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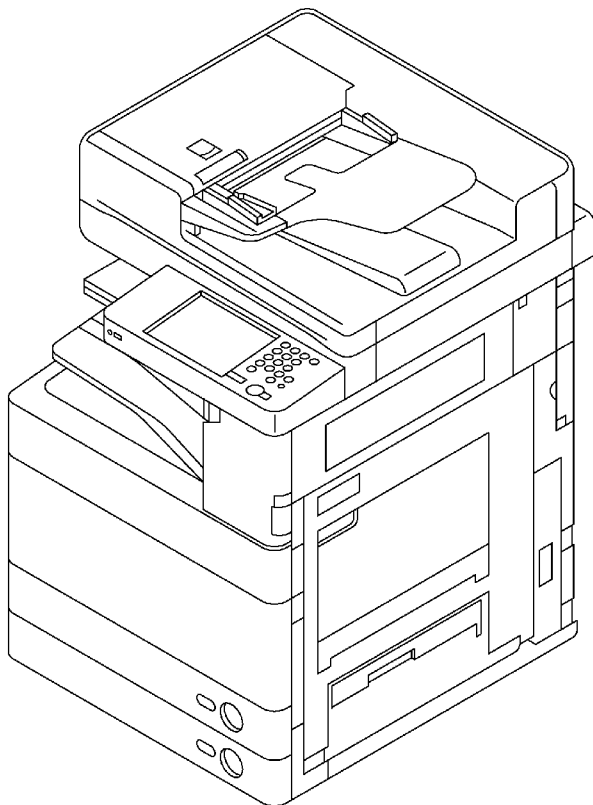
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(54) Title: RECYCLED RESIN AND METHOD OF MANUFACTURING THE SAME



(57) Abstract: A recycled resin contains a collected resin and an unused resin, in which the collected resin contains polycarbonate and a styrene resin and when the Charpy impact strength under the following conditions of the recycled resin is defined as aC (A) and the Charpy impact strength under the following conditions of the unused resin is defined as aC (V), the aC (A) value is equal to or higher than 85% of the aC (V) value and in which, as the conditions, the recycled resin is allowed to stand in an environment of 65 degrees (celsius) and a humidity of 85% for 1,000 hours.



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Description

Title of Invention: RECYCLED RESIN AND METHOD OF MANUFACTURING THE SAME

Technical Field

[0001] The present invention relates to a recycled resin. In particular, the present invention relates to a technique of reutilizing a degraded thermoplastic resin.

Background Art

[0002] In recent years, the movement of recycling petrochemicals, particularly recycling resin, has increasingly become strong with an increase in environmental conservation awareness. As a method of recycling used resin, a thermal recycling method of utilizing the thermal energy generated when burned is mentioned.

[0003] On the other hand, a material recycling method of reutilizing the same as raw materials is also mentioned. The material recycling method has the following problem. The problem is that a resin composition degrades by hydrolysis, exposure to ultraviolet rays, and the like, so that the properties, such as strength and fire retardancy, decrease.

[0004] Even when molded articles collected from a market are crushed, and then remolded as they are, it is difficult to obtain molded articles having properties equivalent to those of molded articles obtained from an unused resin.

[0005] As a technique of manufacturing a recycled resin having properties equivalent to those of an unused resin, a technique of mixing a collected resin with additives and an unused resin is known.

[0006] PTL 1 describes a method of compounding additives, such as a core-shell type graft rubbery elastomer, in the collected resin to obtain a recycled resin having physical properties equivalent to those of an unused resin.

[0007] Moreover, PTL 2 describes a method of mixing crushed substances of a resin molded article in which the viscosity average molecular weight and a wet heat retention are limited and an unused aromatic polycarbonate resin to manufacture a recycled resin composition.

[0008] When performing material recycling of a thermoplastic resin, it has been demanded that not only the properties immediately after molding of recycled parts but the properties after the lapse of time are equivalent to the properties after the lapse of time of parts manufactured with an unused resin. This is because there is a possibility that degradation by hydrolysis and the like is further promoted in the recycled resin rather than in the unused resin.

[0009] It is described that, with respect to the recycled resin described in PTL 1 and PTL 2, the properties immediately after manufacturing of the recycled resin close to the

properties of an unused resin are obtained. However, it is imagined that the properties of the recycled resin after the lapse of time are not sufficient.

