

DESCRIPTION

TITLE OF INVENTION

FLAME-RESISTANT TERMITE-RESISTANT CABLE

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TECHNICAL FIELD

The present invention relates to a flame-resistant termite-resistant cable having termite resistance that prevents feeding damage by termites (termite damage) along with having flame-resistance.

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BACKGROUND ART

As examples of a cable, there is an electric power cable, a communication cable, etc. These cables have a sheath provided on their outermost layer as an outer protection layer. The sheath is typically formed by performing extrusion coating with use of a common resin such as low density polyethylene or polyvinyl chloride.

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However, in a case of burying a cable in the ground, a sheath formed of the above-described common resin is susceptible to feeding damage by termites (termite damage). When a sheath receives damage from termites, the properties of the sheath such as insulation deteriorates and degrades electric power and data transmission.

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The use of nylon as the sheath of a cable is proposed for suppressing termite damage of the sheath (see, for example, Patent Document 1). Because nylon is rigid and has satisfactory strength, nylon is strong against termite damage and has a satisfactory termite resistance. In addition, nylon is resistant against damage and has satisfactory outer-damage resistance. Specifically, Patent

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Document 1 proposes a termite-resistant cable having a double-layer structure in which a nylon termite-resistant layer formed of a nylon having termite resistance is layered on a PVC layer formed of polyvinyl chloride (hereinafter also referred to as "PVC") having flame-resistance.

However, nylon has a problem of having low flame-resistance compared to PVC or the like. That is, with the termite-resistant cable of Patent Document 1, it is difficult for the cable to satisfy a required high flame resistance (i.e., to pass the IEEE std. 383 test) because the nylon termite-resistant layer having low flame resistance is provided on an outermost surface of the cable.

Although there is a method of adding a large amount of flame retardant for improving the flame resistance of the nylon termite-resistant layer, the mechanical strength of the nylon termite-resistant layer may be degraded and result in the nylon termite-resistant layer receiving outer-damage when the cable is placed.

Therefore, another PVC layer having flame resistance is provided around the circumference of the nylon termite-resistant layer having low flame resistance. That is, the sheath is formed with a triple-layer structure in which a PVC layer, a nylon termite-resistant layer, and a PVC layer are layered in order from an inner side. Thus, a termite-resistant cable having the triple-layer structure has satisfactory flame resistance.

However, because the termite-resistant cable has the triple-layer structure, the termite-resistant cable has problems of large outer diameter

and heavy weight. Further, the termite-resistant cable has high cost due to the use of expensive nylon.

In order to solve such problems, there is
5 proposed a flame-resistant termite-resistant cable using polypropylene (hereinafter also referred to as "PP") having rigidity greater than or equal to 60 (Shore D) as a sheath instead of using nylon (see, for example, Patent Document 2). PP not only has
10 greater flame resistance than nylon but also satisfactory termite resistance by having a predetermined rigidity. In Patent Document 2, a PP termite-resistant layer formed of PP having high rigidity is provided instead of a nylon termite-
15 resistant layer. For example, there is provided a sheath having a double-layer structure in which a PVC layer formed of PVC having an oxygen index of 30 and a PP termite-resistant layer formed of PP having a rigidity of 60 with an oxygen index of 20 are
20 layered in order from the inner side. By using the flame-resistant termite-resistant cable of Patent Document 2, its outer diameter and weight can be reduced. Further, the flame-resistant termite-resistant cable is inexpensive and has satisfactory
25 termite resistance and a flame resistant property.

CITATION LIST

PATENT LITERATURE

Patent Literature 1: Japanese Laid-Open Patent
Publication No. 3-15114

30 Patent Literature 2: Japanese Laid-Open Patent
Publication No. 2012-174574

SUMMARY OF INVENTION

TECHNICAL PROBLEM

In a case where a cable is buried in the ground, the cable is placed in, for example, a pipeline. When placing the cable, the cable is extended by drawing the cable into the pipeline and
5 moving the cable.

However, with the flame-resistant termite-resistant cable having a PP termite-resistant layer on its outermost surface as shown in Patent Document 2, the PP termite-resistant layer may peel due to
10 the cable being dragged when extending the cable by moving the cable. This is because the PP termite-resistant layer of Patent Document 2 is susceptible to damage by friction and has an insufficient outer-damage resistance.

15 The present invention aims to provide a flame-resistant termite-resistant cable that has satisfactory termite resistance and flame-resistance along with satisfactory outer-damage resistance.

SOLUTION TO PROBLEM

20 As described above, although nylon is hard and has satisfactory rigidity, nylon has insufficient flame resistance. On the other hand, the high rigidity polypropylene (hereinafter also referred to as "PP") shown in Patent Document 2 is
25 hard and has satisfactory flame resistance, but has low strength (tensile strength) compared to nylon. That is, the high rigidity PP cannot attain a tensile strength as much as that of nylon. Therefore, the PP termite-resistant layer formed of
30 high rigidity PP cannot endure the tension that is created and becomes damaged and is peeled when friction or the like is caused when the cable is pulled during the extension of the cable. Thus, the

PP termite-resistant layer has insufficient outer-damage resistance.

Therefore, the inventors of the present invention focused on the stress/strain curve (so-called SS curve) and investigated on a PP which not only has satisfactory termite resistance but also has satisfactory outer-damage resistance.

The SS curve that is obtained by a tension test of resin shows the correlation between stress (tensile stress) and strain (ductility). Typically, when resin is pulled, elongation and stress that attempts to resist against the force of the ductility are generated. An SS curve can be obtained by assuming that the elongation is indicated by a horizontal axis and that the stress (i.e., tensile strength) is indicated by a vertical axis. By using the SS curve, the mechanical characteristics of the resin can be understood. Typically, the SS curve has an area in which tensile strength linearly increases with respect to ductility (elasticity area) and an area in which tensile strength only moderately increases due to plastic deformation of the resin (plastic deformation area). The point where the elasticity areas changes to the plastic deformation area is a yield point. The yield point is a point that indicates the start of the plastic deformation of the resin. The tensile strength at the yield point indicates the tensile strength at the time when the plastic deformation of the resin begins. The greater the tensile strength at the yield point, the more difficult plastic deformation of resin becomes. Assuming that "S₁" is the tensile strength at the

yield point and " S_2 " is the elongation percentage at the yield point, a slope (S_1/S_2) indicates the tensile strength per unit elongation, that is, inductility. The greater the S_1/S_2 , the smaller the ductility.

