

DESCRIPTION

CONDUCTIVE THERMOPLASTIC RESIN COMPOSITION, AND MOLDED ARTICLES USING THE SAME

5 Technical Field

The present invention relates to a conductive thermoplastic resin composition which has high-heat resistance, flame retardance, high-strength and high-rigidity, excels in dimensional stability and can be suitably utilized for various electric and/or electronic components,
10 and also relates to molded articles using the conductive thermoplastic resin composition.

Background Art

Generally, for thermoplastic resins suitably used for various
15 electric components and electronic components, for example, there have been known polypropylene resins, polystyrene resins, polyamide resins, polyester resins, and the like. With a view to improving the mechanical strength of these thermoplastic resins, glass fibers are added to these thermoplastic resins.

20 Further, with a view to imparting conductivity to these thermoplastic resins, there has been known a conductive thermoplastic resin composition in which carbon black is dispersed. By using the conductive thermoplastic resin composition, electric and/or electronic components with conductivity and antistatic properties imparted
25 thereto can be formed. Examples of the electric and/or electronic

components include magazines and trays which prevent damages of electronic components such as Integrated Circuit (IC), Large Scale Integrated Circuit (LSI), and Light Emitting Diode (LED), by means of static electricity.

5 In recent years, it is desired that electric and/or electronic components such as gears, ink cartridges, and sheet-feed guides which are components such as for personal computers, and printers; and components for scanners and facsimiles have high-heat resistance, high-strength, high-rigidity, and high-dimensional stability in
10 addition to conductivity, and excel in high-flame retardance.

 However, there are shortcomings that the polypropylene resins and the styrene resins are poor in heat resistance; and the polyamide resins and the polyester resins cause degradation in strength caused by moisture absorption, have high-mold shrinkage factor, and are
15 poor in dimensional stability. A conductive thermoplastic resin composition with carbon black dispersed therein needs to add a large amount of carbon black to obtain a predetermined conductivity. In this case, the flame retardance of the conductive thermoplastic resin composition is significantly degraded because of inflammability of
20 carbon black, and this makes it hard to ensure the desired flame retardance. Further, when carbon black is used in combination with a glass fiber for the purpose of obtaining both conductivity and strength, it is difficult to obtain both of the predetermined conductivity and strength, because the filling amounts of the carbon
25 black and the glass fiber relative to the resin components are limited.

In addition, since the thermal conductivity of glass fiber is as low as that of plastics, and the glass fiber serves as a lampwick, this causes further degradation of flame retardance.

In order to overcome these shortcomings, there is, for example,
5 a conductive thermoplastic resin composition proposed, having (a) 60% by mass to 95% by mass of polyphenylene ether resin which contains a polyphenylene ether or a mixture of 70% by mass or more of the polyphenylene ether and 30% by mass or less of a styrene resin; (b) a resin component which is 5% by mass to 40% by mass of a
10 hydrogenated block copolymer that the bonding amount of a styrene compound which can be obtained by hydrogenating a block copolymer of the styrene compound and a conjugate diene is 15% by mass to 60% by mass, and the polystyrene-reduced weight average molecular weight of the copolymer is 100,000 or more; and (c) one or
15 more selected from conductive materials in the resin component (b) (see Patent Literature 1).

However, with the proposal, it is difficult to satisfy all the properties of high-heat resistance, high-strength, high-rigidity, high-dimensional stability, and flame retardance, although the form
20 stability, heat resistance, and impact resistance are improved at a certain level.

Thus, a conductive thermoplastic resin composition which has high-heat resistance, flame retardance, high-strength, and high-rigidity, and excels in dimensional stability, and can be suitably
25 utilized for various electric and/or electronic components, has not

been provided yet.

Patent Literature 1 Japanese Patent Application Laid-Open
(JP-A) No. 11-256025

5 Disclosure of the Invention

It is therefore an object of the present invention to provide a
conductive thermoplastic resin composition which can overcome the
conventional shortcomings and respond to the requests, has high-heat
resistance, high-strength, high-rigidity, and high-dimensional stability
10 in addition to excellent conductivity, excels in flame retardance, and
can be suitably utilized for electric and/or electronic components, and
OA device components; and to provide molded articles using the
conductive thermoplastic resin composition.

