159159
G00002

DESCRIPTION

WIG

Technical Field

[0001]

The present invention relates to a wig in which hairs composed of polyamide fibers are attached to a wig base.

Background Art

[0002]

A wig is constituted by attaching hairs to a wig base formed in a head shape. The wig base is commonly composed of an artificial skin or net base made of a synthetic resin, or a combination thereof. As the hair, a natural hair collected from human hairs and other animals, or an artificial hair made of a synthetic fiber is used. As the artificial hair, fibers made of synthetic resins as materials, for example, polyamide resins such as nylon, polyester resins, polyvinyl chloride resins, acryl resins and the like have been put into practical used, and have overcome drawbacks of the human hair, such as low strength, fading and style retention properties. Among these fibers made of synthetic resins as materials, a polyamide-based fiber is similar to the human hair since it has flexibility

and water absorptivity, and is also more suited for use as a hair for a wig since it is easy to set by heat.

[0003]

However, since the polyamide fiber has relatively low elastic modulus and bending rigidity value as compared with other fibers, when hairs composed of polyamide fibers are attached to a wig base, the hairs exhibit less erection (or buildup) from the wig base. Therefore, the polyamide fiber has a drawback that it is difficult to create the appearance of the entire hair volume and three-dimensional impression is inferior, and thus designable hair style is limited. Moreover, the polyamide fiber has properties in which, when the polyamide fibers are bundled, the fibers are attracted to each other to form a bundle, resulting in adhesion (hereinafter referred to as "bundling tendency (or bundling property)"). Therefore, even when the fibers are evenly attached to the wig base, the fibers may be sometimes coagulated with each other to form a plurality of linear or fascicular lumps, or may be sometimes converted into a state where a comb mark is left upon combing, resulting in unnatural appearance.

[0004]

In order to solve the disadvantage in the case of using the polyamide fiber as the hair, for example, there has been known that a fiber made of a material different

from polyamide, such as a polyester fiber is mixed with the polyamide fiber. Patent Reference 1 discloses a wig provided with artificial hairs obtained by mixing nylon fibers and polyester fibers, while Patent Reference 2 discloses that polyamide-based artificial hairs may be used in combination with hairs made of modacrylic, polyvinyl chloride and the like, or human hairs.

Conventional Art References

Patent References

[0005]

Patent Reference 1: JP H09-324314A (refer to [Abstract])

Patent Reference 2: JP 2007-332507A (refer to paragraph 0067)

[0006]

Non-Patent Reference 1: Hideo Kawabata, Senikikai Gakkaishi (Journal of Textile Machine Society, Textile Engineering), 26, 10, pp.721-728, 1973

Non-Patent Reference 2: KATO TECH CO., LTD., Handling Manual of KES-SH Single Hair Bending Tester

Disclosure of the Invention

Problems to be Solved by the Invention

[0007]

According to a known technology, it would be possible to enhance hair volume and to overcome bundling tendency by mixing polyamide fibers with fibers made of a material different from the polyamide fibers. However, the following disadvantages arise by mixing with different fibers to produce hairs.

That is, the following problems arise additionally. First, flexibility peculiar to polyamide is lost and the texture is changed by mixing with fibers made of a different material. Second, frizz arises at a temperature other than a moderate temperature in the case of curling by heating since a melting temperature and a softening temperature are changed by mixing with fibers made of a different material. Third, hair style is likely to be collapsed because of poor curl retention properties. Fourth, since curl behavior imparted by a difference in water absorptivity of the material is different, unnatural appearance is likely to appear.

[0008]

Thus, the object of the present invention is to solve the above problems and to provide a wig which can enhance hair volume and also can improve bundling tendency (bundling property) while maintaining flexibility and high heat setting properties of the polyamide fiber.

Means for Solving the Problems

[0009]

In order to achieve the above object, the wig according to the constitution of the present invention is a wig including a wig base and hairs attached to the wig base, wherein a first artificial hair made of an aliphatic polyamide resin and a second artificial hair made of a mixture of an aliphatic polyamide resin and a semiaromatic polyamide resin are mixed in a weight ratio of 30: 70 to 60: 40 and are attached to the wig base.

In the above constitution, an aliphatic polyamide resin and a semiaromatic polyamide resin of the second artificial hair are preferably composed of any one of a combination of a single layer structure, a sheath/core structure and a sea/island structure.

In the above constitution, the second artificial hair preferably has a sheath/core structure, the core portion is made of a semiaromatic polyamide resin and the sheath portion is made of an aliphatic polyamide resin.

In the above constitution, the second artificial hair preferably has a sea/island structure, in which the sea portion is made of an aliphatic polyamide resin and the island portion is made of a semiaromatic polyamide resin.

In the above constitution, both the first artificial hair and the second artificial hair preferably have a

bending rigidity value of 7.8×10^{-5} N·cm^2/strand or less reduced in terms of a diameter 80 μm under the measuring conditions of a temperature of 20°C and a humidity of 40%.

In the above constitution, wherein a difference in a bending rigidity value between the first artificial hair and the second artificial hair is preferably from 1.5×10^{-5} N·cm^2/strand to 2.0×10^{-5} N·cm^2/strand.

Effect of the Invention

[0010]

According to the present invention, a wig is produced by forming an artificial hair made from different kinds of polyamide resins among polyamide resins as a hair material and attaching this artificial hair made of only similar kinds of the polyamide resins to a wig base. Therefore, even when these artificial hairs are attached to one wig while mixing, basic properties of polyamide are the same. Accordingly, it is possible to perform moderate curling at one temperature without forming frizz even in case of curling, and also curl retention properties are high and hair style is less likely to be collapsed. Since the upper limit of the bending rigidity value of the artificial hairs to be mixed, and the optimum range of a difference in the rigidity value between artificial hairs to be mixed with each other have been found, it is possible to enhance hair

volume without losing flexibility possessed by a polyamide fiber by attaching first and second artificial hairs within these moderate ranges to a wig, and thus realizing variety of designable hair style. Furthermore, since each of artificial hairs to be mixed has a different composition, bundling tendency are improved similar to the case of mixing fibers made of different materials, and natural appearance is created and also it becomes easy to handle such as combing.

Brief Description of the Drawings

[0011]

Fig. 1 is a view schematically showing a wig according to an embodiment of the present invention.

Fig. 2 shows a structure of a hair shown in Fig. 1, in which Fig. 2(A) is a view schematically showing a hair having a single layer structure, Fig. 2(B) is a view schematically showing a hair having a sheath/core structure and (C) is a view schematically showing a hair having a sea/island structure, respectively

Fig. 3 is view schematically showing the vicinity of a discharge portion in a spinning device, in which Fig. 3(A) is a schematic view and Fig. 3(B) is a plan view of a nozzle.

Fig. 4 conceptually shows a manufacturing system of an artificial hair, in which Fig. 4(A) is a manufacturing system of an artificial hair having a single layer structure and Fig. 4(B) is a manufacturing system of an artificial hair having a sheath/core structure.

Fig. 5 is a view schematically showing a step of curling a prepared hair material.

Fig. 6 is a view schematically showing a step of attaching an artificial hair to a wig base.

Fig. 7 is a view schematically showing the procedure for evaluation of flexibility.

Fig. 8 is a view schematically showing a procedure for evaluation of style setting properties.

Fig. 9 is a view schematically showing a procedure for evaluation of style retention properties.

Fig. 10 is a view schematically showing a method for evaluation of bundling tendency.

Fig. 11 is a graph showing the results of recovery rate of a hair bundle showing flexibility.

Fig. 12 is a graph showing the results of a height increase ratio of hair bundle with respect to style setting properties.

Fig. 13 is a graph showing the results of a height increase ratio of a hair bundle showing style retention properties.

Fig. 14 is a graph showing the results of a width increase ratio of a hair bundle showing bundling tendency.

Fig. 15 is a graph showing the results of a hair bundle curl diameter showing curl settng properties.

Fig. 16 is a graph showing the results of an extension ratio of a curl diameter showing curl retention properties.

Explanation of Marks and Symbols

[0012]

1: Wig

2, 41: Wig Base

3, 4, 5, 6, 43, 62: Artificial Hair (Hair)

3A: First Artificial Hair

3B: Second Artificial Hair

5a: Sheath Portion

5b: Core Portion

6a: Sea Portion

6b: Island Portion

7a: Cylinder

7b: Nozzle

7c, 7d: Resin

7e: Opening

11, 26a, 26b: Melting Bath

12, 27a, 27b: Gear Pump

13, 28: Discharge Portion

14: Warm Water Bath

15: First Drawing Roll

16: First Dry Heating Bath

17: Second Drawing Roll

18: Second Dry Heating Bath

19: Third Drawing Roll

20: Third Dry Heating Bath

21: Oiling Device

22: Fourth Drawing Roll

23: Blast Machine

24: Rollup Machine

30: Hair Bundle

31: Hair

32: Sewing Thread

33: Aluminum Pipe

41: Wig Base

42: Crochet Needle

42a: Tip Hook Portion

43: Hair

51: Filament

60: Swatch

61: Virtual Wing Base

62: Hair

63: Loading Plate

64: Comb

Best Modes for Carrying out the Invention

[0013]

The present invention will be described by way of embodiments with reference to the accompanying drawings.

Fig. 1 is a view schematically showing a wig according to an embodiment of the present invention. The wig 1 according to the embodiment of the present invention includes a wig base 2 formed in a head shape, and hairs (also referred to as "artificial hairs") 3 are attached to this wig base 2. In Fig. 1, although only several hairs 3 attached to the wig base 2 are shown, hairs are actually attached to the entire wig base 2 in a predetermined density.

With respect to the hairs 3, a plurality of artificial hairs 3A, 3B, each being made of a different kind of polyamide resin as a material, are mixed in a predetermined ratio. In this embodiment, first artificial hairs 3A made of an aliphatic polyamide resin and second artificial hairs 3B made of an aliphatic polyamide resin and a semiaromatic polyamide resin integrated with each other are mixed in a predetermined ratio and attached to the wig base 2. Since both the first artificial hairs 3A and the second artificial hairs 3B belong to the polyamide

resin, basic properties of the polyamide resin do not change every hair. Therefore, before attaching to the wig base 2 as the first artificial hairs 3A and second artificial hairs 3B, frizz scarcely arises even by heat when hair material is curled.

[0014]

Hairs to be applied to the present invention, that is, artificial hairs 3 may have an upper limit or less of a bending rigidity value in a natural hair, specifically a bending rigidity value of 7.8×10^{-5} N·cm^2/strand or less so as to close to a bending rigidity of a natural hair. This value is a value in which a value measured under an environment at a temperature of 20°C and a humidity of 40% and is reduced in terms of a cross-sectional diameter of 80 μm. Hereinafter, the bending rigidity value described is the value obtained by measuring under this environment, followed by reduction, unless otherwise specified.