Citation List

Patent Literature

[0010] PTL 1: Japanese Patent Laid-Open No. 2004-352762

PTL 2: Japanese Patent No. 4881531

Summary of Invention

[0011] Then, the present invention provides a recycled resin having properties close to those of an unused resin even after the lapse of time.

[0012] Therefore, the invention provides a recycled resin containing a collected resin and an unused resin, in which the collected resin contains polycarbonate and a styrene resin and when the Charpy impact strength under the following conditions of the recycled resin is defined as aC (A) and the Charpy impact strength under the following conditions of the unused resin is defined as aC (V), the aC (A) value is equal to or higher than 85% of the aC (V) value.

[0013] Herein, as the conditions, the recycled resin is allowed to stand in an environment of 65 degrees (celsius) and a humidity of 85% for 1,000 hours.

[0014] Further features of the invention will become apparent from the following description of exemplary embodiments with reference to the attached drawings.

Brief Description of Drawings

[0015] [fig.1A]Fig. 1A is an outside view of an example of an image formation apparatus according to this embodiment.

[fig.1B]Fig. 1B is a schematic view of an example of the image formation apparatus according to this embodiment.

Description of Embodiment

[0016] The present invention is a recycled resin containing a collected resin and an unused resin, in which the collected resin contains polycarbonate and a styrene resin and when the Charpy impact strength under the following conditions of the recycled resin is defined as aC (A) and the Charpy impact strength under the following conditions of the unused resin is defined as aC (V), the aC (A) value is equal to or higher than 85% of the aC (V) value.

[0017] Herein, as the conditions, the recycled resin is allowed to stand in an environment of 65 degrees (celsius) and a humidity of 85% for 1000 hours.

[0018] This can be expressed as aC (A)/aC (V) being more than or equal to 0.85, when the Charpy impact strength after subjected to the conditions of the recycled resin is defined as aC (A) and the Charpy impact strength after subjected to the conditions of the unused resin is defined as aC (V).

- [0019] By being subjected to the conditions, the state of a degraded resin can be reproduced. More specifically, the properties of the resin after subjected to the conditions can be defined as the properties of the degraded resin.
- [0020] Therefore, the relationship where $aC(A)/aC(V)$ is more than or equal to 0.85 shows that there is no big difference between the Charpy impact strength of the degraded recycled resin and the Charpy impact strength of the degraded unused resin. More specifically, this shows that, in the recycled resin which satisfies the relationship where $aC(A)/aC(V)$ is more than or equal to 0.85, the degradation speed is almost the same as that of the unused resin.
- [0021] The recycled resin according to this embodiment is not particularly limited insofar as the Charpy impact strength ratio is satisfied, but it is suitable to satisfy the following melt flow rate ratio.
- [0022] When the melt flow rate of the recycled resin is defined as MFR (A) and the melt flow rate of the unused resin is defined as MFR (V), it is suitable to satisfy the relationship where $MFR(A)/MFR(V)$ is 1.0 or more and 1.7 or less.
- [0023] Herein, the melt flow rate indicates the fluidity in a molten state of the resin and is synonymous with one specified in ISO.
- [0024] The value of the ratio of the MFR (A) to the MFR (V) is suitably $MFR(A)/MFR(V)$ being 1.0 or more and 1.7 or less and more suitably $MFR(A)/MFR(V)$ being 1.0 or more and 1.5 or less.
- [0025] In general, with respect to the fluidity of an alloy resin of a polycarbonate resin and an ABS resin, a reduction in the molecular weight and the like of the polycarbonate resin component occur due to the heat history in melt molding and molding of parts, changes with time during use, changes under the conditions of light and heat, and the like, and as a result, the fluidity tends to increase.
- [0026] More specifically, the MFR value increases with an increase in the degradation degree. When the value of $MFR(A)/MFR(V)$ exceeds 1.7, even when the initial properties are maintained to be equivalent to those of the unused resin, the degradation speed increases, so that the properties equivalent to those of the unused resin cannot be maintained during use.
- [0027] When the recycled resin is manufactured in such a manner that the value of $MFR(A)/MFR(V)$ is in a suitable range, the recycled resin having the properties equivalent to those of the unused resin not only immediately after molding but after a degradation behavior can be obtained. As a method of adjusting the MFR (A) value, the use of a collected resin whose MFR is low and the like are mentioned.
- [0028] In a flame retardancy test (V test) according to the UL94 standard, the recycled resin according to the invention is judged to be suitably V-1 or more and more suitably V-0 or more.

