PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 :
C07C 309/24, 49/683, C07D 233/96, A61K 7/42

A1

(11) International Publication Number: **WO 00/20384**

(43) International Publication Date: 13 April 2000 (13.04.00)

(21) International Application Number: PCT/EP99/06985

(22) International Filing Date: 21 September 1999 (21.09.99)

(30) Priority Data:
98810992.2 2 October 1998 (02.10.98) EP

(71) Applicant *(for all designated States except US)*: CIBA SPECIALTY CHEMICALS HOLDING INC. [CH/CH]; Klybeckstrasse 141, CH–4057 Basel (CH).

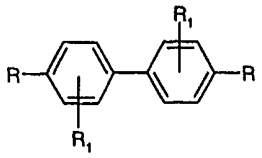
(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: ZINK, Rudolf [CH/CH]; Nelkenstrasse 19, CH–4106 Therwil (CH). REINEHR, Dieter [DE/DE]; Wolfsheule 10, D–79400 Kandern (DE). LUTHER, Helmut [DE/DE]; Tüllingerweg 3a, D–79639 Grenzach–Wyhlen (DE). HERZOG, Bernd [DE/DE]; Hornrain 21, D–79639 Grenzach–Wyhlen (DE).

(74) Common Representative: CIBA SPECIALTY CHEMICALS HOLDING INC.; Patentabteilung, Klybeckstrasse 141, CH–4057 Basel (CH).

(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published
With international search report.

(54) Title: DIPHENYL COMPOUNDS SUBSTITUTED BY CAMPHOR OR HYDANTOIN DERIVATIVES AS SUNSCREEN COMPOSITIONS



(1)

(57) Abstract

A description is given of diphenyl compounds of formula (1) wherein R is a camphor or hydantoin derivative; and R_1 is hydrogen; or C_1–C_5alkyl. These compounds are suitable as light stabilisers in cosmetic, pharmaceutical and veterinary formulations.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	**ES**	Spain	**LS**	Lesotho	**SI**	Slovenia
AM	Armenia	**FI**	Finland	**LT**	Lithuania	**SK**	Slovakia
AT	Austria	**FR**	France	**LU**	Luxembourg	**SN**	Senegal
AU	Australia	**GA**	Gabon	**LV**	Latvia	**SZ**	Swaziland
AZ	Azerbaijan	**GB**	United Kingdom	**MC**	Monaco	**TD**	Chad
BA	Bosnia and Herzegovina	**GE**	Georgia	**MD**	Republic of Moldova	**TG**	Togo
BB	Barbados	**GH**	Ghana	**MG**	Madagascar	**TJ**	Tajikistan
BE	Belgium	**GN**	Guinea	**MK**	The former Yugoslav Republic of Macedonia	**TM**	Turkmenistan
BF	Burkina Faso	**GR**	Greece			**TR**	Turkey
BG	Bulgaria	**HU**	Hungary	**ML**	Mali	**TT**	Trinidad and Tobago
BJ	Benin	**IE**	Ireland	**MN**	Mongolia	**UA**	Ukraine
BR	Brazil	**IL**	Israel	**MR**	Mauritania	**UG**	Uganda
BY	Belarus	**IS**	Iceland	**MW**	Malawi	**US**	United States of America
CA	Canada	**IT**	Italy	**MX**	Mexico	**UZ**	Uzbekistan
CF	Central African Republic	**JP**	Japan	**NE**	Niger	**VN**	Viet Nam
CG	Congo	**KE**	Kenya	**NL**	Netherlands	**YU**	Yugoslavia
CH	Switzerland	**KG**	Kyrgyzstan	**NO**	Norway	**ZW**	Zimbabwe
CI	Côte d'Ivoire	**KP**	Democratic People's Republic of Korea	**NZ**	New Zealand		
CM	Cameroon			**PL**	Poland		
CN	China	**KR**	Republic of Korea	**PT**	Portugal		
CU	Cuba	**KZ**	Kazakstan	**RO**	Romania		
CZ	Czech Republic	**LC**	Saint Lucia	**RU**	Russian Federation		
DE	Germany	**LI**	Liechtenstein	**SD**	Sudan		
DK	Denmark	**LK**	Sri Lanka	**SE**	Sweden		
EE	Estonia	**LR**	Liberia	**SG**	Singapore		

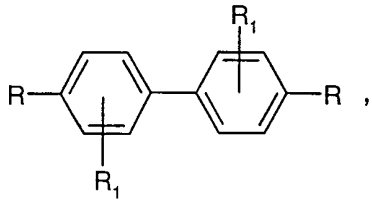
DIPHENYL COMPOUNDS SUBSTITUTED BY CAMPHOR OR HYDANTOIN DERIVATIVES AS SUNSCREEN COMPOSITIONS

The present invention relates to diphenyl compounds, to a process for their preparation and to their use as light stabilisers.