In view of the above-mentioned shortcomings, the inventors of
15 the present invention have investigated vigorously, and have obtained
the following finding. Specifically, it is found that a conductive
thermoplastic resin composition containing a polyphenylene ether
resin, a butadiene-styrene graft copolymer, and a carbon fiber has
high-heat resistance, high-strength, high-rigidity, and high-stability in
20 addition to conductivity, excels in flame retardance, and can be
suitably utilized for electric and/or electronic components, and OA
device components.

The present invention is based on the finding of the present
inventors, and how to overcome the aforesaid shortcomings is as
25 follows:

< 1 > A conductive thermoplastic resin composition containing a polyphenylene ether resin, a butadiene-styrene graft copolymer, and a carbon fiber.

5 wherein the polyphenylene ether resin has an intrinsic viscosity (IV) of 0.3 dL/100g to 0.5 dL/100g

< 2 > The conductive thermoplastic resin composition according to any one of the item < 1 > , wherein the content of the polyphenylene ether resin in the conductive thermoplastic resin
10 composition is 60% by mass to 90% by mass.

< 3 > The conductive thermoplastic resin composition according to any one of the items < 1 > to < 2 >, wherein the melt mass-flow rate (MFR) of the butadiene-styrene graft copolymer is 1 g/10 min to 30 g/10 min under the measurement conditions of 200°C
15 and 49.03N.

< 4 > The conductive thermoplastic resin composition according to any one of the items < 1 > to < 3 >, wherein the content of the butadiene-styrene graft copolymer in the conductive thermoplastic resin composition is 5% by mass to 40% by mass.

20 < 5 > The conductive thermoplastic resin composition according to any one of the items < 1 > to < 4 >, wherein the content of styrene in the butadiene-styrene graft copolymer is 90% by mass or more.

< 6 > The conductive thermoplastic resin composition
25 according to any one of the items < 1 > to < 5 >, wherein the fiber

length of the carbon fiber in the kneaded conductive thermoplastic resin composition is 100 μm to 500 μm .

< 7 > The conductive thermoplastic resin composition according to any one of the items < 1 > to < 6 >, wherein the content of the carbon fiber is 5 parts by mass to 30 parts by mass relative to 100 parts by mass of the resin components which include the polyphenylene ether resin and the butadiene-styrene graft copolymer.

< 8 > The conductive thermoplastic resin composition according to any one of the items < 1 > to < 7 >, further containing a glass fiber.

< 9 > The conductive thermoplastic resin composition according to the item < 8 >, wherein the content of the glass fiber is 1 part by mass to 20 parts by mass relative to 100 parts by mass of the resin components which include the polyphenylene ether resin and the butadiene-styrene graft copolymer.

< 10 > A molded article formed from a conductive thermoplastic resin composition according to any one of the items < 1 > to < 9 >.

< 11 > The molded article according to the item < 10 >, wherein the surface resistivity of the molded article is $1.0 \times 10^2 \Omega$ to $1.0 \times 10^{10} \Omega$.

< 12 > The molded article according to any one of the items < 10 > to < 11 >, being at least one selected from molded articles of electric components, molded articles of electronic components, molded articles of OA device components, and molded articles of packaging

electronic components.

< 13 > The molded article according to the item < 12 >, being any one of a gear, a cartridge, a sheet-feed guide, a magazine, and a tray.

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Best Mode for Carrying Out the Invention

(Conductive Thermoplastic Resin Composition)

The conductive thermoplastic resin composition of the present invention contains a polyphenylene ether resin, a butadiene-styrene
10 graft copolymer, and a carbon fiber and further contains glass fiber, and other components suitably selected in accordance with the necessity.

- Polyphenylene Ether Resin -

The polyphenylene ether resin is not particularly limited, may
15 be suitably selected from among those known in the art, and may be a commercially available one or may be suitably synthesized. When a synthesized polyphenylene ether resin is used, the synthesizing method is not particularly limited and may be suitably selected in accordance with the intended use.

20 Examples of the polyphenylene ether resin include polyphenylene oxide (PPE) being an amorphous resin which can be obtained by polymerization of 2,6-xylene; poly(2,3,6-trimethyl-1,4-phenylene) ether synthesized by oxidative coupling of 2,6-dimethylphenol, 2,3,6-trimethylphenol, and the like; or
25 single polymers such as poly(2,3,6-trimethyl-1,4-phenylene ether);

copolymers such as 2,6-dimethylphenol, and 2,3,6-trimethylphenol; or polymers of which these polymers are modified by an unsaturated carboxylic acid such as maleic acid anhydride.