By investigating the SS curve of the high rigidity PP, it is confirmed that a high tensile strength can be attained together with a small slope (S_1/S_2) and a large ductility depending on the composition of the PP. That is, even with the high rigidity PP, it is confirmed that the high rigidity PP has a low outer-damage resistance in a case where the ductility is large. Accordingly, the inventors of the present invention have found that, not only a large tensile strength but also inductility (small ductility) is essential for improving the outer-damage resistance of PP.

Thus, the inventors of the present invention have investigated on how to reduce elongation of PP. As a result of the investigation, the inventors of the present invention found it significant to add PP with a resin that has a solubility parameter greater than or equal to 7.0 and less than or equal to 9.5 and has satisfactory compatibility with PP. By using this PP resin composition, the tensile strength S_1 at the yield point is greater than or equal to 27 MPa, and the slope (S_1/S_2) of the tensile strength S_1 and the elongation percentage S_2 at the yield point is greater than or equal to 2.8. Further, the PP resin composition not only has high tensile strength but also has small ductility. Therefore, satisfactory termite resistance and satisfactory outer-damage

resistance can be obtained with a termite-resistant layer formed of the PP resin composition.

The present invention that is conceived according to the above-described findings has the following configuration.

According to a first embodiment of the present invention, there is provided a flame-resistant termite-resistant cable including a sheath. The flame-resistant termite-resistant cable includes the sheath having a surface on which a polypropylene termite-resistant layer including a polypropylene composition is provided. The polypropylene composition contains (A) a propylene homopolymer and (B) a resin component having a solubility parameter greater than or equal to 7.0 and less than or equal to 9.5. A tensile strength S_1 of the polypropylene composition is greater than or equal to 27 MPa at a yield point in a tension test. A slope S_1/S_2 of the tensile strength S_1 and an elongation percentage S_2 of the polypropylene composition is greater than or equal to 2.8 at the yield point.

According to a second embodiment of the present invention, the polypropylene composition contains (A) the propylene homopolymer being greater than or equal to 90% by mass and less than 100% by mass and (B) the resin component being greater than 0% by mass and less than or equal to 10% by mass with respect to the total of (A) the propylene homopolymer and (B) the resin component being 100% by mass.

According to a third embodiment of the present invention, (B) the resin component includes one of or a combination of two kinds of a copolymer

of propylene and an α olefin other than propylene, a vinyl resin, a diene rubber, an ethylene-propylene rubber, an ethylene-propylene-diene rubber, and a thermoplastic elastomer.

5 According to a fourth embodiment of the present invention, the polypropylene composition further contains a flame retardant having a melting peak temperature less than or equal to 230 °C, the flame retardant content being greater than or equal
10 to 1% by mass and less than or equal to 10% by mass with respect to the total of (A) the propylene homopolymer and (B) the resin component being 100% by mass.

 According to a fifth embodiment of the
15 present invention, the polypropylene composition further contains a flame retardant having a peak mass loss rate of 1% at a temperature less than or equal to 300 °C, the flame retardant content being greater than or equal to 1% by mass and less than or
20 equal to 10% by mass with respect to the total of (A) the propylene homopolymer and (B) the resin component being 100% by mass.

 According to a sixth embodiment of the present invention, the sheath includes a double-
25 layer structure in which a polyvinyl chloride layer formed of a polyvinyl chloride composition and the polypropylene termite-resistant layer are layered from an inner side to the surface.

 According to a seventh embodiment of the
30 present invention, polypropylene termite-resistant layer has a thickness greater than or equal to 0.5 mm and less than or equal to 50% of a thickness of the polyvinyl chloride layer.

ADVANTAGEOUS EFFECTS OF INVENTION

According to the present invention, a flame-resistant termite-resistant cable having
5 satisfactory termite resistance, flame resistance, and outer-damage resistance can be obtained.

BRIEF DESCRIPTION OF DRAWINGS

Fig.1 is cross-sectional view of a flame-resistant termite-resistant cable according to an
10 embodiment of the present invention;

Fig. 2 is a diagram illustrating a correlation between the tensile strength of a polypropylene composition at a yield point and a slope S_1/S_2 of the tensile strength S_1 and the
15 elongation percentage S_2 of the polypropylene composition at a yield point according to a practical example;

Fig. 3 is a diagram for describing an evaluation of termite resistance according to a
20 practical example; and

Fig. 4 is a diagram for describing an outer-damage resistance test of a flame-resistant termite-resistant cable according to a practical example, in which (a) is a diagram viewed from a
25 side direction, (b) is a diagram viewed from a cross-sectional direction, and (c) is an enlarged view of the dotted area in (a).

DESCRIPTION OF EMBODIMENTS

[Embodiments of present invention]

30 Next, a flame-resistant termite-resistant cable according to an embodiment of the present invention is described. Although a flame-resistant termite-resistant cable used as an electric power

cable is described below, the flame-resistant termite-resistant cable of the present invention is not limited to the electric power cable. For example, the flame-resistant termite-resistant cable
5 may also be used as a communication cable or the like.

Fig. 1 is a cross-sectional view illustrating the flame-resistant termite-resistant cable according to an embodiment of the present
10 invention.

As illustrated in Fig. 1, the flame-resistant termite-resistant cable 1 of this embodiment includes a conductor 10. An internal semiconductor layer 11, an insulation layer 12, an
15 external semiconductor layer 13, a shield layer 14, a pressing tape 15, a water-shielding layer 16, and a sheath 17 are provided on an outer periphery of the conductor 10 in this order. The sheath 17 has a double-layer structure in which a polyvinyl chloride
20 layer 17a formed of a polyvinyl chloride composition and a polypropylene termite-resistant layer 17b formed of a polypropylene compound are layered from an inner side of the flame-resistant termite-resistant cable 1 to an outer surface of the flame-
25 resistant termite-resistant cable 1.

Except for using the polypropylene termite-resistant layer 17b for the flame-resistant termite-resistant cable 1, conventionally known components may be used for the flame-resistant
30 termite-resistant cable 1. The conductor 10 may be formed of, for example, copper or aluminum. The internal semiconductor layer is formed of a semiconductive resin composition containing, for

example, a conducting agent (e.g., carbon black) or a resin component such as an ethylene-vinyl acetate copolymer. The insulation layer 12 may be formed of an insulating resin compound including a resin
5 component such as polyethylene. Similar to the internal semiconductor layer 11, the external semiconductor layer 13 is formed of a semiconductive resin compound. The shield layer 14 has a shielding property that shields an electric field generated by
10 the conductor 10. The shield layer 14 is formed of, for example, an annealed copper tape. The pressing tape 15 is formed by, for example, winding a non-woven fabric tape or a semiconductive tape around an outer periphery of the shield layer 14. The water
15 shielding layer 16 is formed of, for example, an aluminum laminated water shielding tape.