[0015]

Herein, the bending rigidity value is the property relating to such feeling as tactile and texture of fibers and indicates the magnitude of a force required to bending, and is widely recognized in fiber and textile industries as such that capable of numerical expression by a KAWABATA method of measurement (refer to Non-Patent Literature 1). Also, an apparatus capable of measuring the bending

rigidity value using a single strand of fiber or hair has been developed (refer to Non-Patent Literature 2.). The bending rigidity value is also called bending rigidity, and is defined as the reciprocal number of curvature change generated when a unit bending moment is applied to artificial hair. The larger the rigidity for bending of artificial hair, the less bendable, the more resistant to bending, that is, the harder and the less bendable is artificial hair. On the other hand, the smaller the bending rigidity value, the more bendable and the softer is artificial hair.

[0016]

A single component of an aliphatic polyamide and a semiaromatic polyamide, a blend of different kinds of aliphatic polyamides to each other, a blend of different kinds of semiaromatic polyamides to each other, or a blend of an aliphatic polyamide and a semiaromatic polyamide is exemplified as the composition of hairs 3. In the embodiment of the present invention, particularly, an aliphatic polyamide resin is used as the material of hairs 3 in first artificial hairs 3A, and an aliphatic polyamide resin and a semiaromatic polyamide resin are used in second artificial hairs 3B. Fibers using an entire aromatic polyamide resin, even when it is a polyamide resin, are not preferred since the bending rigidity value is high and is

more than the upper limit of the bending rigidity value of natural hairs. Examples of the aliphatic polyamide resin include nylon 4, nylon 6, nylon 66, nylon 46, nylon 610, nylon 12 and the like. Examples of the semiaromatic polyamide resin include nylon 6T, nylon 9T, nylon MXD6 and the like, and all polyamide resins can be used in the present invention.

[0017]

As the structure of hairs 3, as described hereinafter, a single layer structure, and a composite structure such as a sea/island structure and a sheath/core structure are exemplified. As long as the bending rigidity value of the artificial hair is equal to or less than the upper limit of value of 7.8×10^{-5} $N \cdot cm^2$/strand and a difference in the bending rigidity value between artificial hair to be mixed with each other is within a range from 1.50×10^{-5} $N \cdot cm^2$/strand to 2.0×10^{-5} $N \cdot cm^2$/strand, there is no particular limitation on the structure of hairs 3.

[0018]

Fig. 2 shows a structure of hairs 3 shown in Fig. 1, in which Fig. 2(A) a view schematically showing a hair 4 having a single layer structure, Fig. 2(B) a view schematically showing a hair 5 having a sheath/core structure, and Fig. 2(C) is a view schematically showing a hair 6 having a sea/island structure. All of the

respective hairs 4, 5, 6 have unevenness on a surface (not shown).

Examples of one of hairs 3 include a hair 4 having a single layer structure as schematically shown in Fig. 2(A), and the hair 3 may be made of either a single component or a plurality of components.

Examples of one of hairs 3 include a hair 5 having a sheath/core structure as schematically shown in Fig. 2(B), and the hair 5 has a sheath portion 5b around a core portion 5a, and the core portion 5a and the sheath portion 5b are respectively made of a different material. Both the material of the core portion 5a and the material of the sheath portion 5b may be a single component or a plurality of components.

Examples of one of hairs 3 include a hair 6 having a sea/island structure as schematically shown in Fig. 2(C). The hair 6 has a radial cross-sectional sea/island structure in which a plurality of island parts 6b are dotted by isolation in a sea portion 6a. This sea/island structure is also called a cylinder structure.

As a matter of course, the hair 3 may have a composite structure other than a sheath/core structure and a sea/island structure, for example, a lamellar structure. Taking properties of hairs, such as bending rigidity value and curl characteristics into consideration, the

sheath/core structure and the sea/island structure are preferred.

[0019]

Herein, if a difference in a bending rigidity value between first artificial hairs 3A and second artificial hairs 3B is less than 1.50×10^{-5} $N \cdot cm^2$/strand, when attached to a wig base 2, the entirety of hairs have neither body (or resilience) nor elasticity, and sufficient hair volume is not created. In contrast, when the difference is 2.0×10^{-5} $N \cdot cm^2$/strand or more, the first artificial hairs 3A and the second artificial hairs 3B are not blended well each other, and the hair having a high bending rigidity value may rises or the hair having a low bending rigidity value may be entangled and thus bundling tendency are promoted. Therefore, the difference is preferably within a range from 1.50 to 2.0×10^{-5} $N \cdot cm^2$/strand.

[0020]

In the embodiment of the present invention, both first artificial hair 3A and second artificial hair 3B may have the same cross-sectional shape. Commonly, when an artificial hair 3 is attached to a wig base 2, it is widely performed to mix with a modified cross sectional fiber having a different cross-sectional shape. This is because it is possible to enhance the volume of the hair attached

to the wig base 2 and to suppress gloss of a hair surface by changing an angle of reflected light of light with which the hair was irradiated. However, this method commonly employed is not preferred since crimp or waviness is likely to be imparted by mixing with a fiber having a modified cross section, and a specific surface gloss due to a different cross-sectional shape may appear.

[0021]

By the way, a fiber per se made of polyamide has a peculiar specular gloss and is not suited for a hair for a wig as it is, and therefore it is necessary for an artificial hair to roughen a fiber surface so as to suppress the gloss. There are many kinds of the technique of suppressing the gloss. A so-called blasting method of roughening by spraying an abrasive material over the fiber surface is preferred since flexibility peculiar to polyamide is not impaired as compared with a method in which unevenness is imparted to a fiber surface by mixing with foreign matters such as inorganic substances.

[0022]

If possible, the artificial hair is colored with a color corresponding to a color of the remaining hairs of head of a wig wearer or colored with a desired hair color of the wearer. Examples of a wig coloration method include a dope dyeing method (or spin-dyeing method) in which a dye

and/or a pigment are kneaded with a polyamide resin upon manufacturing of an artificial hair, and a dyeing method using a dye after manufacturing an artificial hair. Taking durability after coloration and dimensional stability after finishing into consideration, a dope dyeing method is preferred. According to the dope dyeing method, a colored artificial hair can be produced by spinning in a state where 10 to 20% of masterbatch chips, prepared by mixing 2 to 6% of a pigment with a resin which is the same as that of a fiber to be melt-spun, is blended with a resin to be melted.

[0023]

Manufacturing of an artificial hair will be described.

The artificial hair is produced by cutting a synthetic fiber into a predetermined length. The synthetic fiber commonly uses a thermoplastic resin as a raw material. The thermoplastic resin is formed into a fiber utilizing properties in which a solid state of the thermoplastic resin is change into a liquid state when heated. The thermoplastic resin is formed into a fiber through two steps of spinning and drawing steps. The spinning step and the drawing step may be continuously or separately and is selected according to the thickness and strength of the raw material and fibers.

In the spinning step, a pellet-shaped thermoplastic resin is dissolved, that is, melted by heating and the molten resin is supplied into a nozzle by applying a pressure. Then, the resin is extruded into a strand of fiber through an opening provided outside the nozzle. In that case, the nozzle may be provided with a lot of openings and 10 to 20 fibers may be extruded at a time.

In the drawing step, the fiber is rolled up while stretching by continuously heating with applying a given tension by a rotation of a drawing roll. Whereby, a spun fiber can be adjusted to a desired thickness and strength. In the case of drawing, similar to spinning, several tens of spun fibers may be drawn at a time.

[0024]

Fig. 3 schematically shows the vicinity of a discharge portion in a spinning device, in which Fig. 3(A) is a schematic view and Fig. 3(B) is plan view of a nozzle. The molten polyamide resin 7c is passed through a cylinder 7a and then supplied into a nozzle 7b by applying a pressure. Therefore, a molten resin is ejected through an opening 7e in the nozzle 7b and the fiber is extruded as shown by the symbol 7d. Herein, it is mainly determined by a shape of the nozzle 7b used in the spinning step what structure of the fiber is obtained, for example, a single layer structure, a sheath/core structure, a sea/island

structure or other composite structures. The nozzle has a structure in which a second plate is arranged under a first plate called as a distributor with a space therebetween. Any one of a groove, a protrusion and an opening is formed in the first plate so as to distribute the resin, and an opening for ejecting the resin is formed in the second plate. A fiber having either a single layer structure or a specific composite structure can be produced by pouring a molten resin to this first plate by means of a groove, a protrusion and a shape or an arrangement relationship of the opening in the first plate, and a shape or an arrangement relationship of an opening in a second plate. The cross-sectional shape of the fiber can be adjusted to a circular shape, a cocoon shape, a horseshoe shape, a cross shape and the like by selecting the shape of the opening in the second plate.

[0025]

Furthermore, the description is made by way of the case of a single layer structure and a sheath/core structure as examples.

Fig. 4 conceptually shows a manufacturing system of an artificial hair, in which Fig. 4(A) is a conceptual diagram of a manufacturing system of an artificial hair having a single layer structure and Fig. 4(B) is a

conceptual diagram of a manufacturing system of an artificial hair having a sheath/core structure.

The artificial hair having a single layer structure is manufactured by a melt spinning and drawing machine shown in Fig. 4(A).

Specifically, polyamide resin chips prepared by kneading polyamide resin chips and a pigment in a predetermined amount are charged in a melting bath 11 and the molten resin is sent out to a charging spinneret of a discharge portion 13 provided with a nozzle having a nozzle size of 0.3 to 1.0 mm using a gear pump 12, and then the fibrous resin discharged through the discharging spinneret is passed through a warm water bath 14 at 40 to 80°C. Thereafter, the fibrous resin is drawn by passing through a first drawing roll (stretching roll) 15 and a first dry heating bath 16, further drawn by passing through a second drawing roll 17 and a second dry heating bath 18, passed through a third drawing roll 19 and a third dry heating bath 20, subjected to a heat treatment for dimensional stabilization of the fiber, namely, annealing, and then passed through an oiling device 21 for static protection. In the final step, a fine alumina powder is sprayed over a fiber surface in a fourth drawing roll 22 and a blast machine 23 thereby roughening a fiber surface, and then rolled up to a rollup machine 24.

In this step, it is possible to obtain a polyamide fiber having a fiber diameter of about 80 μm and a predetermined bending rigidity value by adjusting a draw ratio within a range from 3.5 to 5.5, adjusting a speed of first to fourth drawing rolls 15, 17, 19, 22, and adjusting a temperature of first to third dry heating baths 16, 18, 20 at a temperature within a range from 150 to 180°C.

[0026]

The artificial hair having a composite structure can be manufactured by a melt spinning and drawing machine shown in Fig. 4(B).