Benzylidene camphors and their use as sunscreens in cosmetics are known, for example, from EP-A-0,693,471 and EP-A-0,370,867.

Surprisingly, it has now been found that reaction products of diphenylbisaldehyde and camphor and hydantoin compounds have pronounced photostability.

Accordingly, this invention relates to diphenyl compounds of formula

(1) 

,

wherein

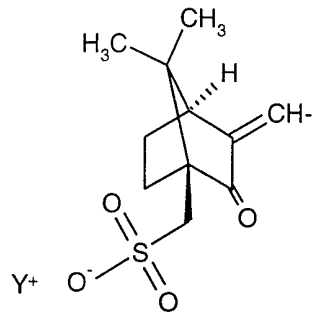
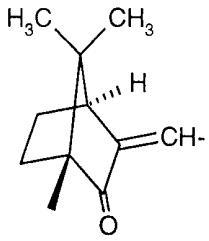
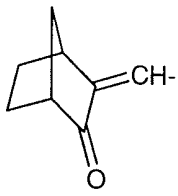
R is a camphor or hydantoin derivative; and

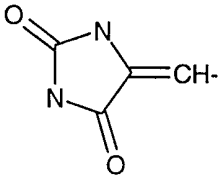
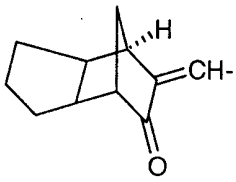
R_1 is hydrogen; or C_1-C_5alkyl.

C_1-C_5Alkyl is straight-chain or branched alkyl radicals, such as methyl, ethyl, n-propyl, isopropyl, n-butyl, sec-butyl, tert-butyl, amyl, isoamyl or tert-amyl.

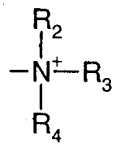
Preferred diphenyl compounds are those of formula (1), wherein

R is a radical of formulae

(1a)  ; (1b)  ; (1c)  ;

(1d)  ; or (1e)  .

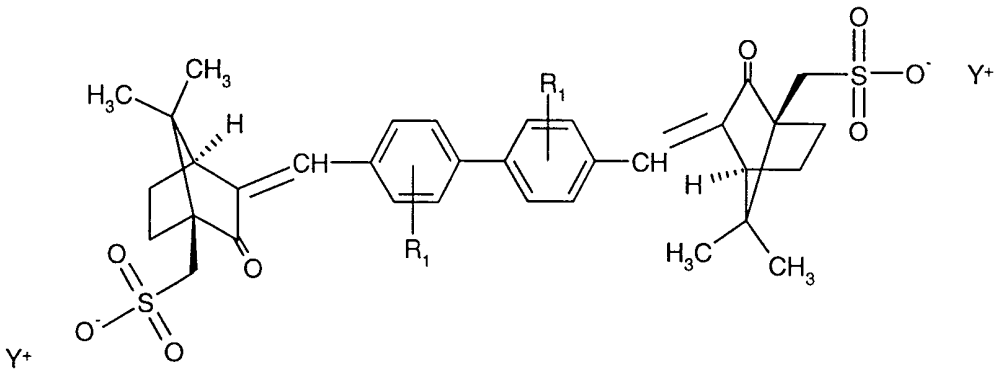
In these formulae

Y^+ is hydrogen; alkali metal; alkaline earth metal, ½ Zn^{2+}, 1/3 Al^{3+}, ½ Ba^{2+},  ;

and

R_2, R_3 and R_4 are each independently of one another hydrogen; C_1-C_5alkyl or hydroxy-C_1-C_5alkyl.

Particularly preferred compounds are those of formula

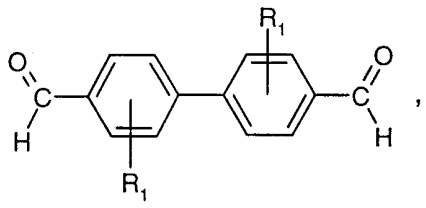
(2)  ,

wherein

R_1 is hydrogen; or C_1-C_5alkyl; and

Y^+ has the meaning given in formula (1).

The compounds of formula (1) are obtained, for example, by reacting a diphenylbisaldehyde of formula

(3)  ,

wherein

R_1 has the meaning given in formula (1), in the presence of a base or a Lewis acid with the corresponding camphor or hydantoin derivative.

The reaction is usually carried out in an inert diluent, preferably in a protic solvent, in particular an alcohol, such as methanol, ethanol, isopropanol or tert-butanol, or in an aprotic solvent, such as diethyl ether, toluene or cyclohexane, or in mixtures of the cited solvents.

The base is preferably an alkali alcoholate, such as sodium methylate, sodium ethylate or potassium tert-butylate.