Examples of the commercially available polyphenylene ether resin include YPX-100F, YPX-100D, PX-100F (available from MITSUBISHI GAS CHEMICAL CO., INC.); and PPO640 (available from GE Plastics Company).

It should be noted that it is difficult to process a typically used polyphenylene ether resin alone, and thus the polyphenylene ether resin is modified by copolymerizing it into a copolymer or blending it with a polystyrene resin, and the like, for use.

The intrinsic viscosity (IV) of the polyphenylene ether resin is preferably 0.3 dL/100g to 0.5 dL/100g, more preferably 0.3 dL/100g to 0.45 dL/100g, and still more preferably 0.35 dL/100g to 0.45 dL/100g.

When the intrinsic viscosity (IV) exceeds 0.5 dL/100g, the forming processability of the polyphenylene ether resin may be degraded due to the excessive viscosity, and when the intrinsic viscosity (IV) is less than 0.3 dL/100g, desired rigidity may not be obtained because of the excessively low molecular mass of the polyphenylene ether resin.

The content of the polyphenylene ether resin in the conductive thermoplastic resin composition is preferably 60% by mass to 90% by mass, and more preferably 65% by mass to 80% by mass.

When the content of the polyphenylene ether resin is less than 60% by mass, desired heat resistance and high-temperature

dimensional stability may not be obtained. When the content is more than 90% by mass, the forming processability and impact resistance of the polyphenylene ether resin may be degraded.

- Butadiene-Styrene Graft Copolymer -

5 The butadiene-styrene graft copolymer is a copolymer that styrene is used as a stem, and a butadiene is graft-polymerized as a branch with the styrene.

 The content of styrene in the butadiene-styrene graft copolymer is preferably 90% by mass or more, and more preferably 90% by mass
10 to 95% by mass. When the content of the styrene is less than 90% by mass or less, the compatibility with the polyphenylene ether resin may be degraded.

 The butadiene-styrene graft copolymer is not particularly limited, may be suitably selected from among those known in the art,
15 and may be a commercially available one or may be suitably synthesized.

 Examples of the commercially available butadiene-styrene graft copolymer include polystyrene H8601 (available from A & M Styrene Co., Ltd.).

20 The melt mass-flow rate (MFR) of the butadiene-styrene graft copolymer is preferably, under the measurement conditions of 200°C and 49.03N, 1 g/10 min to 30 g /10 min, more preferably 3 g/10 min to 25 g/10 min, and still more preferably 10 g/10 min to 25 g/10 min.

 When the melt mass-flow rate is less than 1 g/10 min, the
25 forming processability may be degraded due to the excessively

high-viscosity. When the melt mass-flow rate is more than 30 g/10 min, the improvement effect of the impact strength may be reduced. In order to improve the melt mass-flow rate (MFR) of the butadiene-styrene graft copolymer within a range where the molecular mass of the butadiene-styrene graft copolymer is not reduced, it is possible to blend oil such as mineral oil as an internal lubricant.

The content of the butadiene-styrene graft copolymer in the conductive thermoplastic resin composition is preferably 10% by mass to 40% by mass, and more preferably 15% by mass to 30% by mass.

When the content is less than 10% by mass, the forming processability and the impact resistance may be degraded, and when the content is more than 40% by mass, the high-temperature dimensional stability may not be obtained.

- Carbon Fiber -

The carbon fiber is not particularly limited and may be suitably selected from among those known in the art in accordance with the intended use. Examples thereof include pitch carbon fibers or chopped strands each of which original yarn of PAN carbon fiber is chopped.

In addition, in order to improve the handling property, a carbon fiber that the carbon fiber density falls within a range of 10 k to 20 k using a sizing agent, and the fiber length is 3 mm to 6 mm, is preferable.

The fiber diameter of the carbon fiber is preferably 5 μm to 15 μm , more preferably 5 μm to 12 μm , and still more preferably 6 μm to

10μm.

The fiber length of the kneaded carbon fiber in the conductive thermoplastic resin composition is preferably 100 μm to 500 μm, and more preferably around 300 μm from the perspective of reinforcement effect and conductivity.

