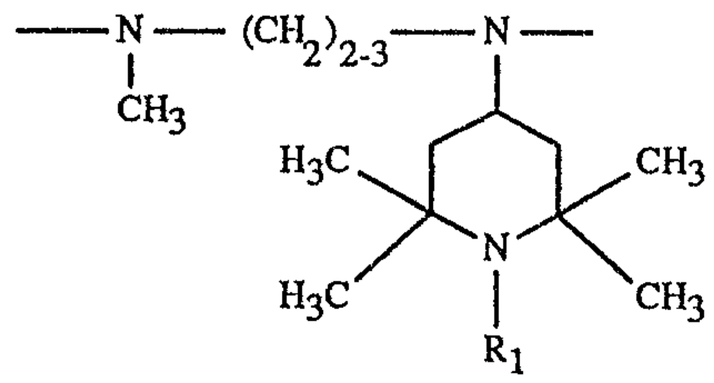


(III)

where R_3 is as defined for R, or X is 1,4-piperazinediyl or a group of the formula (IVa) or (IVb)

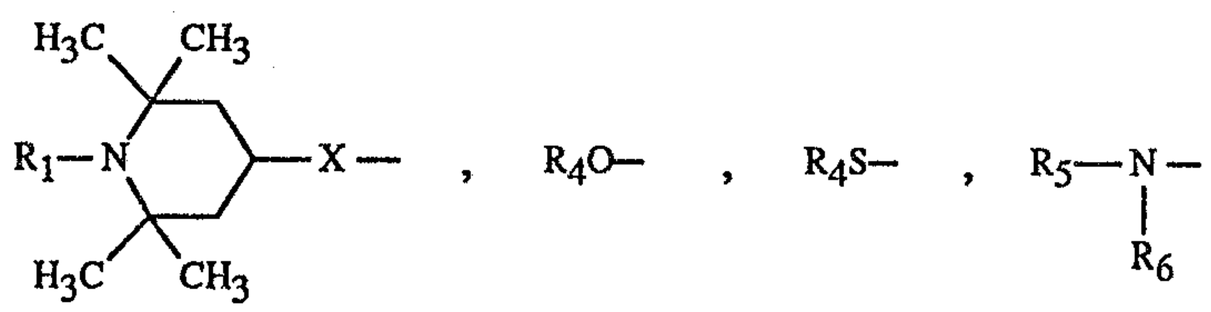


(IVa)



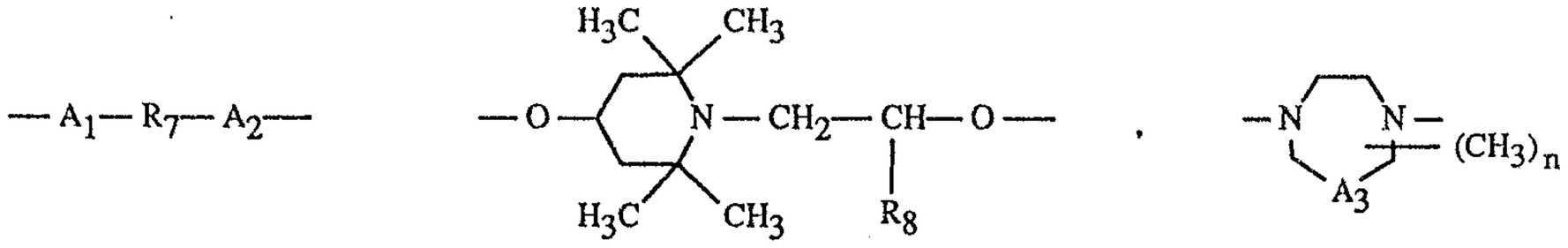
(IVb)

with R_1 being as defined above and with the nitrogen atom substituted by the piperidyl group being bound to the triazine ring, Y is one of the groups



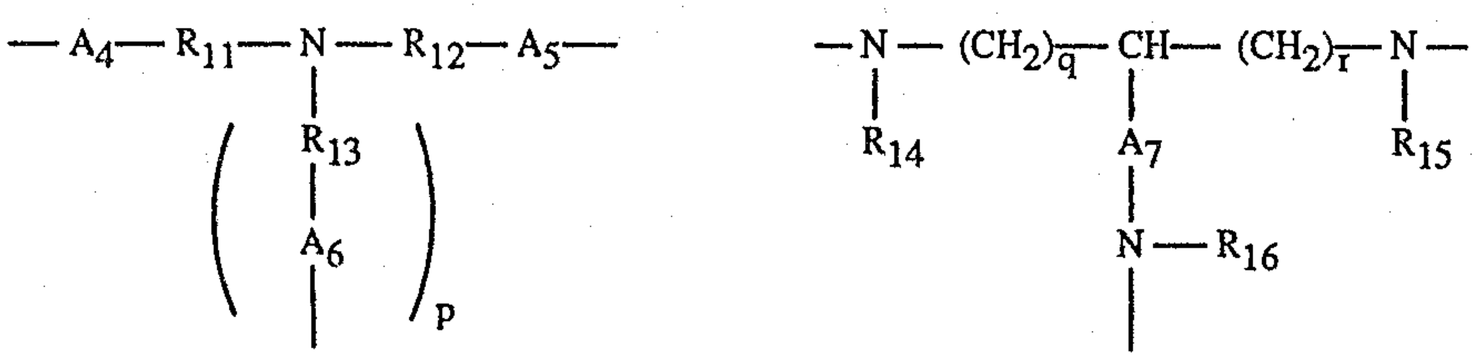
in which R_1 and X are as defined above and R_4, R_5 and R_6 which can be identical or different are as defined for R_2 with the exception of the definition as a group of the formula (III), or they are C_3-C_{18}alkenyl or phenyl which is unsubstituted or mono-, di- or tri-substituted by C_1-C_4alkyl or C_1-C_4alkoxy, or $-\underset{\underset{R_5}{|}}{N}-R_6$ is a 5- to 7-membered nitrogenous

heterocyclic group, m is an integer from 1 to 6, and, if m is 1, Z is as defined for Y, and, if m is 2, Z is one of the groups of the formulae (Va)-(Vc)

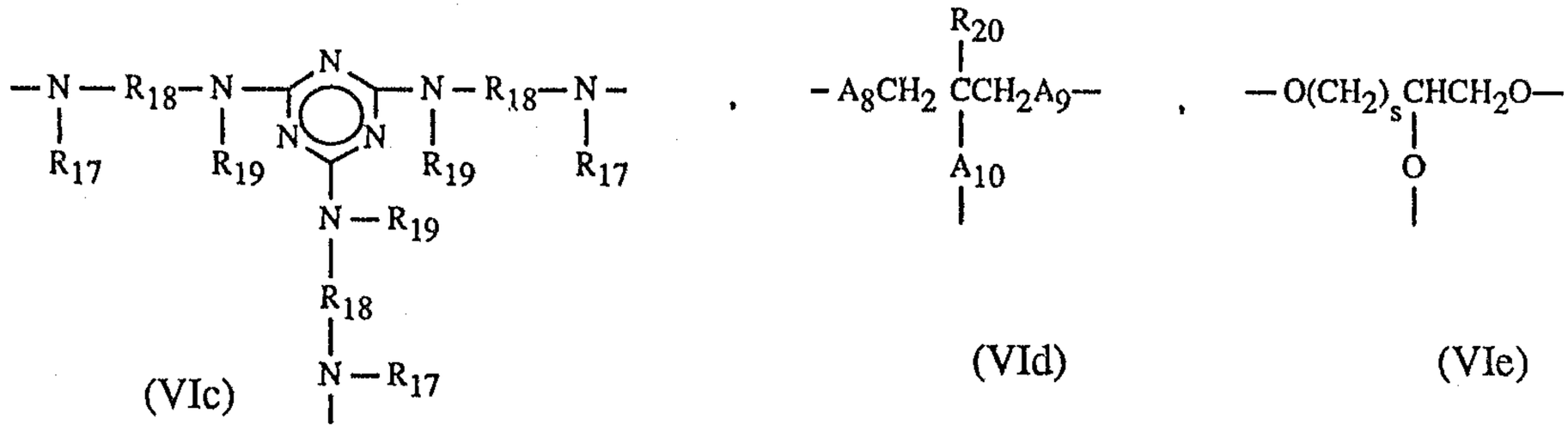


(Va) (Vb) (Vc)

in which A_1 and A_2 which can be identical or different are -O- or >N-R_9 with R_9 being hydrogen, C_1-C_{18}alkyl, C_5-C_{12}cycloalkyl, C_7-C_9phenylalkyl or a group of the formula (III), R_7 is C_2-C_{12}alkylene, cyclohexylene, cyclohexylenedimethylene, methylenedicyclohexylene, isopropylidenedicyclohexylene, phenylene, isopropylidenediphenylene, xylylene or C_4-C_{12}alkylene interrupted by 1, 2 or 3 oxygen atoms or by 1 or 2 >N-R_{10} groups where R_{10} is C_1-C_{18}alkyl, C_5-C_{12}cycloalkyl, C_7-C_9phenylalkyl or a group of the formula (III) or, if A_1 and A_2 both are >N-R_9, R_{10} can also be hydrogen, C_1-C_8acyl or (C_1-C_8alkoxy)-carbonyl, or R_7 or A_1R_7 respectively are a group $-(CH_2)_{2-3}-N\smile N-(CH_2)_{2-3}-$ or a group $-N\smile N-(CH_2)_{2-3}-$ R_8 is C_1-C_8alkyl, A_3 is a direct bond or -CH_2- and n is zero, 1, 2 or 3, and, if m is 3, Z is one of the groups of the formulae (VIa)-(VIe)

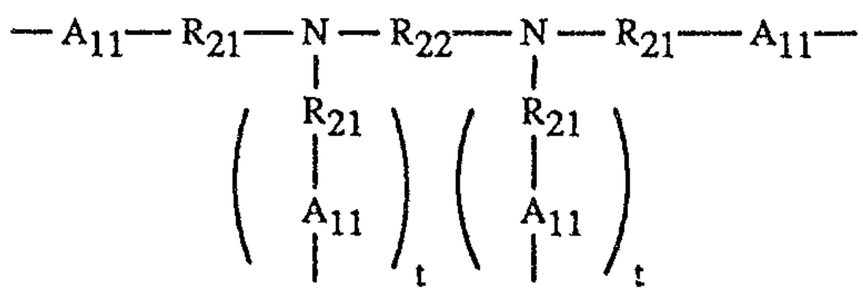


(VIa) (VIb)

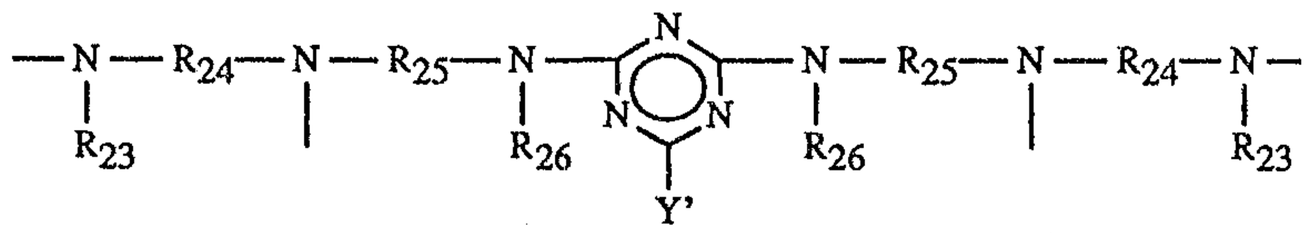


(VIc) (VId) (VIe)

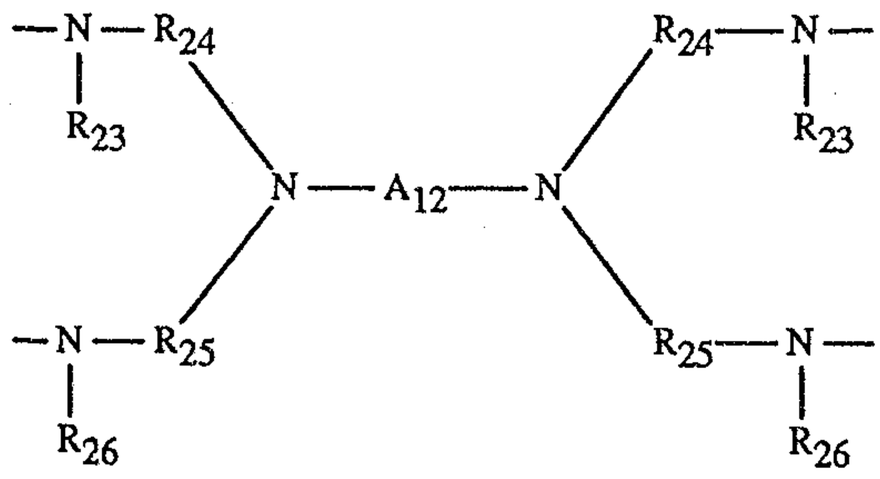
in which A_4, A_5, A_6, A_8, A_9 and A_{10} which can be identical or different are as defined above for A_1 and A_2, and, if A_8 and A_9 both are -O-, A_{10} can also be a -CH_2O- group, R_{11}, R_{12}, R_{13} and R_{18} which can be identical or different are C_2-C_6alkylene, p is zero or 1, R_{14}, R_{15}, R_{16}, R_{17} and R_{19} which can be identical or different are as defined above for R_9, A_7 is a direct bond or -CH_2-, q, r and s which can be identical or different are integers from 2 to 6 and R_{20} is hydrogen or C_1-C_8alkyl, and, if m is 4, Z is one of the groups of the formulae (VIIa)-(VIId)



(VIIa)



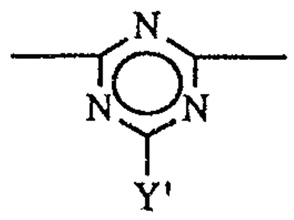
(VIIb)



(VIIc)

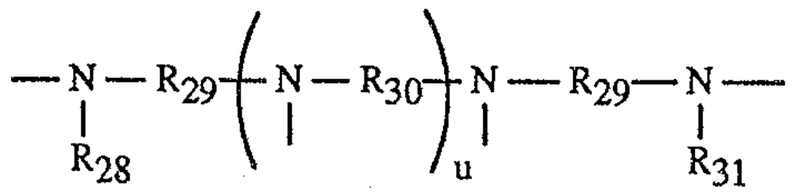
(VIId)

in which A_{11} is as defined above for A_1 and A_2, R_{21}, R_{22}, R_{24} and R_{25} which can be identical or different are C_2-C_6alkylene, t is zero or 1, R_{23} and R_{26} which can be identical or different are as defined above for R_9, Y' is as defined for Y, A_{12} is 2-hydroxytrimethylene, -CH_2CO-, xylylene, aliphatic or aromatic diacyl having not more than 12 carbon atoms, a group -$COO(CH_2)_{4-6}OOC$- or a group of the formula (VIII)



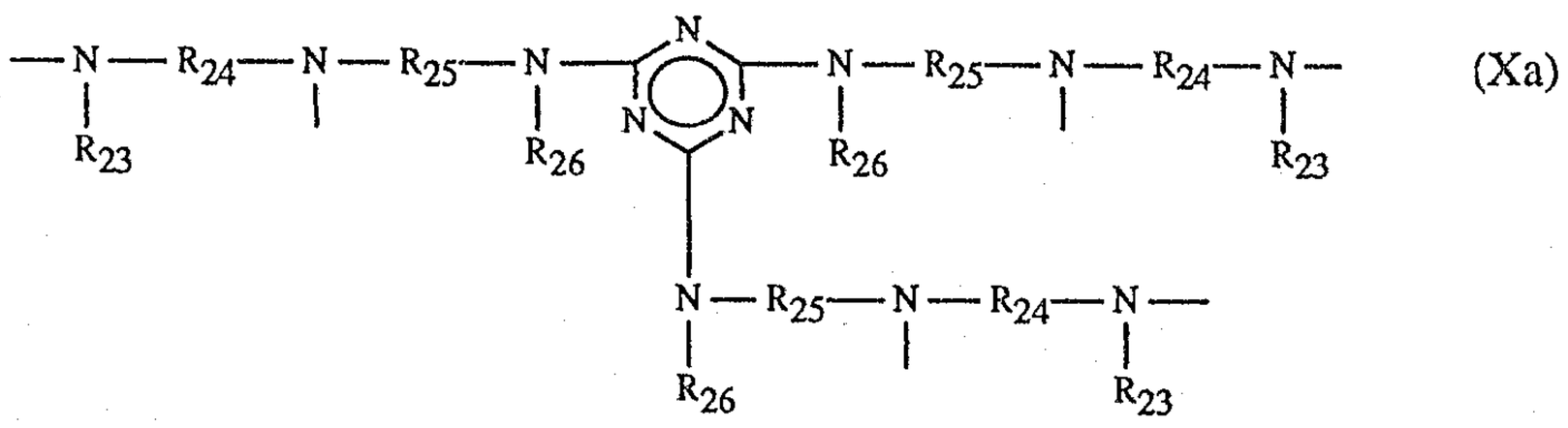
(VIII)

where Y' is as defined above, and R_{27} is C_4-C_{12}alkanetetrayl, and, if m is 5 or 6, Z is a group of the formula (IX)

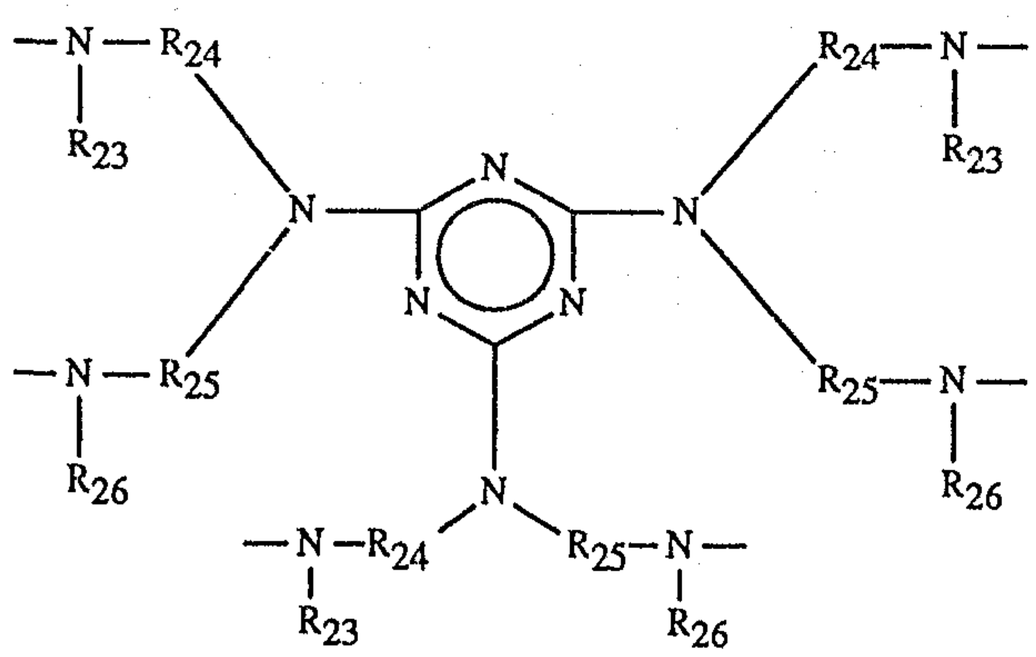


(IX)