The reaction can be carried out in the temperature range from 0°C to the boiling point of the reaction mixture, the preferred reaction temperature being in the range from 25 to 60°C.

As a rule, about 0.8 to 1.2 mol of the camphor or hydantoin derivative, based on 1 mol of the compound of formula (1), is used.

The camphor or hydantoin derivatives used as starting compounds are known compounds which are commercially available.

The process for the preparation of the compounds of formula (1) is another subject matter of this invention.

The compounds of formula (1) are particularly suitable as UV filters, i.e. for protecting ultraviolet-sensitive organic materials, especially human and animal skin and hair, from the

harmful effect of UV radiation. These compounds are therefore suitable as light stabilisers in cosmetic, pharmaceutical and veterinary formulations. The compounds can be used both in dissolved and in micronised state.

In another of its aspects, this invention relates to a cosmetic formulation comprising a compound of formula (1).

For cosmetic application, these light stabilisers - unless they are water-soluble - usually have an average particle size in the range from 0.02 to 2, preferably from 0.05 to 1.5, particularly preferably from 0.1 to 1.0 nm. The insoluble light stabilisers of this invention can be brought to the desired particle size by conventional methods, for example by grinding using e.g. a nozzle mill, ball mill, vibratory or hammer mill. Grinding is preferably carried out in the presence of 0.1 to 30, preferably of 0.5 to 15 % by weight, based on the UV absorber, of a grinding aid, for example a vinyl pyrrolidone polymer, a vinyl pyrrolidone-vinyl acetate copolymer, an acylglutamate, an alkylpolyglucoside or, preferably, a phospholipid.

The light stabilisers can also be used dry in powder form. To this purpose, the light stabilisers are subjected to known grinding processes, such as vacuum atomisation, countercurrent spray drying and the like. These powders have a particle size of 0.1 nm to 2 µm. In order to avoid agglomeration processes, the light stabilisers can be coated prior to the pulverisation process with a surfactant, for example with an anionic, nonionic or amphoteric surfactant, e.g. phospholipids or known polymers, such as PVP, acrylates etc.

Besides the novel UV absorber, the cosmetic formulation can also contain one or several UV protectives of the following substance classes.

1. p-Aminobenzoic acid derivatives, such as 4-dimethylaminobenzoic acid-2-ethylhexyl ester;
2. Salicylic acid derivatives, such as salicylic acid-2-ethylhexyl ester;
3. Benzophenone derivatives, such as 2-hydroxy-4-methoxybenzophenone and its 5-sulfonic acid derivative;
4. Dibenzoylmethane derivatives, such as 1-(4-tert-butylphenyl)-3-(4-methoxyphenyl)-propane-1,3-dione;
5. Diphenylacrylates, such as 2-ethylhexyl-2-cyano-3,3-diphenylacrylate and 3-(benzofuranyl)-2-cyanoacrylate;

6. 3-Imidazol-4-yl-acrylic acid and 3-imidazol-4-yl-acrylate;
7. Benzofuran derivatives, in particular 2-(p-aminophenyl)benzofuran derivatives, described in EP-A-582,189, US-A-5,338,539, US-A-5,518,713 and EP-A-613,893;
8. Polymeric UV absorbers, such as the benzylidenemalonate derivatives described, inter alia, in EP-A-709,080;
9. Cinnamic acid derivatives, such as the 4-methoxycinnamic acid-2-ethylhexyl ester or isoamyl esters or cinnamic acid derivatives disclosed, inter alia, in US-A-5,601,811 and WO 97/00851;
10. Camphor derivatives, such as 3-(4'-methyl)benzylidenebornan-2-one, 3-benzylidene-bornan-2-one, N-[2(and 4)-2-oxyborn-3-ylidenemethyl)benzyl]acrylamide polymer, 3-(4'-trimethyl ammonium)benzylidenebornan-2-one methylsulfate, 3,3'-(1,4-phenylenedime-thine)bis(7,7-dimethyl-2-oxo-bicyclo-[2.2.1]heptane-1-methanesulfonic acid) and its salts, 3-(4'-sulfo)benzylidenebornan-2-one and its salts;
11. Trianilino-s-triazine derivatives, such as 2,4,6-trianiline-(p-carbo-2'-ethyl-1'-oxi)-1,3,5-triazine and the UV absorbers disclosed in US-A-5,332,568, EP-A-517,104, EP-A-507,691, WO 93/17002 and EP-A-570,838;
12. 2-Hydroxyphenylbenzotriazole derivatives;
13. 2-Phenylbenzimidazole-5-sulfonic acid and their salts;
14. Menthyl-o-aminobenzoate;
15. Inorganic micropigments, such as TiO_2 (differently coated);
16. N-substituted benzimidazoles, such as described in EP-A-0,843,995;
17. Hydroxyphenylbenzotriazoles and their derivatives, in particular siloxane derivatives;
18. Siloxanes of oxanilide derivatives, such as described in EP-A-0,712,856.