Specifically, polyamide resin chips prepared by kneading polyamide resin chips and a pigment as a first component in a predetermined amount is charged in a melting bath 26A, and polyamide resin chips prepared by kneading a polyamide resin chips and a pigment as a second component in a predetermined amount are charged in a melting bath 26B. The molten first component resin is send out to a first charging spinneret of a discharge portion 28 using a gear pump 27A, and the molten second component resin is send out to a second charging spinneret of a discharge portion 28 using a gear pump 27B to obtain a desired composite structure, and a fibrous resin is send out through a send out spinneret with a nozzle having a g a nozzle size of 0.3

to 1.0 mm. Subsequently, the same step as in an artificial hair having a single layer structure is carried out.

[0027]

Herein, a cross-sectional shape of any artificial hair is determined by a nozzle shape of a send out spinneret of discharge portions 13, 28, and a shape of the nozzle may be any of circular shape, an elliptical shape, a cocoon shape, a star shape and the like.

[0028]

The fiber thus produced above is cut into a predetermined length to complete a hair material. AS described below, this hair material may be curled. Fig. 5 is a view schematically showing a step of curling the hair material thus produced. As shown in Fig. 5(A), a lot of (for example, about 400 to 700) hair materials 31 cut into a moderate length such as about 30 to 80 cm are laterally arranged as one set and a center portion is sawn using a sewing thread 32 so as no to cause disassembling to prepare a wefty hair bundle 30. As shown in Fig. 5(B), the hair bundle 30 is wound around an aluminum pipe 33 or the like and then cured by a heat treatment. Whereby, an artificial fiber 3 is completed. Herein, the reason why curling is performed before attaching the artificial hair to a wig base will be described. When the case of curling using an iron or rod for curling after attaching the artificial hair

to a wig base and the case of attaching the artificial hair curled in advance to a wig base are regarded as Comparative Examples, desired curl diameter can be obtained in the latter case, and curl retention properties are excellent.

[0029]

The method for manufacturing a wig will be described.

First, the wig base is produced by the following procedure.

When the wig base is made of a synthetic resin sheet material as the material, a resin solution dissolved in an organic solvent is coated on gypsum of a head shape male mold of a wig wearer, dried and then the resin is remove from gypsum to form a head shape. Alternatively, a sheet-like synthetic resin is covered on gypsum, fixed and heated, and then a resin is removed from gypsum to form a head shape. The resin used at this time is preferably thermoplastic elastomer having flexibility, such as polyurethane or silicone.

When the wig base is composed of a net base as the material, a net is covered on gypsum and fixed, and then a resin solution prepared by dissolving urethane in an organic solvent, which easily shapes gypsum, is coated thereon so as to make retention proprties satisfactory, dried and the resin is remove from gypsum to form a head shape.

[0030]

The artificial hair manufactured as described above is attached to a wig base in the following manner.

Fig. 6 is a view schematically showing a step of attaching an artificial hair to a wig base. In Fig. 6, a filament 51 constituting a wig base 41 or a net base of an artificial skin is partially shown.

When the wig base is composed of an artificial skin, a crochet hook needle 42 is inserted into the wig base 41 as shown in Fig. 6(A). As shown Fig. 6(B), in a state where loop-shaped hairs 43 is hooked to a tip hook portion 42A of the crochet hook needle and the crochet hook needle 42 is turned, so that disengagement of the engagement with the loop does not arises, hairs can be pulled out of the loop by hooking the tip hook portion 42A to the loop release end side of hairs 43, thereby knotting hairs 43 to the wig base 41 as shown in Fig. 6(C).

When the wig base is a net, a crochet hook needle 42 is inserted into filaments 51 constituting the net as shown in Fig. 6(D). As shown in Fig. 6(E), in a state where loop-shaped hairs 43 is hooked to a tip hook portion 42A of the crochet hook needle and the crochet hook needle 42 is turned, so that disengagement of the engagement with the loop does not arises, hairs can be pulled out of the loop by hooking the tip hook portion 42A to the loop release end

side of hairs 43, thereby knotting hairs 43 to the wig base 41 as shown in Fig. 6(F).

In both cases, knotting of the hair 43 is performed by a known method performed in the manufacture of a wig.

[0031]

Regarding the mixing ratio of first and second artificial hairs to be attached to the wig base, mixing is preferably performed so that [hair having relatively low bending rigidity value]/[hair having relatively high bending rigidity value] is within a range from 30/70 to 60/40 in a mass ratio. When the mixing ratio is not within the above range, since the effect of the hair having a low mixing proportion is not exerted, a difference of behavior of fibers in a wig composed of a single hair having a high mixing proportion disappears and thus it is impossible to achieve the object of the present invention.

In the present invention, first artificial hairs and second artificial hairs may be thoroughly attached to the entire surface of the wig base in the above mixing proportion.

Furthermore, when the wearer wants to enhance hair volume only at a specific site of a wig base, or to keep a hair style over a long period by maintaining specific curl, it is possible to deviate the above mixing ratio of first artificial hairs to second artificial hairs by specifying a

specific region of the wig base, and this modification is also within the scope of the present invention. For example, when the wearer wants to enhance hair volume by particularly standing only a parietal region or a region of part, a mixing ratio of first artificial hairs to second artificial hairs can be appropriately adjusted within a range from 5:20 to 95:80 in a mass ratio. Also in this case, mixing is preferably performed so that the mixing ratio of first artificial hairs to second artificial hairs to be attached to the entire wig base in a mass ratio is within a range from 30/70 to 60/40, as described above. When the mixing ratio is within the above range, a local region such as a parietal region or part can exhibit desired curling and desired hair volume, and also retention proprties of curl of the entire wig are high and hair style is scarcely collapsed. It is also possible to enhance hair volume without losing flexibility possessed by polyamide fibers and to realize various designable hair styles. Furthermore, since the respective artificial hairs to be mixed have different compositions, bundling tendency are improved similar to the case of mixing fibers made of different materials, and thus natural appearance is created and it is also easy to handle combing or the like.

[0032]

Herein, as described above, an aliphatic polyamide resin is used as the material of a first artificial hair, and an aliphatic polyamide resin and a semiaromatic polyamide resin are used as the material of a second artificial hair, and the second artificial hair has a single layer structure, or a composite structure such as a sheath/core or sea/island structure. When the second artificial hair has a sheath/core structure, a semiaromatic polyamide resin is preferably used as the material of a core portion 5a, and aliphatic polyamide resin is preferably used as the material of a sheath portion 5b. When the second artificial hair has a sea/island structure, an aliphatic polyamide resin is preferably used as the material of a sea portion 6a, and a semiaromatic polyamide resin is preferably used as the material of an island portion 6b. The details are described in Examples.

A wig is completed by the following procedure.

Example 1

[0033]

Embodiments of the present invention will be descried in more detail by way of Examples.

In both Examples and Comparative Examples, first artificial hairs 3A and second artificial hairs 3B were prepared by setting manufacturing conditions so that a

diameter becomes about 80 μm, and the respective bending rigidity value of first and second artificial hairs 3A, 3B were measured. The first artificial hairs 3A and the second artificial hairs 3B were mixed in a different mixing ratio in the respective Examples and Comparative Examples to produce an artificial hair bundles, and the hair bundle having a length of 20 cm was curled in advance by winding around an aluminum pipe having a diameter of 25 mm and subjecting to a heat treatment. Then, the hair bundle was center-folded so as to have a length of 10 cm and each one hair was tied to a net base measuring 5 cm × 5 cm to produce a swatch. Using the swatch, characteristics as the hair were evaluated.

[0034]

In Example 1, fibers of nylon 6 (PA6) having a perfect circular cross-sectional shape and a single layer structure were produced as first artificial hairs 3A. Specifically, chips of nylon 6 (PA6), Grade NOVAMID1020 manufactured by Mitsubishi Engineering-Plastics Corporation were used as raw chips, and a speed of each roll of first to fourth drawing rolls 15, 17, 19, 22 in Fig. 4(A) was adjusted. As a result, a fiber cross-sectional diameter became 83.7 μm.

Fibers having a perfect circular cross-sectional shape and a single layer structure were produced as second

artificial hairs 3B. Specifically, chips of nylon MXD6 (PAMXD6), Grade MX nylon manufactured by Mitsubishi Gas Chemical Company, Inc. and chips of nylon 6 (PA6), Grade NOVAMID1020 manufactured by Mitsubishi Engineering-Plastics Corporation mixed in a weight ratio of 70:30 were used as raw chips, and a speed of each roll of first to fourth drawing rolls 15, 17, 19, 22 in Fig. 4(A) was adjusted. A cross-sectional diameter of fibers became 82.1 μm.

In Example 1, first artificial hairs 3A and second artificial hairs 3B were mixed in a mixing ratio of 50:50 to produce an artificial hair bundle.

Example 2

[0035]

In Example 2, fibers of nylon 6 (PA6) produced in Example 1 were used as first artificial hairs 3A.

Fibers having a perfect circular cross-sectional shape and a sheath/core structure were produced as second artificial hairs. Specifically, chips of nylon MXD6 (PAMXD6), Grade MX Nylon manufactured by Mitsubishi Gas Chemical Company, Inc. were used as raw chips which would be the portion serving as a core, and chips of nylon 6 (PA6), Grade NOVAMID1020 manufactured by manufactured by Mitsubishi Engineering-Plastics Corporation were used as raw chips which would be the portion serving as a sheath, a weight ratio of chips of nylon MXD6 and chips of nylon 6

was adjusted to 72: 25. Using the manufacturing system of Fig. 4(B), a speed of each roll of first to fourth drawing rolls 15, 17, 19, 22. As a result, a cross-sectional diameter of fibers became 81.6 μm. Herein, since a diameter of the core portion was 72.9 μm, the core portion was 0.89 based on 1 of the hair diameter with respect to a cross-sectional size of second artificial hairs.

In Example 2, first artificial hairs 3A and second artificial hairs 3B were mixed in a mixing ratio of 50:50 to produce an artificial hair bundle.

Example 3

[0036]

In Example 3, fibers of nylon 6 (PA6) produced in Example 1 were used as first artificial hairs 3A.

Fibers having a perfect circular cross-sectional shape and a sea/island structure were produced as second artificial hairs. Specifically, chips of nylon MXD6 (PAMXD6), Grade MX Nylon manufactured by Mitsubishi Gas Chemical Company, Inc. were used as raw chips which would be the portion serving as a base material, that is, a sea portion, and chips of nylon 6 (PA6), Grade NOVAMID1020 manufactured by Mitsubishi Engineering-Plastics Corporation were used as raw chips which would be the portion serving as an island portion, and a weight ratio of chips of nylon MXD6 to chips of nylon 6 was set as 65: 35. In the same

manner as in Example 1 and Example 2, a speed of each drawing roll was adjusted. As a result, a cross-sectional diameter of fibers became 83.2 μm. Herein, a cross-sectional structure in an axial direction of second artificial hairs is a structure in which one island portion is present near the center of a cross section and six island portions are circumferentially arranged, nearly equally, so as to surround an island portion in the center. each of island portions has a circular cross section. Since all of the respective island portions have a circular cross section and a diameter of the island portion was 24.2 μm, an area ratio of the island portion to the sea portion was 1.45:1.