- [0029] In this embodiment, the resin is suitably a thermoplastic resin.
- [0030] In this embodiment, the unused resin is a resin of the same as the collected resin and is a resin containing polycarbonate and a styrene resin. The unused resin is a resin which is not molded into molded articles which are marketed as housings and the like and is a resin which is not degraded.
- [0031] For example, a resin which is merely molded as pellets when transporting the resin is an unused resin. Moreover, a resin which is molded but is immediately crushed, i.e., a resin which is almost non-degraded, is an unused resin.
- [0032] On the other hand, when molded as an image formation apparatus, such as a copying machine, and then several years pass have passed while being stored in a warehouse and the like, a resin obtained from the image formation apparatus is not an unused resin. It is a matter of course that a resin obtained from a molded article which is collected after marketed for several years is not an unused resin.
- [0033] In this embodiment, the degraded or collected resin is a resin which is collected from the market and contains polycarbonate and a styrene resin. This resin is obtained from a molded article of a thermoplastic resin collected from a market. The collected molded article is crushed or not crushed to be used for manufacturing of a recycled resin.
- [0034] The collected resin is a resin containing polycarbonate and a styrene resin. This resin is suitably an alloy resin of polycarbonate and ABS or an alloy resin of polycarbonate and SAN. The polycarbonate is also indicated as PC and the alloy resin of polycarbonate and ABS is also indicated as PC+ABS.
- [0035] In this embodiment, the styrene resin refers to one in which the styrene structure is contained in the structure of a repeating unit. Examples of the styrene resin include ABS, SAN, PS, and the like, for example. In particular, the use of ABS and SAN is suitable in the invention.
- [0036] The ABS is a resin containing a copolymer of acrylonitrile, butadiene, and styrene. The SAN is a resin containing a copolymer of acrylonitrile and styrene. It is a matter of course that a slight amount of impurities are permitted insofar as the properties are not altered.
- [0037] The degraded resin is a resin whose properties decrease due to changes with time or a resin whose properties decrease due to light or heat. In the degraded resin, the properties, such as the Charpy impact strength, decrease.
- [0038] Examples of molded articles of the degraded resin include molded articles which are housings, mechanism elements, and the like which are constituent elements of electrical home appliances, information appliances, communication facilities, automobiles, and the like and which are collected from a market after the use for about 5 to about 7 years, for example.

- [0039] More specifically, examples of the collected resin include a resin used for a housing of an image formation apparatus, a resin used for camera parts, and molded articles used for housings and internal parts of personal computers, housings and internal parts of televisions, housings of water bottles, and automobiles. Among the above, a resin obtained from an image formation apparatus is suitable.
- [0040] Then, crushed substances obtained by crushing the collected molded article, and then classifying the same are utilized. With respect to the size of the classified crushed substances, the average particle diameter is suitably 10 mm or less in terms of ease of mixing with unused resin pellets and ease of supplying to a kneader. In particular, as crushed substances, a resin material which is crushed in the range of 3 mm or more and 8 mm or less is suitable.
- [0041] The crushed substance according to this embodiment is not limited to those obtained by crushing the molded articles and may be those scraped or cut out from the molded articles.
- [0042] A method of manufacturing the recycled resin according to the invention is a manufacturing method including a process of preparing crushed substances of a resin containing polycarbonate and ABS obtained from the collected molded article, and then mixing the crushed substances and an unused resin.
- [0043] The addition amount of the crushed substances is an addition amount in which the crushed substances are added in such a manner that when the Charpy impact strength under the following conditions of the recycled resin is defined as aC (A) and the Charpy impact strength under the following conditions of the unused resin is defined as aC (V), the aC (A) value is equal to or higher than 85% of the aC (V) value.
- [0044] When mixing the unused resin and the crushed substances, melt kneading may be performed after the mixing. Or, an aspect of mixing under melt kneading of the unused resin and the crushed substances may be acceptable.
- [0045] A method of performing the melt kneading is not particularly limited and the mixture can be prepared by mixing them beforehand with a blender and the like, and then mixing them with a single axial extruder, a biaxial kneading extruder, a Banbury mixer, a roll, a Brabender, a Plastograph, a kneader, or the like. Among the above, it is suitable to mix them with a biaxial kneading extruder, and then pelletizing the mixture.
- [0046] The molded article according to this embodiment is molded by a molding method, such as injection molding, extrusion molding, sandwich molding, dichromatic molding, core back molding, compression molding, blow molding, vacuum molding, or rotational molding. Among the above, molding by injection molding is suitable.
- [0047] The molded article according to this embodiment may further contain additives, such as a flame retardant, a colorant, an internal mold release agent, an antioxidant, an ultraviolet absorber, various fillers, and a drip inhibitor.

