

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
18 December 2008 (18.12.2008)

PCT

(10) International Publication Number
WO 2008/153166 A1

(51) International Patent Classification:

C08L 23/04 (2006.01) **C08K 5/00** (2006.01)
A01M 1/20 (2006.01) **D01F 6/46** (2006.01)
A01M 29/00 (2006.01)

(21) International Application Number:

PCT/JP2008/060925

(22) International Filing Date: 10 June 2008 (10.06.2008)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

2007-153724 11 June 2007 (11.06.2007) JP

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report

(54) Title: METHOD FOR PRODUCING INSECT-CONTROLLING AGENT-CONTAINING RESIN COMPOSITION AND METHOD FOR PRODUCING FILAMENTS

(57) Abstract: There is provided a method for producing a resin composition, the use of the resin composition for shaping filaments being effective to decrease the filament-cutting frequency in process of shaping the filaments, and a method for producing filaments using the resin composition produced by the method. The method for producing an insect-controlling agent-containing resin composition comprises melt-mixing 100 parts by weight of a polyethylene-based resin, 0.1 to 100 parts by weight of an insect-controlling agent-containing support and 0.01 to 10 parts by weight of an antioxidant at a temperature of 160 to 300 °C.



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DESCRIPTION

METHOD FOR PRODUCING INSECT-CONTROLLING AGENT-CONTAINING
RESIN COMPOSITION AND METHOD FOR PRODUCING FILAMENTS

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TECHNICAL FIELD

This application was filed claiming Paris Convention
priority of Japanese Patent Application No. 2007-153724,
the entire content of which is herein incorporated by
10 reference.

The present invention relates to a method for
producing an insect-controlling agent-containing resin
composition and a method for producing filaments.

15 BACKGROUND OF INVENTION

Resin compositions comprising insect-controlling
agents and polyethylene-based resins are processed into
various shaped articles for use as materials for
controlling insects such as ticks, sucking lice, mosquitoes,
20 flies, etc. For example, there is proposed in JP-A-6-
315332 (Patent Publication 1) a resin composition
comprising an insect-controlling agent and a linear low
density polyethylene. There is also proposed in JP-A-8-
302080 (Patent Publication 2) a resin composition
25 comprising an insect-controlling agent, a low density
polyethylene and a high density polyethylene.

Patent Publication 1: JP-A-6-315332

Patent Publication 2: JP-A-8-302080

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DISCLOSURE OF INVENTION

In the production of a resin composition comprising an

insect-controlling agent and a polyethylene-based resin, by blending a support, an insect-controlling agent and, if needed, other additives, an insect-controlling agent-containing support comprising the support, and the insect-controlling agent and, if needed, other additives supported on the support is previously prepared and the insect-controlling agent-containing support is blended with a polyethylene-based resin. However, the resin composition produced by a conventional production method comprising the step of blending the insect-controlling agent-containing support with the polyethylene-based resin has difficulties in the shaping of filaments thereof such as cutting of the filaments, and therefore is insufficient in its shaping property.

Under such a situation, an object of the present invention is to provide a method for producing a resin composition, the use of the resin composition for shaping of filaments being effective to decrease a filament-cutting frequency in process of shaping the filaments of the resin composition. Another object of the invention is to provide a method for producing filaments, using the resin composition produced by the method.

Firstly, the present invention relates to a method for producing an insect-controlling agent-containing resin composition, which comprises melt-mixing 100 parts by weight of a polyethylene-based resin, 0.1 to 100 parts by weight of an insect-controlling agent-containing support and 0.01 to 10 parts by weight of an antioxidant at a temperature of 160 to 300°C.

Secondly, the present invention relates to a method for producing filaments, which comprises melt-spinning a resin composition obtained by melt-mixing a polyethylene-

based resin with a resin composition produced by the above-described method at a temperature of 160 to 300°C, or the resin composition produced by the above-described method.

According to the present invention, there are provided
5 a method for producing a resin composition, the use of the same resin composition for shaping filaments being effective to decrease a filament-cutting frequency in process of shaping the filaments; and a method for producing filaments, using the resin composition produced
10 by the method.