It is also possible to use the UV absorbers described in "Sunscreens", Eds. N.J. Lowe, N.A.Shaath, Marcel Dekker, Inc., New York and Basel or in Cosmetics & Toiletries (107), 50ff (1992) as additional UV protectives in the formulation of this invention.

The novel cosmetic formulation can furthermore also be used together with known anti-oxidants, for example amino acids (e.g. glycerol, histidine, tyrosine, tryptophane) and their derivatives, peptides (e.g. carnosine) and their derivatives, vitamin E or vitamin A and their derivatives, derivatives of vitamin C, carotinoids, flavanoids and their derivatives and ubi-quinones or HALS (= hindered amine light stabiliser) compounds.

The cosmetic formulations contain 0.1 to 15 % by weight, preferably 0.5 to 10 % by weight, based on the total weight of the formulation, of a light stabiliser of formula (1) or of a mixture of light stabilisers and a cosmetically compatible auxiliary.

The cosmetic formulations may be prepared by physically mixing the UV absorber(s) with the auxiliary by standard methods, for example by simply stirring the individual components together, preferably by exploiting the solubility characteristics of known cosmetic UV absorbers, such as OMC, isooctyl salicylate and others.

The cosmetic formulations can be formulated as water-in-oil or oil-in-water emulsion, as oil-in-alcohol lotion, as vesicular dispersion of a ionic or nonionic amphiphilic lipid, as gel, solid stick or as aerosol formulation.

As water-in-oil- or oil-in-water emulsion, the cosmetically compatible auxiliary preferably comprises 5 to 50% of an oil phase, 5 to 20% of an emulsifier and 30 to 90% of water. The oil phase can in this case contain any oil suitable for cosmetic formulations, for example one or several hydrocarbon oils, wax, natural oil, silicone oil, fatty acid ester or fatty alcohol. Preferred mono- or polyols are ethanol, isopropanol, propylene glycol, hexylene glycol, glycerol and sorbitol. It is also possible to use di- or/and trivalent metal salts (alkali earth metal, Al^{3+} and others) of one or several alkylcarboxylic acids.

To prepare the cosmetic formulations it is possible to use any conventionally usable emulsifier, typically one or several ethoxylated esters of natural derivatives, such as polyethoxylated esters of hydrogenated castor oil; or silicone oil emulsifiers, such as silicone polyol; free or ethoxylated fatty acid soaps; fatty alcohol or fatty acid and their polyoxethylene derivatives; free or ethoxylated sorbitan esters; ethoxylated fatty acids or fatty acid esters; or ethoxylated glycerides.

Other suitable emulsifiers are partial fatty acid esters of polyvalent alcohols, such as glycol, 1,2-propylene glycol, glycerol, sorbitol and pentaerythritol, and also protein-fatty acid condensates and lanolin derivatives, the salts of alkylcarboxylic acids, alkylsulfates or alkylsulfonates or polyglycol ethers. It is also possible to use mixtures of anion-active and nonionic emulsifiers or mixtures of purely nonionic surface-active substances having different HLB-

values. Mixtures of fatty alcohol ethers and fatty acid polyglycol ethers or ethoxylated fats are also conventionally used.

The cosmetic formulations can also contain other components, for example emollients, emulsion stabilisers, skin moisturisers, suntan promoters, thickeners such as xanthan, moisture retention agents such as glycerol, preservatives, fragrances and colourants.

Cosmetic formulations of this invention include different cosmetic compositions. Particularly suitable compositions are, for example, the following:

- skin-care products, for example skin washing and cleansing products in the form of bars of soap or liquid soaps, syndets or washing pastes,
- bath products, for example liquid (foam baths, milks, shower products) or solid bath products, such as bath pearls and bath salts;
- skin-care products, such as skin emulsions, multiple emulsions or skin oils;
- decorative body-care products, for example face make-ups in the form of day or powder creams, face powders (lose and compressed), rouge or cream make-ups, eye-care products, for example eye shadow products, mascara, eyeliners, eye creams or eye-fix creams; lip-care products, for example lipstick, lip gloss, lip liner, nail-care products, such as nail varnish, nail varnish remover, nail hardeners or cuticle removers;
- feminine hygiene products, such as feminine hygiene washing lotions or sprays;
- foot-care products, for example foot baths, foot powders, foot creams or foot balms, special deodorants and antiperspirants or products for scrubbing off calluses;
- sunscreens, such as sun milks, lotions, creams, oils, sunblockers or tropicals, pre-sun products or after-sun products;
- suntanning products, for example self-tanning creams;
- depigmenting products, for example products for bleaching or lightening skin;
- insect repellents, for example insect oils, lotions, sprays or sticks;
- deodorants, for example deodorant sprays, non-aerosol sprays, deodorant gels, sticks or roll-ons;
- antiperspirants, for example antiperspirant sticks, creams or roll-ons;
- products for cleansing and treating impure skin, for example syndets (solid or liquid), peeling or scrubbing products or peeling masks;
- chemical depilatory products, for example depilatory powders, liquid depilatory products, creamy or pasty depilatory products, depilatory gels or aerosol foams;