The sheath 17 has a double-layer structure in which the polyvinyl chloride layer 17a and the polypropylene layer 17b are layered from an inner
20 side to the surface.

The polyvinyl chloride layer 17a is formed of a polyvinyl chloride compound and has satisfactory flame resistance. Although the termite resistance of the polyvinyl chloride layer 17a may
25 be insufficient, the polyvinyl chloride layer 17a is covered and protected by the polypropylene termite-resistant layer 17b having satisfactory termite resistance as described below. A conventionally known component may be used as the polyvinyl
30 chloride composition. The thickness of the polyvinyl chloride layer 17a is not limited in particular. However, from the standpoint of attaining flame resistance, the thickness of the

polyvinyl chloride layer 17a is preferably greater than or equal to 4% of the outer diameter of the flame-resistant termite-resistant cable 1, and more preferably, greater than or equal to 2 mm and less than or equal to 10 mm. If the thickness of the polyvinyl chloride layer 17a is less than 2 mm, the polyvinyl chloride layer 17a may be unable to attain sufficient flame resistance. On the other hand, although flame resistance improves if the thickness of the polyvinyl chloride layer 17a is greater than 10 mm, the increase of the outer diameter of the flame-resistant termite-resistant cable 1 may degrade flexibility of the flame-resistant termite-resistant cable 1 and cause difficulty in inserting the flame-resistant termite-resistant cable 1 into a pipeline.

The polypropylene termite-resistant layer 17b is formed of the below-described polypropylene composition and has satisfactory flame resistance, termite resistance, and outer-damage resistance. The polypropylene termite-resistant layer 17b is formed on the outer periphery of the polyvinyl chloride layer 17a. The polypropylene termite-resistant layer 17b covers and protects the polyvinyl chloride layer 17a having insufficient termite resistance. The thickness of the polypropylene layer 17b is not limited in particular. However, from the standpoint of attaining characteristics such as termite resistance and outer-damage resistance, the thickness of the polypropylene layer 17b is preferably greater than or equal to 0.5 mm, and more preferably, greater than or equal to 0.5 mm and less than or equal to 2

mm. If the thickness of the polypropylene layer 17b is less than 0.5 mm, the polypropylene layer 17b may be unable to sufficiently attain its characteristics. On the other hand, if the thickness of the

5 polypropylene layer 17b is greater than 2 mm, the polypropylene layer 17b may be unable attain its characteristics (e.g., flame resistance) despite of its thickness. In addition, the increase of the outer diameter of the flame-resistant termite-

10 resistant cable 1 may degrade flexibility of the flame-resistant termite-resistant cable 1. Further, the thickness of the polypropylene layer 17b is preferably less than or equal to 50% of the thickness of the polyvinyl chloride layer 17a.

15 Owing to the configuration described above, the flame-resistant termite-resistant cable 1 can attain an appropriate degree of flame resistance and termite resistance.

Note that the sheath 17 is formed by

20 extrusion coating the polyvinyl chloride composition and the polypropylene composition on the outer periphery of the water-shielding layer 16. In performing the extrusion coating, a layer of the polyvinyl chloride composition and a layer of the

25 polypropylene composition may be simultaneously extrusion coated to form the two layers consisting of the polyvinyl chloride layer 17a and the polypropylene termite-resistant layer 17b. Alternatively, the two layers may be formed by

30 extrusion coating one layer at a time.

<Polypropylene composition>

Next, a propylene composition included in the polypropylene termite-resistant layer 17b is

described.

The propylene composition contains (A) a propylene homopolymer and (B) a resin component having a solubility parameter that is greater than
5 or equal to 7.0 and less than or equal to 9.5. The propylene composition is obtained by kneading the propylene homopolymer and the resin component. The component (A) is a homopolymer composited by homopolymerizing propylene and has high rigidity and
10 high tensile strength. The component (B) is a resin component having a solubility parameter that is greater than or equal to 7.0 and less than or equal to 9.5. The component (B) has a satisfactory compatibility with the component (A) that has a
15 solubility parameter of approximately 8.0. The polypropylene composition obtained by kneading the components (A) and (B) is in a state in which the component (B) is compatibilized inside the component (A) phase or a state in which the component (B) is
20 dispersed into fine particles inside the component (A) phase. Thereby, in a case where a tension test is performed on the polypropylene composition when the component (A) constituting the polypropylene composition is greater than or equal to 82% by mass
25 and the component (B) constituting the polypropylene composition is less than or equal to 18% by mass, the SS curve indicating the correlation between the tensile strength S_1 and the elongation percentage S_2 of the polypropylene composition shows that the
30 tensile strength S_1 is greater than or equal to 23 MPa at a yield point. Accordingly, the polypropylene composition can attain termite resistance. Further, the polypropylene composition

can attain a more satisfactory termite resistance by setting the component (A) to be greater than or equal to 90% by mass and less than 100% by mass and the component (B) to be greater than 0% and less than or equal to 10% by mass under a condition where the tensile strength S_1 is greater than or equal to 27 MPa and the slope S_1/S_2 of the tensile strength S_1 and the elongation percentage S_2 is greater than or equal to 2.8 at the yield point. In addition, the polypropylene composition can attain satisfactory outer-damage resistance that is required when the polypropylene composition is formed into a cable. The tensile strength S_1 at the yield point is preferably greater than or equal to 27 MPa and less than or equal to 35 MPa. Further, the slope S_1/S_2 of the tensile strength S_1 and the elongation percentage S_2 at the yield point is preferably greater than or equal to 2.9 and less than or equal to 5.0. With the polypropylene composition having the tensile strength S_1 and the slope S_1/S_2 of the tensile strength S_1 and the elongation percentage S_2 in the above-described ranges, the polypropylene composition not only has a high tensile strength but also has an inductile property. Therefore, the polypropylene termite-resistant layer 17b not only has satisfactory termite resistance but is also less susceptible to outer damage when the flame-resistant termite-resistant cable 1 is dragged during extension of the flame-resistant termite-resistant cable 1. Further, the polypropylene termite-resistant layer 17b has satisfactory flame resistance because polypropylene having satisfactory flame resistance is included in the polypropylene

termite-resistant layer 17b.