BEST MODE FOR CARRYING OUT THE INVENTION

The insect-controlling agent-containing support is produced by blending an insect-controlling agent with a
15 support. Examples of the insect-controlling agent include insect-controllable compounds such as insecticides, insect growth-controlling agents, insect-repelling agents, etc.

Examples of the insecticides include pyrethroid-based compounds, organophosphorus-based compounds, carbamate-
20 based compounds, phenyl pyrazole-based compounds, etc. Examples of the pyrethroid-based compounds include permethrin, allethrin, d-allethrin, dd-allethrin, d-tetramethrin, prallethrin, cifenothrin, d-pfenothrin, d-resmethrin, empenthrin, fenvalerate, esfenvalerate,
25 fenpropathrin, cyhalothrin, cyfluthrin, etofenprox, tralomethrin, esbiothrin, benfluthrin, terallethrin, deltamethrin, cypermethrin, fenothrin, tefluthrin, bifenthrin, cyfluthrin, cyphenothrin, cypermethrin, alphacypermethrin, etc. Examples of the organophosphorus-
30 based compounds include fenitrothion, dichlorovos, naled, fenthion, cyanophos, chlorpyrifos, diazinon, carcrofos, salithion, diazinon, etc. Examples of the carbamate-based

compounds include methoxydiazon, propoxur, fenobucarb, carbaryl, etc. Examples of the phenyl pyrazole-based compound include fipronyl, etc.

Examples of the insect growth-controlling agent
5 include pyriproxfen, methoprene, hydroprene, diflubenzuron, cyromazine, phenoxycarb, lufenuron (CGA 184599), etc.

Examples of the insect-repelling agent include diethyl-toluamide, dibutyl phthalate, etc.

Each of these insect-controlling agents may be used
10 alone, or at least two selected therefrom may be used as a mixture. As the insect-controlling agent, the insecticides are preferable, and the pyrethroid-based compounds are more preferable. Some of the pyrethroid-based compounds, showing vapor pressures of lower than 1×10^{-6} mmHg at 25°C,
15 are still more preferable. As the pyrethroid-based compounds which show vapor pressures of lower than 1×10^{-6} mmHg at 25°C, resmethrin, permethrin, etc. are exemplified.

As the support, a support capable of supporting the insect-controlling agent is used. Examples of the support
20 include silica-based compounds, zeolites, clay minerals, metal oxides, micas, hydrotalcites, organic supports, etc. As the silica-based compounds, amorphous silica and crystalline silica are exemplified, and examples thereof include silicic acid powder, fine silicic acid powder,
25 acidic china clay, diatom earth, quartz, white carbon, etc. As the zeolites, A type zeolite, mordenite, etc. are given. As the clay minerals, montmorillonite, saponite, bidellite, bentonite, kaolinite, halloysite, nacrite, dickite, anauxite, illite, sericite, etc. are given. As the metal
30 oxides, zinc oxide, magnesium oxide, aluminum oxide, iron oxide, copper oxide, titanium oxide, etc. are given. As the mica, mica, vermiculite, etc. are given. As the

hydrotalcites, smectite, etc. are given. As the organic supports, charcoals (charcoal, marl, grass peat, etc.), polymer beads (microcrystal cellulose, polystyrene beads, acrylate beads, methacrylate beads, polyvinyl alcohol-based
5 beads, etc.) and their crosslinked polymer beads are given. In addition to these supports, perlite, gypsum, ceramics, volcanic rocks, etc. are given.

As the support, amorphous inorganic compounds are preferable, and amorphous silica is more preferable.

10 In the blending of the support with the insect-controlling agent, the amount of the support to be blended is usually from 10 to 400 parts by weight based on 100 parts by weight of the insect-controlling agent.

In the blending of the support with the insect-
15 controlling agent, if needed, other additives may be blended.

Examples of the polyethylene-based resin to be melt-blended with the insect-controlling agent-containing support include a high-pressure-processed low density
20 polyethylene, a high density polyethylene, a linear low density polyethylene, an ultralow density polyethylene, etc., and these polyethylene-based resins may be used alone, or two or more kinds of them may be used in combination.

The high-pressure-processed low density polyethylene
25 is produced by polymerizing ethylene at a high temperature under a high pressure, using a radical-generating agent.