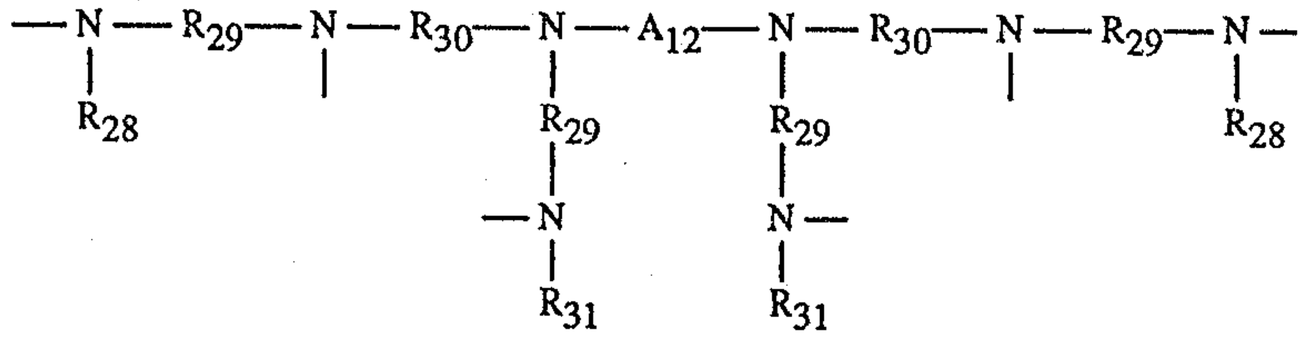
in which R_{28} and R_{31} which can be identical or different are as defined above for R_9, R_{29} and R_{30} which can be identical or different are C_2-C_6alkylene and u is 2 or 3, and, if m is 6, Z is also a group of the formulae (Xa)-(Xc)



(Xa)



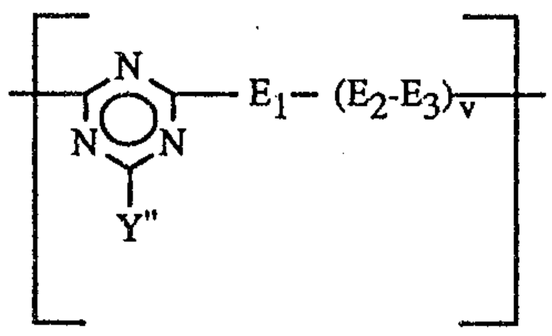
(Xb)



(Xc)

with R_{23}, R_{24}, R_{25}, R_{26}, R_{28}, R_{29}, R_{30}, R_{31} and A_{12} being as defined above;

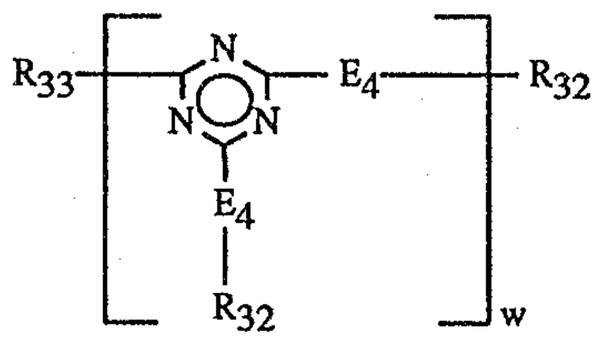
b) oligomers having a molecular weight between 1,000 and 10,000 and containing recurring units of the formula (XI)



(XI)

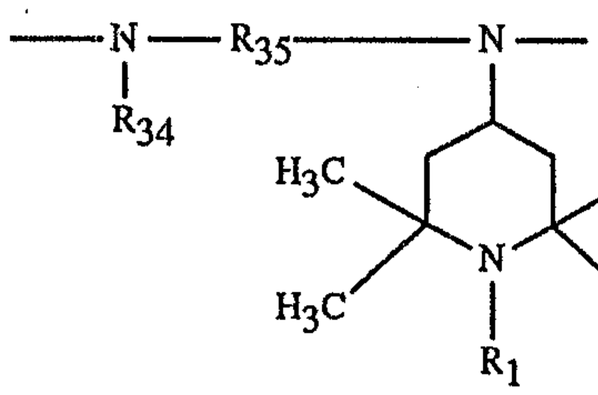
in which Y" is as defined above for Y, E_1 and E_3 which can be identical or different are groups of the formulae (Va)-(Vc), E_2 is as defined above for A_{12} and v is zero, 1, 2, 3 or 4, with the proviso that at least one group of the formula (III) must be present in each recurring unit of the formula (XI);

c) oligomers of the formula (XII)

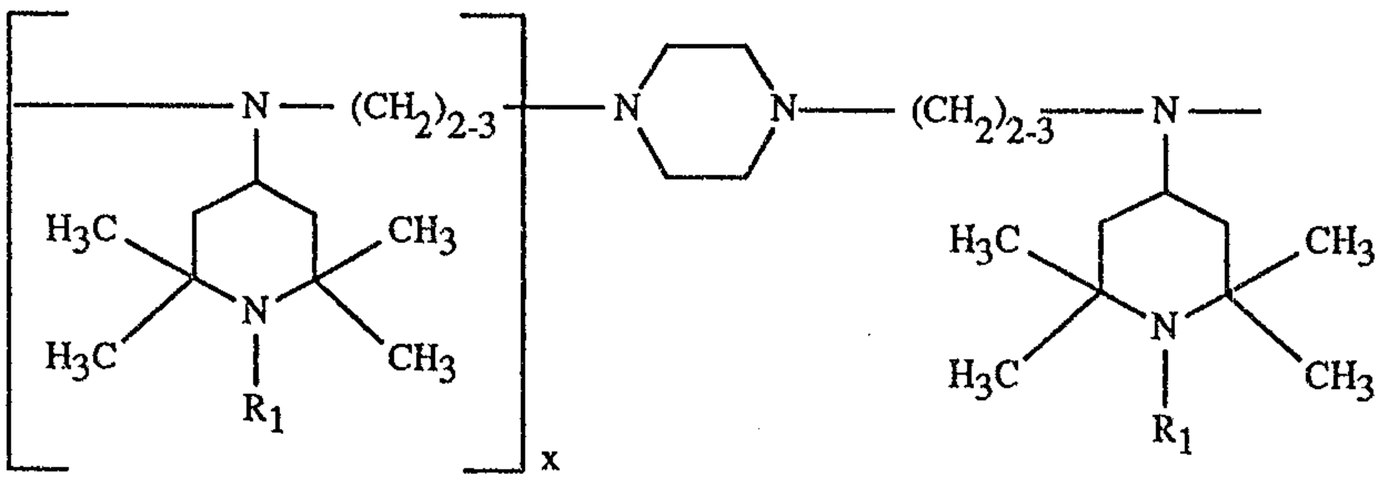


(XII)

in which R_{32} is hydrogen, C_1-C_8alkyl, C_3-C_6alkenyl, C_7-C_9phenylalkyl, C_1-C_8acyl or (C_1-C_8alkoxy)-carbonyl, E_4 is a group of the formula (XIIIa) or (XIIIb)

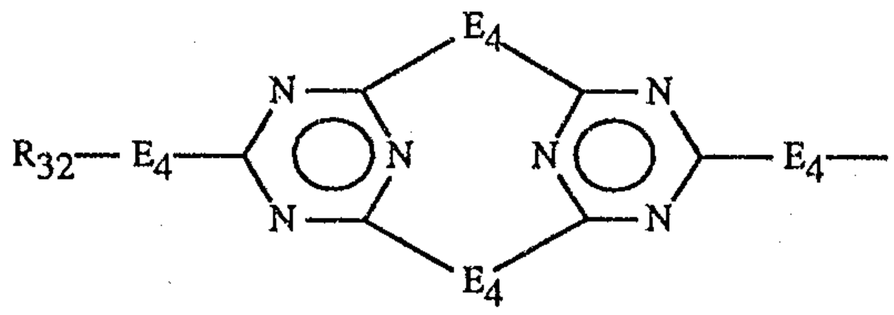


(XIIIa)



(XIIIb)

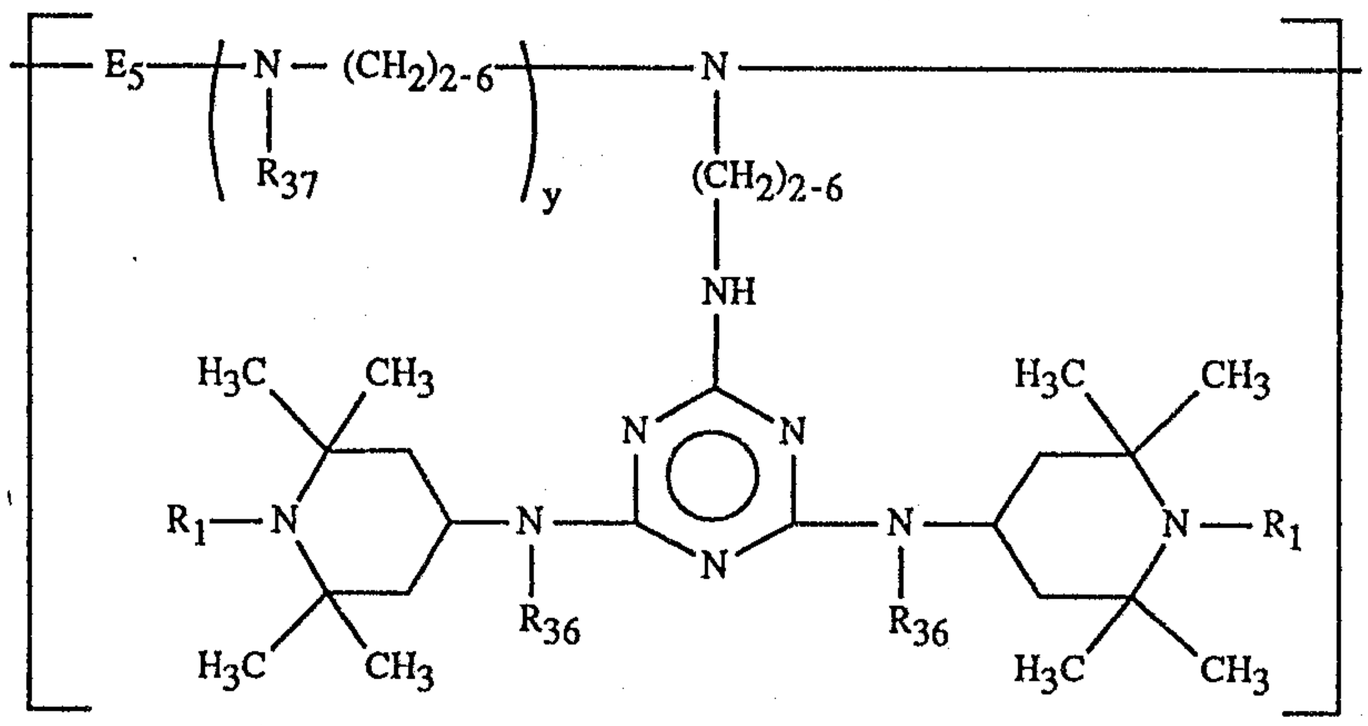
in which R_{34} is as defined above for R_9, R_{35} is C_2-C_{12}alkylene, cyclohexylene, cyclohexylenedimethylene, methylenedicyclohexylene, xylylene or C_4-C_{12}alkylene interrupted by 1, 2 or 3 oxygen atoms or by a group >N-CH_3, R_1 is as defined above and x is zero or 1, R_{33} is OH, ONa, OK, C_1-C_8alkoxy, C_3-C_6alkenyloxy, C_7-C_9phenylalkoxy, C_1-C_8acyloxy, a group R_{32}-E_4- or a group of the formula (XIV)



(XIV)

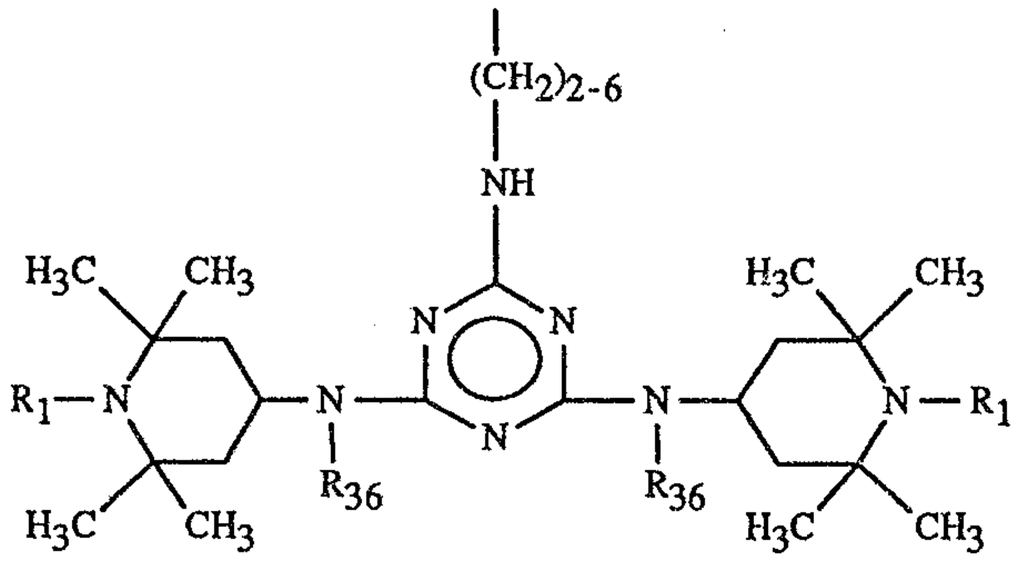
and w is a number from 1 to 20;

d) oligomers having a molecular weight between 1,000 and 10,000 and containing recurring units of the formula (XV)



(XV)

in which R_1 is as defined above, R_{36} is as defined above for R_2, R_{37} is hydrogen, C_1-C_{18}alkyl, a group of the formula (III) or a group of the formula (XVI)



(XVI)

y is zero or 1 and E_5 is as defined above for E_2 or C_2-C_6alkylene.

Examples of alkyl having not more than 18 carbon atoms are methyl, ethyl, propyl, isopropyl, butyl, 2-butyl, isobutyl, t-butyl, pentyl, 2-pentyl, hexyl, heptyl, octyl, 2-ethylhexyl, t-octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, hexadecyl and octadecyl.

Alkyl having not more than 12 carbon atoms is preferred.

Examples of C_2-C_4alkyl substituted by OH in the 2-, 3- or 4-position are 2-hydroxyethyl, 2-hydroxypropyl, 3-hydroxypropyl, 2-hydroxybutyl and 4-hydroxybutyl.

Examples of C_2-C_4alkyl substituted by C_1-C_8alkoxy in the 2-, 3- or 4-position are 2-methoxyethyl, 2-ethoxyethyl, 3-methoxypropyl, 3-ethoxypropyl, 3-butoxypropyl, 3-octoxypropyl and 4-methoxybutyl.

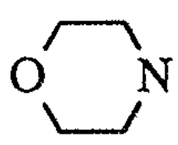
3-Methoxypropyl and 3-ethoxypropyl are preferred.

Examples of C_2-C_4alkyl substituted by di(C_1-C_4alkyl)amino in the 2-, 3- or 4-position are 2-dimethylaminoethyl, 2-diethylaminoethyl, 3-dimethylaminopropyl, 3-diethylaminopropyl, 3-dibutylaminopropyl and 4-diethylaminobutyl.

3-Dimethylaminopropyl and 3-diethylaminopropyl are preferred.

Representative examples of C_2-C_4alkyl R_2 substituted in the 2-, 3- or 4-position by a 5- to 7-membered nitrogenous heterocyclic group are groups of the formula

$-(CH_2)_{2-4}-$ in which G is a direct bond, -O-, $-CH_2-$ or $-CH_2-CH_2-$.



$-(CH_2)_{2-3}-$ is preferred.

Examples of alkoxy having not more than 8 carbon atoms are methoxy, ethoxy, propoxy, isopropoxy, butoxy, isobutoxy, t-butoxy, pentoxy, isopentoxy, hexoxy, heptoxy and octoxy.

C_6-C_8alkoxy and in particular heptoxy and octoxy are preferred for R_1 and R_3.

Representative examples of C_5-C_8cycloalkoxy R_1 and R_3 are cyclopentoxy, cyclohexoxy, cycloheptoxy and cyclooctoxy.

Cyclopentoxy and cyclohexoxy are preferred.

The various C_5-C_{12}cycloalkyl substituents are unsubstituted or mono-, di- or tri-substituted by C_1-C_4alkyl; representative examples are cyclopentyl, methylcyclopentyl, dimethylcyclopentyl, cyclohexyl, methylcyclohexyl, dimethylcyclohexyl, trimethylcyclohexyl, t-butylcyclohexyl, cyclooctyl, cyclodecyl and cyclododecyl. Cyclohexyl is preferred.

Examples of alkenyl having not more than 18 carbon atoms are allyl, 2-methylallyl, butenyl, pentenyl, hexenyl, undecenyl and oleyl. Alkenyl groups in which the carbon atom in the 1-position is saturated are preferred; allyl is particularly preferred.

Examples of substituted phenyl are methylphenyl, dimethylphenyl, trimethylphenyl, t-butylphenyl, di-t-butylphenyl, methoxyphenyl and ethoxyphenyl.

The various C_7-C_9phenylalkyl substituents are unsubstituted or mono-, di- or tri-substituted on the phenyl by C_1-C_4alkyl; representative examples are benzyl, methylbenzyl, dimethylbenzyl, t-butylbenzyl and 2-phenylethyl. Benzyl is preferred.

Acyl R_1, R_3 and R_{10} having not more than 8 carbon atoms can be an aliphatic or aromatic group.

Representative examples are formyl, acetyl, propionyl, butyryl, pentanoyl, hexanoyl, heptanoyl, octanoyl, benzoyl, acryloyl or crotonyl. Acetyl is preferred.

A $-\underset{\underset{R_5}{|}}{N}-R_6$ group as a 5- to 7-membered heterocyclic group can contain a further hetero atom, for example nitrogen or oxygen; representative examples are 1-pyrrolidyl, 1-piperidyl, 4-morpholinyl, 4-methyl-1-piperazinyl and 1-hexahydroazepinyl. 4-Morpholinyl is preferred.

Examples of alkylene having not more than 12 carbon atoms are ethylene, propylene, trimethylene, tetramethylene, pentamethylene, 2,2-dimethyltrimethylene, hexamethylene, trimethylhexamethylene, octamethylene, decamethylene and dodecamethylene.

Examples of C_4-C_{12}alkylene interrupted by 1, 2 or 3 oxygen atoms are 3-oxapentane-1,5-diyl, 4-oxaheptane-1,7-diyl, 3,6-dioxaoctane-1,8-diyl, 4,7-dioxadecane-1,10-diyl, 4,9-dioxadodecane-1,12-diyl and 3,6,9-trioxaundecane-1,11-diyl.

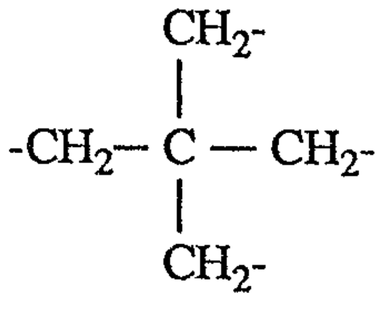
Representative examples of C_4-C_{12}alkylene R_7 interrupted by 1 or 2 >N-R_{10} groups are the groups

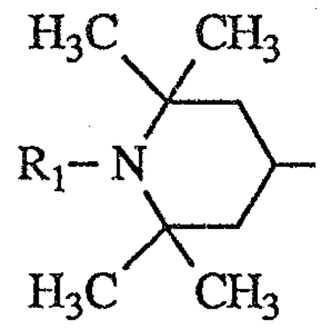
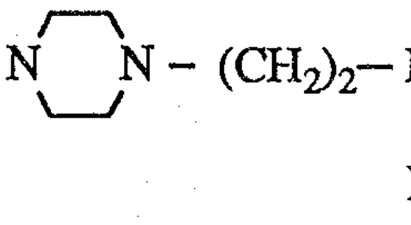
$$-(CH_2)_{2\text{-}6}-\underset{\underset{R_{10}}{|}}{N}-(CH_2)_{2\text{-}6}- \quad , \quad -\underset{\underset{CH_3}{|}}{C}HCH_2-\underset{\underset{R_{10}}{|}}{N}-CH_2\underset{\underset{CH_3}{|}}{C}H- \quad , \quad -(CH_2)_{2\text{-}3}-\underset{\underset{R_{10}}{|}}{N}-(CH_2)_{2\text{-}6}-\underset{\underset{R_{10}}{|}}{N}-(CH_2)_{2\text{-}3}-$$

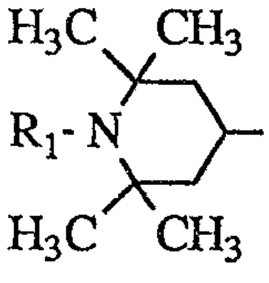
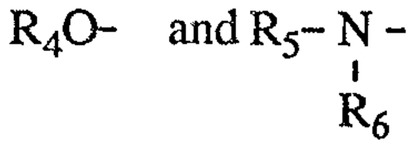
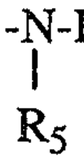
A representative example of C_4-C_{12}alkylene R_{36} interrupted by an >N-CH_3 group is the group of the formula $-(CH_2)_{2\text{-}6}-\underset{\underset{CH_3}{|}}{N}-(CH_2)_{2\text{-}6}-$.