Note that the solubility parameter is calculated by using Fedors method (Polymer Engineering and Science, Vol. 14, page 152). The values described by known references such as "(New)
5 -Basic and Applied- Plastic Compounds, Taisei Inc." may be used in actual practice.

Next, each component is described.

The polypropylene composition includes (A)
10 a polymer resin containing a propylene homopolymer and (B) a resin component having a solubility parameter that is greater than or equal to 7.0 and less than or equal to 9.5. Because this polymer resin has the component (B) contained in the
15 component (A), the moldability and physical properties such as tensile strength and ductility are adjusted according to the purpose for using the polypropylene composition.

The method for mixing the component (A)
20 and the component (B) of the polymer resin is not limited in particular. For example, the mixing method may be a mixing method that includes copolymerization during propylene polymerization or another mixing method of performing melt-kneading.
25 Further, the copolymer may be a random copolymer or a block copolymer.

The component (B) is not limited in particular as long as the component (B) is a resin component that has a solubility parameter greater
30 than or equal to 7.0 and less than or equal to 9.5 and has satisfactory compatibility with the component (A). By using the component (B), the tensile strength and the ductility of the

polypropylene composition can be adjusted. From the standpoint of adjusting tensile strength and ductility, the component (B) is preferably a resin component having high compatibility with the component (A). That is, the resin component is preferred to have a solubility parameter similar to that of the component (A), the solubility parameter preferably being greater than or equal to 7.5 and less than or equal to 9.0.

The component (B) may be, for example, a copolymer of propylene and an α olefin other than propylene, a vinyl-based resin, a diene-based rubber, an ethylene-propylene rubber, an ethylene-propylene-diene rubber (EPDM), and a thermoplastic elastomer. One of or a combination of two kinds of these components may be included in the component (B).

The vinyl-based resin may be, for example: a polyethylene-based resin (e.g., polyethylene, ethylene- α -olefin (carbon number of 3 to 12) copolymer, ethylene-vinyl acetate copolymer); a polypropylene-based resin (e.g., propylene- α -olefin (carbon number of 4 to 12) copolymer); a (META) acrylic-based resin (e.g., (co)-polymer of one or more monomers selected from a group including methacrylic acid, methyl methacrylate, ethyl methacrylate, and 2-ethylhexyl methacrylate); or a styrene-based resin (polystyrene, AS (Acrylonitrile-Styrene) resin, styrene-butadiene resin, styrene-maleic anhydride resin, styrene-acrylic ester resin, or HIPS (High Impact Polystyrene) resin).

The diene-based rubber may be, for example, butadiene rubber, butyl rubber, chloroprene rubber, isoprene rubber, or nitrile rubber (e.g.,

acrylonitrile-butadiene copolymer).

The thermoplastic elastomer may be, for example, styrene-butadiene rubber (SBR), styrene-butadiene block copolymer (SEBS), styrene-isoprene-
5 styrene block copolymer (SIS), styrene-isoprene rubber (SIR), styrene-ethylene-propylene-styrene block copolymer (SEPS), polystyrene-poly(ethylene/butylene) block copolymer, polystyrene-poly(ethylene/propylene) block copolymer,
10 styrene-ethylene-butylene-ethylene block copolymer, or a hydrogenated derivative of the above.

From the standpoint of the balance between tensile strength and ductility, the polypropylene composition is preferred to have a content in which
15 the component (A) is greater than or equal to 90% by mass and less than 100% by mass and the component (B) is greater than 0% by mass and less than or equal to 10% by mass with respect to the total of the component (A) and the component (B) being 100%
20 by mass. More preferably, the component (A) is greater than or equal to 90% by mass and less than or equal to 95% by mass and the component (B) is greater than 5% by mass and less than or equal to 10% by mass with respect to the total of the
25 component (A) and the component (B) being 100% by mass. With the preferred contents of component (A) and (B), the polypropylene composition can attain higher tensile strength and smaller ductility.
(Flame retardant)

30 The polypropylene composition is preferred to further contain a flame retardant from the standpoint of flame resistance. The flame retardant may be, for example, a flame retardant having a

melting peak temperature less than or equal to 230 °C, or a flame retardant having a peak mass loss rate of 1% at a temperature less than or equal to 300 °C. A single kind of flame retardant or two or
5 more kinds of flame retardants may be used. The flame retardant content is preferably greater than or equal to 1% by mass and less than or equal to 10% by mass with respect to the total of (A) the polypropylene polymer and (B) the resin component
10 being 100% by mass. In a case of using two or more kinds of flame retardants, the total of the flame retardants is preferred to be within the above-described range.

Although the flame retardant having a
15 melting peak temperature less than or equal to 230 °C is not limited in particular, the flame retardant may be, for example, tetrabromobisphenol A or its derivative, tris (tribromoneopentyl) phosphate or its derivative, and triallyl
20 isocyanurate-6 bromide or its derivative. The flame retardant may be a single kind of flame retardant or a combination of two or more kinds of flame retardants.

Although the flame retardant that has a
25 peak mass loss rate of 1% at a temperature less than or equal to 300 °C is not limited in particular, the flame retardant may be, for example: a phosphate mixture or its derivative, in which the phosphate mixture contains 2 kinds of phosphate compounds of
30 phosphoric acid and a triazine derivative or diamine (e.g., linear diamine, diamine containing piperazine or piperazine ring) , each of the 2 kinds of phosphate compounds being greater than or equal to

1% by mass and less than or equal to 99% by mass; a phosphate ester or its derivative; metal hydroxide; melamine sulfate; red phosphorous; and alkoxy imino hindered amine or its derivative. The flame

5 retardant may be a single kind of flame retardant or a combination of two or more kinds of these flame retardants.

(Auxiliary flame retardant)

According to necessity, the polypropylene
10 composition may contain an auxiliary flame retardant along with the above-described flame retardant.

Although the auxiliary flame retardant is not limited in particular, the auxiliary flame retardant may be, for example, antimony trioxide, zinc borate,
15 polytetrafluoroethylene, silicon dioxide, hydrotalcite, magnesium bicarbonate, zinc oxide, aluminum oxide, magnesium oxide, zirconium oxide, vanadium oxide, molybdenum oxide (and its surfactants), melamine, melamine cyanurate,
20 pentaerythritol, di pentaerythritol, tripentaerythritol, monopentaerythritol, tris (2-hydroxyethyl) isocyanurate, or polytetrafluoroethylene.