Examples of the radical-generating agent include organic peroxides such as di-t-butyl peroxide, t-butyl hydroperoxide, t-butyl-peroxy-2-ethyl hexanate, dicumyl
30 peroxide, t-butylperoxyisopropyl carbonate, t-butylperoxy benzoate, di-t-amyl peroxide, cumyl hydroperoxide, t-butylperoxy pivalate, etc. and oxygen.

The high density polyethylene, the linear low density polyethylene and the ultralow density polyethylene are produced by a known polymerization process such as the solution polymerization process, the slurry polymerization process, the vapor phase polymerization process, the high-pressure ionic polymerization process or the like, using a known olefin polymerization catalyst such as a Ziegler-Natta catalyst, a chromium-based catalyst, a metallocene-based catalyst or the like. This polymerization process may be of batch type or of continuous type, or may be a multi-step polymerization process comprising two or more steps.

As the Ziegler-Natta catalyst, for example, the following catalysts (1) and (2) are given:

- (1) a catalyst which comprises a component obtained by supporting at least one selected from the group consisting of titanium trichloride, vanadium trichloride, titanium tetrachloride and haloalcoholate on a magnesium-based compound, and an organic metal compound as a co-catalyst, and
- (2) a catalyst which comprises a co-precipitate or an eutectic crystal of a magnesium compound and a titanium compound, and an organic metal compound as a co-catalyst.

As the chromium-based catalyst, for example, a catalyst which comprises a component obtained by supporting a chromium compound on silica or silica-alumina, and an organic metal compound as a co-catalyst is given.

As the metallocene-based catalyst, for example, the following catalysts (1) to (4) are given:

- (1) a catalyst which comprises a component containing a transition metal compound having a cyclopentadiene framework, and a component containing an almoxane compound,

(2) a catalyst which comprises the above transition metal compound-containing component and a component containing an ionic compound such as trityl borate, anilinium borate or the like,

5 (3) a catalyst which comprises the above transition metal compound-containing component, the above ionic compound-containing component and a component containing an organic aluminum compound, and

(4) a catalyst obtained by supporting or incorporating the
10 above respective components on or into a particle-shaped inorganic compound such as SiO_2 , Al_2O_3 or the like, or a particle-shaped polymer such as an olefin polymer of ethylene, styrene or the like.

The melt flow rate (MFR) of the polyethylene-based
15 resin is usually from 0.1 to 50 g/10 mins. When this MFR is too high, the filament-cutting frequency tends to increase. The MFR is preferably not larger than 40 g/10 mins., more preferably not larger than 30 g/10 mins. The MFR is preferably not smaller than 0.3 g/10 mins., more
20 preferably not smaller than 0.5 g/10 mins. from the viewpoint of decrease of burden on a motor of an extruder upon melt-blending. The MFR is measured under the conditions of a load of 21.18 N and a temperature of 190°C according to the method regulated in JIS K7210-1995.

25 The density of the polyethylene-based resin is usually from 900 to 965 kg/m^3 . It is preferably from not lower than 905 kg/m^3 , more preferably not lower than 910 kg/m^3 , from the viewpoint of improvement of the insect-controlling property of the filaments. It is preferably not higher
30 than 960 kg/m^3 , more preferably not higher than 955 kg/m^3 , from the viewpoint of a decrease in the filament-cutting frequency. In this regard, this density is measured

according to a method regulated in the method A among the methods of JIS K7112-1980, using a test piece annealed according to JIS K6760-1995.

As the antioxidant used, phenol-based antioxidants,
5 phosphorus-based antioxidants, sulfur-based antioxidants, etc. are given.

Examples of the phenol-based antioxidants include 2,6-di-t-butyl-4-methylphenol (BHT), n-octadecyl-3-(3,5-di-t-butyl-4-hydroxyphenyl)propionate (Irganox® 1076
10 manufactured by Ciba Specialty Chemicals K.K.), pentaerythrityl-tetrakis[3-(3,5-di-t-butyl-4-hydroxyphenyl)propionate] (Irganox® 1010 manufactured by Ciba Specialty Chemicals K.K.), 1,3,5-tris(3,5-di-tert-butyl-4-hydroxybenzyl)isocyanurate (Irganox® 3114
15 manufactured by Ciba Specialty Chemicals K.K.), 1,3,5-trimethyl-2,4,6-tris(3,5-di-t-butyl-4-hydroxybenzyl)benzene, 3,9-bis[2-{3-(3-t-butyl-4-hydroxy-5-methylphenyl)propionyloxy}-1,1-dimethylethyl]-2,4,8,10-tetraoxaspyro[5.5]undecane (Sumilizer® GA80 manufactured
20 by Sumitomo Chemical Company, Limited), etc.