- [0048] Examples of the flame retardant include a phosphoric acid flame retardant. The content of the flame retardant contained in the recycled resin according to this embodiment is suitably 5% by weight or more and 20% by weight or less when the total weight of the recycled resin is 100% by weight.
- [0049] Examples of the drip inhibitor include a fluorine compound. More specifically, polytetrafluoroethylene (PTFE) is mentioned. Further specifically, Metablen A-3800 (Trade name, manufactured by Mitsubishi Rayon) which is an acrylic resin modified PTFE is mentioned.
- [0050] The content of the fluorine compound contained in the recycled resin according to this embodiment is suitably 0.1% by weight or more and 1% by weight or less when the total weight of the recycled resin is 100% by weight. When the content is less than 0.1% by weight, the resin is likely to melt and drip from a test piece in flame contact with a burning test piece, and therefore the flame retardancy of V-1 or more according to the UL94 standard is hard to achieve.
- [0051] Moreover, when the influence on the environment is taken into consideration, the content of the PTFE to be contained in the recycled resin is suitably less than 0.5% by weight when the total amount of the flame-resistant resin composition of this embodiment is 100% by weight.
- [0052] With respect to the weight ratio of the composition in the recycled resin according to this embodiment, the charging ratio can also be regarded as the composition ratio of the composition. Moreover, the composition ratio of the composition can also be measured by measuring the NMR and the pyrolysis GC/MS.
- [0053] The molded article according to this embodiment can be used for internal parts of copying machines, internal parts of laser beam printers, housings and internal parts of ink jet printers, toner cartridge parts of copying machines and laser beam printers, housings and internal parts of facsimiles, camera parts, housings and internal parts of personal computers, housings and internal parts of televisions, and the like.
- [0054] Since the molded article according to this embodiment has high impact resistance, the molded article according to this embodiment can be used for parts requiring impact resistance in an image formation apparatus, such as copying machines, laser beam printers, and ink jet printers. Specific examples include housing, fixing portions, such as a regulating board which changes the position according to the size of paper, actuators, such as an opening-and-closing door, and the like.
- [0055] When the design is not affected, the molded article according to the invention can also use as an exterior.
- [0056] As the image formation apparatus, one illustrated in Fig. 1 is mentioned, for example. Fig. 1A is an outside view of an example of the image formation apparatus. The exterior is illustrated in Fig. 1A. Fig. 1B is a schematic view illustrating the inside

of an example of the image formation apparatus. The internal parts are illustrated in Fig. 1B.

Examples

[0057] Hereinafter, the present invention is more specifically described with reference to specific examples. However, the present invention is not limited at all by Examples described below.

(Examples 1 to 3, Comparative Examples 1 to 6)

[0058] In each of the examples and the comparative examples, a recycled resin was produced using a degraded thermoplastic resin shown below (hereinafter defined as an A component) and an unused resin (hereinafter defined as a B component).

(1) The A component is an alloy resin of a polycarbonate resin and an ABS resin which were degraded (hereinafter also referred to as a PC+ABS resin). Specifically, the PC+ABS resin for use in the exterior of the image formation apparatus collected from the market after used for about 5 to 7 years was crushed, and then the crushed substances were sieved by a vibrating sieve to sort out particles having a particle diameter of 3 mm or more and 8 mm or less for use.

(2) The B component is an unused resin of the PC+ABS resin whose grade is the same as that of the A component.

[0059] The A component and the B component were mixed with the compounding ratio shown in Table 1, and then the mixture was melt kneaded to obtain recycled thermoplastic resin pellets. The melt kneading was performed using a biaxial segment extruder (Laboplastomill 4C150-1 manufactured by Toyo Seiki Seisakusho Co., Ltd.) in the same directional rotation, at 80 rpm, and at a cylinder temperature of 230 degrees (celsius).

Evaluation of fluidity

[0060] The thermoplastic resin composition obtained by the melt kneading was measured for the melt mass-flow rate (hereinafter referred to as MFR) based on ISO1133 under the measurement conditions of 21.18 N and 260 degrees (celsius).