(Other additives)

25 To the extent of not degrading the effects of the present invention, the polypropylene composition may be combined with an additive such as an antioxidant, a lubricant, a crystal nucleating agent, an anti-blocking agent, various stabilizers
30 such as an ultraviolet absorber, an antistatic agent, a coloring agent such as a dye or a pigment, a plasticizer, a crystallization accelerator, a release agent, or a filler.

Although the antioxidant is not limited in particular, the antioxidant may be, for example, a phenol-based antioxidant, a phosphorous-based antioxidant, or a thiether-based antioxidant. The antioxidant may be a single kind of antioxidant or a combination of two or more kinds of these antioxidants.

Although the lubricant is not limited in particular, the lubricant may be, for example, a fatty acid amide-based lubricant, a fatty acid ester-based lubricant, a fatty acid-based lubricant, or a fatty acid metal salt-based lubricant. The lubricant may be a single kind of lubricant or a combination of two or more kinds of these lubricants.

Although the crystal nucleating agent is not limited in particular, the crystal nucleating agent may be, for example, a sorbitol-based nucleating agent, a phosphorous-based nucleating agent, a rosin-based nucleating agent, or a petroleum resin-based nucleating agent. The crystal nucleating agent may be a single kind of crystal nucleating agent or a combination of two or more kinds of these crystal nucleating agents.

The polypropylene composition is obtained by kneading the above-described components and additives with a Banbury mixer, an extruder, or the like. Taking productivity into consideration, the extruder is preferable because the extruder can perform production continuously. Of the extruders, a twin screw extruder is preferable. When kneading the above-described components and additives, the kneading is preferred to be performed while heating the above-described components and additives at a

temperature higher than or equal to the melting point of the polypropylene composition.

[Effects of the invention]

One or more of the following effects can
5 be attained by the embodiments of the present invention.

With the flame-resistant termite-resistant cable 1 according to an embodiment of the present invention, the sheath 17 has a surface on which a
10 polypropylene termite-resistant layer 17b formed of a polypropylene composition is provided. The polypropylene composition has a tensile strength S_1 greater than or equal to 27 MPa at a yield point in a tension test. The polypropylene composition has a
15 slope S_1/S_2 in which the tensile strength S_1 and an elongation percentage S_2 is greater than or equal to 2.8 at the yield point. Because the polypropylene termite-resistant layer 17b is formed of a polypropylene composition having high tensile
20 strength and low ductility, the flame-resistant termite-resistant cable 1 has satisfactory termite resistance and outer-damage resistance. In addition, the flame-resistant termite-resistant cable 1 has satisfactory flame resistance because the
25 polypropylene termite-resistant layer 17b contains polypropylene having satisfactory flame resistance.

Further, the sheath 17 is preferred to have a double-layer structure in which a polyvinyl chloride layer 17a formed of a polyvinyl chloride
30 composition and the polypropylene termite-resistant layer 17b are layered from an inner side to the surface. Although the polyvinyl chloride layer 17a has satisfactory flame resistance, the polyvinyl

chloride layer 17a has poor termite resistance. However, by forming the sheath 17 to have the double-layer structure by covering the poor termite-resistance polyvinyl chloride layer 17a with the polypropylene layer 17b, flame resistance can be improved without degrading the termite resistance of the flame-resistant termite-resistant cable 1.

The polypropylene composition constituting the polypropylene termite-resistant layer 17b preferably contains the component (A) being greater than or equal to 90% by mass and less than 100% by mass and the component (B) being greater than 0% by mass and less than or equal to 10% by mass. More preferably, the polypropylene composition contains the component (A) being greater than or equal to 90% by mass and less than or equal to 95% by mass and the component (B) being greater than or equal to 5% by mass and less than or equal to 10% by mass. Thereby, the polypropylene composition attains greater tensile strength and less ductility. Accordingly, the polypropylene termite-resistant layer 17b formed of these components has satisfactory termite resistance and outer-damage resistance.

The polypropylene composition constituting the polypropylene termite-resistant layer 17b further contains a flame retardant having a melting peak temperature less than or equal to 230 °C. The flame retardant content is preferably greater than or equal to 1% by mass and less than or equal to 10% by mass with respect to the total 100% of the component (A) and the component (B) by mass. More preferably, the polypropylene composition is to

contain a flame retardant having a peak mass loss rate of 1% at a temperature less than or equal to 300 °C. The flame retardant content is greater than or equal to 1% by mass and less than or equal to 10% by mass with respect to the total 100% of the component (A) and the component (B) by mass. Thereby, the flame resistance of the flame-resistant termite-resistant cable 1 can be further improved.

Moreover, the polypropylene termite-resistant layer 17b of the sheath 17 preferably has a thickness greater than or equal to 0.5 mm and is less than or equal to 50% of a thickness of the polyvinyl chloride layer 17a. Thereby, in addition to achieving balance between termite resistance and outer-damage resistance, the outer-diameter of the flame-resistant termite-resistant cable 1 can be prevented from increasing.

PRACTICAL EXAMPLE

Next, a practical example of the present invention is described. In the practical example, a flame-resistant termite-resistant cable was manufactured, and flame-resistance, termite resistance, and outer-damage resistance of the flame-resistant termite-resistant cable were evaluated according to the below-described methods and conditions. The following practical example(s) is merely an illustration of the present invention, and is not intended to limit the scope of the present invention.

(1) Materials

In the practical example, a propylene homopolymer was used as the component (A). A resin

component containing at least one kind of an ethylene-vinyl acetate copolymer (solubility parameter: 8.96) and a copolymer of propylene and ethylene (solubility parameter: 7.9 to 8.1) was used
5 as the component (B). Further, 2, 2' bis [4-(2, 3-(dibromopropoxy)-3, 5-dibromophenyl] propane (solubility peak temperature: 90 to 105 °C) was used as the flame retardant having a melting peak
10 temperature less than or equal to 230 °C. Further, a phosphate mixture (peak mass loss rate of 1% at a temperature ranging from 90 to 105 °C) was used as the flame retardant having a peak mass loss rate of 1% at a temperature less than or equal to 300 °C). Note that the phosphate mixture contains 2 kinds of
15 phosphate compounds of phosphoric acid and a triazine derivative or diamine (e.g., linear diamine, diamine containing piperazine or piperazine ring) . Each of the 2 kinds of phosphate compounds is greater than or equal to 1% by mass and less than or
20 equal to 99% by mass.