Examples of the phosphorus-based antioxidants include distearyl-pentaerythritol diphosphite (ADK STAB® PEP8), tris(2,4-di-tert-butylphenyl)phosphite (Irgafos® 168
manufactured by Ciba Specialty Chemicals K.K.), bis(2,4-di-tert-butylphenyl)pentaerythritol diphosphite, tetrakis(2,4-di-tert-butylphenyl)4,4'-biphenylene diphosphonite
25 (Sandostab® P-EPQ manufactured by Clariant (Japan) K.K.), bis(2-t-butyl-4-methylphenyl)pentaerythritol diphosphite, etc.

30 Examples of an antioxidant having both of a phenol structure and a phosphorus structure include 6-[3-(3-tert-

butyl-4-hydroxy-5-methyl)propoxy]-2,4,8,10-tetra-tert-butyl-
dibenz[d,f][1,3,2]-dioxaphosphine (Sumilizer® GP
manufactured by Sumitomo Chemical Company, Limited), etc.

Example of the sulfur-based antioxidant include 4,4'-
5 thiobis(3-methyl-6-tert-butylphenol) (Sumilizer® WXR
manufactured by Sumitomo Chemical Company, Limited), 2,2-
thiobis-(4-methyl-6-tert-butylphenol) (IRGANOX® 1081
manufactured by Ciba Specialty Chemicals K.K.), etc.

Examples of other antioxidants include vitamin E,
10 vitamin A, etc.

Preferable antioxidants are antioxidants having phenol
structures, and more preferable antioxidants are phenol-
based antioxidants. Still more preferable antioxidant is a
propionate ester having a phenyl group which has 1 to 2 t-
15 butyl groups and one hydroxy group, and most preferable
antioxidant is an ester of propionic acid having a phenyl
group which has 1 to 2 t-butyl groups and one hydroxy group
with an alcohol having 2 or more carbon atoms.

In the melt-blending of the polyethylene-based resin,
20 the insect-controlling agent-containing support and the
antioxidant, the amount of the insect-controlling agent-
containing support to be blended is usually from 0.1 to 100
parts by weight based on 100 parts by weight of the
polyethylene-based resin, and the amount of the antioxidant
25 to be blended is usually from 0.01 to 10 parts by weight
based on 100 parts by weight of the polyethylene-based
resin. When the resin composition after blending is a main
raw material of a raw material for melt spinning, the
amount of the insect-controlling agent-containing support
30 to be blended is preferably from 0.1 to 20 parts by weight
based on 100 parts by weight of the polyethylene-based
resin, and the amount of the antioxidant to be blended is

preferably from 0.01 to 1 part by weight based on 100 parts by weight of the polyethylene-based resin. When the resin composition after blending is an insect-controlling agent master batch, the amount of the insect-controlling agent-containing support to be blended is preferably from 5 to 100 parts by weight based on 100 parts by weight of the polyethylene-based resin, and the amount of the antioxidant to be blended is preferably from 0.03 to 10 parts by weight based on 100 parts by weight of the polyethylene-based resin.

When the resin composition is used for a filament, the content of the support (only a support in an insect-controlling agent-containing support) in the resin composition is preferably not higher than 50 parts by weight, more preferably not higher than 30 parts by weight, based on 100 parts by weight of the polyethylene-based resin from the viewpoints of enhancement of the mechanical strength. The content is preferably not lower than 0.3 part by weight, more preferably not lower than 0.6 part by weight, from the viewpoints of improvement of the insect-controlling effect.