In Example 3, first artificial hairs 3A and second artificial hairs 3B were mixed in a mixing ratio of 50:50 to produce an artificial hair bundle.

Example 4

[0037]

In Example 4, fibers of nylon 6 (PA6) produced in the first Example were used as first artificial hairs 3A. Fibers having a single layer structure made of nylon 6 and nylon MXD6 produced in the first Example were used as second artificial hairs 3B. First artificial hairs 3A and second artificial hairs 3B were mixed in a mixing ratio of 30:70 to produce an artificial hair bundle.

Example 5

[0038]

In Example 5, fibers of nylon 6 (PA6) produced in the first Example were used as first artificial hairs 3A. Fibers having a single layer structure made of nylon 6 and nylon MXD6 produced in the first Example were used as second artificial hairs 3B. First artificial hairs 3A and second artificial hairs 3B were mixed in a mixing ratio of 60: 40 to produce an artificial hair bundle.

Example 6

[0039]

In Example 6, fibers of nylon 6 (PA6) produced in the first Example were used as first artificial hairs 3A. Fibers having a sheath/core structure produced in the second Example were used as second artificial hairs 3B. First artificial hairs 3A and second artificial hairs 3B were mixed in a mixing ratio of 30:70 to produce an artificial hair bundle.

Example 7

[0040]

In Example 7, fibers of nylon 6 (PA6) produced in the first Example were used as first artificial hairs 3A. Fibers having a sheath/core structure produced in the second Example were used as second artificial hairs 3B. First artificial hairs 3A and second artificial hairs 3B

were mixed in a mixing ratio of 60:40 to produce an artificial hair bundle.

Example 8

[0041]

In Example 8, fibers of nylon 6 (PA6) produced in the first Example were used as first artificial hairs 3A. Fibers having a sea/island structure produced in the third Example were used as second artificial hairs 3B. First artificial hairs 3A and second artificial hairs 3B were mixed in a mixing ratio of 30:70 to produce an artificial hair bundle.

Example 9

[0042]

In Example 9, fibers of nylon 6 (PA6) produced in the first Example were used as first artificial hairs 3A. Fibers having a sea/island structure produced in the third Example were used as second artificial hairs 3B. First artificial hairs 3A and second artificial hairs 3B were mixed in a mixing ratio of 60:40 to produce an artificial hair bundle.

[0043]

(Comparative Example 1)

In Comparative Example 1, only fibers of nylon 6 (PA6) produced in Example 1 were used without using second artificial hairs, an artificial hair bundle was produced.

[0044]

(Comparative Example 2)

In Comparative Example 2, fibers of nylon 6 (PA6) produced in the first Example were used as first artificial hairs 3A. Fibers having a perfect circular cross-sectional shape and a single layer structure were produced as second artificial hairs 3B. Specifically, using chips of nylon 46 (PA46) as raw chips, a speed of each roll of first to fourth drawing rolls 15, 17, 19, 22 in Fig. 4(A) was adjusted. A cross-sectional diameter of fibers became 82.4 μm.

In Comparative Example 2, first artificial hairs 3A and second artificial hairs 3B were mixed in a mixing ratio of 50:50 to obtain an artificial hair bundle.

[0045]

(Comparative Example 3)

In Comparative Example 3, fibers of nylon 6 (PA6) produced in the first Example were used as first artificial hairs 3A. Fibers having a perfect circular cross-sectional shape and a single layer structure were produced as second artificial hairs 3B. Specifically, chips of nylon MXD6 (PAMXD6), Grade MX Nylon manufactured by Mitsubishi Gas Chemical Company, Inc. and chips of nylon 6 (PA6), Grade NOVAMID1020 manufactured by Mitsubishi Engineering-Plastics Corporation mixed in a weight ratio of 25: 75 were used as

raw chips, and a speed of each roll of first to fourth drawing rolls 15, 17, 19, 22 in Fig. 4(A) was adjusted. A cross-sectional diameter of fibers became 82.1 μm.

In Comparative Example 3, first artificial hairs 3A and second artificial hairs 3B were mixed in a mixing ratio of 50:50 to produce an artificial hair bundle.

[0046]

(Comparative Example 4)

In Comparative Example 4, fibers of nylon 6 (PA6) produced in the first Example were used as first artificial hairs 3A. Fibers having a perfect circular cross-sectional shape and a single layer structure were produced as second artificial hairs 3B. Specifically, chips of nylon MXD6 (PAMXD6), Grade MX Nylon manufactured by Mitsubishi Gas Chemical Company, Inc. and chips of nylon 6 (PA6), Grade NOVAMID1020 manufactured by Mitsubishi Engineering-Plastics Corporation mixed in a weight ratio of 85:15 were used as raw chips, and a speed of each roll of first to fourth drawing rolls 15, 17, 19, 22 in Fig. 4(A) was adjusted. A cross-sectional diameter of fibers became 83.1 μm.

In Comparative Example 4, First artificial hairs 3A and second artificial hairs 3B were mixed in a mixing ratio of 50:50 to produce an artificial hair bundle.

[0047]

(Comparative Example 5)

In Comparative Example 5, fibers of nylon 6 (PA6) produced in the first Example were used as first artificial hairs 3A. Fibers having a perfect circular cross-sectional shape and a single layer structure were produced as second artificial hairs 3B. Specifically, polyethylene terephthalate (PET), Grade RE530A manufactured by TOYOBO CO., LTD. were used as raw chips, and a speed of each roll of first to fourth drawing rolls 15, 17, 19, 22 in Fig. 4(A) was adjusted. A cross-sectional diameter of fibers became 80.1 μm.

In Comparative Example 5, first artificial hairs 3A and second artificial hairs 3B were mixed in a mixing ratio of 70:30 to produce an artificial hair bundle. In Comparative Example 5, since hard fibers made of polyethylene terephthalate resin as a polyester-based resin are mixed in first artificial hairs are used as second artificial hairs, a mixing ratio of first artificial hairs to second artificial hair was not at 50:50, but at 70:30.

[0048]

(Comparative Example 6)

In Comparative Example 6, fibers of nylon 6 (PA6) produced in the first Example were used as first artificial hairs 3A. Fibers having a single layer structure made of nylon 6 (PA6) and nylon MXD6 (PAMXD6) produced in the first Example were used as second artificial hairs 3B.

First artificial hairs 3A and second artificial hairs 3B were mixed in a mixing ratio of 15:85 to produce an artificial hair bundle.

[0049]

(Comparative Example 7)

In Comparative Example 7, fibers of nylon 6 (PA6) produced in the first Example were used as first artificial hairs 3A. Fibers having a single layer structure made of nylon 6 (PA6) and nylon MXD6 (PAMXD6) produced in the first Example were used as second artificial hairs 3B.

First artificial hairs 3A and second artificial hairs 3B were mixed in a ratio of 85:15 to produce an artificial hair bundle.

[0050]

(Comparative Example 8)

In Comparative Example 8, fibers of nylon (PA6) produced in the fiber first Example were used as first artificial hairs 3A. Fibers having a sheath/core structure produced in the second Example were used as second artificial hairs 3B. First artificial hairs 3A and second artificial hairs 3B were mixed in a mixing ratio of 15:85 to produce artificial hair bundle.

[0051]

(Comparative Example 9)

In Comparative Example 9, fibers of nylon 6 (PA6) produced in the first Example were used as first artificial hairs 3A. Fibers having a sheath/core structure produced in the second Example were used as second artificial hairs 3B. First artificial hairs 3A and second artificial hairs 3B were mixed in a mixing ratio of 85:15 to produce an artificial hair bundle.

[0052]

(Comparative Example 10)

In Comparative Example 10, fibers of nylon 6 (PA6) produced in the first Example were used as first artificial hairs 3A. Fibers having a sea/island structure produced in the third Example were used as second artificial hairs 3B. First artificial hairs 3A and second artificial hairs 3B were mixed in a mixing ratio of 15:85 to produce artificial hair bundle.

[0053]

(Comparative Example 11)

In Comparative Example 11, fibers of nylon 6 (PA6) produced in the first Example were used as first artificial hairs 3A. Fibers having a sea/island structure produced in the third Example were used as second artificial hairs 3B. First artificial hairs 3A and second artificial hairs 3B were mixed in a mixing ratio of 85:15 to produce an artificial hair bundle.

[0054]

A bending rigidity value of hairs produced and prepared in the respective Examples and Comparative Examples was measured. With respect to the bending rigidity value of the respective hairs, using Single Hair Bending Tester which is modified version of Kawabata Evaluation System (manufactured by KATO TECH CO., LTD. under the trade name of KES-FB2-SH), one hair was bent in a circular arc shape at a uniform speed to a given bending moment under the following measuring conditions, and then a microbending moment accompanied thereby was detected and a relationship between the bending moment and the curvature was measured. A bending rigidity value was determined by this measurement based on bending moment/change in curvature. The measurement was made under an environment at temperature of 20°C and a humidity of 40%.

(Measuring Conditions)

Distance between chucks: 1 cm

Torque detector: Torsion detection system of torsion wire (steel wire)

Curvature: ±2.5 cm^{-1}

Bend deviation rate: 0.5 cm^{-1}/second

Measurement cycle: One round trip

[0055]

The measurement results of the bending rigidity value will be described.

The measurement results of the bending rigidity value of the respective Examples and Comparative Examples are shown in Table 1. In Table 1, manufacturing conditions of first and second artificial hairs are also shown. In Table 1, in addition to the measured value of the bending rigidity value of the respective hairs of the respective Examples and Comparative Examples, values reduced in terms of a cross-sectional diameter of 80 μm were also shown. A difference between the bending rigidity value of first artificial hairs and the bending rigidity value of second artificial hairs was determined. Reduction of the numerical value in terms of the cross-sectional diameter of 80 μm is as follows. Since it is said that the bending rigidity value is proportion to the biquadrates of a fiber radius, it is commonly considered that there is a proportional relationship between the bending rigidity and thickness of the fiber. Therefore, the value of the bending rigidity measured actually by a tester was divided by a cross-sectional area calculated from the measured diameter of the hair to determine the value per unit area (mm^2), which was regarded as a value multiplied by a cross-sectional area at a hair diameter of 80 μm.