(2) Preparation of resin composition for termite-resistant layer

By using the above-described materials, samples 1 to 8 formed of polypropylene compositions
25 were prepared as the resin composition used for the termite-resistant layer. The conditions for preparing samples are shown in the following Table 1. In this practical example, a sample 9 formed of a nylon composition, and samples 10 and 11 formed of
30 PVC compositions were prepared as conventional resin compositions.

[Table 1]

			SAMPLE										
			1	2	3	4	5	6	7	8	9	10	11
POLY- PROPYLENE COMPOSITION	COMPOSITION	% COMPONENT (A) BY MASS	82	80	98	90	81	92	95	93	NYLON COMPO- SITION	PVC COMPO- SITION	PVC COMPO- SITION
		% COMPONENT (B) BY MASS	18	20	2	10	19	8	5	7			
	DENSITY (g/cm ³)		0.94	1.04	0.93	0.93	1.04	0.93	0.94	0.94			
	CHARAC- TERISTIC	TENSILE STRENGTH S ₁ (MPa)	23.0	19.0	31.0	27.0	22.0	28.0	31.0	30.0			
		ELONGATION PERCENTAGE S ₂ (%)	10.0	5.5	11.0	7.5	4.8	7.2	7.1	6.8			
		TENSILE STRENGTH S ₁ / ELONGATION PERCENTAGE S ₂ S ₁ /S ₂	2.3	3.5	2.8	3.6	4.6	3.9	4.4	4.4			
EVALUATION	TERMITE- RESISTANCE	CIRCUMFERENTIAL TERMITE DAMAGE RATE a (%)	4.0	100.0	17.3	24.6	87.8	10.3	11.0	18.2	8.9	16.6	70.5
		TERMITE DAMAGE PROGRESSION DISTANCE b (mm)	1.0	6.0	0.1	0.1	3.0	0.1	0.1	0.1	1.0	3.0	7.0
		a × b	4.0	600.0	1.7	2.5	263.4	1.0	1.1	1.8	8.9	49.8	493.5
		EVALUATION	○	×	○	○	×	○	○	○	CRITERION	×	×

(3) Evaluation method of resin composition for termite-resistant layer

Specimens were fabricated by using the
5 above-described prepared resin compositions used for
the termite-resistant layer. The tensile strength
and the termite resistance of the specimens were
evaluated. The method for evaluating the tensile
strength and the termite resistance is described
10 below, respectively.

(Tensile strength)

By performing a tensile test on each of
the specimens formed of the propylene compositions
shown in Table 1, the slope S_1/S_2 of the tensile
15 strength S_1 at the yield point of each of the
specimens and the elongation percentage S_2 at the
yield point of each of the specimens were obtained.
More specifically, the tests were performed on the
specimens in compliance with the JIS C3005 tensile
20 test method (Test methods for rubber or plastic
insulated wires and cables). Thereby, the tensile
strength and the ductility at the yield point of
each of the specimens was continuously measured
until the specimen fractured. According to the
25 results of the tensile tests, the tensile strength
 S_1 at the yield point of sample 1 was confirmed to
be 23 MPa and the slope S_1/S_2 of the tensile
strength S_1 at the yield point of sample 1 and the
elongation percentage S_2 at the yield point of
30 sample 1 was confirmed to be 2.3. The results shown
in Table 1 were confirmed by measuring the samples 2
to 8 in a similar manner as sample 1. The
correlations between the tensile strength S_1 and the

slope S_1/S_2 of each of the samples 1 to 8 are shown in Fig. 2. In Fig. 2, the horizontal axis indicates the tensile strength S_1 (MPa) at the yield point and the vertical axis indicates the slope S_1/S_2 of the tensile strength S_1 at the yield point and the elongation percentage S_2 at the yield point. (Termite resistance)

The termite resistance of the specimens formed of the polypropylene compositions of samples 1 to 8 and the specimens formed of the above-described compositions of samples 9 to 11 were evaluated based on the degree of damage that is caused when the specimens are exposed to feeding by termites (termite damage).

More specifically, specimens (size: 50 mm $\times$ 50 mm, thickness: 1 mm) were fabricated from the compositions of samples 1 to 11. Each specimen was clamped between bait wood for termites and placed in a termite colony for 1 month. The degree of the feeding damage by termites (termite damage) was observed for each specimen placed in the colony. As illustrated in Fig. 3, the length of termite damage (c) (mm units) was measured in a width direction throughout the circumference of the specimen. The termite damage rate (a) (% units) which is the ratio between the total length of the termite damage and the circumferential length of the specimen (= total length of termite damage in width direction/circumferential length 200 mm (50 mm $\times$ 4 sides)) was measured. Further, the termite damage progression distance (b) (mm units) was measured in a depth direction throughout the circumference of the specimen. The maximum value of the termite

damage progression distance and the termite damage rate (a) were multiplied ((a) $\times$ (b)). In measuring the length of termite damage (c) in the width direction, the areas of termite damage were identified as follows. As illustrated in Fig. 3, not only the areas subjected to termite damage throughout in the thickness direction of the specimen were identified as the areas of termite damage, but also the areas subjected to termite damage halfway from an upper side or a lower side of the specimen in the thickness direction of the specimen are also identified as the areas of termite damage. In a case where an area subjected to termite damage from the upper side of the specimen and an area subjected to termite damage from the lower side of the specimen overlap at a region of the specimen (hatched portion illustrated in Fig. 3), the length of termite damage (c) at this region of the specimen can be measured by subtracting the length of the hatched portion from the total length of the overlapped areas.

In the practical example, termite resistance was evaluated by using the specimen of sample 9 (nylon 12) as a criterion. By comparing the specimens with the criterion values below, a specimen having an evaluation value ((a) $\times$ (b)) that is large (satisfactory termite resistance) is judged as "○", and a specimen having an evaluation ((a) $\times$ (b)) that is small (poor termite resistance) is judged as "×". The obtained results are shown in Table 1.