[0061] Moreover, the value of the ratio of the MFR of the produced recycled thermoplastic resin composition [MFR (A)] to the MFR of the unused resin [MFR (V)] which was the B component (MFR (A)/MFR (V)) was calculated.

Evaluation of impact strength

[0062] ISO20753 type A1 multiple-purpose test pieces containing the produced thermoplastic resin were molded using an injection molding machine (manufactured by Sumitomo Heavy Industries, Ltd., SE100DU) under the molding conditions of a cylinder temperature of 240 degrees (celsius) and a die temperature of 40 degrees (celsius). The central portion of the obtained molded article was cut out into strip-

shaped test pieces, and then the Charpy impact test based on ISO179/1eA was performed.

Wet heat treatment

- [0063] The produced test pieces were held under the temperature and humidity conditions of 65 degrees (celsius) and 85% RH in a thermohygrostat (manufactured by Espec Corp., Platinous PR-3KP) for 1,000 hours, and then the above-described Charpy impact test was performed. Furthermore, a change between the Charpy impact strength of the thermoplastic resin (hereinafter defined as aC (A)) at this time and the impact strength of the unused resin (hereinafter defined as aC (V)) which was similarly allowed to stand under the temperature and the humidity conditions of 65 degree and 85% RH for 1,000 hours was calculated.
- [0064] The compounding ratio of the components and the evaluation results of Examples 1 to 3, Comparative Examples 1 to 6, and Reference Example 1 are collectively shown in Table 1.
- [0065] In Reference Example 1, only an unused resin is used. More specifically, 14.2 which is the MFR shown in Reference Example 1 is MFR (V). 11.6 which is the Charpy impact strength after the wet heat treatment shown in Reference Example 1 is aC (V).
- [0066] From the results shown in Table 1, when the value of MFR (A)/MFR (V) is less than 1.7, the value of aC (A)/aC (V) is 0.85 or more. More specifically, even when degraded due to the temperature and humidity influence, a molded article containing the recycled thermoplastic resin can maintain the mechanical strength equivalent to that of an unused resin of the same grade.
- [0067] On the other hand, when the value of MFR (A)/MFR (V) exceeds 1.7, the value of aC (A)/aC (V) is less than 0.85, so that there is a possibility that the mechanical strength equivalent to that of the unused resin cannot be maintained during use. More specifically, there is a possibility that the recycled resin cannot be used for substitution in a molded article which is to be used using an unused resin in a former case.
- [0068] From the above results, the degraded PC+ABS resin was mixed with an unused resin, and then the mixture was melt kneaded to obtain a recycled resin. In order to also maintain the level of the degradation speed due to the temperature and humidity of the recycled resin to be equivalent to that of the unused resin, it is suitable to adjust the MFR of the produced recycled resin to be maintained at a suitable level.
- [0069]

[Table 1-1]

Examples	1	2	3	Examples	1	2	3	4	5	6	1
A component	10	20	30	A component	100	90	80	70	60	50	100
B component	90	80	70	B component	0	10	20	30	40	50	0
MFR (A) [g/10 min]	18.4	19.7	20.9	MFR (A) [g/10 min]	24.7	29.8	28.3	26.8	25.6	24.5	24.7
MFR (A)/MFR (V)	1.30	1.39	1.47	MFR (A)/MFR (V)	1.74	2.10	1.99	1.89	1.80	1.73	1.74
Charpy impact strength [kJ/m ²]	>30	>30	>30	Charpy impact strength [kJ/m ²]	>30	>30	>30	>30	>30	>30	>30
Charpy impact strength after wet heat treatment [kJ/m ²]	10.2	10.6	9.9	Charpy impact strength after wet heat treatment [kJ/m ²]	7.8	8.1	9.0	8.9	9.3	9.4	7.8
aC (A)/aC (V)	0.88	0.91	0.85	aC (A)/aC (V)	0.67	0.70	0.78	0.77	0.80	0.81	0.67

[0070] [Table 1-2]

Reference Example	1
A component	0
B component	100
MFR (V) [g/10 min]	14.2
Charpy impact strength [kJ/m ²]	>30
Charpy impact strength after wet heat treatment [kJ/m ²]	11.6

[0071] By the invention, a degraded plastic can be used for the same intended use as that of an unused resin.