[0056]

Table 1

	First artificial hair			Second artificial hair					Mixing ratio	Difrence in value of bending rigidity ($N \cdot cm^2$/strand)
	Matreial and Structure	Value of bending rigidity ($N \cdot cm^2$/strand)		Material	Weight ratio (%)	Structure	Value of bending rigidity ($N \cdot cm^2$/strand)			
		Measured value	Reduced value				Measured value	Reduced value		
Example 1	PA6 Single layer structure	3.43×10^{-5}	3.13×10^{-5}	PAMXD6/PA6	70:30	Single layer structure	5.33×10^{-5}	5.06×10^{-5}	50/50	1.93×10^{-5}
Example 2				Sheath PA6/Core PAMXD6	25:75	Sheath/Core structure	4.86×10^{-5}	4.67×10^{-5}	50/50	1.54×10^{-5}
Example 3				Island PAMXD6/Sea PA6	65:35	Island/Sea structure	5.28×10^{-5}	4.88×10^{-5}	50/50	1.75×10^{-5}
Example 4				PAMXD6/PA6	70:30	Single layer structure	5.33×10^{-5}	5.06×10^{-5}	30/70	1.93×10^{-5}
Example 5									60/40	
Example 6				Sheath PA6/Core PAMXD6	25:75	Sheath/Core structure	4.86×10^{-5}	4.67×10^{-5}	30/70	1.54×10^{-5}
Example 7									60/40	
Example 8				Island PAMXD6/Sea PA6	65:35	Island/Sea structure	5.28×10^{-5}	4.88×10^{-5}	30/70	1.75×10^{-5}
Example 9									60/40	
Comparative Example 1										
Comparative Example 2				PA46	100	Single layer structure	4.96×10^{-5}	4.67×10^{-5}	50/50	1.54×10^{-5}
Comparative Example 3				PAMXD6/PA6	25:75	Single layer structure	4.72×10^{-5}	4.48×10^{-5}	50/50	1.35×10^{-5}
Comparative Example 4				PAMXD6/PA6	85:15	Single layer structure	5.66×10^{-5}	5.24×10^{-5}	50/50	2.11×10^{-5}
Comparative Example 5				PET	100	Single layer structure	8.11×10^{-5}	8.09×10^{-5}	70/30	4.96×10^{-5}
Comparative Example 6				PAMXD6/PA6	70:30	Single layer structure	5.33×10^{-5}	5.06×10^{-5}	15/85	1.93×10^{-5}
Comparative Example 7									85/15	
Comparative Example 8				Sheath PA6/Core PAMXD6	25:75	Sheath/Core structure	4.86×10^{-5}	4.67×10^{-5}	15/85	1.54×10^{-5}
Comparative Example 9									85/15	
Comparative Example 10				Island PAMXD6/Sea PA6	65:35	Island/Sea structure	5.28×10^{-5}	4.88×10^{-5}	15/85	1.75×10^{-5}
Comparative Example 11									85/15	

[0057]

In any of Examples 1 to 9 and Comparative Examples 1 to 11, since first artificial hairs produced by the same step are used, the bending rigidity value was 3.43×10^{-5} $N \cdot cm^2$/strand. The value reduced in terms of a yarn diameter of 80 μm at a temperature of 20°C and a humidity of 40% was 3.13×10^{-5} $N \cdot cm^2$/strand.

Since second artificial hairs are respectively produced in Examples 1 to 3 and Comparative Examples 2 to 5, the bending rigidity values of the respective hairs were sequentially 5.33×10^{-5} $N \cdot cm^2$/strand, 4.86×10^{-5} $N \cdot cm^2$/strand, 5.28×10^{-5} $N \cdot cm^2$/strand, 4.96×10^{-5} $N \cdot cm^2$/strand, 4.72×10^{-5} $N \cdot cm^2$/strand, 5.66×10^{-5} $N \cdot cm^2$/strand and 8.11×10^{-5} $N \cdot cm^2$/strand.

[0058]

A difference in the bending rigidity value between first and second artificial hairs was as follows.

In Example 1, Example 4, Example 5, Comparative Example 6 and Comparative Example 7, a difference in the bending rigidity value between first and second artificial hairs was 1.93×10^{-5} $N \cdot cm^2$/strand.

In Example 2, Example 6, Example 7, Comparative Example 8 and Comparative Example 9, a difference in the bending rigidity value between first and second artificial hairs was 1.54×10^{-5} $N \cdot cm^2$/strand.

In Example 3, Example 8, Example 9, Comparative Example 10 and Comparative Example 11, a difference in the bending rigidity value between first and second artificial hairs was 1.75×10^{-5} N·cm^2/strand.

In Comparative Example 2, a difference in the bending rigidity value between first and second artificial hairs was 1.54×10^{-5} N·cm^2/strand.

In Comparative Example 3, a difference in the bending rigidity value between first and second artificial hairs was 1.35×10^{-5} N·cm^2/strand.

In Comparative Example 4, a difference in the bending rigidity value between first and second artificial hairs was 2.11×10^{-5} N·cm^2/strand.

In Comparative Example 5, a difference in the bending rigidity value between first and second artificial hairs was 4.96×10^{-5} N·cm^2/strand.

[0059]

[Evaluation of Artificial Hair Bundle]

In order to evaluate artificial hair bundles produced respectively in Examples and Comparative Examples, hairs having a length of 20 cm were curled in advance by winding around an aluminum pipe having a diameter of 25 mm and subjecting to a heat treatment. Then, the hair bundle was center-folded and attached to a net base as a virtual wig base measuring 5 cm × 5 cm to produce a swatch 60 having a

hair length of 10 cm (refer to Fig. 7 to Fig. 10). Using the swatch 60, characteristics were evaluated as hairs. Evaluation items of characteristics include flexibility, style setting properties, style retention properties, bundling tendency, curl setting properties and curl retention properties, which were evaluated as follows.

[0060]

<Flexibility>

Evaluation of flexibility was performed in the following manner. Fig. 7 is a view schematically showing an evaluation procedure of flexibility. As shown in Fig. 7(A), hairs 62 tied to a virtual wig base 61 were set and a curl height was measured. As shown in Fig. 7(B), a loading plate 63 as 50 g of a load was placed on hairs 62. After a lapse of 5 minutes, the loading plate 63 was removed. After being left to stand for 1 minute, the curl height was measured as shown in Fig. 7(C). As shown in Fig. 7(A), a recovery rate was calculated by the formula: $(h1'/h1) \times 100$ (where h1 denotes a height of curl before loading as shown in Fig. 7(A) and h1' denotes a height of curl after loading as shown in Fig. 7(C)). It was rated that hardness is higher as the numerical value is larger, and it was rated that flexibility is inferior.

[0061]

<Style setting properties>

Evaluation of style setting properties was performed in the following manner. Fig. 8 is a view schematically showing an evaluation procedure of style setting properties. As shown in Fig. 8(A), the curl height was measured by stretching hairs 62 tied to a virtual wig base 61 using a steamer. As shown in Fig. 8(B), a comb 64 was inserted into hairs 62 and moved in the direction of arrow. As shown in Fig. 8(C), the comb 64 was half-turned and, after maintaining the state for 10 seconds, the comb 64 was removed. After being left to stand for 10 seconds, the curl height was measured as shown in Fig. 8(D). A ratio of an increase in curl height was calculated by the formula: $(h2'-h2)/h2 \times 100$ (where h2 denotes a curl height in the state shown in Fig. 8(A), and h2' denotes a curl height in the state shown in Fig. 6(D)). It was rated that style is likely to change by a comb as the numerical value is higher, and therefore setting properties are excellent.

[0062]

<Style Retention Properties>

Evaluation of style retention properties was performed in the following manner. Fig. 9 is a view schematically showing an evaluation procedure of style retention properties. As shown in Fig. 9(A), hairs 62 tied to a virtual wig base 61 were set and then a curl height was measured. Subsequently, as shown in Fig. 9(B), a

crochet hook needle 65 was inserted into the center of a width of hairs 62 and a hair 62 was hooked. Subsequently, as shown in Fig. 9(C) and Fig. 9(D), the crochet hook needle 65 was vertical lifted until the hair 62 was removed from the crochet hook needle 65, and then the height was measured.

A ratio of an increase in curl height was calculated by the formula: (h3' - h3)/h3) (where h3 denotes a height of curl in the state shown in Fig. 9(A), and h3' denotes a height of curl in the state shown in Fig. 9(D)). It was rated that style is likely to be collapsed by an external factor as the numerical value is higher.

[0063]

<Bundling tendency>

Evaluation of bundling tendency will be described. Bundling tendency mean a state where individual hairs adhere to each other when hairs are wetted to cause coagulation. In case of natural hairs, when moisture is usually removed, hairs are separated from each other and a coagulated state disappears. In contrast, in case of fibers made of a synthetic resin, even when moisture is removed from a bundled state, the bundled state doe not disappear but the state is maintained, or the fibers have properties that coagulation occurs even when moisture is absent. Due to a phenomenon of bundling tendency, when the

same numbers of hairs are laterally arranged, the width of the entire hair bundle arranged decreases in the bundled state, whereas, the width of the entire hair bundle increases in the non-bundled state. Since bundling is likely to occur in case of high humidity, hairs were left to stand under a high humidity environment to cause bundling, and then transferred to a low humidity environment and the degree of disappearance of bundling was measured.

[0064]

Specific evaluation method of bundling tendency will be described.

Fig. 10 is a view schematically showing an evaluation method of bundling tendency. As shown in Fig. 10(A), a swatch 60 is set under an environment at a temperature of 25°C and a humidity of 50±5%. Subsequently, the swatch was transferred to an environment at a temperature of 25°C and a humidity of 80±5% and is then left to stand for 30 minutes. As a result, as shown in Fig. 10(B), hairs 62 are entangled with each other. Then, when returned to an environment at a temperature of 25°C and a humidity of 50±5%, there exist the case where the bundled state nearly disappears as shown in Fig. 10(C) and the case where the bundled state does not disappear and is maintained as shown in Fig. 10(D).

Even when the curled portion of hairs is fixed by setting using a comb or the like, hairs are attached to a wig base by hand work, and thus entanglement of curled hair varies with the swatch. Therefore, in order to reduce error as small as possible, bundling tendency were quantificated by determining widths W1, W2, W3, W4 of a hair bundle based on the position of a starting point of curling under each environment. As compared with the width W1 shown in Fig. 10(A), the width W2 shown in Fig. 10(B) decreases. As compared with the width W2 shown in Fig. 10(B), the width W3 shown in Fig. 10(C) and the width W4 shown in Fig. 10(D) tend to increase. Therefore, bundling tendency were quantificated by a relationship between the width W1 and the width W3, and relationship between the width W1 and the width W4.