In the melt-blending of the polyethylene-based resin, the insect-controlling agent-containing support and the antioxidant, the resin composition may contain other components, if needed. For example, the resin composition may contain a compound which acts to improve the insect-controlling effect. As such a compound, piperonyl butoxide, MGK 264, octachlorodipropylether, etc. are exemplified. The resin composition of the present invention may also contain additives such as an anti-blocking agent, a filler, a lubricant, an antistatic agent, a weather resistant agent, a pigment, a processability-improving agent and a metal

soap, and two or more kinds of these additives may be used in combination.

The temperature, at which the polyethylene-based resin, the insect-controlling agent-containing support and the antioxidant are melt-blended, is usually from 160 to 300°C, preferably from 180 to 260°C.

Melt-blending of the polyethylene-based resin, the insect-controlling agent-containing support and the antioxidant can be carried out by a known mixer, for example, a twin-screw extruder, a Banbury mixer, a roll kneader or the like.

The resin composition prepared by melt-blending the polyethylene-based resin, the insect-controlling agent-containing support and the antioxidant is used as a main raw material of a raw material for melt spinning to shape filaments. Also, the resin composition is used as an insect-controlling agent master batch and is melt-blended with the above-described polyethylene-based resin to shape filaments.

The content of the insect-controlling agent-containing support in the resin composition prepared by melt-blending the insect-controlling agent master batch with the above-described polyethylene-based resin is preferably from 1 to 20 parts by weight based on 100 parts by weight of the total amount of the polyethylene-based resin (the total amount of the polyethylene-based resin in the master batch and the polyethylene-based resin to be blended with the master batch), and the content of the antioxidant is preferably from 0.05 to 1 part by weight based on 100 parts by weight of the total amount of the polyethylene-based resin (the total amount of the polyethylene-based resin in the master batch and the polyethylene-based resin to be

blended with the master batch).

The temperature, at which the insect-controlling agent master batch and the above-described antioxidant are melt-blended, is usually from 160 to 300°C, preferably from 180 to 260°C. Melt-blending can be carried out by a known mixer, for example, a twin-screw extruder, a Banbury mixer, a roll kneader or the like.

Filaments are produced by melt-spinning. An example of the method is as follows: an extruder or the like is used to melt the resin composition; the molten resin composition is extruded from a die or a nozzle through a gear pump; the extruded resin composition is taken up to form a strand-like resin composition; the strand-like resin composition is cooled using a cooling medium such as water or an air for spinning; and then, if needed, the resultant spun filament of the resin composition is drawn under heating, heat-treated and coated with an oil and is then wound up.

The resultant filament has a sectional shape of, for example, a circle, ellipse, triangle, rectangle, hexagon, star or the like.

A monofilament shaped of the resin composition of the present invention is used for nets such as a mosquito net, screen, insect-controlling net, etc.; ropes; yarns; and filters. A multifilament shaped of the resin composition of the present invention is used for ropes, nets, carpets, non-woven cloth, filters, shoes, clothing, etc. In particular, they are suitably used for applications required for insect-controlling effects, such as mosquito nets, screens, insect-controlling nets, filters, carpets, shoes and clothing.

Examples of insects as objects to be controlled by the

filaments shaped of the resin composition of the present invention are Arthropoda such as spiders, ticks and insects. The following are examples thereof: *Ornithonyssus sylviarum*, citrus red mite, *Tyrophagus putrescentiae*, etc. belonging to Acarina; and *Atypus karshi*, *Pholcus phalangioides*, etc. belonging to Araneae, in Arachnida: *Thereuopoda clunifera*, etc. belonging to Scutigeromorpha; and *Bothropolys asperatus*, etc. belonging to Lithobiomorpha in Chilopoda: and *axidus gracilis*, *Nedyopus tambanus*, etc. belonging to Polydesmoidea, in Chilopoda.