- shaving products, for example shaving soap, foaming shaving creams, non-foaming shaving creams, shaving foams and gels, preshaving products for dry shaving, after-shaves or aftershave lotions;
- scents, for example perfumes (Eau de Cologne, Eau de Toilette, Eau de Parfum, Parfum de Toilette, perfume), perfume oils or perfume creams;
- products for oral and dental hygiene as well as for dentures, for example toothpastes, tooth gels, tooth powders, mouth-wash concentrates, anti-plaque mouth-washes, denture cleaning products or denture adhesion products;
- cosmetic formulations for hair treatment, for example hair washes in the form of shampoos, hair conditioners, hair-care products, for example pretreatment products, hair tonics, hair styling creams and gels, pomades, hair rinses, deep conditioning treatments, intensive hair care treatments, hair setting products, for example waving agents for perms (hot wave, mild wave, cold wave), hair straightening products, liquid hair fixatives, hair foams, hair sprays, bleaching agents, for example hydrogen peroxide solutions, bleaching shampoos, bleaching creams, bleaching powders, bleaching pastes or oils, temporary, semitemporary or permanent hair dyes, products containing self-oxidising dyes, or natural hair dyes, such as henna or camomile.

The formulations listed above can be in different forms of presentation, for example

- in the form of liquid formulations as W/O, O/W, O/W/O, W/O/W, PIT emulsions and all types of microemulsions,
- in the form of a gel,
- in the form of an oil, cream, milk or lotion,
- in the form of a powder, lacquer, pellets or make-up,
- in the form of a stick,
- in the form of a spray (spray with propellant or non-aerosol spray) or an aerosol,
- in the form of a foam, or
- in the form of a paste.

The cosmetic formulations are distinguished by excellent protection of the human skin against the harmful effect of sunlight.

In the following Examples, percentages are by weight and amounts used are based on the pure substance.

Working Examples of novel compounds

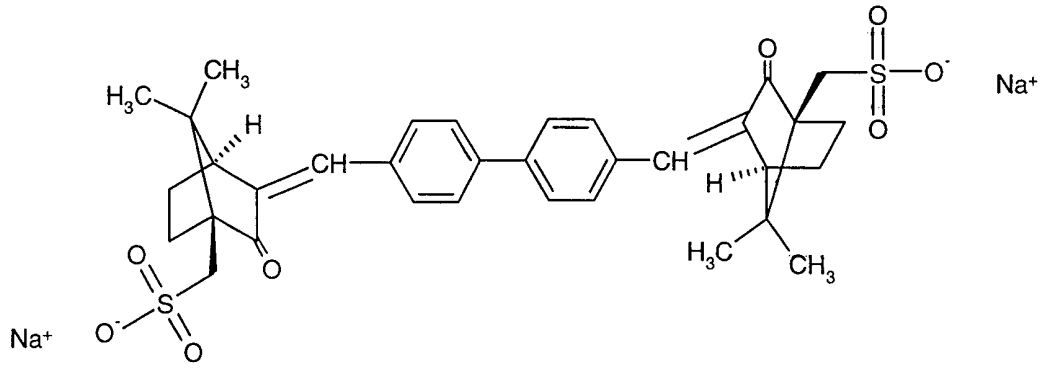
Example 1:

23.3 g (+-) of camphor-10-sulfonic acid are dissolved in 100 ml of toluene and 5 ml of methanol at 25°C and are then charged with 11.2 g of sodium methylate and the mixture is heated, with stirring, to 66°C.

A circa 50°C warm solution consisting of 10.5 g of 1,1'-diphenyl-4,4'-bisaldehyde in 145 ml of toluene and 16 ml of methanol is then added to the above mixture over 2 hours at 66 to 70°C. This temperature is maintained for another 5 hours until no further increase of the product is found in a DC.

Toluene and methanol are then distilled off as an azeotrope while being charged successively with a total of 115 ml of water. A solution forms at 98°C which is clarified by filtration using some carbon. At about 50°C, 300 ml of methanol are added dropwise and the mixture is cooled to 10°C, the compound crystallising out as a sodium salt. After 2 hours, the precipitate is subjected to filtration and washed with 100 ml of methanol. Drying yields 16.8 g of crude product of the compound of formula

(101)



To purify the crude product, it is dissolved in 150 ml of methanol and 200 ml of water at 50°C and clarified by filtration. For crystallisation, 200 ml of brine 15% and 100 ml of methanol are added and the mixture is cooled to 10°C. After 2 hours, the precipitate is collected by filtration, washed with 20 ml of methanol/water 1:1 and dried.