The volume resistivity of the carbon fiber is preferably $9.9 \times 10^{-1} \Omega \cdot \text{cm}$ or less, and more preferably $9.9 \times 10^{-2} \Omega \cdot \text{cm}$ or less. When the volume resistivity is more than $9.9 \times 10^{-1} \Omega \cdot \text{cm}$, desired conductivity may not be obtained.

The fiber length of the kneaded carbon fiber in the conductive thermoplastic resin composition is preferably 100 μm to 500 μm, and more preferably around 300μm from the perspective of reinforcement effect and conductivity.

The content of the carbon fiber relative to 100 parts by mass of the resin components which include the polyphenylene ether resin and the butadiene-styrene graft copolymer is preferably 5 parts by mass to 30 parts by mass, and more preferably 5 parts by mass to 20 parts by mass.

The content of the carbon fiber departs from the above-mentioned range, predetermined conductivity, high-strength (particularly, tensile strength), high-rigidity (particularly, flexural modulus), and dimensional stability of the conductive thermoplastic resin composition may be degraded.

In the present invention, graphitization is more utilized than the use of carbon black, and by containing a carbon fiber, which excels

in burning resistance, in the conductive thermoplastic resin composition, it is possible to obtain both conductivity and flame retardance in the conductive thermoplastic resin composition.

- Glass Fiber -

5 The glass fiber is not particularly limited and may be suitably selected from among those known in the art in accordance with the intended use, and examples thereof include chopped strands each of which original yarn thereof is chopped.

10 In order to improve the handling property, a glass fiber that the glass fiber density falls within a range of 10 k to 20 k using a sizing agent, and the fiber length is 3 mm to 6 mm, is preferable.

 The fiber diameter of the glass fiber is preferably 5 μm to 15 μm , more preferably 7 μm to 12 μm , and still more preferably 7 μm to 10 μm .

15 The fiber length of the kneaded glass fiber in the conductive thermoplastic resin composition is preferably 100 μm to 500 μm , and more preferably around 300 μm from the perspective of reinforcement effect and conductivity.

20 The content of the glass fiber relative to 100 parts by mass of the resin components which include the polyphenylene ether resin and the butadiene-styrene graft copolymer is preferably 1 part by mass to 20 parts by mass, and more preferably 1 part by mass to 10 parts by mass.

25 The content of the glass fiber departs from the above-mentioned range, high-strength (particularly, tensile strength), high-rigidity

(particularly, flexural modulus), and dimensional stability of the conductive thermoplastic resin composition may be degraded.

- Other Components -

5 The other components are not particularly limited, may be suitably selected in accordance with the intended use, and examples thereof include other synthetic resins, inorganic fillers, plasticizers, heat stabilizers, processing aids, various flame retardant agents, lubricants, and colorants.

(Method for Producing Conductive Thermoplastic Resin Composition)

10 The method for producing a conductive thermoplastic resin composition is not particularly limited and may be suitably selected in accordance with the intended use. For example, a polyphenylene ether resin, a butadiene-styrene graft copolymer, and a carbon fiber are mixed with, preferably, a glass fiber, by a known method, and
15 kneaded to thereby prepare a conductive thermoplastic resin composition. For example, the conductive thermoplastic resin composition can be formed into a pellet-like compound.

The method for forming a conductive thermoplastic resin composition into a pellet-like compound is not particularly limited.
20 It is possible to easily produce a conductive thermoplastic resin composition using devices, and equipment used in mixing and kneading typical thermoplastic resins. For example, individual components are poured into a preparative mixer such as tumbler, and HENSCHEL MIXER at the same time to uniformly mix the individual
25 components and the mixed components can be kneaded.

Alternatively, specific components can be separately supplied into a kneader using a quantitative feeder, a volumetric feeder, or the like.

Next, mixtures of the individual components are supplied into a melting kneader to fuse and knead them, and kneaded mixture is

5 extruded from a die to thereby pelletize the mixture using a pelletizer.