[0065]

Specifically, hairs 62 attached to a virtual wig base 61 were set and were left to stand under an environment at a temperature of 25°C and a humidity of 80±5% for 30 minutes as shown in Fig. 10(A). As shown in Fig. 10(B), the hair bundle width W2 was measured at the position of the starting point where curling of hairs 62 initiates. Then, hairs were transferred to an environment at a temperature of 25°C and a humidity of 50±5% and were left to stand for 30 minutes and the bundled state was allowed

to temporarily disappear by subjecting to combing once. Subsequently, hair bundle widths W3, W4 were measured at the position of the starting point where curling of hairs initiated. The increase ratio was calculated by the formula: (W3 - W2)/W2 × 100 or (W4 - W2)/W2 × 100. It was rated that hairs disassemble as the numerical value is high, and therefore bundling tendency is low.

[0066]

<Curl Setting Properties>

Evaluation of curl setting properties was performed in the following manner. As shown in Fig. 5(A), a lot of (for example, about 450 to 500) hair materials 31 cut into a length of 20 cm were laterally arranged as one set and a nearly center portion was sawn using a sewing thread 32 so as not to cause disassembling to prepare a wefty hair bundle 30 having a width of 13 to 15 cm. This hair bundle 30 was wetted by immersing in water. Then, as shown in Fig. 5(B), the hair bundle 30 was wound around an aluminum pipe 33 having a diameter of 25 mm and a non-woven fabric made of nylon was wound around thereon, followed by subjecting to a heat treatment at 180°C for 1 hour and further measurement of a curl diameter of hairs in this curled hair bundle. It was rated that curl setting properties are satisfactory as the measured value of the curl diameter is closer to a diameter of the aluminum pipe (25 mm).

[0067]

<Curl Retention Properties>

Evaluation of curl retention properties was performed in the following manner. Using the hair bundle 30 which was used in the evaluation of curl setting properties and was curled, a curl diameter F1 was measured under an environment at a temperature of 25°C and a humidity of 65±5% and, after repeating shampooing, drying using a dryer and brushing 50 times, a curl diameter F2 of hairs was measured. The extension ratio of the curl diameter was determined from the respective measured values by the formula: (F2 - F1)/F1 × 100. It was rated that retention properties of the curl diameter are inferior as the numerical value of the extension ratio of the curl diameter is larger.

[0068]

Table 2 is a table which shows the evaluation results of Examples 1 to 9 and Comparative Examples 1 to 11. In Table 2, in addition to materials and structures of first and second artificial hair, a difference in a bending rigidity value between first and second artificial hairs is also shown.

[0069]

[Table 2]

	Material and structure of first artificial hair	Second artificial hair			Difference in value of bending rigidity ($N \cdot cm^2$/strand)	Mixing ratio	Recovery rate (%)	Setting properties (height increase ratio of hair bundle) (%)	Retention properties (height increase ratio of hair bundle) (%)	Width increase ratio of hair bundle (%)	Curl diameter of hair bundle (mm)	Extension ratio of curl diameter (%)
		Matreial	Weight ratio (%)	Structure								
Example 1	PA6 Single layer structure	PAMXD6/PA6	70:30	Single layer structure	1.93×10^{-5}	50/50	58.4	40.7	18.6	33.9	31.9	6.4
Example 2		Sheath PA6/Core PAMXD6	25:75	Sheath/Core structure	1.54×10^{-5}	50/50	56.9	39.2	19.8	34.3	32.3	6.7
Example 3		Island PAMXD6/Sea PA6	65:35	Island/Sea structure	1.75×10^{-5}	50/50	57.3	39.9	19.1	34.6	32.0	6.6
Example 4		PAMXD6/PA6	70:30	Single layer structure	1.93×10^{-5}	30/70	60.1	42.5	16.5	32.7	31.2	5.8
Example 5						60/40	56.2	38.1	20.0	34.9	32.5	6.9
Example 6		Sheath PA6/Core PAMXD6	25:75	Sheath/Core structure	1.54×10^{-5}	30/70	59.0	41.2	18.1	33.1	31.7	6.1
Example 7						60/40	54.7	36.9	20.9	35.2	33.0	7.2
Example 8		Island PAMXD6/Sea PA6	65:35	Island/Sea structure	1.75×10^{-5}	30/70	59.5	42.0	17.7	33.5	31.4	5.9
Example 9						60/40	55.0	37.4	20.4	35.4	32.8	7.0
Comparative Example 1						100	48.8	20.6	26.2	23.5	41.8	11.8
Comparative Example 2		PA46	100	Single layer structure	1.54×10^{-5}	50/50	49.7	21.1	28.3	23.7	41.2	11.3
Comparative Example 3		PAMXD6/PA6	25:75	Single layer structure	1.35×10^{-5}	50/50	50.5	25.1	28.7	27.8	37.6	10.4
Comparative Example 4		PAMXD6/PA6	85:15	Single layer structure	2.11×10^{-5}	50/50	65.1	46.8	32.9	34.1	36.7	9.5
Comparative Example 5		PET	100	Single layer structure	4.96×10^{-5}	30/70	72.3	23.0	33.6	36.0	36.6	9.4
Comparative Example 6		PAMXD6/PA6	70:30	Single layer structure	1.93×10^{-5}	15/85	66.4	48.8	34.1	26.0	37.0	9.7
Comparative Example 7						85/15	51.5	24.5	29.4	24.7	37.9	10.6
Comparative Example 8		Sheath PA6/Core PAMXD6	25:75	Sheath/Core structure	1.54×10^{-5}	15/85	65.6	47.4	43.8	26.6	37.4	10.3
Comparative Example 9						85/15	51.0	24.2	32.0	24.9	40.5	11.0
Comparative Example 10		Island PAMXD6/Sea PA6	65:35	Island/Sea structure	1.75×10^{-5}	15/85	65.9	48.1	36.2	27.1	37.1	9.9
Comparative Example 11						85/15	51.3	24.3	30.9	25.6	40.1	10.7

[0070]

Fig. 11 to Fig. 16 are graphs in which the values of the respective evaluation items are rearranged in an ascending order, Fig. 11 is a graph showing a recovery rate of a hair bundle concerning flexibility, Fig. 12 is a graph showing a height increase ratio of a hair bundle concerning style setting properties, Fig. 13 is a graph showing a height increase ratio of a hair bundle concerning style retention properties, Fig. 14 is a graph showing a width increase ratio of a hair bundle concerning bundling tendency, Fig. 15 is a graph showing a curl diameter of a hair bundle concerning curl setting properties, and Fig. 16 is a graph showing an extension ratio of a curl diameter concerning curl retention properties.

[0071]

Regarding a recovery rate of a hair bundle showing flexibility, as shown in Fig. 11, the values in Example 1 to Example 9 exist between the values in Comparative Examples 1, 2, 3, 9, 11 and 7 (48.8%, 49.7%, 50.5%, 51.0%, 51.3% and 51.5%) and the values in Comparative Examples 4, 8, 10, 6 and 5 (65.1%, 65.6%, 65.9%, 66.4% and 72.3%). It became apparent that the artificial hair bundles in Example 1 to Example 9 are hard and rigid as compared with the artificial hair bundle composed only of one kind of a polyamide fiber like Comparative Example 1, and is soft as

compared with the artificial hair bundle made by mixing with a polyester-based fiber other than polyamide like Comparative Example 5. In other words, the artificial hair bundles in Comparative Examples 1, 2, 3, 9, 11 and 7 cannot create sufficient hair volume since the recovery rate is less than 52% and they are too soft as the hair bundle. In contrast, in the artificial hair bundles in Comparative Examples 4, 8, 10, 6 and 5, the recovery rate is more than 65% and the hair volume is excessively large, and thus softness peculiar to polyamide fibers are lost by the fact that both first and second artificial hairs are composed of polyamide fibers, and it is not preferred.

As is apparent from the above results, the recovery rate of the artificial hair bundle is preferably a combination of first and second artificial hairs shown in Example 1 to Example 9, and moderate flexibility is imparted without losing flexibility peculiar to polyamide fibers.

[0072]

Regarding the height increase ratio of a hair bundle concerning style setting properties, as shown in Fig. 12, the values in Examples 1 to 9 exist between the value in Comparative Examples 1, 2, 5, 9, 11, 7 and 3 (20.6, 21.1%, 23.0%, 24.2%, 24.3%, 24.5% and 25.1%) and the values in Comparative Examples 4, 8, 10 and 6 (46.8%, 47.4%, 48.1%

and 48.8%). It is not preferred that small height increase ratio of an artificial hair bundle causes less change in movement of hairs even when an attempt is made to set styling using a brush or a comb, and thus it becomes difficult to exhibit a desired style. In contrast, when the height increase ratio of an artificial hair bundle is high, hairs are largely changed by slight brushing, and thus it becomes difficult to perform fine adjustment.

As is apparent from the above results, the height increase rate of the artificial hair bundle is preferably a combination of first and second artificial hairs shown in Example 1 to Example 9, and it becomes easy to set a desired hair style as compared with the artificial hair bundle composed of one kind of a polyamide fiber in all Examples.

[0073]

As shown in Fig. 13, regarding the height increase ratio of hair bundle concerning style retention properties, the respective Comparative Examples are arranged in an ascending order after aggregation of Example 1 to Example 9. Therefore, it became apparent that the style is less likely to be collapsed and is likely to be maintained after style setting in the respective Examples as compared with a series of Comparative Examples.

[0074]

As shown in Fig. 14, regarding the width increase ratio of hair bundle concerning bundling tendency, it became apparent that since the results of the respective Examples are higher as compared with Comparative Examples 1 to 3 and Comparative Examples 6 to 11, it is possible to improve bundling tendency when second artificial hairs are made of the material which is different from the polyamide resin constituting first artificial hairs, and first artificial hairs are mixed with second artificial hairs so as to satisfy predetermined conditions. In Comparative Example 5, the width increase ratio of a hair bundle was slightly high as compared with all Examples, and this reason is considered that second artificial hairs are composed of PET fibers. In Comparative Example 4, the same material as in Example 1, Example 4 and Example 5 is used as the material of second artificial hairs. Also, this reason is considered that, in the mixing ratio of the materials, the mixing ratio of nylon MXD6 (PAMXD6) to nylon 6 (PA6) is 85:15 and the proportion of nylon MXD6 is increased, and also a difference in the bending rigidity value between first and second artificial hairs increases. As is apparent from synthetic judgment of the evaluation results other than bundling tendency, particularly the results of the height increase ratio of a hair bundle concerning recovery rate, style setting properties and

style retention properties, Comparative Example 4 and Comparative Example 5 are not suited to achieve the object of the present invention.

[0075]

As shown in Fig. 15, regarding the hair bundle curl diameter of curl setting properties, since Comparative Examples are arranged after the respective Examples, the value of the curl diameter is close to the diameter of the aluminum pipe (25 mm) in all respective Examples as compared with the respective Comparative Examples. Therefore, it became apparent that curl setting properties are satisfactory in Examples 1 to 9.