Examples of diacyl A_{12} having not more than 12 carbon atoms are oxalyl, malonyl, succinyl, glutaryl, adipoyl, sebacoyl, isophthaloyl and terephthaloyl.

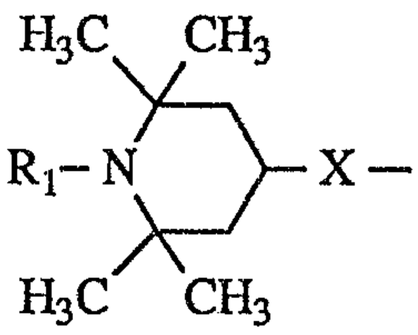
Preferred examples of C_4-C_{12}alkanetetrayl R_{27} are 1,2,3,4-butanetetrayl and the group

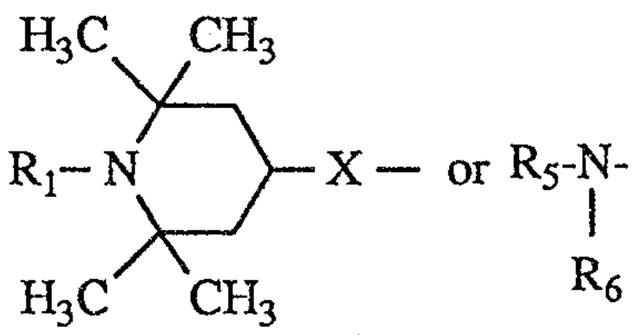


Preferred compounds containing groups of the formula (I), which can be used according to the present invention, are those of the formula (II) in which R_1 is hydrogen, methyl, allyl, benzyl or acetyl, X is -O- or >N-R_2, R_2 is hydrogen, C_1-C_{12}alkyl, C_2-C_3alkyl substituted in the 2- or 3-position by C_1-C_4alkoxy, by dimethylamino, by diethylamino or by 4-morpholinyl, cyclohexyl, benzyl, tetrahydrofurfuryl or a group of formula (III) with R_3 being as defined above for R_1, Y is a group  ,m is an integer from 2 to 6 and, if m is 2, Z is a group of the formula (Va) in which A_1 and A_2 are >N-R_9 with R_9 being hydrogen, C_1-C_{12}alkyl, cyclohexyl, benzyl or a group of the formula (III), R_7 is C_2-C_6alkylene, cyclohexylenedimethylene, methylenedicylohexylene, xylylene or C_4-C_{10}alkylene interrupted by 1 or 2 oxygen atoms or by 1 or 2 >N-R_{10} groups where R_{10} is hydrogen, C_1-C_{12}alkyl, cyclohexyl, benzyl, a group of the formula (III), C_1-C_4acyl or (C_1-C_4alkoxy)-carbonyl, or Z is a group  , and, if m is 3, Z is a group of the formula (VIa) in which A_4 and A_5 are as defined above for A_1 and A_2, R_{11} and R_{12} which can be identical or different are C_2-C_6alkylene and p is zero, and, if m is 4, Z is a group of the formula (VIIa) or (VIIc) in which A_{11} is as defined above for A_1 and A_2, R_{21}, R_{22}, R_{24} and R_{25} which can be identical or different are C_2-C_6alkylene, t is zero, R_{23} and R_{26} are as defined above for R_9 and A_{12} is aliphatic or aromatic diacyl having not more than 10 carbon atoms or a group -COO(CH_2)$_{4-6}$OOC-, and, if m is 5 or 6, Z is a group of the formula (IX) in which R_{28} and R_{31} are as defined above for R_9, R_{29} and R_{30} which can be identical or different are C_2-C_6alkylene and u is 2 or 3, and, if m is 6, Z is also a group of the formula (Xc) with R_{28}, R_{29}, R_{30}, R_{31} and A_{12} being as defined above; oligomers having a molecular weight between 1,000 and 5,000 and containing recurring units of the formula (XI) in which Y" is one of the groups



and where R_1 and X are as defined above, and R_4, R_5 and R_6 which can be identical or different are as defined above for R_2, or -N-R_6 is


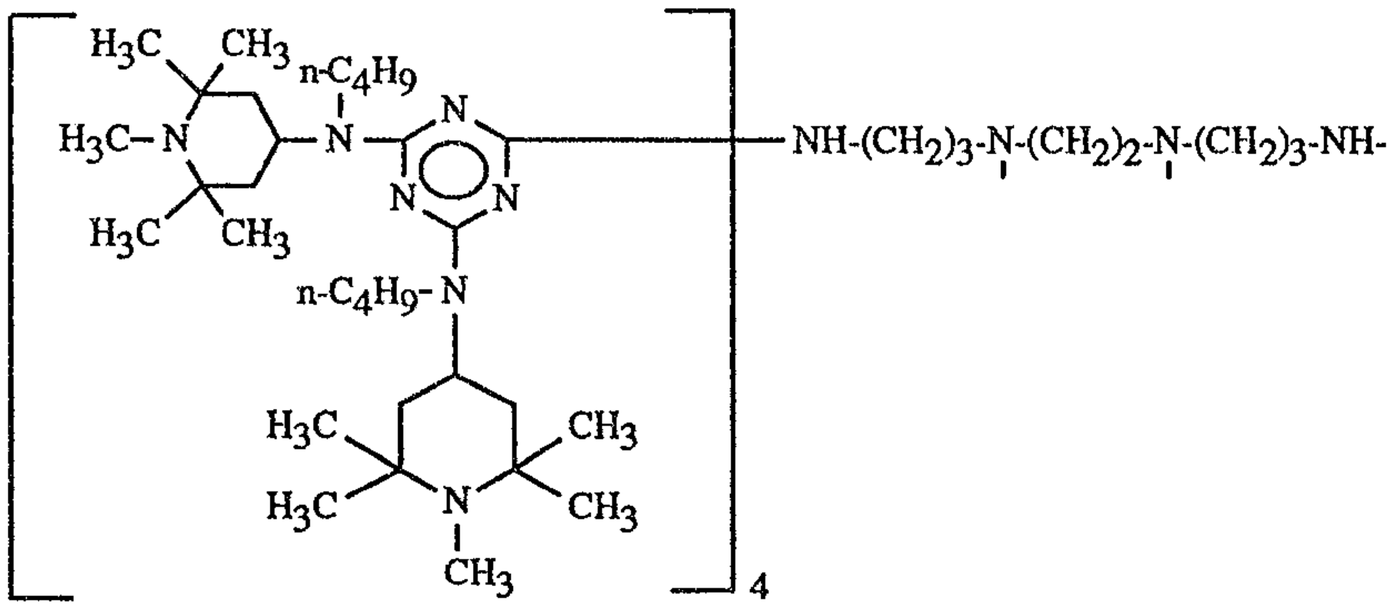
4-morpholinyl, E_1 and E_3 which can be identical or different are groups of the formulae (Va)-(Vc) where A_1, A_2 and R_7 are as defined above, R_8 is hydrogen or methyl, A_3 is a direct bond and n is zero, E_2 is 2-hydroxytrimethylene, aliphatic or aromatic diacyl having not more than 10 carbon atoms, a group -COO$(CH_2)_{4-6}$OOC- or a group of the formula (VIII) where Y' is as defined for Y" and v is zero, 1 or 2, with the proviso that at least one group of the formula (III) must be present in each recurring unit of the formula (XI); oligomers of the formula (XII) in which R_{32} is hydrogen, C_1-C_4alkyl, C_1-C_4acyl or (C_1-C_4alkoxy)-carbonyl, E_4 is a group of the formula (XIIIa) or (XIIIb) in which R_{34} is as defined above for R_9, R_{35} is C_2-C_6alkylene, cyclohexylenedimethylene, methylenedicyclohexylene or C_4-C_{10}alkylene interrupted by 1 or 2 oxygen atoms or by an >N-CH_3 group, R_1 is as defined above and x is zero or 1, R_{33} is OH, ONa, OK, C_1-C_4alkoxy, C_1-C_4acyloxy, a group R_{32}-E_4- or a group of the formula (XIV) and w is a number from 1 to 10; oligomers having a molecular weight between 1000 and 5000 and containing recurring units of the formula (XV) in which R_1 is as defined above, R_{36} is as defined above for R_2, R_{37} is hydrogen, C_1-C_{12}alkyl, a group of the formula (III) or a group of the formula (XVI), y is 1 and E_5 is as defined above for E_2 or C_2-C_6alkylene.

Particularly preferred compounds containing groups of the formula (I), which can be used according to the present invention are a) those of the formula (II) in which R_1 is hydrogen or methyl, X is >N-R_2, R_2 is C_1-C_8alkyl, 2,2,6,6-tetramethyl-4-piperidyl or 1,2,2,6,6-pentamethyl-4-piperidyl, Y is a group 
, m is 2, 3 or 4 and, if m is 2, Z is a group of the formula (Va) in which A_1 and A_2 are >N-R_9 with R_9 being hydrogen, C_1-C_4alkyl, 2,2,6,6-tetramethyl-4-piperidyl, or 1,2,2,6,6-pentamethyl-4-piperidyl, R_7 is C_2-C_6alkylene, cyclohexylenedimethylene, methylenedicyclohexylene, xylylene or C_4-C_{10}alkylene interrupted by 1 or 2 oxygen atoms or by an >N-R_{10} group where R_{10} is hydrogen, methyl, cyclohexyl, benzyl,

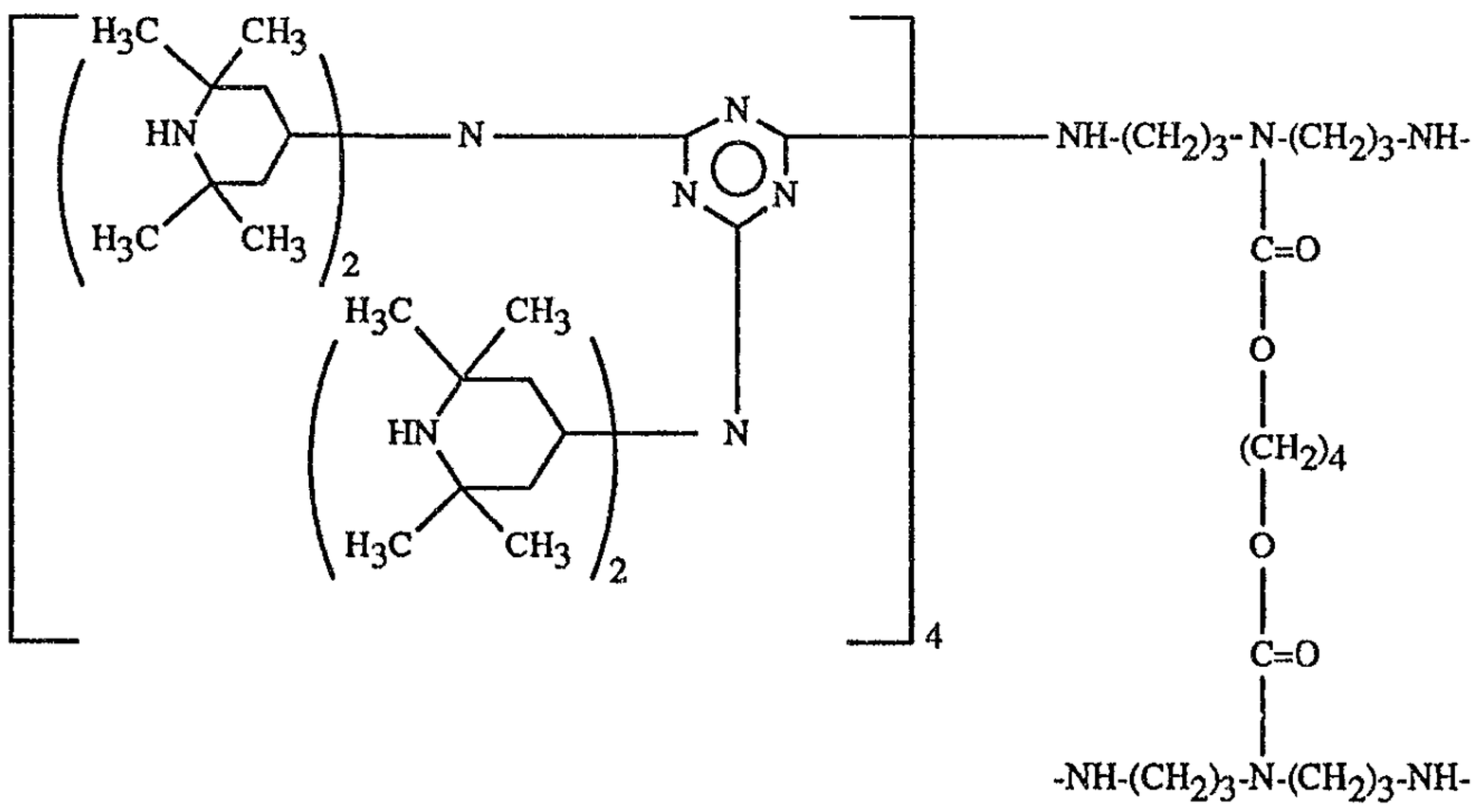
C_1-C_4acyl or (C_1-C_4alkoxy)-carbonyl, or Z is a group $-N\langle\rangle N-(CH_2)_2-NH-$, and, if m is 3, Z is a group of the formula (VIa) in which A_4 and A_5 are as defined above for A_1 and A_2, R_{11} and R_{12} which can be identical or different are C_2-C_6alkylene and p is zero, and, if m is 4, Z is a group of the formula (VIIa) or (VIIc) in which A_{11} is as defined above for A_1 and A_2, R_{21}, R_{22}, R_{24} and R_{25} which can be identical or different, are C_2-C_6alkylene, t is zero, R_{23} and R_{26} are as defined above for R_9 and A_{12} is aliphatic C_2-C_{10}diacyl or a group -$COO(CH_2)_{4-6}OOC$-; b) oligomers having a molecular weight between 1,500 and 5,000 and containing recurring units of the formula (XI) in which Y" is one of the groups  where R_1 and X are as defined above and R_5 and R_6 which can be identical or different are C_1-C_8alkyl, or R_5 can also be hydrogen, or R_5-N(-R_6)- is 4-morpholinyl, E_1 is a group of the formula (Va) as defined above and v is zero, with the proviso that at least one group of the formula (III) must be present in each recurring unit of the formula (XI); c) oligomers of the formula (XII) in which R_{32} is hydrogen, methyl, acetyl or (C_1-C_2alkoxy)-carbonyl, E_4 is a group of the formula (XIIIa) in which R_{34} is 2,2,6,6-tetramethyl-4-piperidyl or 1,2,2,6,6-pentamethyl-4-piperidyl, R_{35} is C_2-C_6alkylene or C_8-C_{10}alkylene interrupted by 2 oxygen atoms, R_1 is as defined above, R_{33} is a group R_{32}-E_4- or a group of the formula (XIV) and w is a number from 1 to 5; oligomers having a molecular weight between 1,500 and 5,000 and containing recurring units of formula (XV) in which R_1 is as defined above, R_{36} is as defined above for R_2, R_{37} is hydrogen or a group of the formula (XVI), y is 1 and E_5 is C_2-C_4alkylene.

Compounds A) of particular interest, which can be used according to the present invention are:

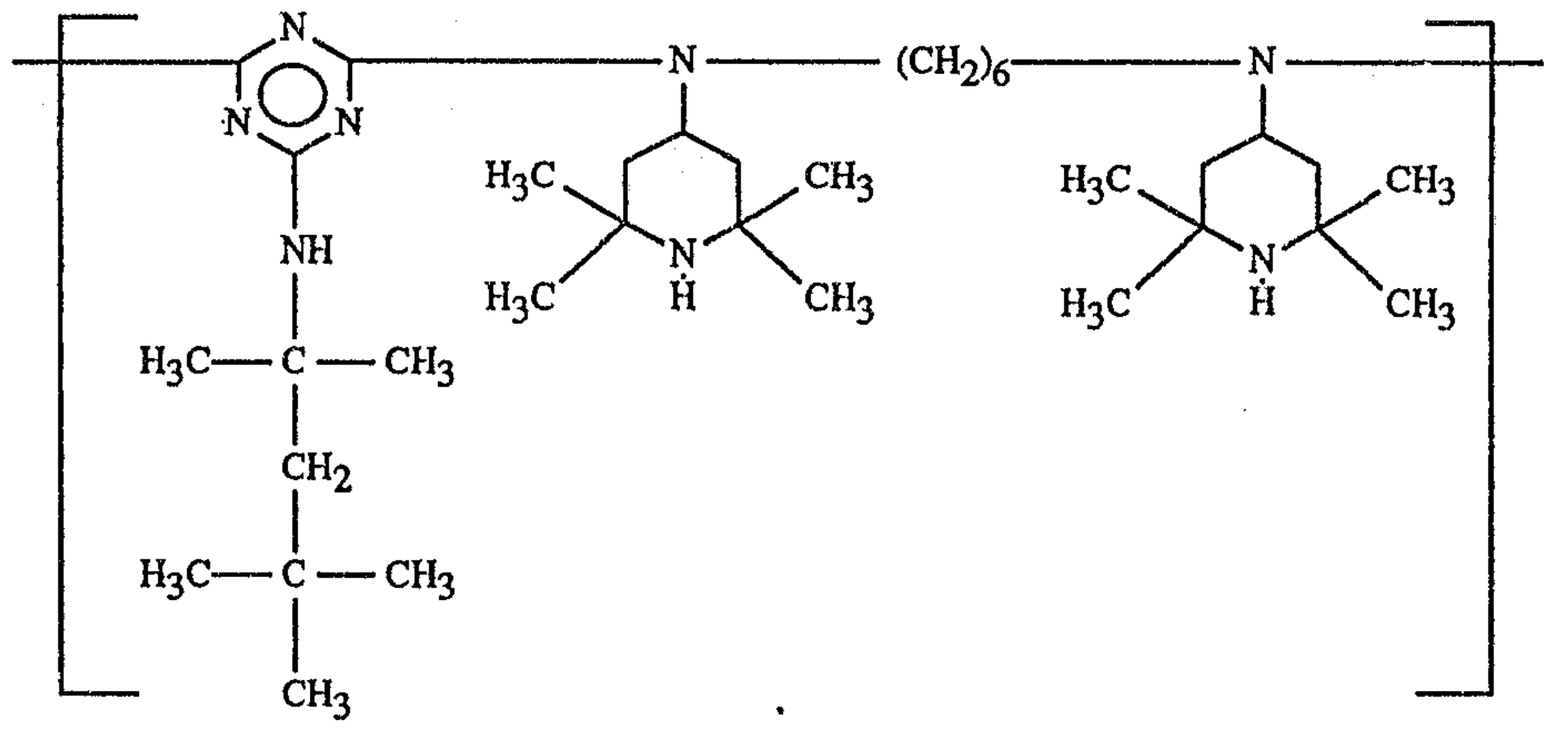
A1)