Examples of the kneader include single-screw extruders each equipped with vents, different direction two-screw extruders; same direction two-screw extruders. Instead of the extruder, it is also possible to use kneaders known in the art such as Super Mixer,

10 Banbury mixer, kneader, tumbler, and co-kneader. Specifically, the conductive thermoplastic resin composition is produced by a continuous extrusion method, using a single-screw extruder, or a two-screw extruder; however, a side feed method is preferable in which carbon fiber and glass fiber are fed in the middle of the barrel of
15 a used two-screw extruder; and it is more preferable that the conductive thermoplastic resin composition be produced by a forced side feed method in which fibers are forcedly supplied into the used extruder barrel.

(Molded Articles)

20 The shape, structure, size, surface resistivity, and the like of the molded articles of the present invention are not particularly limited and may be suitably selected in accordance with the intended use, provided that the molded articles are formed by use of the conductive thermoplastic resin composition of the present invention.

25 The surface resistivity of the molded articles is preferable $1.0 \times$

$10^2 \Omega$ to $1.0 \times 10^{10} \Omega$, and more preferably $1.0 \times 10^2 \Omega$ to $1.0 \times 10^8 \Omega$.

Here, the surface resistivity of the molded articles can be measured in accordance with D257 of the ASTM Standard.

By forming the conductive thermoplastic resin composition into
5 a desired shape using an existing molding machine such as for
injection molding, and extrusion molding, it is possible to make it into
molded articles suitable for semiconductors etc. used for specific
purposes, for example, for countermeasures against static electricity,
or the like of automobile components, and it can be suitably utilized
10 for gears, cartridges, sheet-feed guides, and the like, as molded articles
of electric components, molded articles of electronic components, or
molded articles of OA device components. In addition, it is possible
to suitably use it as molded articles for packaging electronic
components such as Integrated Circuit (IC), Large Scale Integrated
15 Circuit (LSI), Light Emitting Diode (LED) and as molded articles for
packaging electronic components formed into a shape such as a
magazine, and a tray.

Example

20 Hereinafter, the present invention will be described in detail
referring to specific examples, however, the present invention is not
limited to the disclosed examples.

(Examples 1 to 3 and Comparative Examples 1 to 3)

- Preparation of Conductive Thermoplastic Resin Composition -

25 Conductive thermoplastic resin compositions of Examples 1 to 3

and Comparative Examples 1 to 3 each having a composition shown in the following Table 1 were respectively prepared according to common procedures.

Specifically, the various components shown in Table 1 were
5 uniformly mixed in a high-speed mixer, and then the carbon fiber, the carbon black, and the glass fiber were supplied to an extruder using a same direction two-screw extruder, NR-II (screw aperture diameter = 57 mm), available from Nakatani Machinery Co., Ltd., by a forced side feed method. In the meanwhile, a polyphenylene ether resin and a
10 butadiene-styrene copolymer were uniformly mixed in a blender beforehand, and the mixture was supplied into the extruder. The mixed components were kneaded at a temperature ranging from 250°C to 360°C, and the obtained kneaded mixture was water-cooled, and cut into strand to thereby prepare each of pellets made of each of
15 the conductive thermoplastic resin compositions of Examples 1 to 3 and Comparative Examples 1 to 3.

< Evaluations of Performance >

The thus obtained each individual pellets were dried with hot-air at 120°C for 3 hours and then injection-extruded at an injection
20 temperature of 320°C using an injection molder available from Nissei Plastic Industrial Co., Ltd. to thereby prepare each individual pellet samples.

The obtained each pellet samples were evaluated in terms of surface resistivity, heat deflection temperature (HDT), tensile strength,
25 melt mass-flow rate (MFR), coefficient of linear expansion, Charpy

impact strength, mold shrinkage factor, in the following manners.

Table 1 shows the evaluation results.

< Surface Resistivity >

The surface resistivity of the each individual pellet samples was
5 measured in accordance with D257 of the ASTM Standard.

< Heat Deflection Temperature (HDT) >

The heat deflection temperature (HDT) of the each individual
pellet samples was measures in accordance with ISO 75-2Af.

< Tensile Strength >

10 The tensile strength of the each individual pellet samples was
measured in accordance with ISO 527-2/1A/5.

< Melt Mass-Flow Rate (MFR) >

The melt mass-flow rate (MFR) of the each individual pellet
samples was measured in accordance with ISO 1133 (at 300°C, 21.
15 18N).

< Coefficient of Linear Expansion >

The coefficient of linear expansion of the each individual pellet
samples was measured in accordance with E831 of the ASTM Standard
(at a temperature from 30°C to 150°C, under a nitrogen atmosphere,
20 29.4 mN).