As the insects, the following are given: *Ctenolepisma villosa* Escherich, etc. belonging to Thysanura; cave cricket, mole cricket, *Teleogryllus emma*, locusta migratoria, *Schistocerca gregaria*, locust, etc. belonging to Orthoptera; earwig, etc. belonging to Dermaptera; *Blattella germanica*, *Periplaneta fuliginosa*, *Periplaneta Japonica*, *Periplaneta americana*, etc. belonging to Blattaria; Japanese subterranean termite, Formosan subterranean termite, *Incisitermes minor* HAGEN, etc. belonging to Isoptera; *Liposcelis entomophilus* Enderlein, *Liposcelis bostrychophilus* Badonnel, etc. belonging to Psocoptera; *Trichodectes canis*, *Felicola subrostratus*, etc. belonging to Mallophaga; *Pediculus humanus corporis*, *Pthirus pubis*, *Pediculus humanus*, etc. belonging to Anoplura; *Nilaparvata lugens* Stal, *Nephotettix cincticeps*, Greenhouse white fly, *Myzus persicae*, *Cimex lectularius* Linnaeus, *Halyomorpha halys*, etc. belonging to Hemiptera; dermestid beetles, *Aulacophora femoralis*, *Sitophilus zeamais*, *Lyctus brunneus*, *Ptinus japonicus*, *Popillia japonica* Newman, etc. belonging to Coleoptera; cat flea, dog flea, human flea, etc. belonging to Siphonaptera; *Culex pipiens pallens* cougillet, *Aedes aegypti*, anopheles,

Simuliidae, Chironomus, Psychodidae, House fly, Glossina
palpalis, Tabanus trigonus, Syrphinae, etc. belonging to
Diptera; Vespa, Polistes, Nesodiprion japonicus Marlatt,
Dryocosmus kuriphilus, Sclerodermus nipponicus, Monomorium
5 pharaonis, etc. belonging to Hymenoptera; and the like.

EXAMPLES

Hereinafter, the present invention will be described
by way of Examples thereof and Comparative Examples. In
10 Examples and Comparative Examples, the physical properties
were measured according to the following methods.

(1) Melt Flow Rate (MFR, g/10 mins. in unit)

A melt flow rate was measured at 190°C under a load of
15 21.18 N according to the method regulated in JIS K7210-1995.

(2) Density (kg/m³ in unit)

A density was measured according to the method
regulated in the method A among the methods described in
JIS K7112-1980. A test piece to be measured was annealed
20 according to the method regulated in JIS K6760-1995.

Example 1

(1) Preparation of Insect-Controlling Agent-Containing
Support

25 1.5 Parts by weight of an antioxidant (2,6-di-t-butyl-
4-methylphenol, hereinafter referred to as AO-1) was
dissolved in 51 parts by weight of permethrin (Eksmin® of
Sumitomo Chemical Company, Limited). Next, 52.5 parts by
weight of a mixture of permethrin and AO-1 was mixed with
30 47.5 parts by weight (93.1 parts by weight based on 100
parts by weight of permethrin) of amorphous silica (Trade
name: Porous Silica of SUZUKI YUSHI CO., LTD.) under

stirring to prepare an insect-controlling agent-containing support.

(2) Preparation of Insect-Controlling Agent Master batch

60.15 parts by weight of pellets of a high-pressure-processed low density polyethylene (Sumikathene® CE5502 of Sumitomo Chemical Company, Limited, hereinafter referred to as LD), 0.05 part by weight (0.08 part by weight based on 100 parts by weight of LD) of the antioxidant (AO-1), 31 parts by weight (51.54 parts by weight based on 100 parts by weight of LD) of an insect-controlling agent-containing support, 5 parts by weight of zinc stearate and 4.52 parts by weight of a blue coloring agent (available from Sumika Color) were melt-kneaded at a temperature of 200°C with a twin-screw extruder to prepare an insect-controlling agent master batch.

(3) Preparation of Resin Composition for Shaping Filaments

100 parts by weight of pellets of a high density polyethylene (HI-ZEX® 5000S of PRIME POLYMER; MFR = 0.8 g/10 min., density = 948 kg/m³), 16.5 parts by weight of the insect-controlling agent master batch and 7 parts by weight zinc stearate were melt-kneaded at a temperature of 260°C with a twin-screw extruder to obtain a resin composition for shaping filaments.

(4) Shaping of Filaments

The resultant resin composition for shaping filaments was extruded from the die with 150 holes of 0.8 mmφ of a 50 mmφ extruder, at a discharge rate of 20 kg/hr. and at a die set temperature of 190°C, and the resulting strand was taken up at a line speed of 14 m/min., allowed to pass through a heated water tank and was taken up at a rate of 112 m/min., to shape monofilaments with a fineness of 200

deniers. The filament-cutting frequency (number of filaments cut per unit time) in process of the shaping of the filaments was 2.7/hr.