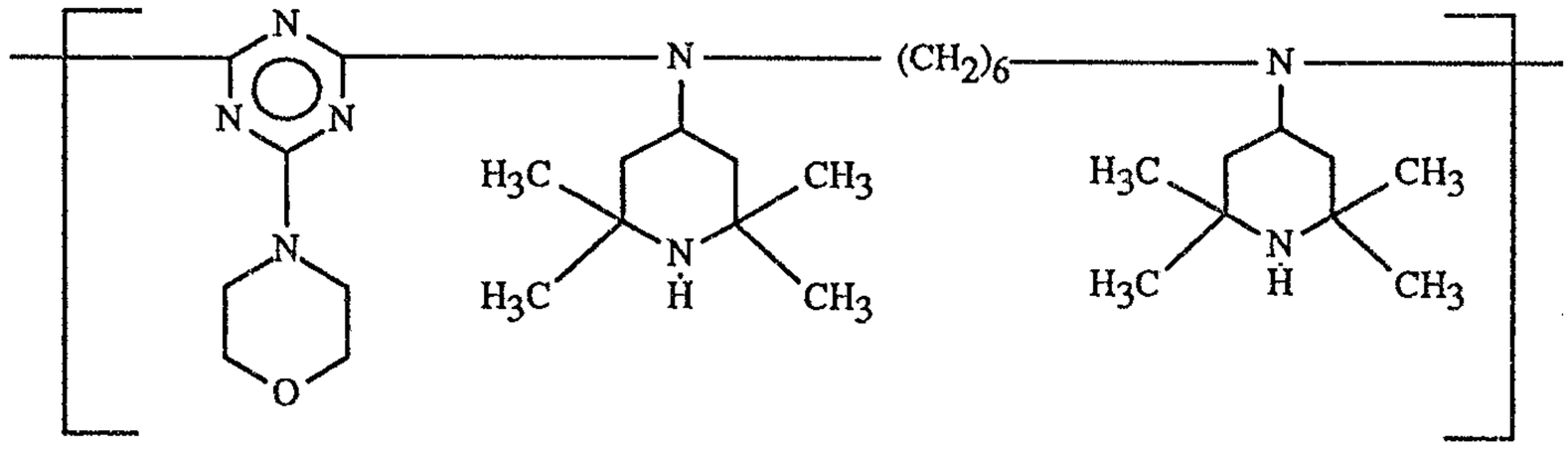
(A2)



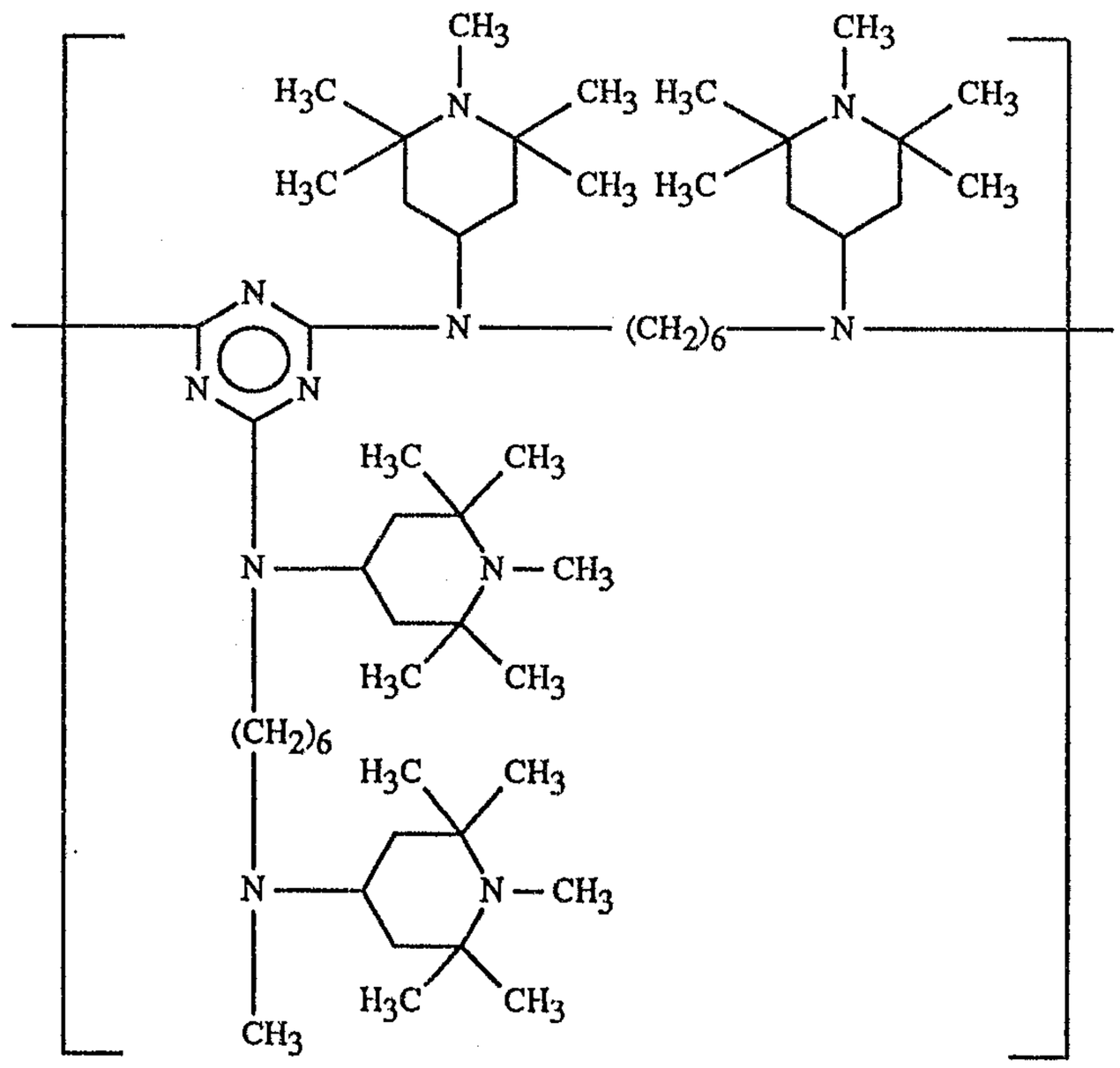
A3) oligomers having a molecular weight between 1,500 and 4,000 and containing recurring units of the formula



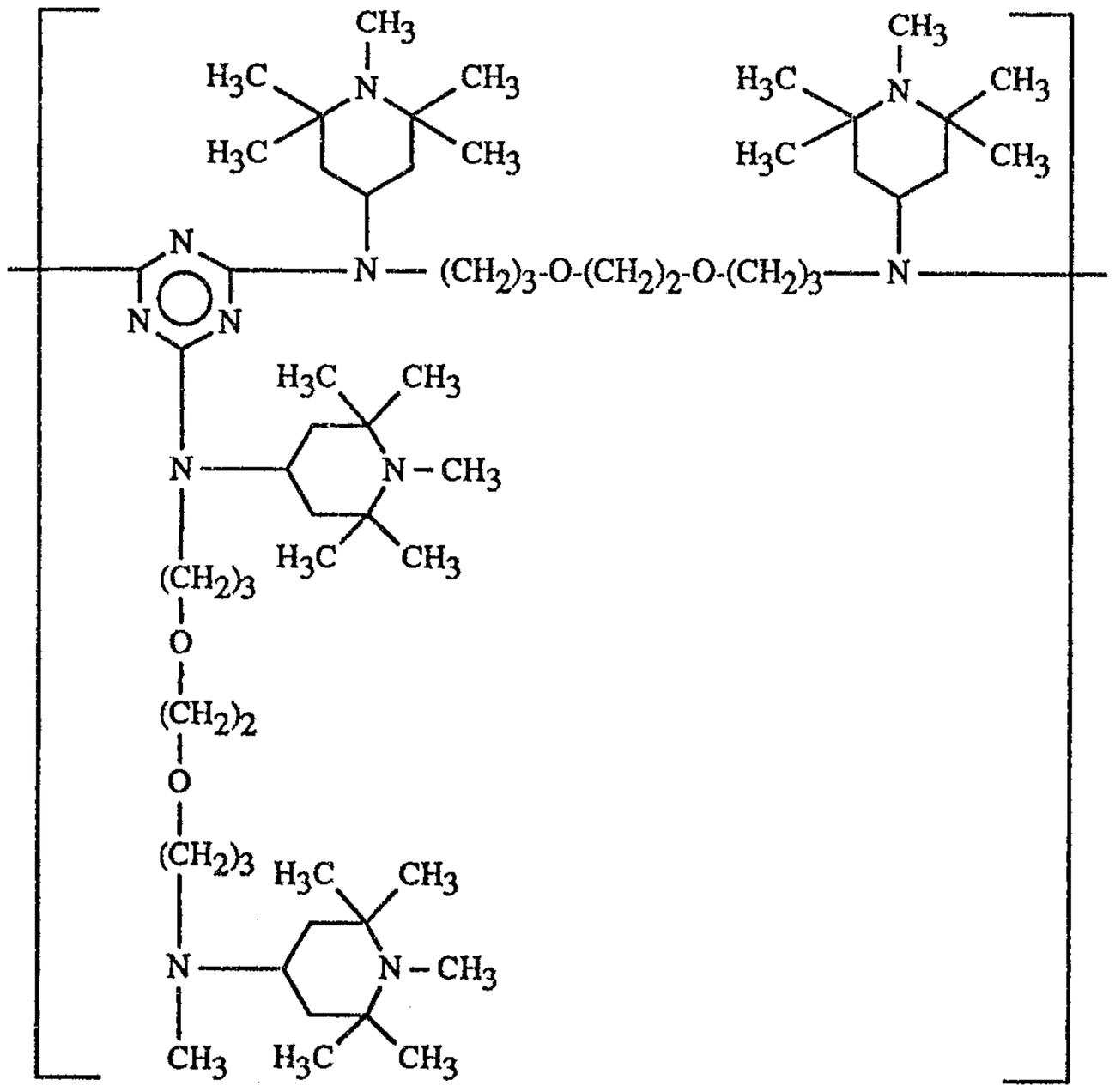
A4) oligomers having a molecular weight between 1,500 and 4,000 and containing recurring units of the formula



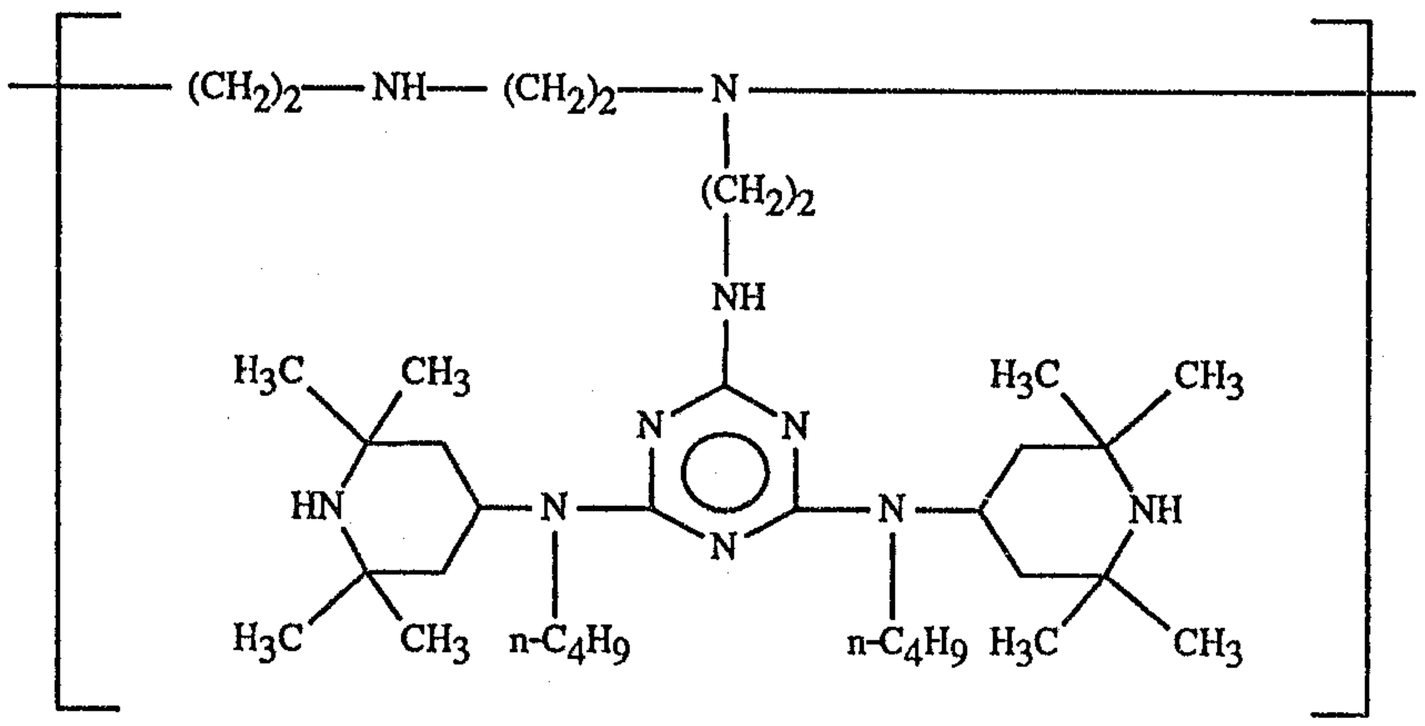
A5) oligomers having a molecular weight between 1,500 and 4,000 and containing recurring units of the formula



A6) oligomers having a molecular weight between 1,500 and 4,000 and containing recurring units of the formula



A7) oligomers having a molecular weight between 1,500 and 4,000 and containing recurring units of the formula



The said compounds can be used alone or as a mixture with one another.

The compounds (B) which can be used according to the present invention are preferably the oxides and hydroxides of Mg and Zn. The oxides of Mg and Zn are particularly preferred, and they can be used alone or as a mixture with one another. The weight ratio of A:B is preferably from 1:0.1 to 1:2.

The percentages by weight, relative to the weight of the polypropylene, of the compounds (A) and (B) which can be used according to the present invention are between 0.025 and 2 %, preferably between 0.05 and 1 %, for the compounds (A) and between 0.005 and 1 %, preferably between 0.025 and 0.5 %, for the compounds (B).

The compounds (A) and (B) can be mixed with one another before the addition to the polymer, or they can be added separately to the polymer, using any of the known procedures.

In addition to the compounds (A) and (B) of the present invention, other conventional additives for polypropylene, such as antioxidants, UV absorbers, nickel stabilisers, pigments, fillers, antistatic agents, flameproofing agents, lubricants, corrosion inhibitors and metal deactivators, can be added.

Particular examples of additives which can be used in admixture with the compounds (A) and (B) are:

1. Antioxidants

1.1. Alkylated monophenols, for example 2,6-di-tert-butyl-4-methylphenol, 2-tert-butyl-4,6-dimethylphenol, 2,6-di-tert-butyl-4-ethylphenol, 2,6-di-tert-butyl-4-n-butylphenol, 2,6-di-tert-butyl-4-isobutylphenol, 2,6-dicyclopentyl-4-methylphenol, 2-(α-methylcyclohexyl)-4,6-dimethylphenol, 2,6-dioctadecyl-4-methylphenol, 2,4,6-tricyclohexylphenol, 2,6-di-tert-butyl-4-methoxymethylphenol, 2,6-dinonyl-4-methylphenol.

1.2. Alkylated hydroquinones, for example 2,6-di-tert-butyl-4-methoxyphenol, 2,5-di-tert-butylhydroquinone, 2,5-di-tert-amylhydroquinone, 2,6-diphenyl-4-octadecyloxyphenol.

1.3. Hydroxylated thiodiphenyl ethers, for example
2,2'-thiobis(6-tert-butyl-4-methylphenol), 2,2'-thiobis(4-octylphenol),
4,4'-thiobis(6-tert-butyl-3-methylphenol), 4,4'-thiobis(6-tert-butyl-2-methylphenol).

1.4. Alkylidenebisphenols, for example 2,2'-methylenebis(6-tert-butyl-4-methylphenol),
2,2'-methylenebis(6-tert-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), 2,2'-methylenebis(4,6-di-tert-butylphenol),
2,2'-ethylidenebis(4,6-di-tert-butylphenol),
2,2'-ethylidenebis(6-tert-butyl-4-isobutylphenol),
2,2'-methylenebis[6-(α-methylbenzyl)-4-nonylphenol],
2,2'-methylenebis[6-(α,α-dimethylbenzyl)-4-nonylphenol],
4,4'-methylenebis(2,6-di-tert-butylphenol),
4,4'-methylenebis(6-tert-butyl-2-methylphenol),
1,1-bis(5-tert-butyl-4-hydroxy-2-methylphenyl)butane,
2,6-bis(3-tert-butyl-5-methyl-2-hydroxybenzyl)-4-methylphenol,
1,1,3-tris(5-tert-butyl-4-hydroxy-2-methylphenyl)butane,
1,1-bis(5-tert-butyl-4-hydroxy-2-methylphenyl)-3-n-dodecylmercaptobutane,
ethylene glycol bis[3,3-bis(3'-tert-butyl-4'-hydroxyphenyl)butyrate],
bis(3-tert-butyl-4-hydroxy-5-methylphenyl)-dicyclopentadiene,
bis[2-(3'-tert-butyl-2'-hydroxy-5'-methylbenzyl)-6-tert-butyl-4-methylphenyl]
terephthalate.

1.5. Benzyl compounds, for example
1,3,5-tris(3,5-di-tert-butyl-4-hydroxybenzyl)-2,4,6-trimethylbenzene,
bis(3,5-di-tert-butyl-4-hydroxybenzyl) sulfide, isooctyl 3,5-di-tert-butyl-
4-hydroxybenzylmercaptoacetate, bis(4-tert-butyl-3-hydroxy-2,6-dimethylbenzyl)
dithiolterephthalate, 1,3,5-tris(3,5-di-tert-butyl-4-hydroxybenzyl) isocyanurate,
1,3,5-tris(4-tert-butyl-3-hydroxy-2,6-dimethylbenzyl) isocyanurate,
dioctadecyl 3,5-di-tert-butyl-4-hydroxybenzylphosphonate, calcium salt of monoethyl
3,5-di-tert-butyl-4-hydroxybenzylphosphonate, 1,3,5-tris(3,5-dicyclohexyl-
4-hydroxybenzyl) isocyanurate.

1.6. Acylaminophenols, for example lauric acid 4-hydroxyanilide, stearic acid
4-hydroxyanilide, 2,4-bis(octylmercapto)-6-(3,5-di-tert-butyl-4-hydroxyanilino)-s-triazine,

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

1.7. Esters of β-(3,5-di-tert-butyl-4-hydroxyphenyl)propionic acid with mono- or polyhydric alcohols, e.g. with methanol, diethylene glycol, octadecanol, triethylene glycol, 1,6-hexanediol, pentaerythritol, neopentyl glycol, tris(hydroxyethyl) isocyanurate, thiodiethylene glycol, N,N'-bis(hydroxyethyl)oxamide.

1.8. Esters of β-(5-tert-butyl-4-hydroxy-3-methylphenyl)propionic acid with mono- or polyhydric alcohols, e.g. with methanol, diethylene glycol, octadecanol, triethylene glycol, 1,6-hexanediol, pentaerythritol, neopentyl glycol, tris(hydroxyethyl) isocyanurate, thiodiethylene glycol, N,N'bis(hydroxyethyl)oxamide.

1.9. Esters of β-(3,5-dicyclohexyl-4-hydroxyphenyl)propionic acid with mono- or polyhydric alcohols, e.g. with methanol, diethylene glycol, octadecanol, triethylene glycol, 1,6-hexanediol, pentaerythritol, neopentyl glycol, tris(hydroxyethyl) isocyanurate, thiodiethylene glycol, N,N'-bis(hydroxyethyl)oxamide.

1.10. Amides of β-(3,5-di-tert-butyl-4-hydroxyphenyl)propionic acid e.g.
N,N'-bis(3,5-di-tert-butyl-4-hydroxyphenylpropionyl)hexamethylenediamine,
N,N'-bis(3,5-di-tert-butyl-4-hydroxyphenylpropionyl)trimethylenediamine,
N,N'-bis(3,5-di-tert-butyl-4-hydroxyphenylpropionyl)hydrazine.

2. UV absorbers and light stabilisers

2.1. 2-(2'-Hydroxyphenyl)benzotriazoles, for example the 5'-methyl, 3',5'-di-tert-butyl, 5'-tert-butyl, 5'-(1,1,3,3-tetramethylbutyl), 5-chloro-3',5'-di-tert-butyl, 5-chloro-3'-tert-butyl-5'-methyl, 3'-sec-butyl-5'-tert-butyl, 4'-octoxy, 3',5'-di-tert-amyl and 3',5'-bis(α,α-dimethylbenzyl) derivatives.

2.2. 2-Hydroxybenzophenones, for example the 4-hydroxy, 4-methoxy, 4-octoxy, 4-decyloxy, 4-dodecyloxy, 4-benzyloxy, 4,2',4'-trihydroxy and
2'-hydroxy-4,4'-dimethoxy derivatives.