< Charpy Impact Strength >

The Charpy impact strength of the each individual pellet
samples was measured in accordance with ISO 179/1eA.

< Flexural Modulus >

25 The flexural modulus of the each individual pellet samples was

measured in accordance with ISO 178/A/2.

< Mold Shrinkage Factor >

The total length of each individual stretched pellet samples which had been left at room temperature for 48 hours after formation thereof, and the die (cavity) size of the each individual pellet samples left at a controlled temperature were respectively measured by use of a slide caliper, and the mold shrinkage factor of the each individual pellet samples was calculated based on the following formula:

$$(\text{Die size} - \text{Total length of stretched pellet sample}) \div \text{Die size}$$

< Flame Retardance >

The flame retardance of the each individual pellet samples was measured in accordance with UL94-HB.

< Total Judgment >

The total judgment on the each individual conductive thermoplastic resin compositions was based on the following evaluation criteria. A conductive thermoplastic resin composition satisfying all the items was evaluated as A; and a conductive thermoplastic resin composition having any one of unachievable items was evaluated as B. The evaluation results are shown in Table 1.

[Evaluation Criteria]

- Surface Resistivity (Ω) : 1×10^6 or less
- Tensile Strength (MPa) : 100 or more
- Flexural modulus (MPa) : 8,000 or more
- Melt mass-flow rate (MFR) (g/10 min) : 2 or more
- Charpy impact strength (kJ/m²) : 3 or more

- Heat deflection temperature (HDT) : 160°C or more
 - Mold shrinkage factor: 5/1,000 or less
 - Coefficient of linear expansion : 5×10^{-5} or less
 - Flame retardance: “flame retardance” means that it does
- 5 not reach a marked line at which measurement of the burning rate is started, and a flame is extinguished soon.

Table 1

		Example			Comparative Example		
		1	2	3	1	2	3
Polyphenylene ether resin	PX-100F	61	-	-	61	61	50
	YPX-100D	-	31	31	-	-	-
	YPX-100F	-	30	30	-	-	-
Butadiene -styrene copolymer	H8601	22	22	22	-	17	18
	D1155JP	-	-	-	22	-	-
	G1657	-	-	-	-	4	-
Carbon fiber		9	9	17	17	-	-
Glass fiber		8	8	-	-	-	17
Carbon black		-	-	-	-	18	15
Total (% by mass)		100	100	100	100	100	100
Evaluation Result	Surface resistivity (Ω)	5×10^5	5×10^5	6×10^3	1×10^4	3×10^6	1×10^6
	Tensile strength (MPa)	130	130	130	90	65	75
	Flexural modulus (MPa)	10,000	10,000	10,000	6,000	3,000	9,000
	MFR (g/10 min)	3	3	3	3	1	0
	Charpy impact strength (kJ/m ²)	5	5	5	4	2	1
	HDT	165	165	165	145	153	165
	Mold shrinkage factor	3/1,000	3/1,000	1/1,000	6/1,000	10/1,000	1/1,000
	Coefficient of linear expansion	3×10^{-5}	3×10^{-5}	3×10^{-5}	Note 1	8×10^{-5}	2×10^{-5}
	Flame retardance	Extinguished soon	Extinguished soon	Extinguished soon	Extinguished soon	A flame spread, exceeding the marked line	
	Total Judgment	A	A	A	B	B	B

Note 1: It was impossible to measure the coefficient of linear expansion, because the conductive thermoplastic resin composition was softened before the temperature reached 150°C.

Abbreviated letters shown in Table 1 respectively have the following meaning:

- Polyphenylene ether resin -

Trade name: YPX-100F; available from MITSUBISHI GAS CHEMICAL COMPANY, INC.; intrinsic viscosity (IV) = 0.41 dL/100g

Trade name: YPX-100D; available from MITSUBISHI GAS CHEMICAL COMPANY, INC.; intrinsic viscosity (IV) = 0.35 dL/100g

Trade name: PX-100F; available from MITSUBISHI GAS CHEMICAL COMPANY, INC.; intrinsic viscosity (IV) = 0.38 dL/100g