[0076]

As shown in Fig. 16, regarding the extension ratio of a curl diameter concerning curl retention properties, similarly to the results concerning the hair bundle curl diameter, Comparative Examples are arranged after the respective Examples and, as described above, the extension ratio of a curl diameter of Example 1 to Example 9 is small as compared with the respective Comparative Examples. Therefore, it became apparent that curl diameter retention proprties are satisfactory in Example 1 to Example 9.

[0077]

As is apparent from the above evaluation results, improvement efficiency is most excellent in Comparative

Example 5, which is apparent from the results of bundling tendency evaluated by the width increase ratio of a hair bundle, while the numerical value of the recovery rate evaluated by flexibility is high and flexibility is poor in Comparative Example 5. That is, it became apparent that Comparative Examples are excellent in specific evaluation as compared with Examples, however, synthetic judgment reveals that all Examples are excellent as compared with Comparative Examples.

[0078]

Accordingly, apparent from the respective Examples shown in Table 1, a combination of first and second artificial hairs, that is, a combination of kinds of polyamide fibers is preferably a single layer in which first artificial hairs having a single layer structure of nylon 6 are mixed with second artificial hair made of nylon 6 and nylon MXD6, a sheath/core structure in which the material of a sheath portion is nylon 6 and the material of the core portion is nylon MXD6, and a sea/island structure in which the material of an island portion is nylon MXD6 and the material of a base material is nylon 6.

[0079]

As is apparent from a comparison between Examples 1 to 3 and Comparative Examples 1 to 4, a difference in a bending rigidity value between first and second artificial

hairs is preferably 1.54×10^{-5} N cm^2/strand or more and 1.75×10^{-5} N cm^2/strand or less, and it is preferred that first and second artificial hairs are mixed in a mixing ratio of 50:50 to produce an artificial hair bundle and this artificial hair bundle is attached to a wig base so that first and second artificial hairs are uniformly distributed per unit region.

[0080]

As is apparent from a comparison between Examples 1, 4 and 5 and Comparative Examples 6 and 7, fibers having a single layer structure of nylon 6 are employed as first artificial hairs and fibers having a single layer structure made of a mixture of nylon MXD6 and nylon 6 in a mixing ratio of 70:30 are employed as second artificial hair in all these Examples and the Comparative Examples, and a mixing ratio of first artificial hairs to second artificial hairs is preferably from 30:70 to 60:40.

[0081]

As is apparent from a comparison between Examples 2, 6 and 7 and Comparative Examples 8 and 9, fibers having a single layer structure of nylon 6 are employed as first artificial hairs, and fibers having a sheath/core structure in which the material of a core portion is nylon MXD6 and the material of a sheath portion is nylon 6, and a weight ratio of the material of the core portion to the material

of the sheath portion is a weight ratio of 75: 25 are employed as second artificial hairs in all these Examples and Comparative Examples, and a mixing ratio of first artificial hairs to second artificial hairs is preferably from 30:70 to 60:40.

[0082]

As is apparent from a comparison between Examples 3, 8 and 9 and Comparative Examples 10 and 11, fibers having a single layer structure of nylon 6 are employed as first artificial hairs and fibers having a sea/island structure in which the material of an island portion is nylon MXD6 and the material of a sea portion (base material) is nylon 6 and a weight ratio of the material of the island portion to the material of the sea portion is a weight ratio of 65: 35 are employed as second artificial hairs in all these Examples and Comparative Examples, and a mixing ratio of first artificial hairs to second artificial hairs is preferably from 30:70 to 60:40.

[0083]

In all Examples 1 to 9 and Comparative Examples 1 to 11, a comparison is made in case the first artificial hairs are the same kind. Thus, a study was made whether or not the same shall apply to even the case first artificial hairs are aliphatic polyamide fibers other than nylon 6 (PA6).

Example 10

[0084]

In Example 10, fibers of nylon 66 (PA66) having a perfect circular cross-sectional shape and a single layer structure were produced as first artificial hairs 3A. Specifically, chips of nylon 66 (UBE nylon 6,6 2020B, manufactured by Ube Industries, Ltd.) were used as raw chips, and a speed of each roll of first to fourth drawing rolls 15, 17, 19, 22 in Fig. 4(A) was adjusted. As a result, a fiber cross-sectional diameter became 83.1 μm.

Fibers having a single layer structure made of nylon 6 (PA6) and nylon MXD6 (PAMXD6) produced in Example 1 were used as second artificial hairs 3B.

In Example 10, first artificial hairs 3A and second artificial hairs 3B were mixed in a mixing ratio of 50:50 to produce an artificial hair bundle.

Example 11

[0085]

In Example 11, fibers of nylon 66 produced in Example 10 were used as first artificial hairs 3A.

Fibers having a sea/island structure in which a sea portion is made of nylon MXD6 (PAMXD6) and an island portion is made of nylon 6 (PA6) produced in Example 3 were used as second artificial hairs 3B.

In Example 11, first artificial hairs 3A and second artificial hairs 3B were mixed in a mixing ratio of 50:50 to produce an artificial hair bundle.

Example 12

[0086]

In Example 12, fibers of nylon 610 (PA610) having a perfect circular cross-sectional shape and a single layer structure were produced as first artificial hairs 3A. Specifically, chips of nylon 610 (Amilan CM2001, manufactured by Toray Industries, Inc.) were used as raw chips, and a speed of each roll of first to fourth drawing rolls 15, 17, 19, 22 in Fig. 4(A) was adjusted. As a result, a fiber cross-sectional diameter became 82.8 μm.

Fibers having a single layer structure made of nylon 6 (PA6) and nylon MXD6 (PAMXD6) produced in Example 1 were used as second artificial hairs 3B.

In Example 12, first artificial hairs 3A and second artificial hairs 3B were mixed in a mixing ratio of 50:50 to produce an artificial hair bundle.

Example 13

[0087]

In Example 13, fibers of nylon 612 (PA612) and nylon 46 (PA46) having a perfect circular cross-sectional shape and a single layer structure were produced as first artificial hairs 3A. Specifically, chips of nylon 612

(Zytel 158, manufactured by DuPont) and nylon 46 (TS300, manufactured by DSM Nutrition Japan K.K.) mixed in a ratio of 70:30 were used as raw chips, and a speed of each roll of first to fourth drawing rolls 15, 17, 19, 22 in Fig. 4(A) was adjusted. As a result, a fiber cross-sectional diameter became 82.5 μm.

Fibers having a single layer structure made of nylon 6 (PA6) and nylon MXD6 (PAMXD6) produced in Example 1 were used as second artificial hairs 3B.

In Example 13, First artificial hairs 3A and second artificial hairs 3B were mixed in a mixing ratio of 50:50 to produce an artificial hair bundle.

Example 14

[0088]

In Example 14, fibers of nylon 612 (PA612) and nylon 46 (PA46) having a perfect circular cross-sectional shape and a single layer structure were produced as first artificial hairs 3A. Specifically, chips of nylon 612 (Zytel 158, manufactured by DuPont) and nylon 46 (TS300, manufactured by DSM Nutrition Japan K.K.) mixed in a mass ratio of 80: 20 were used as raw chips, and a speed of each roll of first to fourth drawing rolls 15, 17, 19, 22 in Fig. 4(A) was adjusted. As a result, a fiber cross-sectional diameter became 83.0 μm.

Fibers having a sheath/core structure produced in Example 2 were used as second artificial hairs 3B.

In Example 14, first artificial hairs 3A and second artificial hairs 3B were mixed in a mixing ratio of 50:50 to produce an artificial hair bundle.

Example 15

[0089]

In Example 15, fibers having a single layer structure of nylon 612 (PA612) and nylon 46 (PA46) produced in Example 14 were used as first artificial hairs 3A.

Fibers having a sea/island structure produced in Example 3 were used as second artificial hairs 3B.

In Example 15, first artificial hairs 3A and second artificial hairs 3B were mixed in a mixing ratio of 50:50 to produce an artificial hair bundle.

Example 16

[0090]

In Example 16, fibers of nylon 612 (PA612) having a perfect circular cross-sectional shape and a single layer structure were produced as first artificial hairs 3A. Specifically, chips of nylon 612 (Zytel 158, manufactured by DuPont) were used as raw chips, and a speed of each roll of first to fourth drawing rolls 15, 17, 19, 22 in Fig. 4(A) was adjusted. As a result, a fiber cross-sectional diameter became 80.3 μm.

Fibers having a perfect circular cross-sectional shape and a sheath/core layer structure were produced as second artificial hairs 3B. Specifically, chips of nylon MXD6 (MX nylon PAMXD6, manufactured by Mitsubishi Gas Chemical Company, Inc.) were used as raw chips which would be the portion serving as a core, and chips of nylon 6 (NOVAMID1020, manufactured by manufactured by Mitsubishi Engineering-Plastics Corporation) were used as raw chips which would be the portion serving as a sheath, and weight ratio of chips of nylon 6 to chips of nylon MXD6 was adjusted to 45: 55. Using a manufacturing system of Fig. 4(B), a speed of each roll of first to fourth drawing rolls 15, 17, 19, 22 was adjusted. As a result, a cross-sectional diameter of fibers became 82.2 μm. Herein, assuming that hair diameter is 1, the core portion was 0.70.

In Example 16, first artificial hairs 3A and second artificial hairs 3B were mixed in a mixing ratio of 50:50 to produce an artificial hair bundle.

[0091]

The bending rigidity values of hairs produced and prepared newly in Example 10 to Example 16 were measured in the same manner as described above. Measuring conditions and the like are as described above. The measurement results of the bending rigidity value will be described. In Table 3, in addition to the measurement results of

Example 10 to Example 16, the values reduced in terms of cross-sectional diameter 80 μm, manufacturing conditions and the like of first and second artificial hairs are also shown.