2.3. Esters of variously substituted benzoic acids, for example 4-tert-butylphenyl salicylate, phenyl salicylate, octylphenyl salicylate, dibenzoylresorcinol, bis(4-tert-butylbenzoyl)resorcinol, benzoylresorcinol, 2,4-di-tert-butylphenyl

3,5-di-tert-butyl-4-hydroxybenzoate and hexadecyl 3,5-di-tert-butyl-4-hydroxybenzoate.

2.4. Acrylates, for example ethyl α-cyano-β,β-diphenylacrylate, isooctyl α-cyano-β,β-diphenylacrylate, methyl α-carbomethoxycinnamate, methyl α-cyano-β-methyl-p-methoxycinnamate, butyl α-cyano-β-methyl-p-methoxycinnamate, methyl α-carbomethoxy-p-methoxycinnamate and N-(β-carbomethoxy-β-cyanovinyl)-2-methylindoline.

2.5. Nickel compounds, for example nickel complexes of 2,2'-thiobis[4-(1,1,3,3-tetramethylbutyl)phenol], such as the 1:1 or 1:2 complex, with or without additional ligands such as n-butylamine, triethanolamine or N-cyclohexyldiethanolamine, nickel dibutyldithiocarbamate, nickel salts of 4-hydroxy-3,5-di-tert-butylbenzylphosphonic acid monoalkyl esters, e.g. of the methyl or ethyl ester, nickel complexes of ketoximes, e.g. of 2-hydroxy-4-methylphenyl undecyl ketoxime, nickel complexes of 1-phenyl-4-lauroyl-5-hydroxypyrazole, with or without additional ligands.

2.6. Oxalic acid diamides, for example, 4,4'-dioctyloxyoxanilide, 2,2'-dioctyloxy-5,5'-di-tert-butyloxanilide, 2,2'-didodecyloxy-5,5'-di-tert-butyloxanilide, 2-ethoxy-2'-ethyloxanilide, N,N'-bis(3-dimethylaminopropyl)oxamide, 2-ethoxy-5-tert-butyl-2'-ethyloxanilide and its mixtures with 2-ethoxy-2'-ethyl-5,4'-di-tert-butyloxanilide and mixtures of ortho- and para-methoxy-disubstituted oxanilides and mixtures of o- and p-ethoxy-disubstituted oxanilides.

2.7. 2-(2-Hydroxyphenyl)-1,3,5-triazines, for example 2,4,6-tris(2-hydroxy-4-octyloxyphenyl)-1,3,5-triazine, 2-(2-hydroxy-4-octyloxyphenyl)-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine, 2-(2,4-dihydroxyphenyl)-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine, 2,4-bis(2-hydroxy-4-propyloxyphenyl)-6-(2,4-dimethylphenyl)-1,3,5-triazine, 2-(2-hydroxy-4-octyloxyphenyl)-4,6-bis(4-methylphenyl)-1,3,5-triazine, 2-(2-hydroxy-4-dodecyloxyphenyl)-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine.

3. Metal deactivators, for example N,N'-diphenyloxamide, N-salicylal-N'-salicyloylhydrazine, N,N'-bis(salicyloyl)hydrazine, N,N'-bis(3,5-di-tert-butyl-4-hydroxyphenylpropionyl)hydrazine,

3-salicyloylamino-1,2,4-triazole, bis(benzylidene)oxalodihydrazide.

4. Phosphites and phosphonites, for example triphenyl phosphite, diphenyl alkyl phosphites, phenyl dialkyl phosphites, tris(nonylphenyl) phosphite, trilauryl phosphite, trioctadecyl phosphite, distearyl pentaerythritol diphosphite, tris(2,4-di-tert-butylphenyl) phosphite, diisodecyl pentaerythritol diphosphite, bis(2,4-di-tert-butylphenyl) pentaerythritol diphosphite, tristearyl sorbitol triphosphite, tetrakis(2,4-di-tert-butylphenyl) 4,4'-biphenylenediphosphonite, 3,9-bis(2,4-di-tert-butylphenoxy)-2,4,8,10-tetraoxa-3,9-diphosphaspiro[5.5]undecane.

4a. Hydroxylamines, for example dibenzylhydroxylamine, dioctylhydroxylamine, didodecylhydroxylamine, ditetradecylhydroxylamine, dihexadecylhydroxylamine, dioctadecylhydroxylamine, 1-hydroxy-2,2,6,6-tetramethyl-4-piperidyl benzoate or bis-(1-hydroxy-2,2,6,6-tetramethyl-4-piperidyl) sebacate.

5. Peroxide scavengers, for example esters of β-thiodipropionic acid, for example the lauryl, stearyl, myristyl or tridecyl esters, mercaptobenzimidazole or the zinc salt of 2-mercaptobenzimidazole, zinc dibutyldithiocarbamate, dioctadecyl disulfide, pentaerythritol tetrakis(β-dodecylmercapto)propionate.

6. Polyamide stabilisers, for example copper salts in combination with iodides and/or phosphorus compounds and salts of divalent manganese.

7. Basic co-stabilisers, for example melamine, polyvinylpyrrolidone, dicyandiamide, triallyl cyanurate, urea derivatives, hydrazine derivatives, amines, polyamides, polyurethanes, alkali metal salts and alkaline earth metal salts of higher fatty acids, for example calcium stearate, zinc stearate, magnesium stearate, sodium ricinoleate and potassium palmitate, antimony pyrocatecholate or zinc pyrocatecholate.

8. Nucleating agents, for example 4-tert-butyl-benzoic acid, adipic acid, diphenylacetic acid.

9. Fillers and reinforcing agents, for example calcium carbonate, silicates, glass fibres, asbestos, talc, kaolin, mica, barium sulfate, metal oxides and hydroxides, carbon black, graphite.

10. Other additives, for example plasticizers, lubricants, emulsifiers, pigments, optical brighteners, flameproofing agents, antistatic agents and blowing agents.

The use of the mixtures stabilised according to the present invention is illustrated by the examples which follow; these are given solely for illustrative purposes and do not imply any restriction.

EXAMPLES 1-7: 2.5 g of each of the products indicated in Table 1, 1 g of tris-(2,4-di-t-butylphenyl) phosphite, 0.5 g of calcium monoethyl 3,5-di-t-butyl-4-hydroxybenzylphosphonate, 1 g of calcium stearate, 2.5 g of titanium dioxide and MgO or ZnO in the quantities indicated in the table are mixed in a slow mixer with 1000 g of polypropylene powder of melt index = 12 g/10 minutes (measured at 230°C and 2.16 kg).

The mixtures are extruded at 200-230°C to give polymer granules which are then converted into fibres, using a pilot-type apparatus (Leonard, Sumirago (VA), Italy) operating under the following conditions:

Extruder temperature	: 200-230°C
Head temperature	: 255-260°C
Stretch ratio	: 1:3.5
Count	: 11 dtex per filament

The fibres thus prepared are exposed, mounted on a white card, in a model 65 WR Weather-O-Meter (ASTM G 26-77) with a black panel temperture of 63°C.

The residual tenacity is measured on samples taken after various times of exposure to light by means of a constant-speed tensometer, and the exposure time in hours (T50) needed to halve the initial tenacity is then calculated.

Fibres prepared under the same conditions as indicated above, but without addition of the compounds of the invention, are exposed for comparison.

The results obtained are shown in Table1:

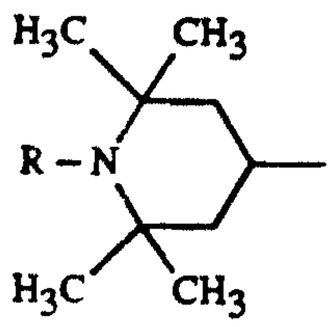
TABLE 1

Example No.	Compound (A)	Compound (B) (g)	T50 (hours)
1	1	-	1110
2	1	MgO (1)	1600
3	1	MgO (2)	1700
4	1	ZnO (1)	1480
5	3	-	1270
6	3	MgO (2)	1600
7	3	ZnO (1)	1790

CLAIMS:

1. A stabiliser composition for polypropylene, comprising:

A) between 0.025 and 2 % by weight, relative to the weight of the polypropylene, of one or more triazine compounds containing piperidine groups of the formula (I)

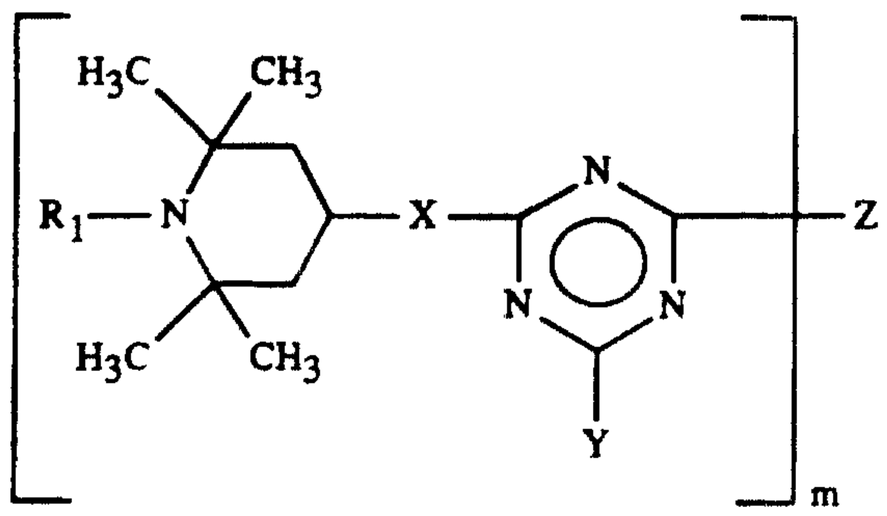


(I)

in which R is hydrogen, C_1-C_4alkyl, O•, OH, C_1-C_8alkoxy, C_5-C_8cycloalkoxy, C_3-C_6alkenyl, C_7-C_9phenylalkyl or C_1-C_8acyl,

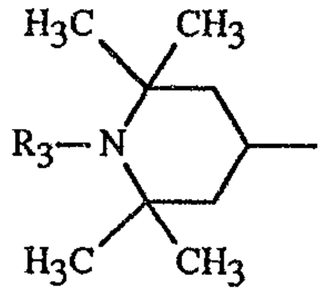
selected from the group consisting of

a) compounds of the formula (II)



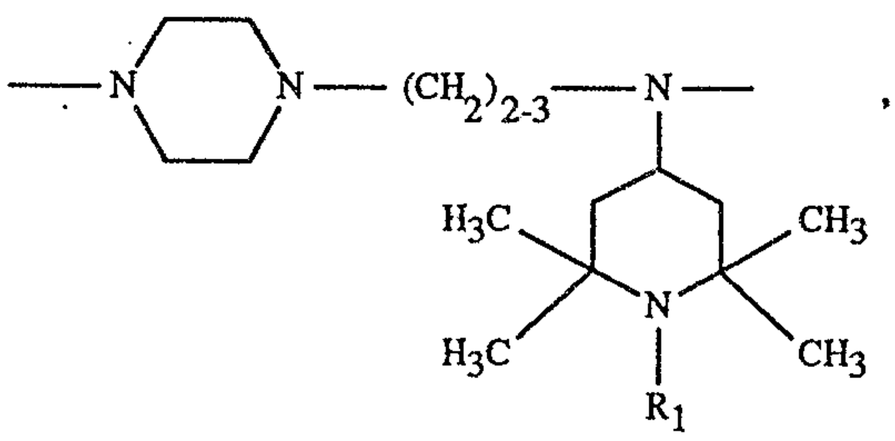
(II)

in which R_1 is as defined above for R, X is -O- or >N-R_2 where R_2 is hydrogen, C_1-C_{18}alkyl, C_2-C_4alkyl substituted in the 2-, 3- or 4-position by OH, by C_1-C_8alkoxy, by di-(C_1-C_4alkyl)amino or by a 5- to 7-membered nitrogenous heterocyclic group with the free valency on the nitrogen atom, C_5-C_{12}cycloalkyl, C_7-C_9phenylalkyl, tetrahydrofurfuryl or a group of the formula (III)

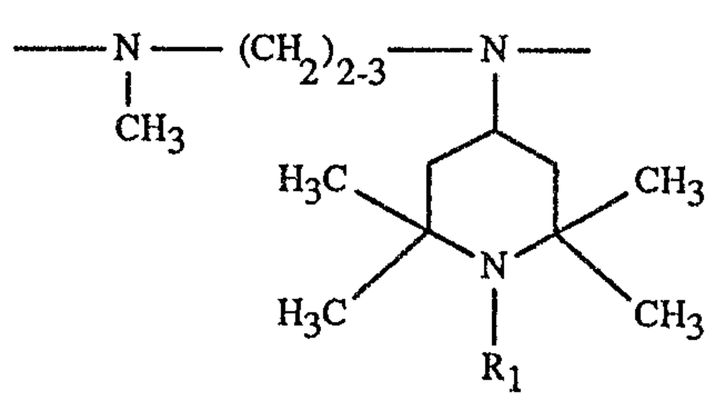


(III)

where R_3 is as defined for R, or X is 1,4-piperazinediyl or a group of the formula (IVa) or (IVb)

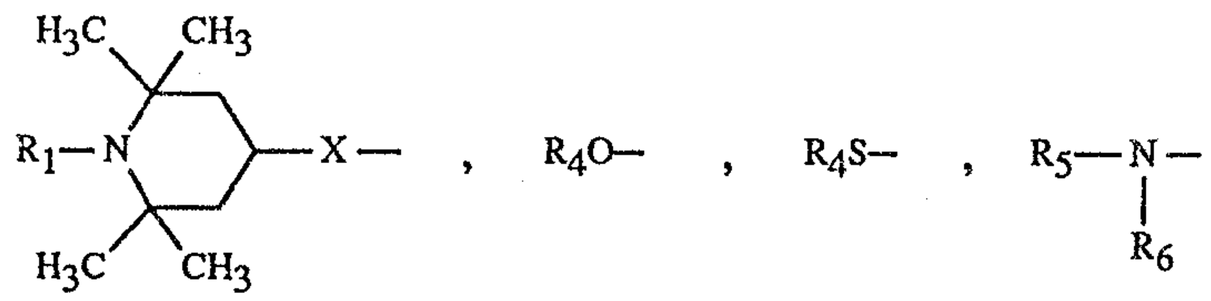


(IVa)

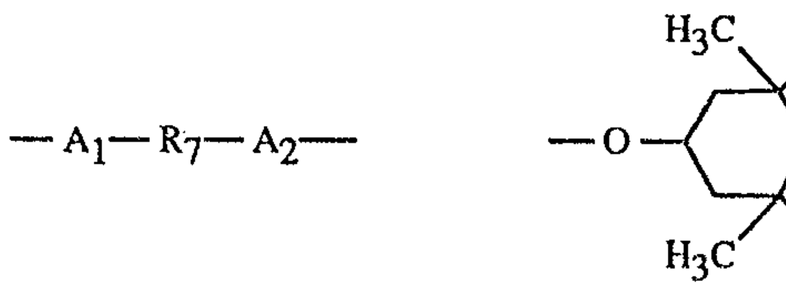


(IVb)

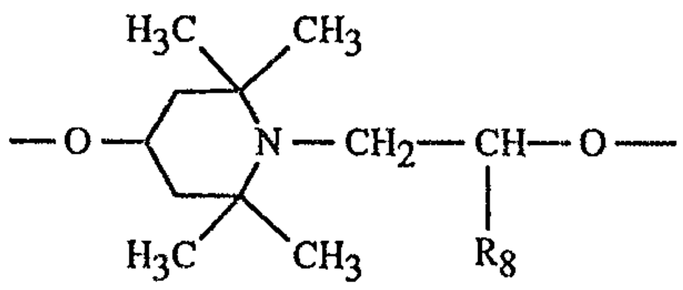
with R_1 being as defined above and with the nitrogen atom substituted by the piperidyl group being bound to the triazine ring, Y is one of the groups



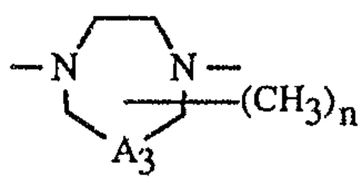
in which R_1 and X are as defined above and R_4, R_5 and R_6 which can be identical or different are as defined for R_2 with the exception of the definition as a group of the formula (III), or they are C_3-C_{18}alkenyl or phenyl which is unsubstituted or mono-, di- or tri-substituted by C_1-C_4alkyl or C_1-C_4alkoxy, or $-\underset{\displaystyle R_5}{\overset{|}{N}}-R_6$ is a 5- to 7-membered nitrogenous heterocyclic group, m is an integer from 1 to 6, and, if m is 1, Z is as defined for Y, and, if m is 2, Z is one of the groups of the formulae (Va)-(Vc)



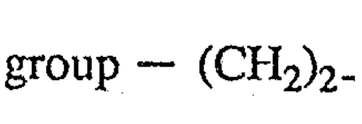
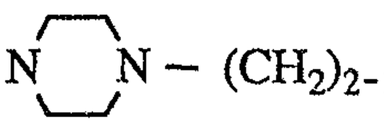
(Va)

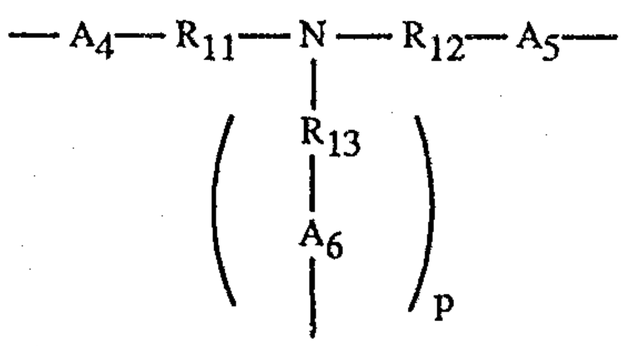


(Vb)

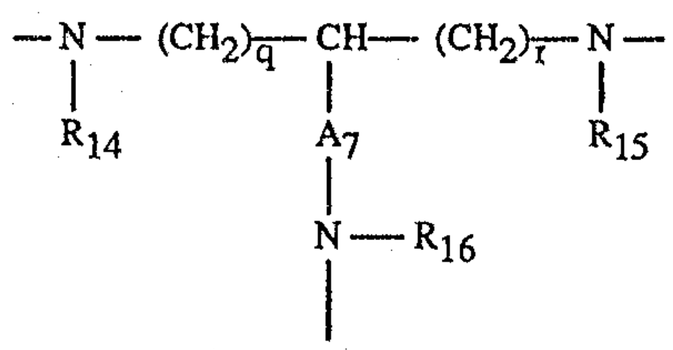


(Vc)

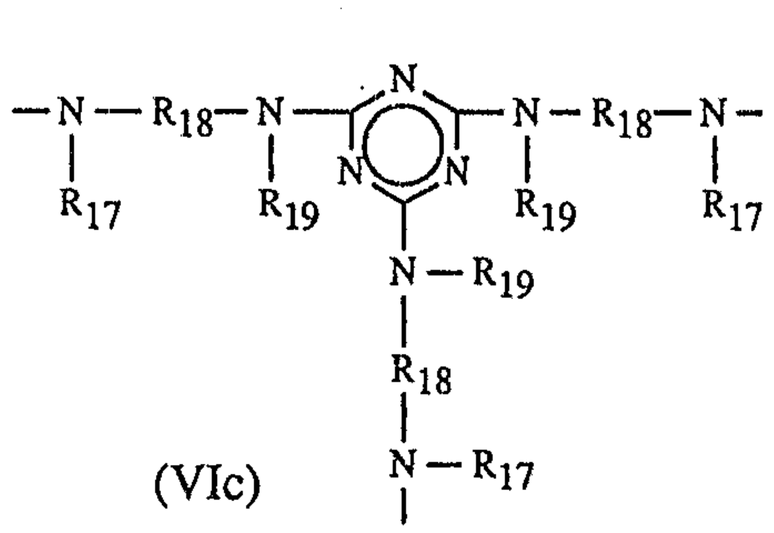
in which A_1 and A_2 which can be identical or different are -O- or >N-R_9 with R_9 being hydrogen, C_1-C_{18}alkyl, C_5-C_{12}cycloalkyl, C_7-C_9phenylalkyl or a group of the formula (III), R_7 is C_2-C_{12}alkylene, cyclohexylene, cyclohexylenedimethylene, methylenedicyclohexylene, isopropylidenedicyclohexylene, phenylene, isopropylidenediphenylene, xylylene or C_4-C_{12}alkylene interrupted by 1, 2 or 3 oxygen atoms or by 1 or 2 >N-R_{10} groups where R_{10} is C_1-C_{18}alkyl, C_5-C_{12}cycloalkyl, C_7-C_9phenylalkyl or a group of the formula (III) or, if A_1 and A_2 both are >N-R_9, R_{10} can also be hydrogen, C_1-C_8acyl or (C_1-C_8alkoxy)-carbonyl, or R_7 or A_1R_7 respectively are a group  or a group  , R_8 is C_1-C_8alkyl, A_3 is a direct bond or CH_2 and n is zero, 1, 2 or 3, and, if m is 3, Z is one of the groups of the formulae (VIa)-(VIe)