Termite resistance of specimen of nylon 12

(criterion value)

Termite damage rate (a): 8.9%

Termite damage progression distance (maximum value)

(b): 1 mm

5 Evaluation value $((a) \times (b))$: 8.9

(4) Evaluation results of resin component for termite-resistant layer

It was confirmed that the samples except
10 for samples 2 and 5 have a tensile strength S_1
greater than or equal to 3.0 MPa at yield point, and
that the samples except for samples 2 and 5 have
more satisfactory termite resistance compared to the
termite resistance of the nylon of sample 9 and the
15 PVC of samples 10 and 11. Thus, it can be
understood that termite resistance becomes
satisfactory when the component (A) contained in a
polypropylene composition is greater than or equal
to 82% by mass and the component (B) contained in
20 the polypropylene composition is less than or equal
to 18% by mass. As illustrated in Table 1, with
the sample 1, the slope S_1/S_2 of the tensile
strength S_1 and an elongation percentage S_2 at the
yield point was 2.3, that is, less than 2.8. On
25 the other hand, with the samples 2 to 8, the slope
 S_1/S_2 of the tensile strength S_1 and an elongation
percentage S_2 at the yield point was greater than or
equal to 2.8. The results of evaluating the outer-
damage resistance of a manufactured cable are
30 described in detail below in relation to the above-
described evaluation results.

(5) Manufacturing of flame-resistant termite-resistant cable

Next, flame-resistant termite-resistant cables of practical examples 1, 2 and a flame-resistant termite-resistant cable of a comparative example 1 were manufactured by using the samples 1, 4, and 6 including the above-described prepared polypropylene compositions having termite resistance. In this practical example, a flame-resistant termite-resistant cable having the structure illustrated in Fig. 1 was used.

First, the internal semiconductor layer 11, the insulation layer 12, the external semiconductor layer 13, the shield layer 14, the pressing tape 15, and the water-shielding layer 16 were formed on the outer periphery of the conductor 10 in this order by using a conventionally known method. Then, the double-layer structure sheath 17 having the polyvinyl chloride layer 17a and the polypropylene termite-resistant layer 17b were layered on the outer periphery of the water-shielding layer 16 by simultaneously forming the polyvinyl chloride composition and the polypropylene composition of sample 4 with a double-layer extrusion-coating process. Thereby, the flame-resistant termite-resistant cable 1 of practical example 1 was manufactured. Further, the flame-resistant termite-resistant cable 1 of practical example 2 was manufactured in a similar manner as the manufacturing of the flame-resistant termite-resistant cable 1 of practical example 1 except for changing the kind of polypropylene composition from the polypropylene composition of sample 4 to the polypropylene composition of sample 6. Further, the flame-resistant termite-resistant cable 1 of

comparative example 1 was manufactured in a similar manner as the manufacturing of the flame-resistant termite-resistant cable 1 of practical example 1 except for changing the kind of polypropylene
5 composition from the polypropylene composition of sample 4 to the polypropylene composition of sample 1. Note that the thickness of the polyvinyl chloride layer 17a was 3.5 mm, the thickness of the polypropylene termite-resistant layer 17b was 1 mm,
10 and the outer diameter of the flame-resistant termite-resistant cable 1 was 40 mm. Further, the polyvinyl chloride composition that was used contained 10 polyvinyl chloride parts by mass and 3 flame retardant parts by mass. The conditions for
15 manufacturing the flame-resistant termite-resistant cable are shown in Table 2 below.

[Table 2]

(6) Method for evaluating cable
Then, evaluation of outer-damage

			SAMPLE		
			COMPARATIVE EXAMPLE 1	PRACTICAL EXAMPLE 1	PRACTICAL EXAMPLE 2
POLY- PROPYLENE COMPOSITION	SHEET SAMPLE No.		1	4	6
	COMPO- SITION	% COMPONENT (A) BY MASS	82	90	92
		% COMPONENT (B) BY MASS	18	10	8
	DENSITY (g/cm³)		0.94	0.93	0.93
	CHARAC- TERISTIC	TENSILE STRENGTH S ₁ (MPa)	23.0	27.0	28.0
		ELONGATION PERCENTAGE S ₂ (%)	10.0	7.5	7.2
		TENSILE STRENGTH S ₁ / ELONGATION PERCENTAGE S ₂ S ₁ /S ₂	2.3	3.6	3.9
FLAME-RESISTANT TERMITE-RESISTANT CABLE		THICKNESS OF POLYVINYL CHLORIDE LAYER (mm)	3.5	3.5	3.5
		THICKNESS OF POLYPROPYLENE TERMITE- RESISTANT LAYER (mm)	1.0	1.0	1.0
		OUTER DIAMETER (mm)	40. 0	40. 0	40. 0
EVALUATION	TERMITE- RESISTANCE	CIRCUMFERENTIAL TERMITE DAMAGE RATE a (%)	4.0	24.6	10.3
		TERMITE DAMAGE PROGRESSION DISTANCE b (mm)	1.0	0.1	0.1
		a × b	4.0	2.5	1.0
	EXTERNAL DAMAGE RESISTANCE		× (PEELING AT 500 kg/m)	○ (NO PEELING AT 1500 kg/m)	○ (NO PEELING AT 1500 kg/m)
	FLAME RESISTANCE		○ (COMBUSTION LENGTH 76 cm, AFTERFLAME TIME 25 min.)	○ (COMBUSTION LENGTH 76 cm, AFTERFLAME TIME 2 min. 30 sec.)	○ (COMBUSTION LENGTH 77 cm, AFTERFLAME TIME 4 min. 50 sec.)

resistance and flame resistance was performed for the manufactured flame-resistant termite-resistant cables of practical examples 1, 2 and comparative example 1, respectively. The method for evaluating
5 each of the outer-damage resistance and the flame resistance is described below.

(Outer-damage resistance)

The outer-damage resistance was evaluated by observing the outer damage of the surface of the
10 flame-resistant termite-resistant cable 1 when the flame-resistant termite-resistant cable 1 placed on an test platform simulated as a pipeline is pulled while a load is applied to the flame-resistant termite-resistant cable 1.

15 More specifically, as illustrated in Figs. 4(a) and 4(b), 2 lines of flame-resistant termite-resistant cables 1, which have been heated to approximately 40 °C for 2 hours or more, are placed on a test platform 20 that is simulated as a
20 pipeline and includes a pipeline step part 21. The flame-resistant termite-resistant cable 1 was moved at a rate of 10 m/minute while a load 30 is evenly applied throughout 1.5 m. Then, the state of damage (e.g., peeling) caused on the exterior
25 (polypropylene termite-resistant layer 17b)) of the flame-resistant termite-resistant cable 1 during the movement of the flame-resistant termite-resistant cable 1 over the pipeline step part 21 was verified. In the practical example, the evaluation was
30 performed by changing the load 30 from approximately 900 kg (300 kg/m) to an upper limit of approximately 4500 kg (1500 kg/m). As illustrated in Fig. 5(c), the pipeline step part 21 that was used has a height

of 8 mm and includes a corner cross section being chamfered approximately 1 to 2 mm. A satisfactory result is indicated with a "○" when no peeling is confirmed at the upper limit and an unsatisfactory
5 result is indicated with "×" along with the load when peeling is confirmed.