[0072] According to the invention, a recycled resin whose degradation speed and impact resistance equivalent to those of an unused resin can be provided. Moreover, a molded article which contains the recycled resin and whose degradation speed is not considerably different from that of an unused resin and has high impact resistance can be provided.

[0073] While the present invention has been described with reference to exemplary embodiments, it is to be understood that the invention is not limited to the disclosed exemplary embodiments. The scope of the following claims is to be accorded the broadest interpretation so as to encompass all such modifications and equivalent structures and functions.

[0074] This application claims the benefit of Japanese Patent Application No. 2013-129225, filed June 20, 2013, which is hereby incorporated by reference herein in its entirety.

Claims

- [Claim 1] A recycled resin, comprising:
a collected resin and an unused resin, wherein
the collected resin contains polycarbonate and a styrene resin, and
when a Charpy impact strength under the following conditions of the recycled resin is defined as aC (A) and a Charpy impact strength under the following conditions of the unused resin is defined as aC (V),
a value of the aC (A) is equal to or higher than 85% of a value of the aC (V) and
as the conditions, the recycled resin is allowed to stand in an environment of 65 degrees (celsius) and a humidity of 85% for 1,000 hours.
- [Claim 2] A recycled resin, comprising:
a collected resin and an unused resin, wherein
the collected resin contains polycarbonate and a styrene resin,
and when a melt flow rate of the recycled resin is defined as MFR (A) and
a melt flow rate of the unused resin is defined as MFR (V),
MFR (A)/MFR (V) being 1.0 or more and 1.7 or less is satisfied.
- [Claim 3] The recycled resin according to Claim 1, wherein
when the melt flow rate of the recycled resin is defined as MFR (A) and
the melt flow rate of the unused resin is defined as MFR (V),
MFR (A)/MFR (V) being 1.0 or more and 1.7 or less is satisfied.
- [Claim 4] The recycled resin according to any one of Claims 1 to 3, wherein the recycled resin is judged as V-0 in a V test in a UL94 standard.
- [Claim 5] The recycled resin according to any one of Claims 1 to 4, wherein the collected resin is an alloy resin of polycarbonate and ABS or an alloy resin of polycarbonate and SAN.
- [Claim 6] The recycled resin according to any one of Claims 1 to 5, wherein the collected resin is a resin obtained from a molded article with reduced impact strength.
- [Claim 7] The recycled resin according to any one of Claims 1 to 6, wherein the collected resin is a resin obtained from any one of a housing of an image formation apparatus, camera parts, housings and internal parts of personal computers, housings and internal parts of televisions, and water bottles.

- [Claim 8] A molded article, which is obtained by molding a recycled resin, wherein the recycled resin is the recycled resin according to any one of Claims 1 to 7.
- [Claim 9] The molded article according to Claim 8, further comprising a flame retardant.
- [Claim 10] An image formation apparatus, comprising the molded article according to Claim 8 or 9.
- [Claim 11] Image formation apparatus, comprising the molded article according to Claim 8 or 9 in internal parts.
- [Claim 12] A method of manufacturing a recycled resin, comprising:
mixing a molded article containing polycarbonate and a styrene resin which are collected and an unused resin, wherein
when a Charpy impact strength under the following conditions of the recycled resin is defined as aC (A) and
a Charpy impact strength under the following conditions of the unused resin is defined as aC (V),
crushed substances and the unused resin are mixed in such a manner that a value of the aC (A) is equal to or higher than 85% of a value of the aC (V).
- [Claim 13] A method of manufacturing a recycled resin, comprising:
preparing crushed substances of a molded article containing polycarbonate and a styrene resin which are collected; and
mixing the crushed substances and an unused resin, wherein
when a Charpy impact strength under the following conditions of the recycled resin is defined as aC (A) and
a Charpy impact strength under the following conditions of the unused resin is defined as aC (V),
the crushed substances and the unused resin are mixed in such a manner that a value of the aC (A) is equal to or higher than 85% of a value of the aC (V).
- [Claim 14] A method of manufacturing a recycled resin, comprising:
preparing crushed substances of a molded article containing polycarbonate and a styrene resin which are collected; and
mixing the crushed substances and an unused resin, wherein
when a melt flow rate of the recycled resin is defined as MFR (A) and
a melt flow rate of the unused resin is defined as MFR (V),
MFR (A)/MFR (V) being 1.0 or more and 1.7 or less is satisfied.
- [Claim 15] The method of manufacturing a recycled resin according to Claim 12 or

13, wherein

when a melt flow rate of the recycled resin is defined as MFR (A) and a melt flow rate of the unused resin is defined as MFR (V),

the crushed substances and the unused resin are mixed in such a manner as to satisfy $MFR(A)/MFR(V)$ being 1.0 or more and 1.7 or less is satisfied.