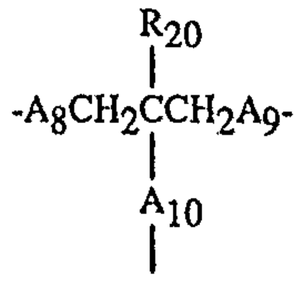
(VIa)



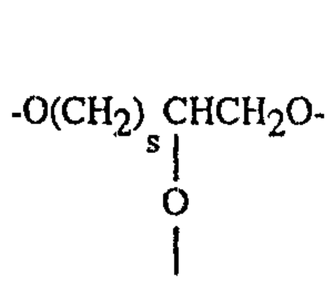
(VIb)



(VIc)



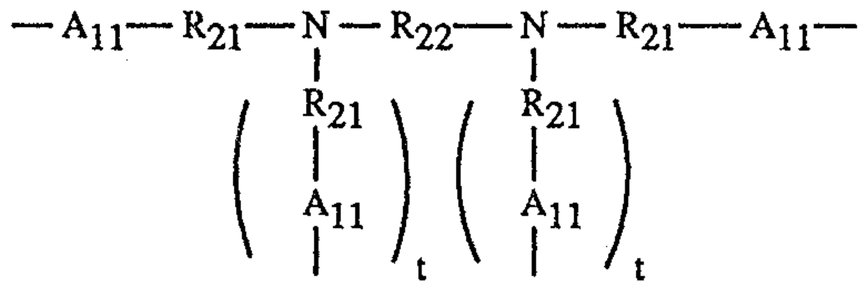
(VId)



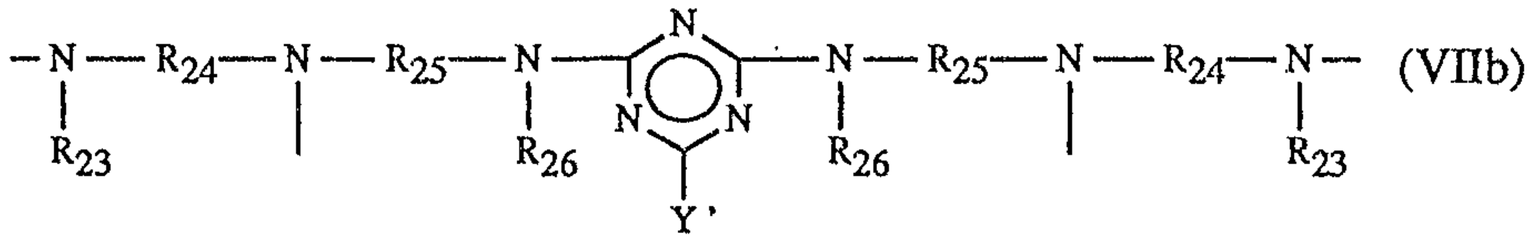
(VIe)

in which A_4, A_5, A_6, A_8, A_9 and A_{10} which can be identical or different are as defined

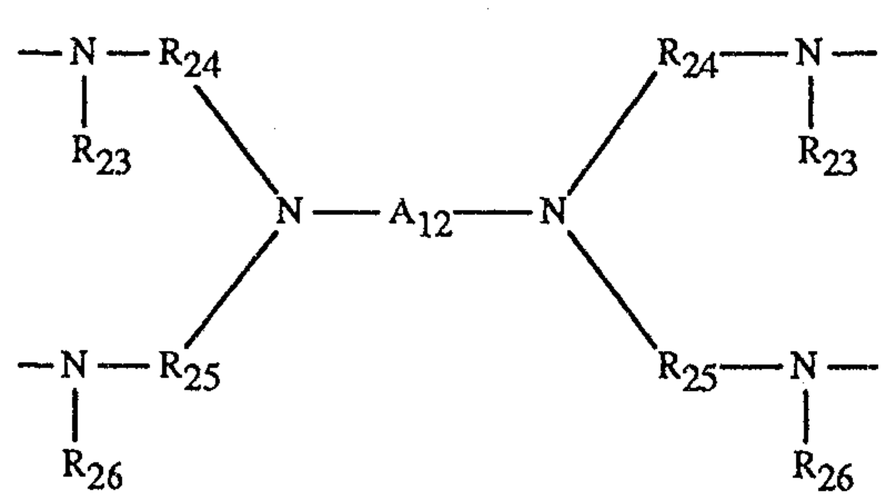
above for A_1 and A_2, and, if A_8 and A_9 both are -O-, A_{10} can also be a -CH_2O- group, R_{11}, R_{12}, R_{13} and R_{18} which can be identical or different are C_2-C_6alkylene, p is zero or 1, R_{14}, R_{15}, R_{16}, R_{17} and R_{19} which can be identical or different are as defined above for R_9, A_7 is a direct bond or -CH_2-, q, r and s which can be identical or different are integers from 2 to 6 and R_{20} is hydrogen or C_1-C_8alkyl, and, if m is 4, Z is one of the groups of the formulae (VIIa)-(VIId)



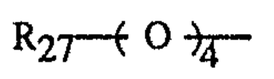
(VIIa)



(VIIb)

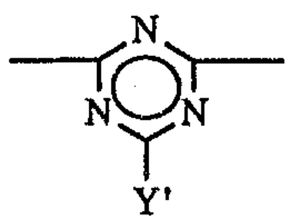


(VIIc)



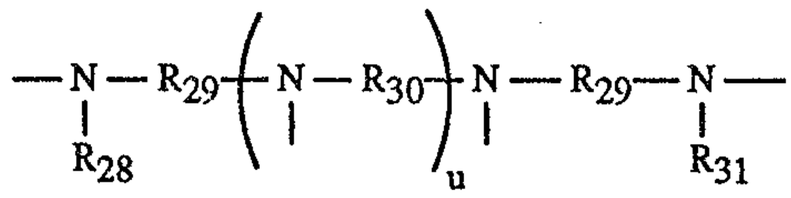
(VIId)

in which A_{11} is as defined above for A_1 and A_2, R_{21}, R_{22}, R_{24} and R_{25} which can be identical or different are C_2-C_6alkylene, t is zero or 1, R_{23} and R_{26} which can be identical or different are as defined above for R_9, Y' is as defined for Y, A_{12} is 2-hydroxytrimethylene, -CH_2CO-, xylylene, aliphatic or aromatic diacyl having not more than 12 carbon atoms, a group -$COO(CH_2)_{4-6}OOC$- or a group of the formula (VIII)



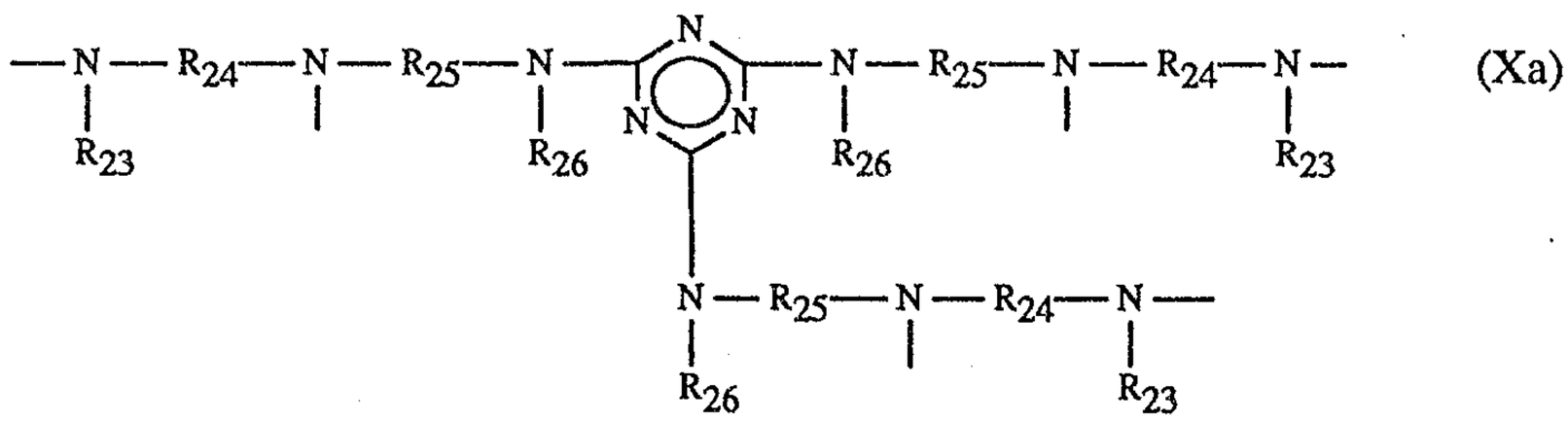
(VIII)

where Y' is as defined above, and R_{27} is C_4-C_{12}alkanetetrayl, and, if m is 5 or 6, Z is a group of the formula (IX)

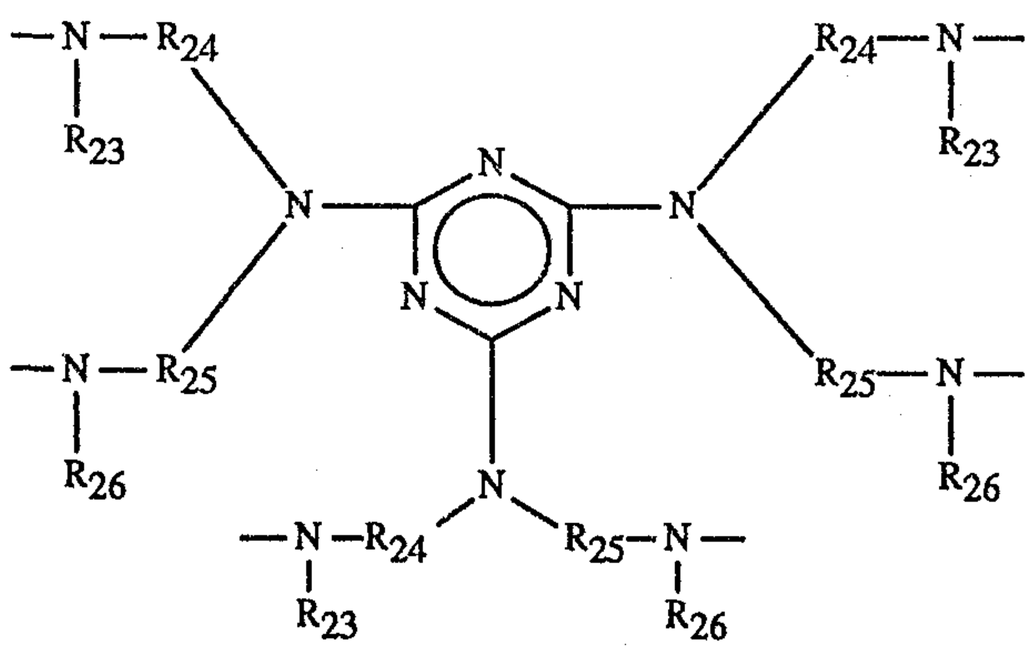


(IX)

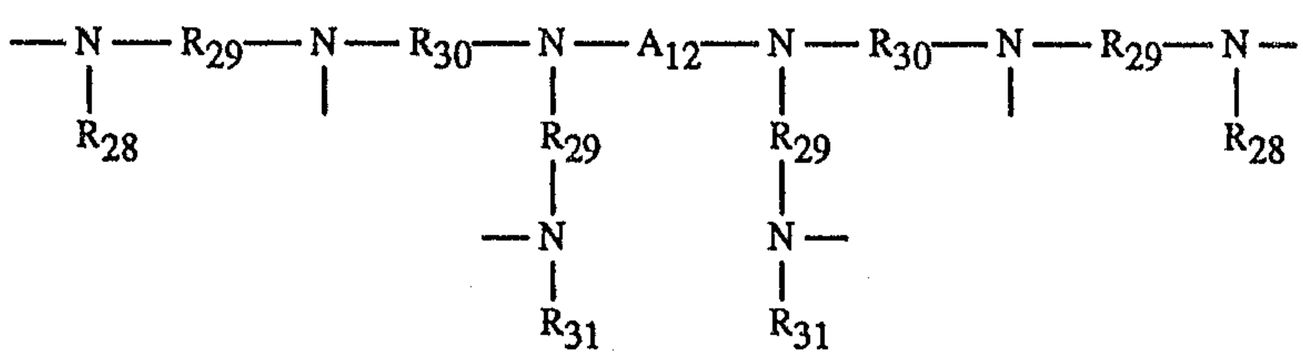
in which R_{28} and R_{31} which can be identical or different are as defined above for R_9, R_{29} and R_{30} which can be identical or different are C_2-C_6alkylene and u is 2 or 3, and, if m is 6, Z is also a group of the formulae (Xa)-(Xc)



(Xa)



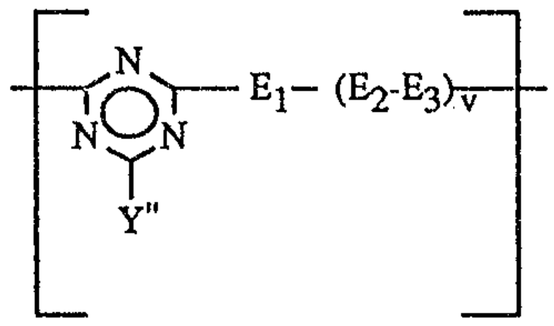
(Xb)



(Xc)

with R_{23}, R_{24}, R_{25}, R_{26}, R_{28}, R_{29}, R_{30}, R_{31} and A_{12} being as defined above;

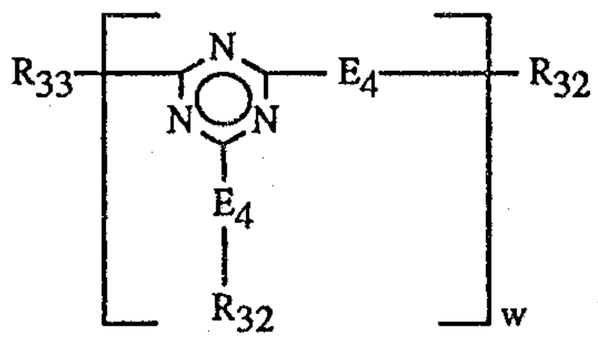
b) oligomers having a molecular weight between 1,000 and 10,000 and containing recurring units of the formula (XI)



(XI)

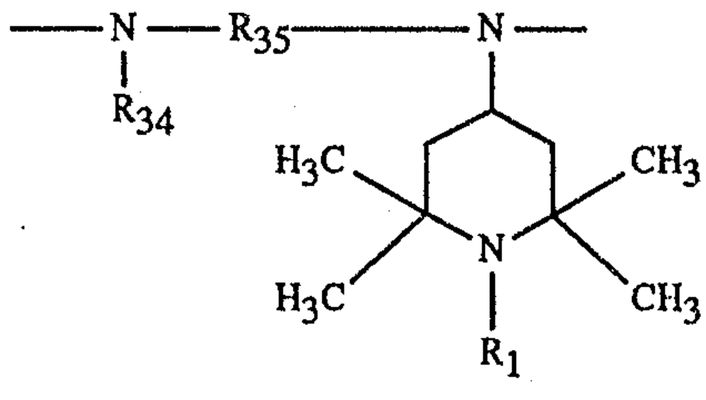
in which Y" is as defined above for Y, E_1 and E_3 which can be identical or different are groups of the formulae (Va)-(Vc), E_2 is as defined above for A_{12} and v is zero, 1, 2, 3 or 4, with the proviso that at least one group of the formula (III) must be present in each recurring unit of the formula (XI);

c) oligomers of the formula (XII)

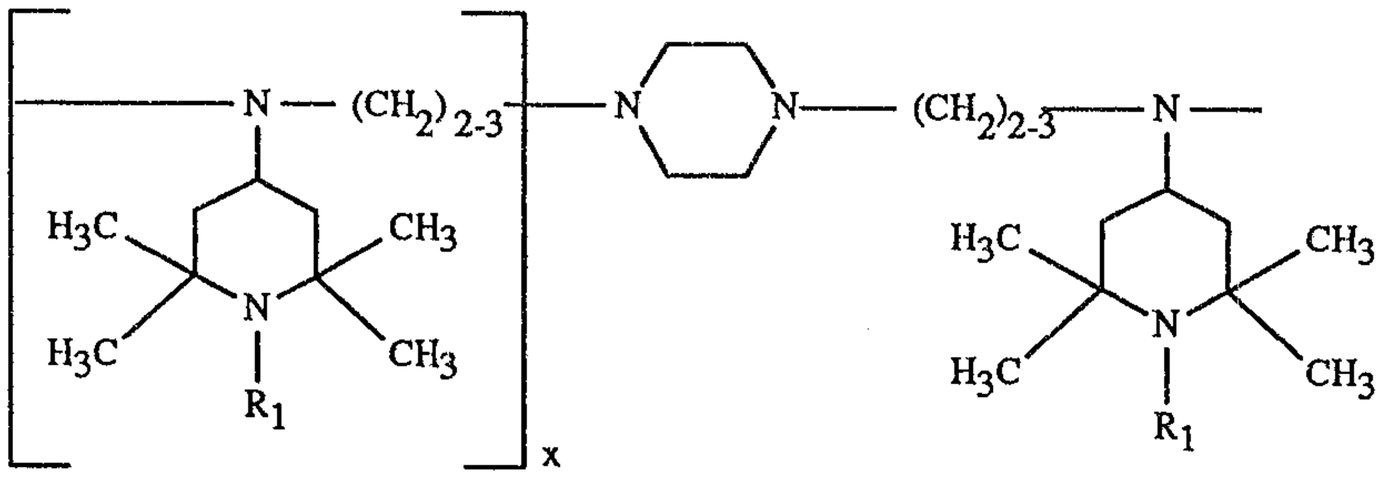


(XII)

in which R_{32} is hydrogen, C_1-C_8alkyl, C_3-C_6alkenyl, C_7-C_9phenylalkyl, C_1-C_8acyl or (C_1-C_8alkoxy)-carbonyl, E_4 is a group of the formula (XIIIa) or (XIIIb)

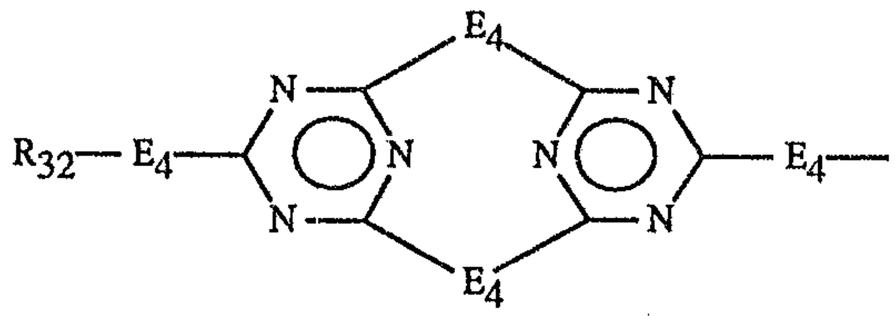


(XIIIa)



(XIIIb)