[0092]

[Table 3]

		Yarn diameter (μm)	Material	Weight ratio (%)	Structure	Value of bending rigidity ($N \cdot cm^2$/strnad)		Mixing ratio	Difference in value of bending rigidity ($N \cdot cm^2$/strnad)
						Measured value	Reduced value		
Example 10	First artificial hair	83.1	PA66	100	Single layer structure	3.64×10^{-5}	3.37×10^{-5}	50/50	1.69×10^{-5}
	Second artificial hair	82.1	PAMXD6/PA6	70:30	Single layer structure	5.33×10^{-5}	5.06×10^{-5}		
Example 11	First artificial hair	83.1	PA66	100	Single layer structure	3.64×10^{-5}	3.37×10^{-5}	50/50	1.51×10^{-5}
	Second artificial hair	83.2	SeaPA6/Island PAMXD6	35:65	Sea/Island structure	5.28×10^{-5}	4.88×10^{-5}		
Example 12	First artificial hair	82.8	PA610	100	Single layer structure	3.67×10^{-5}	3.42×10^{-5}	50/50	1.64×10^{-5}
	Second artificial hair	82.1	PAMXD6/PA6	70:30	Single layer structure	5.33×10^{-5}	5.06×10^{-5}		
Example 13	First artificial hair	82.5	PA612/PA46	70:30	Single layer structure	3.40×10^{-5}	3.20×10^{-5}	50/50	1.86×10^{-5}
	Second artificial hair	82.1	PAMXD6/PA6	70:30	Single layer structure	5.33×10^{-5}	5.06×10^{-5}		
Example 14	First artificial hair	83.0	PA612/PA46	80:20	Single layer structure	3.38×10^{-5}	3.14×10^{-5}	50/50	1.53×10^{-5}
	Second artificial hair	81.6	Sheath PA6/Core PAMXD6	25:75	Sheath/Core structure	4.86×10^{-5}	4.67×10^{-5}		
Example 15	First artificial hair	83.0	PA612/PA46	80:20	Single layer structure	3.38×10^{-5}	3.14×10^{-5}	50/50	1.74×10^{-5}
	Second artificial hair	83.2	SeaPA6/Island PAMXD6	35:65	Sea/Island structure	5.28×10^{-5}	4.88×10^{-5}		
Example 16	First artificial hair	80.3	PA612	100	Single layer structure	3.02×10^{-5}	3.00×10^{-5}	50/50	1.74×10^{-5}
	Second artificial hair	82.2	Sheath PA6/Core PAMXD6	45:55	Sheath/Core structure	5.01×10^{-5}	4.74×10^{-5}		

[0093]

Since first artificial hairs are respectively produced in Examples 10, 12, 13, 14 and 16, the bending rigidity values were sequentially 3.64×10^{-5} N·cm^2/strand, 3.67×10^{-5} N·cm^2/strand, 3.40×10^{-5} N·cm^2/strand, 3.38×10^{-5} N·cm^2/strand, and 3.02×10^{-5} N·cm^2/strand.

Second artificial hairs were newly produced in Example 16, and the bending rigidity value was 5.01×10^{-5} N·cm^2/strand.

[0094]

A difference in a bending rigidity value (reduced value) between first and second artificial hairs was as follows.

The differences in a bending rigidity value between first and second artificial hairs were 1.69×10^{-5} N·cm^2/strand, 1.51×10^{-5} N·cm^2/strand, 1.64×10^{-5} N·cm^2/strand, 1.86×10^{-5} N·cm^2/strand, 1.53×10^{-5} N·cm^2/strand, 1.74×10^{-5} N·cm^2/strand and 1.74×10^{-5} N·cm^2/strand in the order of Example 10, Example 11, Example 12, Example 13, Example 14, Example 15 and Example 16.

[0095]

With respect to Examples 10 to 16, evaluation of an artificial hair bundle was respectively performed in the same manner as described above. Table 4 is a table which

shows evaluation results of Example 10 to Example 16. In Table 4, in addition to materials and structures of first and second artificial hairs, a difference in a bending rigidity value between first and second artificial hairs are also shown.

[Table 4]

	First artificial hair			Second artificial hair			Difference in value of bending rigidity ($N \cdot cm^2$/strnad)	Mixing ratio	Recovery rate (%)	Setting properties (height increase ratio of hair bundle) (%)	Retention properties (height increase ratio of hair bundle) (%)	Width increase ratio of hair bundle (%)	Curl diameter of hair bundle (mm)	Extension ratio of curl diameter (%)
	Material	Weight ratio (%)	Structure	Material	Weight ratio (%)	Structure								
Example 10	PA66	100	Single layer	PAMXD6/ PA6	70:30	Single layer	1.69×10^{-5}	50/50	59.4	38.9	19	34.4	31.2	6.1
Example 11	PA66	100	Single layer	Sea PA6/Island PAMXD6	35:65	Sea/Island	1.51×10^{-5}	50/50	58.0	39.0	19.5	34.1	31.4	6.0
Example 12	PA610	100	Single layer	PAMXD6/ PA6	70:30	Single layer	1.64×10^{-5}	50/50	58.1	39.2	19.6	34.9	30.7	5.8
Example 13	PA612/PA46	70/30	Single layer	PAMXD6/ PA6	70:30	Single layer	1.86×10^{-5}	50/50	56.5	38.0	20.1	35.4	30.5	5.7
Example 14	PA612/PA46	80/20	Single layer	Sheath PA6/Core OAMXD6	25:75	Sheath/Core	1.53×10^{-5}	50/50	54.5	38.8	19.7	35.2	31.9	6.3
Example 15	PA612/PA46	80/20	Single layer	Sea PA6/Island PAMXD6	35:65	Sea/Island	1.74×10^{-5}	50/50	53.6	39.1	19.0	34.7	31.8	6.2
Example 16	PA612	100	Single layer	Sheath PA6/Core OAMXD6	45:55	Sheath/Core	1.74×10^{-5}	50/50	52.4	41.9	16.2	35.1	30.6	5.7

[0096]

The artificial hair bundles in Example 10 to 16 were evaluated in the same manner as in the above Examples and Comparative Examples.

The recovery rates of a hair bundle, which show flexibility, were 59.4%, 58.0%, 58.1%, 56.5%, 54.5%, 53.6% and 52.4% in the order of Examples 10 to 16. As shown in Fig. 11, it became apparent that these values exist between the value of 51.5% of Comparative Example 7 and the value of 65.1% of Comparative Example 4. Similar to Example 1 to Example 9, Examples 10 to 16 are preferably a combination of first and second artificial hairs, and moderate flexibility is imparted without losing flexibility peculiar to polyamide fibers.

[0097]

The height increase ratios of the hair bundle concerning style setting properties were 38.9%, 39.0%, 39.2%, 38.0%, 38.8%, 39.1% and 41.9% in the order of Examples 10 to 16. As shown in Fig. 12, it became apparent that these values exist between the value of 25.1% of Comparative Example 3 and the value of 46.8% of Comparative Example 4. Similar to Example 1 to Example 9, Examples 10 to 16 facilitate desired hair style setting as compared with an artificial hair bundle composed of one kind of a

polyamide fiber as a combination of first and second artificial hairs.

[0098]

The height increase ratios of a hair bundle concerning style retention properties were 19%, 19.5%, 19.6%, 20.1%, 19.7%, 19.0% and 16.2% in the order of Examples 10 to 16. As shown in Fig. 13, these values are less than the value of 26.2% of Comparative Example 1. Similar to Example 1 to Example 9, it became apparent that the style is less likely to be collapsed and is likely to be maintained after style setting in Examples 10 to 16 as compared with a series of Comparative Examples.

[0099]

The width increase ratios of a hair bundle concerning bundling tendency were 34.4%, 34.1%, 34.9%, 35.4%, 35.2%, 34.7% and 35.1% in the order of Examples 10 to 16. AS shown in Fig. 14, these values exist between the value of 27.8% of Comparative Example 3 and the value of 36.0 of Comparative Example 5. Similar to Example 1 to Example 9, regarding Examples 10 to 16, it became apparent that when second artificial hairs are made of the material which is different from the polyamide resin constituting first artificial hairs as a combination of first and second artificial hairs, and first artificial hairs are mixed with

second artificial hairs so as to satisfy predetermined conditions, bundling tendency can be improved.

[0100]

The hair bundle curl diameters concerning curl setting properties were 31.2 mm, 31.4 mm, 30.7 mm, 30.5 mm, 31.9 mm, 31.8 mm and 30.6 mm in the order of Examples 10 to 16. As shown in Fig. 15, it became apparent that these values are less than the value of 36.6 mm of Comparative Example 5 and the value of the curl diameter is within a range (about 31 mm to 35 mm) close to the diameter of an aluminum pipe, and thus curl setting properties are satisfactory in Examples 10 to 16.

[0101]

The extension ratios of a curl diameter concerning curl retention properties were 6.1%, 6.0%, 5.8%, 5.7%, 6.3%, 6.2% and 5.7% in the order of Examples 10 to 16. As shown in Fig. 16, these values are less than the value of 9.4% of Comparative Example 5. Therefore, it became apparent that, similar to Example 1 to Example 9, curl diameter retention ratio is satisfactory even in Example 10 to Example 16 in a combination of first and second artificial hairs.

[0102]

When evaluation results of Example 10 to Example 16 are compared with those of the above Examples 1 to 9 and Comparative Examples 1 to 11, first artificial hairs are

made of an aliphatic polyamide resin, and the reduced bending rigidity value is from 3.00×10^{-5} to 3.42×10^{-5} $N \cdot cm^2$/strand, it can be said that first artificial hairs may be made of nylon 6, nylon 66, nylon 610, nylon 612 alone or a combination thereof. It can be said that second artificial hairs may be made of an aliphatic polyamide resin and a semiaromatic polyamide resin, and may have not a single layer structure or may have a composite structure such as a sheath/core or sea/island structure.

[0103]

As described above, first artificial hairs are composed of aliphatic polyamide fibers and second artificial hairs are composed of the material which is different from that of first artificial hairs, that is, an aliphatic polyamide and a semiaromatic polyamide as a single layer or a composite structure. Accordingly, first, since both first and second artificial hairs are composed of polyamide fibers, while maintaining basic characteristics as hairs possessed by polyamide fibers, that is, flexibility and high heat-setting properties, second, hair volume can be enhance, third, it is possible to provide a wig with natural texture without causing bundling of e polyamide fibers by dispersing different kinds of polyamide fibers in place of a state where the same kind of fibers are entangled with each other.

CLAIMS

1. A wig including a wig base and hairs attached to the wig base, wherein the hairs consist of first artificial hairs made of an aliphatic polyamide resin and second artificial hairs made of a mixture of an aliphatic polyamide resin and a semiaromatic polyamide resin are mixed in a weight ratio of 30: 70 to 60: 40.

2. The wig according to claim 1, wherin the second artificial hair has a structure selected from a single layer structure, a sheath/core structure and a sea/island structure.

3. The wig according to claim 1, wherin the second artificial hair has a single layer structure, a sheath/core structure and a sea/island structure, the core portion is made of a semiaromatic polyamide resin and the sheath portion is made of an aliphatic polyamide resin.

4. The wig according to claim 1, wherin the second artificial hair has a sea/island structure, the sea portion is made of an aliphatic polyamide resin and the island portion is made of a semiaromatic polyamide resin.

5. The wig according to claim 1, wherin both the first artificial hair and the second artificial have a bending rigidity value of 7.8×10^{-5} N·cm^2/strand or less reduced in terms of a diameter 80 μm under the measuring conditions of a temperature of 20°C and a humidity of 40%.

6. The wig according to claim 5, wherin a difference in a bending rigidity value between the first artificial hair and the second artificial hair is from 1.5×10^{-5} N·cm^2/strand to 2.0×10^{-5} N·cm^2/strand.