A first fraction is obtained which consists of 5.8 g of the pure compound of formula (101). Additional fractions can be obtained from the filtrate.

Elemental analysis (after equilibration in air = 6.2% H_2O):

	C	H	S	O
calculated	56.1	5.7	8.8	23.1
found	55.5	5.7	8.4	23.6

Application Examples:

Example 2: Preparation of an O/W lotion

	INCI Name	%
A	polyglyceryl-3 methylglucose distearate	2.0
	decyl oleate	5.7
	isopropyl palmitate	5.0
	caprylic/capric triglyceride	6.5
	octyl methoxycinnamate	5.0
B	glycerol	3.0
	phenoxyethanol & (methyl, ethyl, propyl, butyl)parabens	0.5
	compound of formula (101)	2.0
	deionised water	60.9
C	carbomer	0.2
	isopropyl palmitate	0.8
D	methylene bis-benzotriazolyl tetrametylbutylphenol (50% suspension)	8.0
E	NaOH (10%)	as required

The phases A and B are heated separately to 75-80°C and are gently combined. This is followed by intense homogenisation and cooling to room temperature with slight stirring. With stirring, D is admixed to the emulsion so obtained and is adjusted to pH 6.5 with E.

An *in vitro* SPF of 23 is determined by means of an Optometrics SPF-290 analyser (2 µl/cm^2 on Transpore film).

Example 3: Preparation of an O/W emulsion:

	INCI Name	%
A	polyglyceryl-3 methylglucose distearate	2.0
	decyl oleate	5.7
	isopropyl palmitate	5.0
	vitamin E acetate	1.5
	caprylic/capric triglyceride	6.5
	octyl methoxycinnamate	7.5
B	glycerol	3.0
	phenoxyethanol & (methyl, ethyl, propyl, butyl)parabens	0.5
	compound of formula (101)	3.0
	deionised water	64.3
C	carbomer	0.2
	isopropyl palmitate	0.8
E	NaOH (10%)	as required

The phases A and B are heated separately to 75-80°C and are slowly combined and homogenised. After cooling with slow stirring, the product is adjusted to pH 7.0 with E.

An *in vitro* SPF of 16 is determined by means of an Optometrics SPF-290 analyser (2 µl/cm^2 on Transpore film).

Example 4: Preparation of an O/W lotion

	INCI Name	%
A	polyglyceryl-3 methylglucose distearate	2.0
	decyl oleate	5.7
	isopropyl palmitate	5.0
	caprylic/capric triglyceride	6.5
	bis-octylphenol methoxyphenyl triazine	3.0
B	glycerol	3.0
	phenoxyethanol & (methyl, ethyl, propyl, butyl)parabens	0.5
		2.0
	deionised water	63.3
C	carbomer	0.2
	isopropyl palmitate	0.8
D	methylene bis-benzotriazolyl tetrametylbutylphenol (50% suspension)	8.0
E	NaOH (10%)	as required

The phases A and B are heated separately to 75-80°C and are gently combined. This is followed by intense homogenisation and cooling to room temperature with slight stirring. With stirring, phase D is admixed to the emulsion so obtained and the mixture is adjusted to pH 6.5 with phase E.

An *in vitro* SPF of 18 is determined by means of an Optometrics SPF-290 analyser (2 µl/cm^2 on Transpore film).

Example 5: Preparation of a W/O emulsion:

INCI Name	% w/w
PEG-30 dipolyhydroxy-stearate	3.50
PEG-22/dodecyl glycol copolymer	1.50
microcrystalline wax	1.00
hydrogenated castor oil	1.00
magnesium stearate	1.00
octyl stearate	15.00
coco glycerides	2.00
mineral oil	3.00
phenoxyethanols and (methyl, ethyl, propyl, butyl)parabens	1.00
octyl methoxycinnamate	5.00
dimethicone	0.10
deionised water	51.90
allantoin	0.10
magnesium sulfate	1.00
compound of formula (101)	3.00
propylene glycols	4.00
methylene bis-benzotriazolyl tetrametylbutylphenol (pH 5.5)	6.00

The oil phase and the water phase are heated separately to 75-80°C and are gently combined. This is followed by intense homogenisation and cooling to room temperature with slight stirring. With stirring, methylene bis-benzotriazolyl tetrametylbutylphenol is admixed to the emulsion so obtained.

The Australian standard for UVA protection (Australian/New Zealand Standard, 15/NZS 2604: 1993) is met.