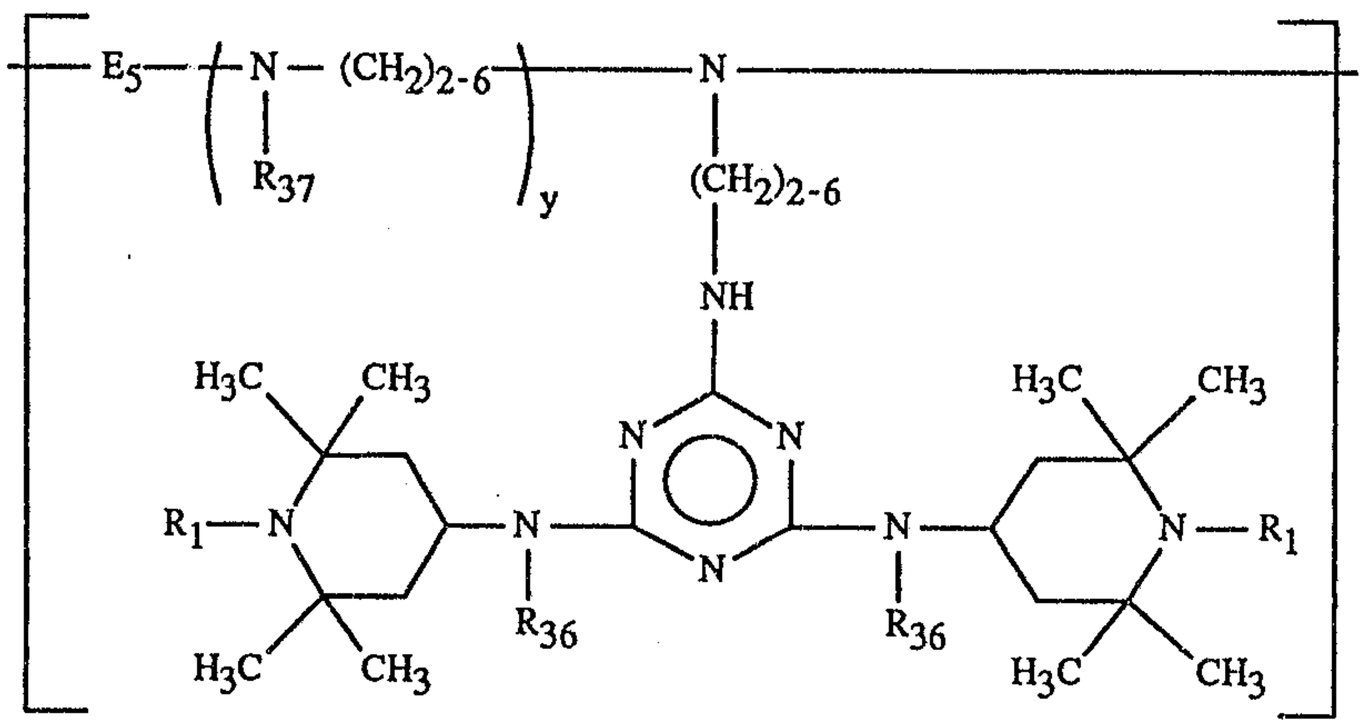
in which R_{34} is as defined above for R_9, R_{35} is C_2-C_{12}alkylene, cyclohexylene, cyclohexylenedimethylene, methylenedicyclohexylene, xylylene or C_4-C_{12}alkylene interrupted by 1, 2 or 3 oxygen atoms or by a group >N-CH_3, R_1 is as defined above and x is zero or 1, R_{33} is OH, ONa, OK, C_1-C_8alkoxy, C_3-C_6alkenyloxy, C_7-C_9phenylalkoxy, C_1-C_8acyloxy, a group R_{32}-E_4- or a group of the formula (XIV)



(XIV)

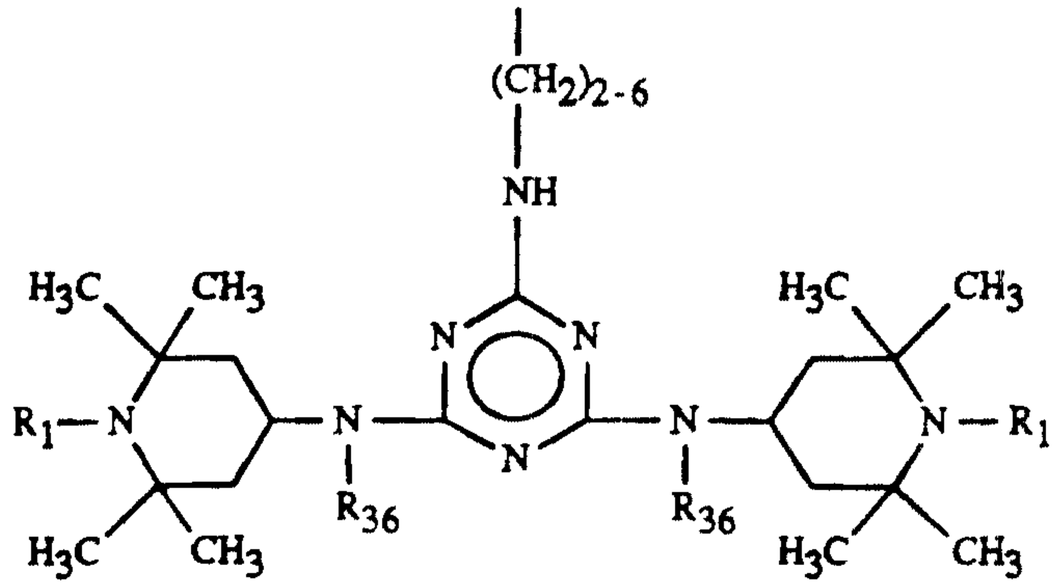
and w is a number from 1 to 20;

d) oligomers having a molecular weight between 1,000 and 10,000 and containing recurring units of the formula (XV)



(XV)

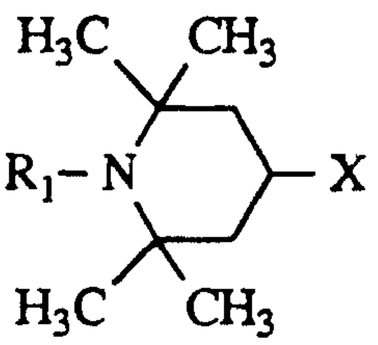
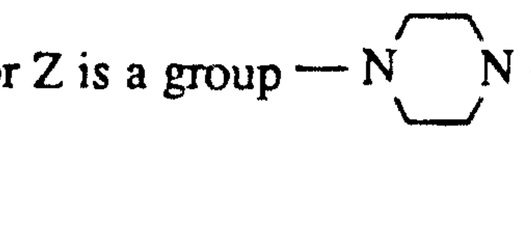
in which R_1 is as defined above, R_{36} is as defined above for R_2, R_{37} is hydrogen, C_1-C_{18}alkyl, a group of the formula (III) or a group of the formula (XVI)



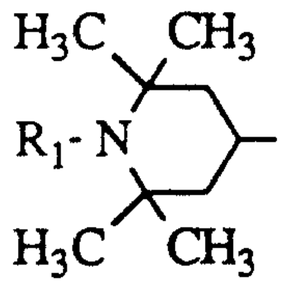
(XVI)

y is zero or 1 and E_5 is as defined above for E_2 or C_2-C_6alkylene , and

B) between 0.005 and 1 % by weight, relative to the weight of the polypropylene, of one or more oxides and hydroxides of Mg, Ca, Ba, Zn, Al and Sn.

2. The stabiliser composition according to claim 1, wherein the compound (A) containing groups of the formula (I) is selected from the group comprising compounds of the formula (II) in which R_1 is hydrogen, methyl, allyl, benzyl or acetyl, X is -O- or >N-R_2, R_2 is hydrogen, C_1-C_{12}alkyl, C_2-C_3alkyl substituted in the 2- or 3-position by C_1-C_4alkoxy, by dimethylamino, by diethylamino or by 4-morpholinyl, cyclohexyl, benzyl, tetrahydrofurfuryl or a group of formula (III) with R_3 being as defined above for R_1, Y is a group  , m is an integer from 2 to 6 and, if m is 2, Z is a group of the formula (Va) in which A_1 and A_2 are >N-R_9 with R_9 being hydrogen, C_1-C_{12}alkyl, cyclohexyl, benzyl or a group of the formula (III), R_7 is C_2-C_6alkylene, cyclohexylenedimethylene, methylenedicylohexylene, xylylene or C_4-C_{10}alkylene interrupted by 1 or 2 oxygen atoms or by 1 or 2 >N-R_{10} groups where R_{10} is hydrogen, C_1-C_{12}alkyl, cyclohexyl, benzyl, a group of the formula (III), C_1-C_4acyl or (C_1-C_4alkoxy)-carbonyl, or Z is a group  , and, if m is 3, Z is a group of the formula (VIa) in which A_4 and A_5 are as defined above for A_1 and A_2, R_{11} and R_{12} which can be identical or different are C_2-C_6alkylene and p is zero, and, if m is 4, Z is a group of the formula (VIIa) or (VIIc) in which A_{11} is as defined above for A_1 and

A_2, R_{21}, R_{22}, R_{24} and R_{25} which can be identical or different are C_2-C_6alkylene, t is zero, R_{23} and R_{26} are as defined above for R_9 and A_{12} is aliphatic or aromatic diacyl having not more than 10 carbon atoms or a group -$COO(CH_2)_{4-6}OOC$-, and, if m is 5 or 6, Z is a group of the formula (IX) in which R_{28} and R_{31} are as defined above for R_9, R_{29} and R_{30} which can be identical or different are C_2-C_6alkylene and u is 2 or 3, and, if m is 6, Z is also a group of the formula (Xc) with R_{28}, R_{29}, R_{30}, R_{31} and A_{12} being as defined above; oligomers having a molecular weight between 1,000 and 5,000 and containing recurring units of the formula (XI) in which Y" is one of the groups

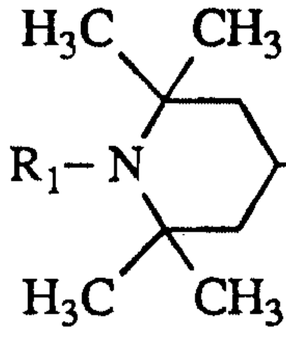


, R_4O- and where R_1 and X are as defined above, and

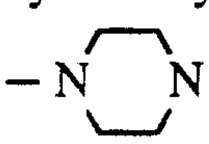
R_4, R_5 and R_6 which can be identical or different are as defined above for R_2, or is

4-morpholinyl, E_1 and E_3 which can be identical or different are groups of the formulae (Va)-(Vc) where A_1, A_2 and R_7 are as defined above, R_8 is hydrogen or methyl, A_3 is a direct bond and n is zero, E_2 is 2-hydroxytrimethylene, aliphatic or aromatic diacyl having not more than 10 carbon atoms, a group -$COO(CH_2)_{4-6}OOC$- or a group of the formula (VIII) where Y' is as defined for Y" and v is zero, 1 or 2, with the proviso that at least one group of the formula (III) must be present in each recurring unit of the formula (XI); oligomers of the formula (XII) in which R_{32} is hydrogen, C_1-C_4alkyl, C_1-C_4acyl or (C_1-C_4alkoxy)-carbonyl, E_4 is a group of the formula (XIIIa) or (XIIIb) in which R_{34} is as defined above for R_9, R_{35} is C_2-C_6alkylene, cyclohexylenedimethylene, methylenedicyclohexylene or C_4-C_{10}alkylene interrupted by 1 or 2 oxygen atoms or by an >N-CH_3 group, R_1 is as defined above and x is zero or 1, R_{33} is OH, ONa, OK, C_1-C_4alkoxy, C_1-C_4acyloxy, a group R_{32}-E_4- or a group of the formula (XIV) and w is a number from 1 to 10; oligomers having a molecular weight between 1000 and 5000 and containing recurring units of the formula (XV) in which R_1 is as defined above, R_{36} is as defined above for R_2, R_{37} is hydrogen, C_1-C_{12}alkyl, a group of the formula (III) or a group of the formula (XVI), y is 1 and E_5 is as defined above for E_2 or C_2-C_6alkylene.

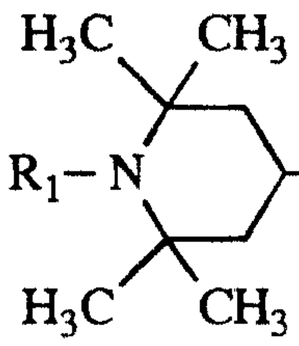
3. The stabiliser composition according to claim 1, wherein the compound (A) containing groups of the formula (I) is selected from a) the group comprising the compounds of the formula (II) in which R_1 is hydrogen or methyl, X is >N-R_2, R_2 is C_1-C_8alkyl, 2,2,6,6-tetramethyl-4-piperidyl or 1,2,2,6,6-pentamethyl-4-piperidyl, Y is a group



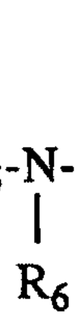
, m is 2, 3 or 4 and, if m is 2, Z is a group of the formula (Va) in which A_1 and A_2 are >N-R_9 with R_9 being hydrogen, C_1-C_4alkyl, 2,2,6,6-tetramethyl-4-piperidyl, or 1,2,2,6,6-pentamethyl-4-piperidyl, R_7 is C_2-C_6alkylene, cyclohexylenedimethylene, methylenedicyclohexylene, xylylene or C_4-C_{10}alkylene interrupted by 1 or 2 oxygen atoms or by an >N-R_{10} group where R_{10} is hydrogen, methyl, cyclohexyl, benzyl, C_1-C_4acyl or (C_1-C_4alkoxy)-carbonyl, or Z is a group



, and, if m is 3, Z is a group of the formula (VIa) in which A_4 and A_5 are as defined above for A_1 and A_2, R_{11} and R_{12} which can be identical or different are C_2-C_6alkylene and p is zero, and, if m is 4, Z is a group of the formula (VIIa) or (VIIc) in which A_{11} is as defined above for A_1 and A_2, R_{21}, R_{22}, R_{24} and R_{25} which can be identical or different are C_2-C_6alkylene, t is zero, R_{23} and R_{26} are as defined above for R_9 and A_{12} is aliphatic C_2-C_{10}diacyl or a group -COO(CH_2)$_{4-6}$OOC; b) oligomers having a molecular weight between 1,500 and 5,000 and containing recurring units of the formula (XI) in which Y" is one of the groups



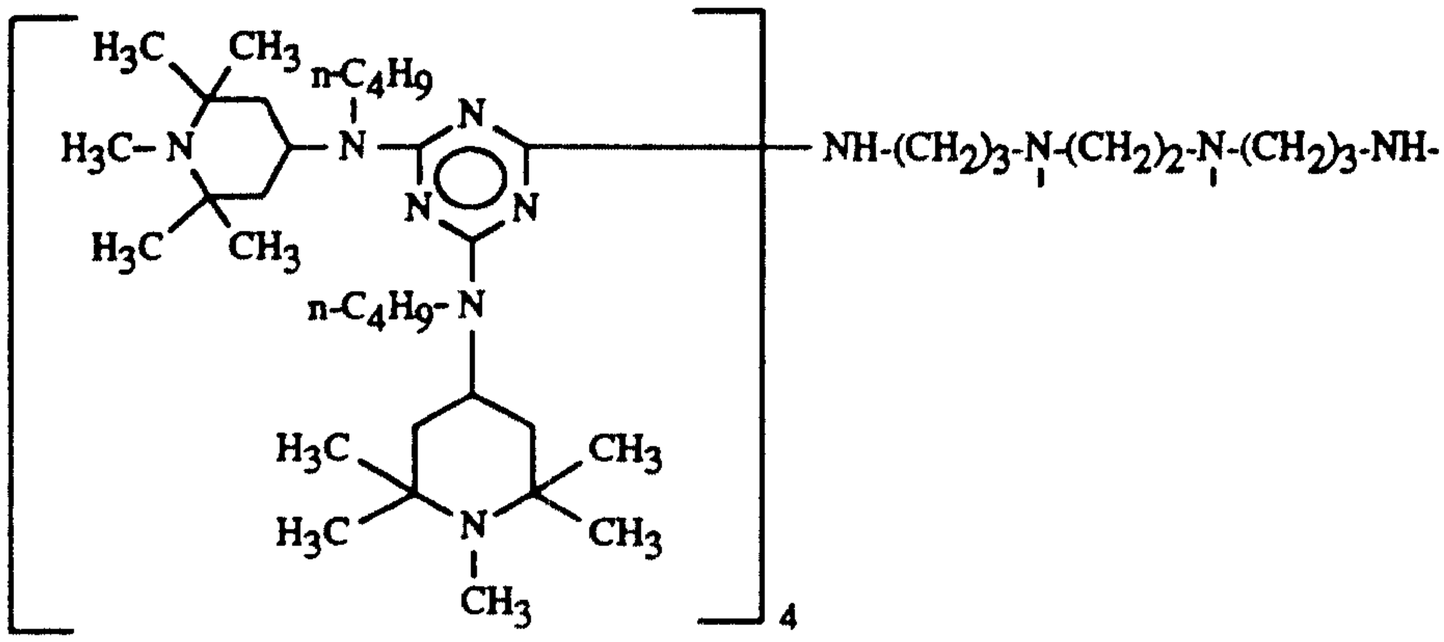
or



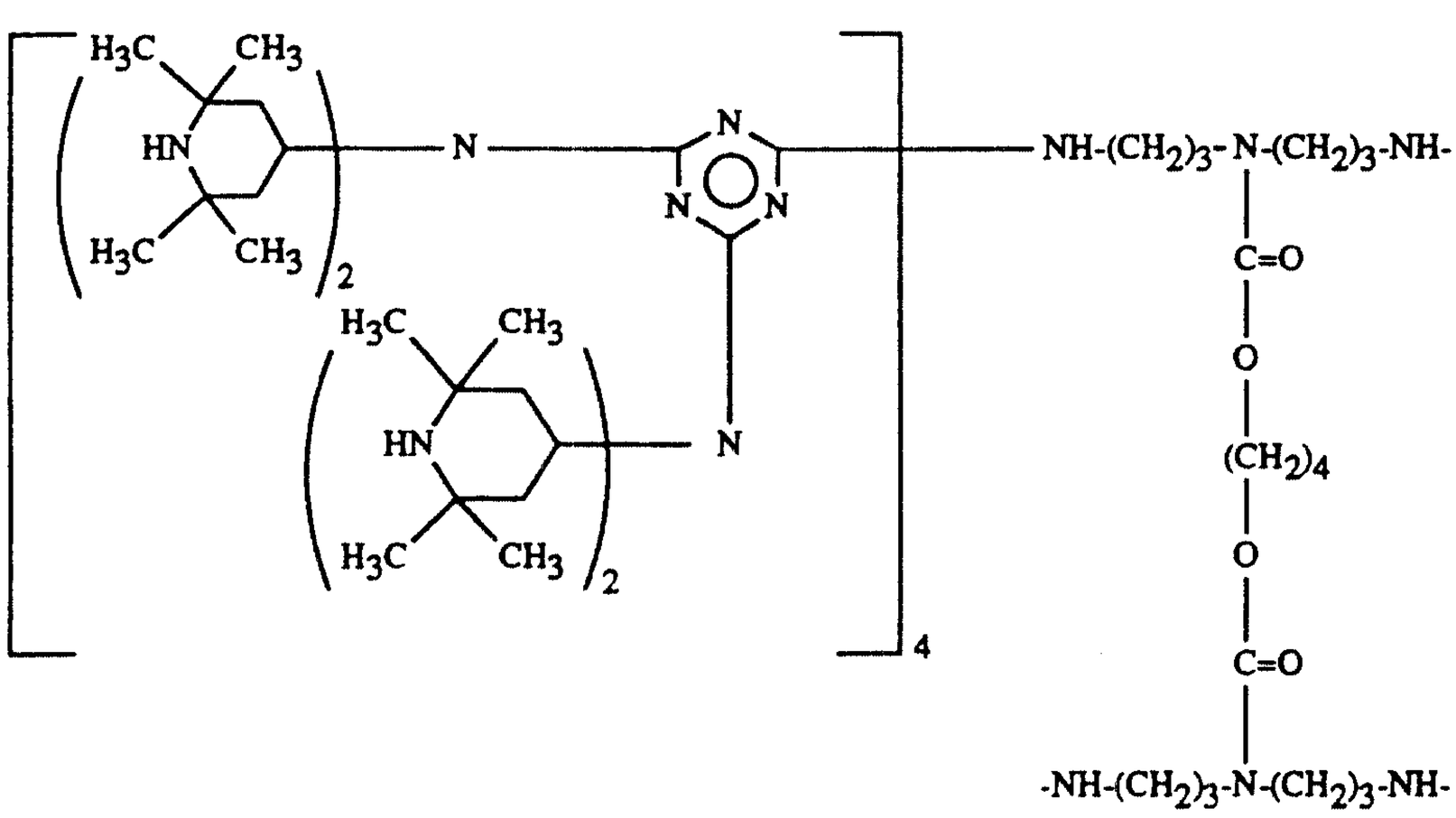
where R_1 and X are as defined above and R_5 and R_6 which can be identical or different are C_1-C_8alkyl, or R_5 can also be hydrogen, or

is 4-morpholinyl, E_1 is a group of the formula (Va) as defined above and v is zero, with the proviso that at least one group of the formula (III) must be present in each recurring unit of the formula (XI); oligomers of the formula (XII) in which R_{32} is hydrogen, methyl, acetyl or (C_1-C_2alkoxy)-carbonyl, E_4 is a group of the formula (XIIIa) in which R_{34} is 2,2,6,6-tetramethyl-4-piperidyl or 1,2,2,6,6-pentamethyl-4-piperidyl, R_{35} is C_2-C_6alkylene or C_8-C_{10}alkylene interrupted by 2 oxygen atoms, R_1 is as defined above, R_{33} is a group R_{32}-E_4- or a group of the formula (XIV) and w is a number from 1 to 5; c) oligomers having a molecular weight between 1,500 and 5,000 and containing recurring units of formula (XV) in which R_1 is as defined above, R_{36} is as defined above for R_2, R_{37} is hydrogen or a group of the formula (XVI), y is 1 and E_5 is C_2-C_4alkylene.