[Claim 16] The method of manufacturing a recycled resin according to any one of Claims 12 to 15, wherein crushed substances having an average particle diameter of 10 mm or less are used as the crushed substances.

[Claim 17] The method of manufacturing a recycled resin according to any one of Claims 12 to 16, wherein crushed substances having an average particle diameter of 3 mm or more and 8 mm or less are used as the crushed substances.

[Claim 18] The method of manufacturing a recycled resin according to any one of Claims 12 to 16, wherein a molded article with reduced impact strength is used as the molded article.

[Claim 19] The method of manufacturing a recycled resin according to any one of Claims 12 to 18, wherein any one of a housing of an image information apparatus, camera parts, housings and internal parts of personal computers, housings and internal parts of televisions, and water bottles is used as the molded article.

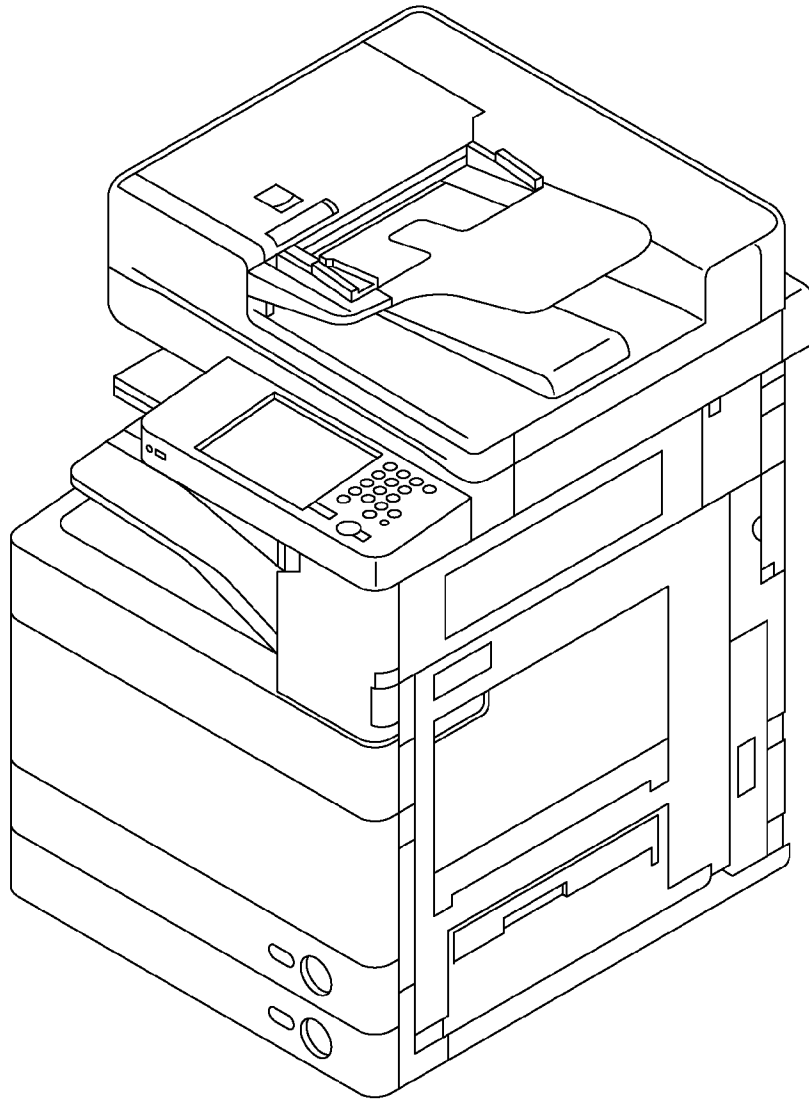
[Claim 20] The method of manufacturing a recycled resin according to any one of Claims 12 to 19, wherein an alloy resin of polycarbonate and ABS or an alloy resin of polycarbonate and SAN is used as the molded article.

[Claim 21] A method of manufacturing a molded article, comprising:
preparing a resin; and then
molding the resin, wherein
the resin is a recycled resin obtained by the method of manufacturing a recycled resin according to any one of Claims 12 to 20.