Comparative Example 1

5 A resin composition for shaping filaments was prepared in the same manner as in Example 1, except that 60.2 parts by weight of the pellets of the high-pressure-processed low density polyethylene were used and the antioxidant was not added in the case of preparing the insect-controlling agent master batch. Monofilaments of the resultant resin
10 composition for shaping filaments were shaped in the same manner as in the shaping of the filaments of Example 1. The filament-cutting frequency in process of the shaping of the filaments was 5.1/hr.

15 Example 2

 A resin composition for shaping filaments was prepared in the same manner as in Example 1, except that 60.08 parts by weight of the pellets of the high-pressure-processed low density polyethylene were used and 0.12 parts by weight of
20 pentaerythrityl-tetrakis[3-(3,5-di-t-butyl-4-hydroxyphenyl)propionate] (Irganox® 1010 manufactured by Ciba Specialty Chemicals K.K., hereinafter referred to as AO-2) was used instead of the antioxidant AO-1 in the case of preparing the insect-controlling agent master batch.
25 Monofilaments of the resultant resin composition for shaping filaments were shaped in the same manner as in the shaping of the filaments of Example 1. The filament-cutting frequency in process of the shaping of the filaments was 2.5/hr.

30 Example 3

 A resin composition for shaping filaments was prepared in the same manner as in Example 1, except that 60.11 parts

by weight of the pellets of the high-pressure-processed low density polyethylene were used and 0.09 parts by weight of n-octadecyl-3-(3,5-di-t-butyl-4-hydroxyphenyl)propionate (Irganox® 1076 manufactured by Ciba Specialty Chemicals

5 K.K., hereinafter referred to as AO-3) was used instead of the antioxidant AO-1 in the case of preparing the insect-controlling agent master batch. Monofilaments of the resultant resin composition for shaping filaments were shaped in the same manner as in the shaping of the

10 filaments of Example 1. The filament-cutting frequency in process of the shaping of the filaments was 0.8/hr.

CLAIMS

1. A method for producing an insect-controlling agent-containing resin composition, which comprises melt-mixing
5 100 parts by weight of a polyethylene-based resin, 0.1 to 100 parts by weight of an insect-controlling agent-containing support and 0.01 to 10 parts by weight of an antioxidant at a temperature of 160 to 300°C.
- 10 2. A method for producing filaments, which comprises melt-spinning a resin composition obtained by melt-mixing a polyethylene-based resin with a resin composition produced by the method according to claim 1 at a temperature of 160 to 300°C, or the resin composition produced by the method
15 according to claim 1.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2008/060925

A. CLASSIFICATION OF SUBJECT MATTER			
Int.Cl. C08L23/04 (2006.01) i, A01M1/20 (2006.01) i, A01M29/00 (2006.01) i, C08K5/00 (2006.01) i, D01F6/46 (2006.01) i			
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)			
Int.Cl. C08L23/04, A01M1/20, A01M29/00, C08K5/00, D01F6/46			
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched			
Published examined utility model applications of Japan 1922-1996 Published unexamined utility model applications of Japan 1971-2008 Registered utility model specifications of Japan 1996-2008 Published registered utility model applications of Japan 1994-2008			
Electronic data base consulted during the international search (name of data base and, where practicable, 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.	
X	JP 2005-139329 A (SUMIKA COLOR KK) 2005.06.02, Claims, [0016], [0024]-[0026] & US 2007/0134495 A1 & GB 2424899 A & WO 2005/044533 A1	1, 2	
A	JP 04-065509 A (SUMITOMO CHEM CO LTD) 1992.03.02, Whole Document (No Family)	1, 2	
A	JP 2002-146121 A (JAPAN POLYOLEFINS CO LTD) 2002.05.22, Whole Document (No Family)	1, 2	
☐ Further documents are listed in the continuation of Box C. ☐ See patent family 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 application or patent 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	
13.08.2008		26.08.2008	
Name and mailing address of the ISA/JP		Authorized officer	
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