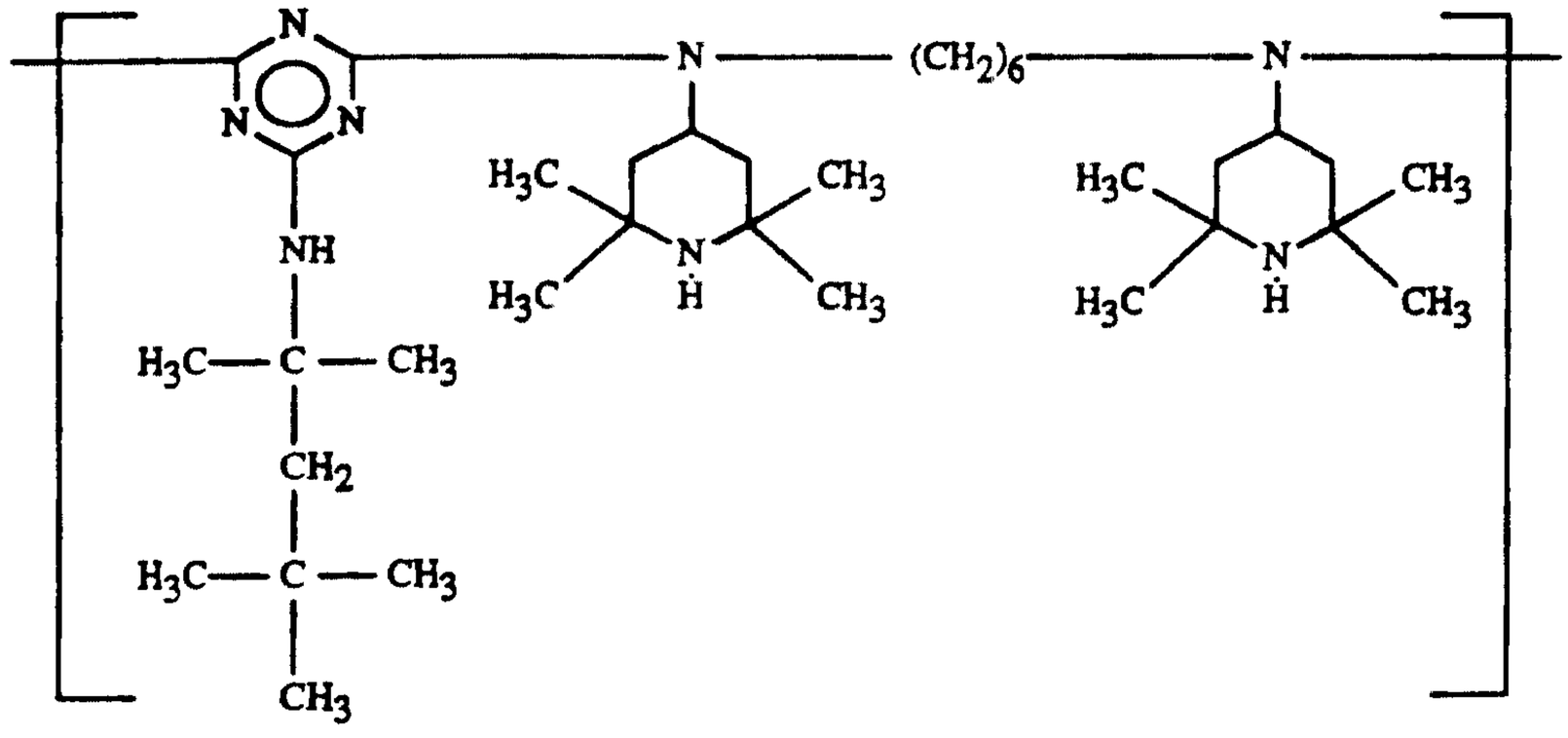
4. The stabiliser composition according to claim 1, wherein the compound (A) is that of the formula



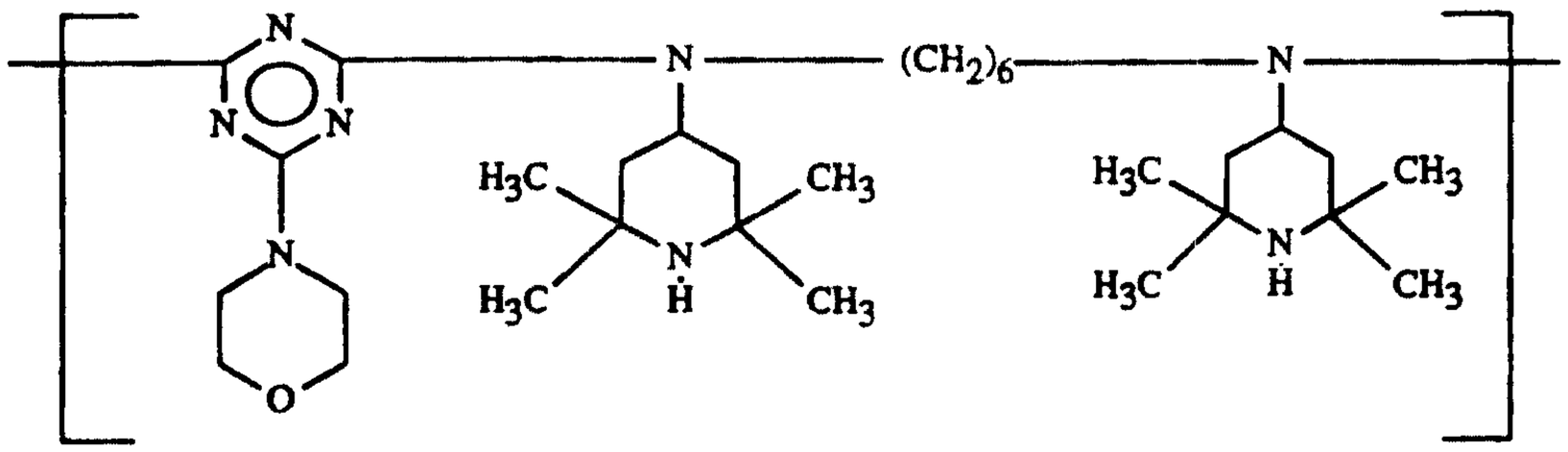
5. The stabiliser composition according to claim 1, wherein the compound (A) is that of the formula



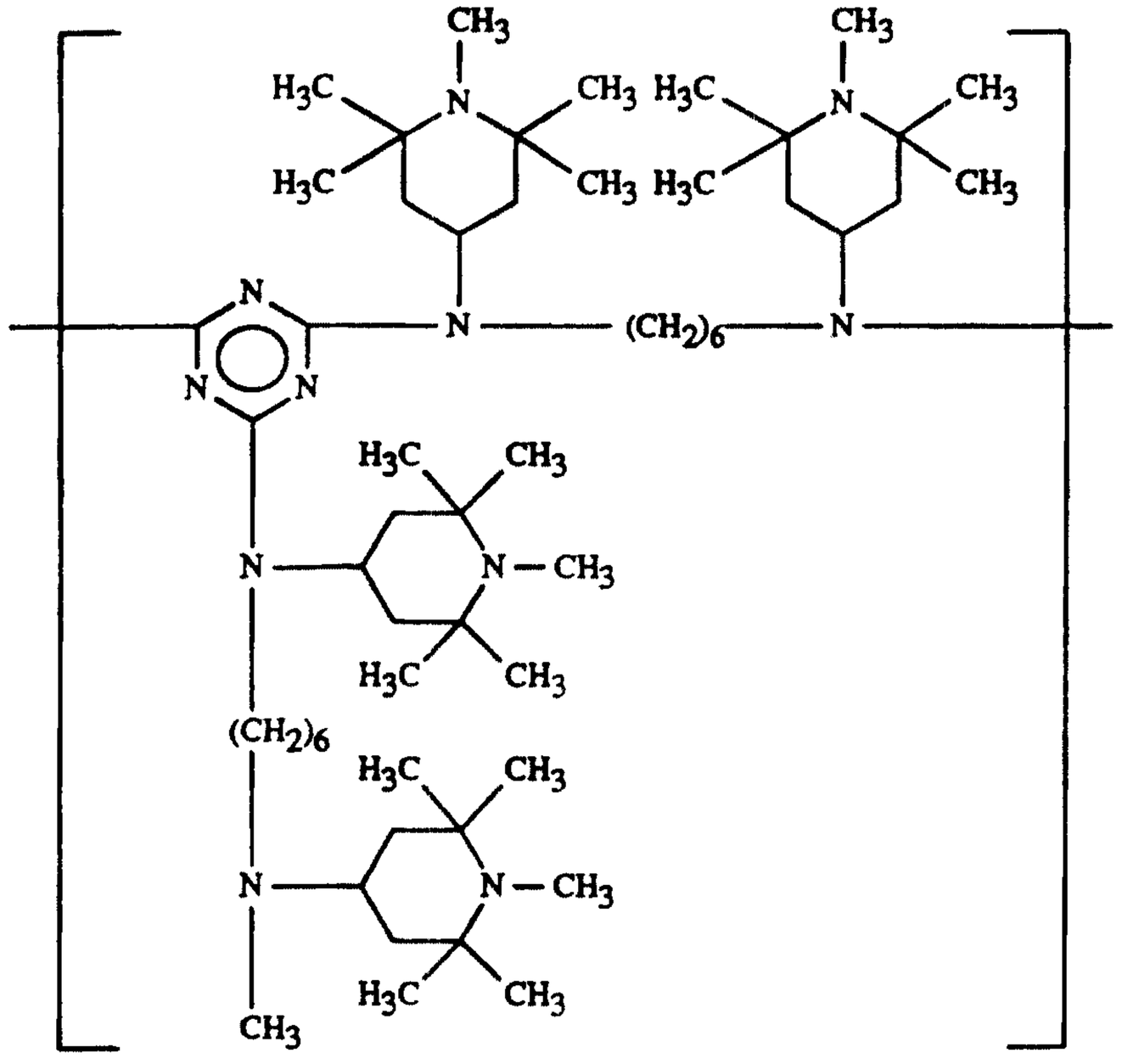
6. The stabiliser composition according to claim 1, wherein the compound (A) is an oligomer having a molecular weight of 1500 to 4000 containing recurring units of the formula



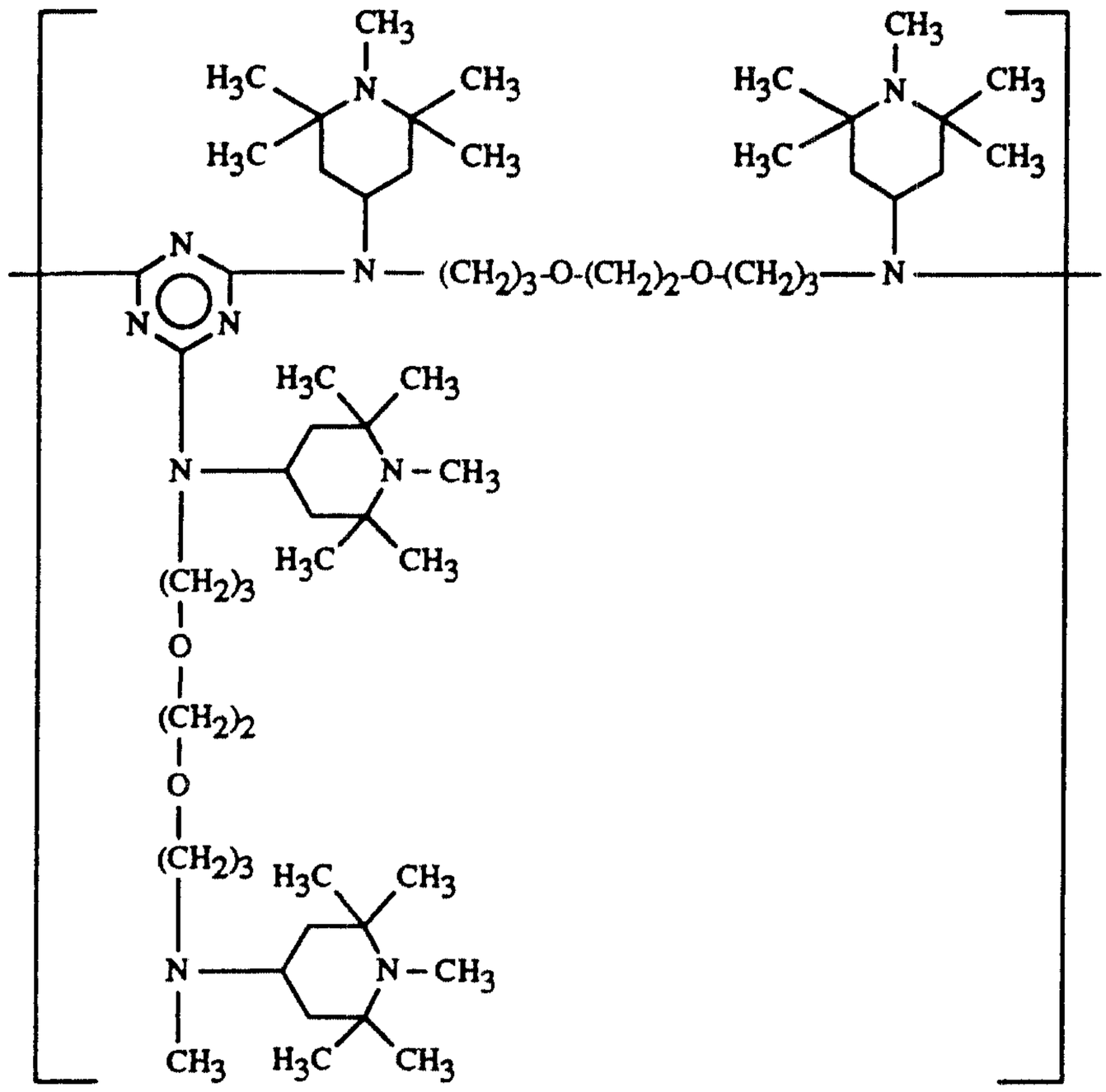
7. The stabiliser composition according to claim 1, wherein the compound (A) is an oligomer having a molecular weight of 1500 to 4000 containing recurring units of the formula



8. The stabiliser composition according to claim 1, wherein the compound (A) is an oligomer having a molecular weight of 1500 to 4000 containing recurring units of the formula

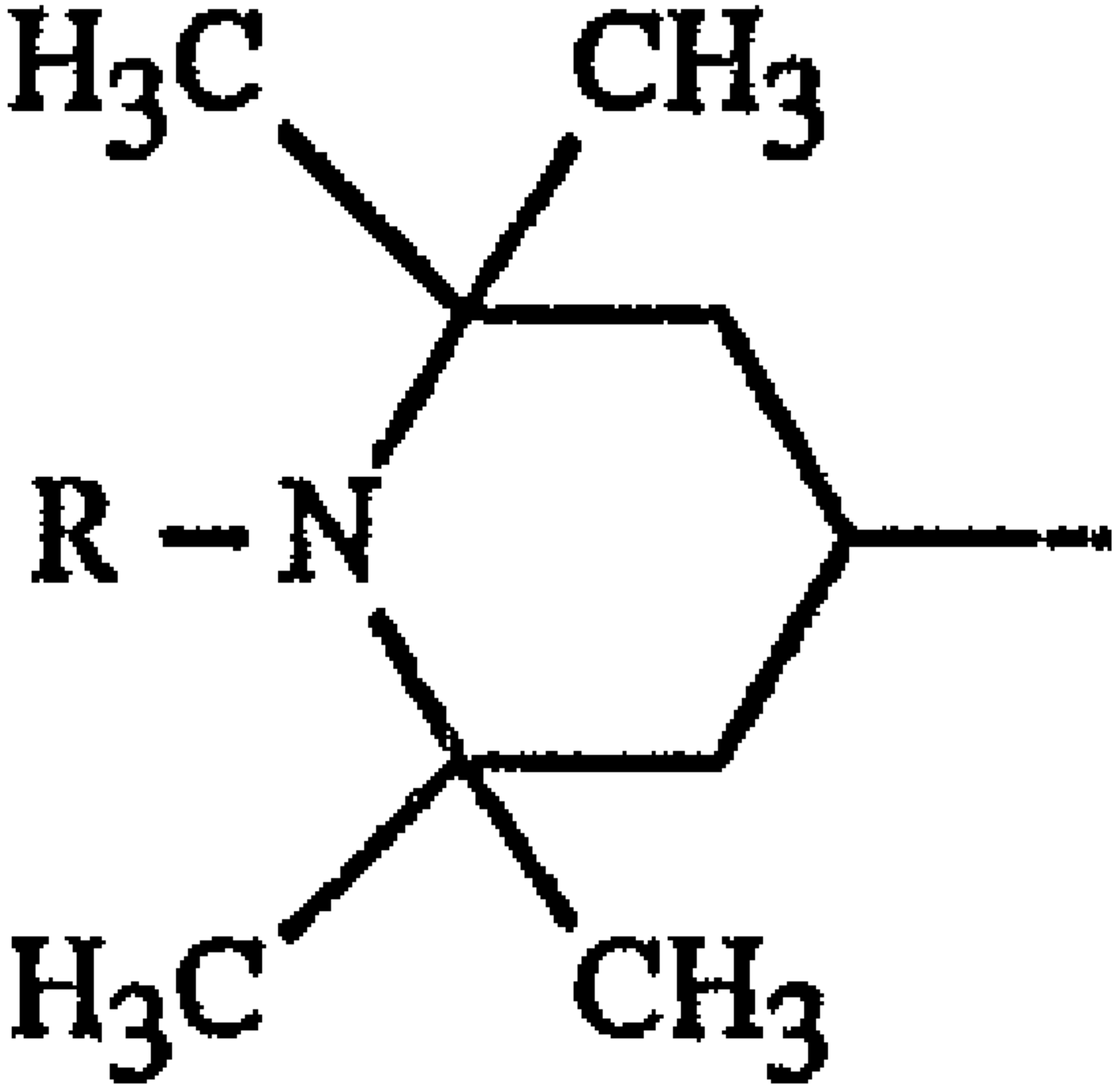


9. The stabiliser composition according to claim 1, wherein the compound (A) is an oligomer having a molecular weight of 1500 to 4000 containing recurring units of the formula



10. The stabiliser composition according to claim 1 wherein the compound B is magnesium oxide or zinc oxide.

11. The stabiliser composition according to claim 1 wherein the weight ratio of A:B is from 1:0.1 to 1:2.



(I)