Example 6: Preparation of a W/O emulsion:

INCI Name	Formulation (A) %	Formulation (B) %
methoxy PEG-22/dodecyl glycol copolymer	3.00	3.00
PEG-22/dodecyl glycol copolymer	3.00	3.00
hydroxyoctacosanyl hydroxystearate	3.00	3.00
octyl stearate	15.00	15.00
coco glycerides	2.00	2.00
mineral oil	3.00	3.00
phenoxyethanols and (methyl, ethyl, propyl, butyl)parabens	1.00	1.00
octyl methoxycinnamate	5.00	5.00
dimethicone	0.20	0.10
water	47.70	46.30
allantoin	0.10	0.10
compound of formula (101)	4.00	1.5
magnesium sulfate	1.00	1.00
propylene glycols	4.00	4.00
methylene bis-benzotriazolyl tetrametyl-butylphenol (pH 5.5) (50% suspension)	8.00	12.00

The oil phase and the water phase are heated separately to 75-80°C and gently combined. This is followed by intense homogenisation and cooling to room temperature with slight stirring. With stirring, methylene bis-benzotriazolyl tetrametylbutylphenol is admixed to the emulsion so obtained.

In vitro SPF values of 18 (A) and 22 (B) are determined by means of an Optometrics SPF-290 analyser (2 µl/cm^2 on Transpore film).

Example 7: Preparation of a W/O emulsion:

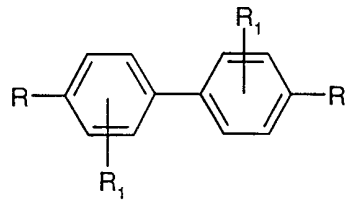
INCI Name	%
polyglyceryl-2 dipolyhydroxystearate	2.00
PEG-30 dipolyhydroxystearate	2.00
hydroxyoctacoanyl hydroxystearate	2.00
zinc stearate	1.00
octyl stearate	15.00
coco glycerides	2.00
mineral oil	3.00
phenoxyethanols and (methyl, ethyl, propyl, butyl)parabens	1.00
bis-octylphenol methoxyphenyl triazine	3.00
octyl methoxycinnamate	7.00
dimethicone	0.20
	3.00
deionised water	53.70
allantoin	0.10
magnesium sulfate	1.00
propylene glycols	4.00

The oil phase and the water phase are heated separately to 75-80°C and are gently combined. This is followed by intense homogenisation and cooling to room temperature with slight stirring.

An *in vitro* SPF of 15 is determined by means of an Optometrics SPF-290 analyser (2 µl/cm^2 on Transpore film).

What is claimed is:

1. A diphenyl compound of formula

(1) 

,

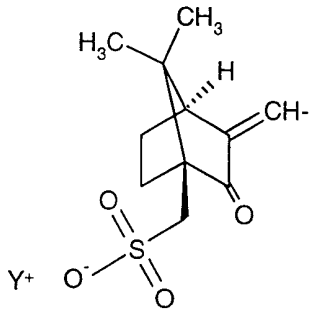
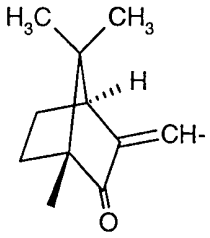
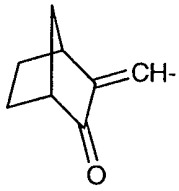
wherein

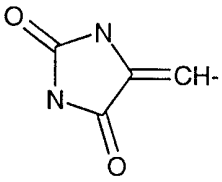
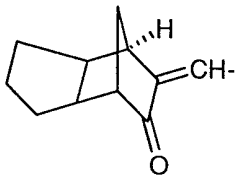
R is a camphor or hydantoin derivative; and

R_1 is hydrogen; or C_1-C_5alkyl.

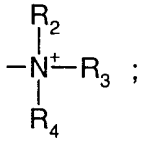
2. A diphenyl compound according to claim 1, wherein

R is a radical of formulae

(1a)  ; (1b)  ; (1c)  ;

(1d)  ; or (1e)  ;

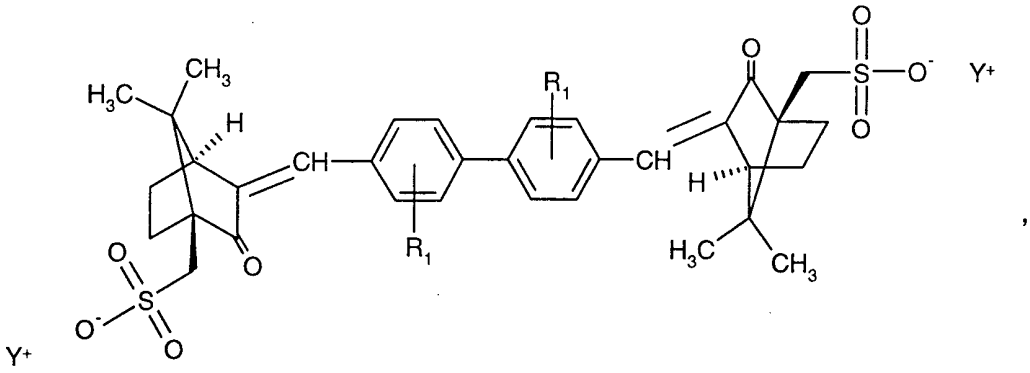
Y^+ being hydrogen; alkali metal; alkaline earth metal, ½ Zn^{2+}, 1/3 Al^{3+}, ½ Ba^{2+},

 ;

R_2, R_3 and R_4 being each independently of one another hydrogen; C_1-C_5alkyl or hydroxy-C_1-C_5alkyl; and

R_1 having the meaning cited in claim 1.