- Butadiene-styrene graft copolymer -

Trade name: Polystyrene H8601, available from A & M Styrene Co., Ltd.; MFR = 18g/10 min (200°C, 49.03N); Content of styrene = more than 90% by mass

- Butadiene-styrene block copolymer -

Trade name: D1155JP, available from KRATON Polymers; styrene-butadiene-styrene straight chain type; Content of styrene = 40% by mass

- Ethylene-butylene-styrene block copolymer -

Trade name: G1657, available from KRATON Polymers;

ethylene-butylene-styrene straight chain type; Content of styrene = 17% by mass

- Carbon Black -

5 Trade name: Asahi F-200, available from Asahi Carbon Co., Ltd.;

DBP oil absorption = 175 mL/100g

- Carbon fiber -

10 Trade name: CF EPU-LCL, available from Nihon Polymer Co., Ltd.; PAN type; Volume resistivity = $2.3 \times 10^{-2} \Omega \cdot \text{cm}$, chopped in 5 mm length; fiber diameter = 7 μm

- Glass fiber -

15 Trade name: RES03-TP78, available from Nippon Sheet Glass Co., Ltd.; alumina borosilicate glass (E glass, alkali-free glass), chopped in 3 mm length; fiber diameter = 10 μm

From the results shown in Table 1, it was found that the conductive thermoplastic resin compositions of Examples 1 to 3 had high-heat resistance, high-strength, high-rigidity, and high-dimensional stability in addition to excellent conductivity and enabled obtaining molded articles which were excellent in flame retardance. In contrast, with molded articles formed using the conductive thermoplastic resin compositions of Comparative Examples 1 to 3, it was impossible to obtain predetermined properties

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and performance.

Industrial Applicability

The conductive thermoplastic resin composition of the present
5 invention can be suitably utilized for electric and/or electronic
components such as gears, ink cartridges, sheet-feed guides, which are
components of electric and electronic devices such as personal
computers, and printers; OA device components such as for printers,
scanners, facsimiles, and cartridges; and molded articles for packaging
10 electronic components such as magazines, trays, because the
conductive thermoplastic resin composition has high-heat resistance,
high-strength, high-rigidity, and high-dimensional stability in
addition to having excellent conductivity, and excels in flame
retardance.

CLAIMS

1. A conductive thermoplastic resin composition comprising:

a polyphenylene ether resin,

5 a butadiene-styrene graft copolymer,

a carbon fiber, and

a glass fiber,

wherein the polyphenylene ether resin has an intrinsic viscosity (IV) of 0.3 dL/100g to 0.5 dL/100g,

10 wherein the content of the polyphenylene ether resin in the conductive thermoplastic resin composition is 60% by mass to 80% by mass,

wherein the melt mass-flow rate (MFR) of the butadiene-styrene graft copolymer is 3 g/10 min to 25 g/10 min under the measurement
15 conditions of 200°C and 49.03N,

wherein the content of the butadiene-styrene graft copolymer in the conductive thermoplastic resin composition is 5% by mass to 40% by mass,

wherein the content of the carbon fiber is 5 parts by mass to 30
20 parts by mass relative to 100 parts by mass of the resin components which include the polyphenylene ether resin and the butadiene-styrene graft copolymer, and

wherein the content of the glass fiber is 1 part by mass to 20 parts by mass relative to 100 parts by mass of the resin components
25 which include the polyphenylene ether resin and the

butadiene-styrene graft copolymer.

2. The conductive thermoplastic resin composition according to claim 1, wherein the content of styrene in the butadiene-styrene graft copolymer is 90% by mass or more.

5 3. The conductive thermoplastic resin composition according to any one of claims 1 to 2, wherein the fiber length of the carbon fiber in the kneaded conductive thermoplastic resin composition is 100 μm to 500 μm .

4. A molded article formed from a conductive thermoplastic
10 resin composition according to any one of claims 1 to 3.

5. The molded article according to claim 4, wherein the surface resistivity of the molded article is $1.0 \times 10^2 \Omega$ to $1.0 \times 10^{10} \Omega$.

6. The molded article according to any one of claims 4 to 5, being at least one selected from molded articles of electric components, molded articles of electronic components, molded articles of OA
15 device components, and molded articles of packaging electronic components.

7. The molded article according to any one of claims 4 to 6, being any one of a gear, a cartridge, a sheet-feed guide, a magazine,
20 and a tray.