(Flame resistance)

Flame resistance was evaluated by performing a flame resistance test IEEE std. 383-
10 1974 on the flame-resistant termite-resistant cable.

More specifically, cables were laid on a tray and burned from below the tray for 20 minutes with a predetermined burner. The cables were mounted on a vertical ladder-like tray to form a
15 total width of 150 mm at intervals that are 1/2 of the outer diameter of a cable. Then, flame resistance is judged to be satisfactory if the combustion length from an orifice of the burner is less than or equal to 120 cm and the after-flame
20 time is less than or equal to approximately 1 hour.

(7) Evaluation result of cable

As illustrated in Table 2, with the flame-resistant termite-resistant cable of comparative example 1, it was confirmed that peeling of the
25 polypropylene termite-resistant layer 17b occurred at 500 kg/m, and that the polypropylene composition of sample 1 has poor outer-damage resistance. This is believed to have occurred because the slope S_1/S_2 of the tensile strength S_1 and the elongation
30 percentage S_2 at the yield point of the sample 1 is less than 2.8, and the sample 1 has high ductility. On the other hand, with the practical examples 1 and 2, it was confirmed that no peeling of the

polypropylene termite-resistant layer 17b occurred at 1500 kg/m, and that the samples 4 and 6 have satisfactory outer-damage resistance. This is believed to have occurred because the slope S_1/S_2 of the tensile strength S_1 and the elongation percentage S_2 at the yield point of each of the samples 4 and 6 is greater than or equal to 2.8, and each of the samples 4 and 6 has small ductility.

Further, it was confirmed that all of the flame-resistant termite-resistant cables have satisfactory flame resistance.

It was confirmed that a cable not only can attain satisfactory termite resistance and flame resistance but also satisfactory outer-damage resistance when the cable is manufactured at the area indicated with arrows in Fig. 2, that is, when the tensile strength S_1 is greater than or equal to 27 MPa at the yield point and the slope S_1/S_2 of the tensile strength S_1 and the elongation percentage S_2 is greater than or equal to 2.8 at the yield point.

Similar to the samples 4 and 6, the samples 3, 7, and 8 have a tensile strength S_1 greater than or equal to 27 MPa at the yield point and the slope S_1/S_2 greater than or equal to 2.8 at the yield point. Thus, the samples 3, 7, and 8 were confirmed to have satisfactory, termite resistance, flame resistance, and outer-damage resistance. On the other hand, the samples 2 and 5 each have slopes S_1/S_2 greater than or equal to 2.8 and low ductility. Thus, the samples 2 and 5 were confirmed to have satisfactory outer-damage resistance but poor termite resistance due to the tensile strength S_1 being less than 23 MPa.

Hence, a flame-resistant termite-resistant cable having satisfactory termite resistance, outer-damage resistance, and flame resistance can be obtained by forming a polypropylene termite-resistant layer by using a polypropylene composition having high tensile strength and elongation percentage.

EXPLANATION OF REFERENCE NUMERALS

- 1 flame-resistant termite-resistant cable
- 10 10 conductor
- 11 internal semiconductor layer
- 12 insulation layer
- 13 external semiconductor layer
- 14 shield layer
- 15 15 pressing tape
- 16 water-shielding layer
- 17 sheath
- 17a polyvinyl chloride
- 17b polypropylene termite-resistant layer

20

CLAIMS

1. A flame-resistant termite-resistant
cable including a sheath, the flame-resistant
5 termite-resistant cable comprising:

the sheath having a surface on which a
polypropylene termite-resistant layer including a
polypropylene composition is provided;

wherein the polypropylene composition
10 contains (A) a propylene homopolymer and (B) a resin
component having a solubility parameter greater than
or equal to 7.0 and less than or equal to 9.5, a
tensile strength S_1 of the polypropylene composition
being greater than or equal to 27 MPa at a yield
15 point in a tension test, and a slope S_1/S_2 of the
tensile strength S_1 and an elongation percentage S_2
of the polypropylene composition being greater than
or equal to 2.8 at the yield point.

20 2. The flame-resistant termite-resistant
cable as claimed in claim 1, wherein the
polypropylene composition contains (A) the propylene
homopolymer being greater than or equal to 90% by
mass and less than 100% by mass and (B) the resin
25 component being greater than 0% by mass and less
than or equal to 10% by mass with respect to the
total of (A) the propylene homopolymer and (B) the
resin component being 100% by mass.

30 3. The flame-resistant termite-resistant
cable as claimed in claim 1 or claim 2, wherein (B)
the resin component includes one of or a combination
of two kinds of a copolymer of propylene and an α

olefin other than propylene, a vinyl resin, a diene rubber, an ethylene-propylene rubber, an ethylene-propylene-diene rubber, and a thermoplastic elastomer.

5

4. The flame-resistant termite-resistant cable as claimed in one of claims 1 to 3, wherein the polypropylene composition further contains a flame retardant having a melting peak temperature
10 less than or equal to 230 °C, the flame retardant content is greater than or equal to 1% by mass and less than or equal to 10% by mass with respect to the total of (A) the propylene homopolymer and (B) the resin component being 100% by mass.

15

5. The flame-resistant termite-resistant cable as claimed in one of claims 1 to 3, wherein the polypropylene composition further contains a flame retardant having a peak mass loss rate of 1%
20 at a temperature less than or equal to 300 °C, the flame retardant content is greater than or equal to 1% by mass and less than or equal to 10% by mass with respect to the total of (A) the propylene homopolymer and (B) the resin component 100% by mass.

25

6. The flame-resistant termite-resistant cable as claimed in one of claims 1 to 5, wherein the sheath includes a double-layer structure in which a polyvinyl chloride layer formed of a
30 polyvinyl chloride composition and the polypropylene termite-resistant layer are layered from an inner side to the surface.

7. The flame-resistant termite-resistant
cable as claimed in claim 6, wherein the
polypropylene termite-resistant layer has a
thickness greater than or equal to 0.5 mm and is
5 less than or equal to 50% of a thickness of the
polyvinyl chloride layer.