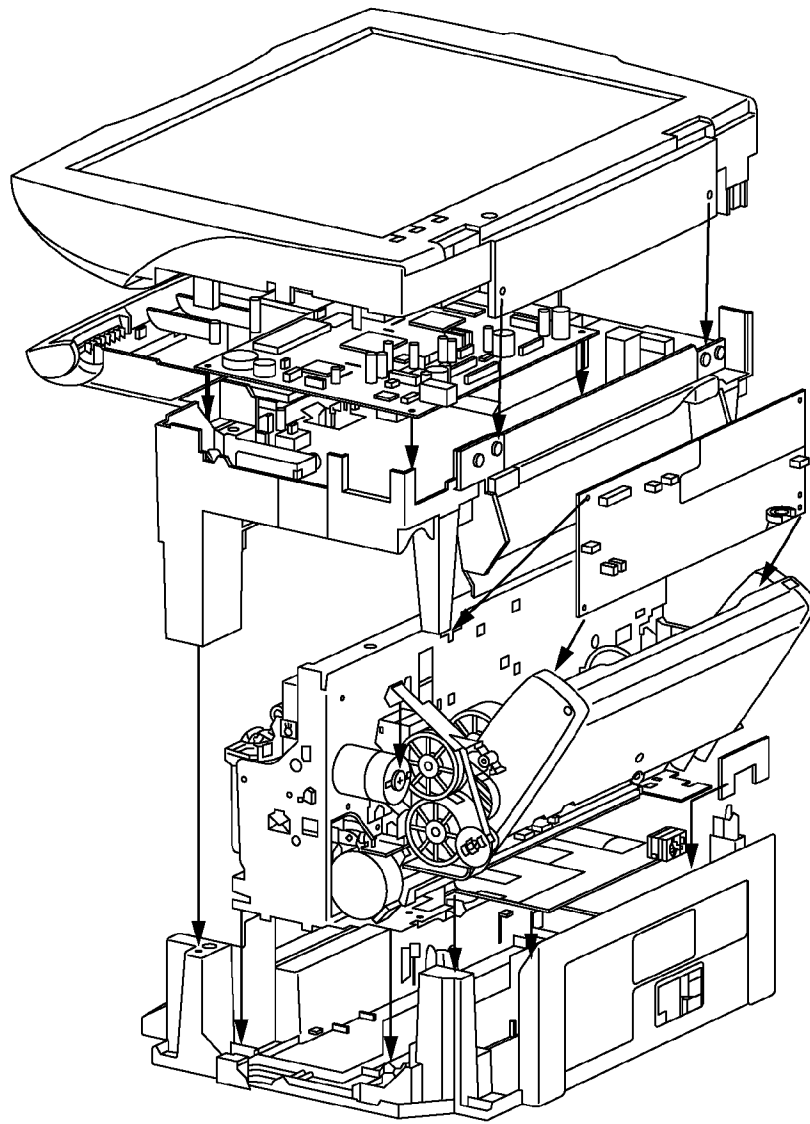
[Claim 22] The method of manufacturing a molded article according to Claim 20, wherein the molding of the resin is performed by any one of injection molding, extrusion molding, sandwich molding, dichromatic molding, core back molding, compression molding, blow molding, vacuum molding, and rotational molding.

[Claim 23] The method of manufacturing a molded article according to Claim 21 or 22, wherein the molding of the resin is performed by injection molding.

[Fig. 1A]



[Fig. 1B]



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2014/003281

A. CLASSIFICATION OF SUBJECT MATTER		
Int.Cl. C08L69/00(2006.01)i, B29B17/00(2006.01)i, C08J11/04(2006.01)i, C08L25/04(2006.01)i, C08L55/02(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. C08L69/00, B29B17/00, C08J11/04, C08L25/04, C08L55/02		
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 1971-2014 Registered utility model specifications of Japan 1996-2014 Published registered utility model applications of Japan 1994-2014		
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 2010-260938 A (Sharp Corporation) 2010.11.18, claims, examples family; none	1-23
X	JP 2003-160724 A (GE Plastics Japan Ltd.) 2003.06.06, claims, examples family; none	1-23
☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.		
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Date of the actual completion of the international search 11.07.2014		Date of mailing of the international search report 22.07.2014
Name and mailing address of the ISA/JP Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan		Authorized officer Eiko Handa Telephone No. +81-3-3581-1101 Ext. 3457