3. A diphenyl compound according to claim 1, which corresponds to formula

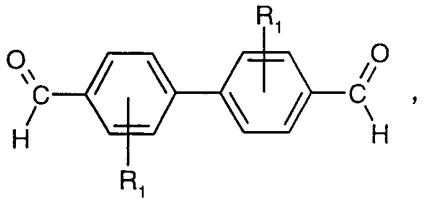
(2) 

wherein

R_1 is hydrogen; or C_1-C_5alkyl; and

Y^+ has the meaning cited in claim 2.

4. A process for the preparation of the compound of formula (1), which comprises reacting a diphenylbisaldehyde of formula

(3) 

wherein

R_1 has the meaning cited for formula (1), in the presence of a base or a Lewis acid with the corresponding camphor or hydantoin derivative.

5. Use of the compound of formula (1) according to claim 1 for protecting human and animal hair and skin from the harmful effect of UV radiation.

6. A cosmetic formulation, which comprises at least one or several compounds of formula (1) according to claim 1 with cosmetically compatible carriers or auxiliaries.

7. A formulation according to claim 6, which comprises additional UV protectives.

8. A formulation according to either claim 6 or claim 7, wherein the additional UV protectives are triazines, oxanilides, triazoles, vinyl groups-containing amides or cinnamic acid amides.

INTERNATIONAL SEARCH REPORT

Inte ɔnal Application No
PCT/EP 99/06985

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 C07C309/24 C07C49/683 C07D233/96 A61K7/42

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 7 C07C C07D A61K

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	EP 0 370 867 A (L'ORÉAL) 30 May 1990 (1990-05-30) cited in the application page 3, line 49 -page 4, line 28; claims 1,5; examples ---	1,5,6
A	EP 0 693 471 A (MERCK PATENT) 24 January 1996 (1996-01-24) cited in the application page 2; claim 1; examples 1,4,8 ---	1,5,6
A	DE 44 42 324 A (MERCK PATENT) 30 May 1996 (1996-05-30) page 2; claim 1 ---	1,5,6
	-/--	

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

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

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
11 January 2000	20/01/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	English, R

1

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Inte onal Application No
PCT/EP 99/06985

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	DE 37 13 094 A (AJINOMOTO) 29 October 1987 (1987-10-29) page 3, line 65 -page 4, line 34; claims 1,12; examples 5-9,14,15; table 2.2	1,5,6
A	DE 24 15 819 A (BASF) 16 October 1975 (1975-10-16) claim 1; example 32	1

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

Inte onal Application No
PCT/EP 99/06985

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0370867 A	30-05-1990	LU 87394 A	12-06-1990
		AT 84301 T	15-01-1993
		BE 1002272 A	13-11-1990
		CA 2003597 A	22-05-1990
		CH 680218 A	15-07-1992
		FR 2639347 A	25-05-1990
		GB 2225013 A,B	23-05-1990
		IT 1238406 B	26-07-1993
		JP 2231463 A	13-09-1990
		US 5064641 A	12-11-1991
EP 0693471 A	24-01-1996	DE 4426216 A	25-01-1996
		DE 59501319 D	26-02-1998
		US 5730960 A	24-03-1998
DE 4442324 A	30-05-1996	EP 0714880 A	05-06-1996
		US 5677314 A	14-10-1997
DE 3713094 A	29-10-1987	JP 2041154 C	09-04-1996
		JP 7076200 B	16-08-1995
		JP 62249959 A	30-10-1987
		JP 2058525 C	10-06-1996
		JP 7098808 B	25-10-1995
		JP 63101371 A	06-05-1988
		JP 2058526 C	10-06-1996
		JP 7098809 B	25-10-1995
		JP 63101372 A	06-05-1988
		JP 2028517 C	19-03-1996
		JP 7068113 B	26-07-1995
		JP 63126817 A	30-05-1988
		FR 2597476 A	23-10-1987
		US 4797493 A	10-01-1989
		US 5000945 A	19-03-1991
		US 4985237 A	15-01-1991
		US 5087729 A	11-02-1992
		KR 9002058 B	31-03-1990
DE 2415819 A	16-10-1975	NONE	