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(54) **Hair for toys**

(57) Hair for toys which is constituted of filaments made of an alcohol-soluble resin is disclosed. The hair for toys may also be hair for toys which is constituted of filaments made of a composite resin made up of a core

and a sheath, where at least one of the resin of the core and that of the sheath is an alcohol-soluble resin.

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Description

[0001] This application claims the benefit of Japanese Patent Applications No. 2007-135108 and No. 2008-082712 which are hereby incorporated by reference.

BACKGROUND OF THE INVENTION

Field of the Invention

[0002] This invention relates to hair for toys. More particularly, it relates to hair for toys which has a function that a condition of hairs transformed into any desired shape upon application of water is fixed in a dry condition.

Related Background Art

[0003] As toy hairs which are changeable in shape, those which make use of a shape memory alloy are disclosed (see, e.g., Japanese Patent Application Laid-open No. 62-137086). Such hairs return to the shape the alloy has memorized, when heated after they have been transformed into any desired shape, but can not have any soft feeling because the hair is made of a metal.

[0004] Hair making use of a shape memory resin is also disclosed (see, e.g., Japanese Patent Application Laid-open No. 2-141498). It, however, is difficult to make the resin have fiber (filament)-forming properties, and also such a resin has had a poor function to retain the shape-transformed condition, being so poor as not to satisfy properties as toys.

[0005] As a means for resolving such a problem, hair for toys is disclosed which has a function that hairs can be transformed into arbitrary shapes upon heating by hand touching or the like, the shape-transformed condition can be fixed by cooling and the fixed shape can be restored to an original condition or transformed into different shapes (see, e.g., U.S. Patent No. 5,895,718). This hair is, taking account of convenience, preferably so made up as to be heated to a temperature around the body heat to transform hairs, but has a nature that the hairs return to an original shape with lapse of time even after they have been transformed. Thus, it has been difficult to retain the shape-transformed condition for a long time.

SUMMARY OF THE INVENTION

[0006] Accordingly, the present invention aims to provide hair for toys which is rich in convenience, having a function that hairs (filaments) can be transformed into arbitrary shapes upon application of water, the shape-transformed condition can be fixed over a long period of time by drying and the fixed shape can optionally be restored to an original condition or transformed into different shapes.

[0007] The present invention requires that it is hair for

toys which comprises hair constituted of filaments made of a resin, where the resin comprises an alcohol-soluble resin.

[0008] The present invention may further require that the alcohol-soluble resin is contained in the resin in an amount of 10% by mass or more; that it is hair for toys which comprises hair constituted of filaments made of a composite resin made up of a core and a sheath, where the resin of the core and/or that of the sheath comprise (s) an alcohol-soluble resin; that the resin of the core is a resin capable of undergoing plastic deformation at a temperature of 50°C or less and the resin of the sheath is an alcohol-soluble resin; that the resin of the core is a resin in which a thermoplastic resin (A) and a thermoplastic polymer (B) having glass transition temperature within the range of from 0°C to 50°C have been melted in an integral form in a proportion of (A):(B) of from 95:5 to 1:99; that the resin of the core is a shape memory resin; that the alcohol-soluble resin is contained in the resin of the sheath in an amount of 1% by mass or more; that the alcohol-soluble resin is an alcohol-soluble nylon; that the alcohol-soluble nylon is a copolymer nylon containing at least nylon 6,6; and that the alcohol-soluble nylon is any of a multi-copolymer nylon containing at least nylon 6 and nylon 6,6, a multi-copolymer nylon containing at least nylon 6, nylon 6,6 and nylon 610 and a multi-copolymer nylon containing at least nylon 6, nylon 6,6, nylon 610 and nylon 12.

[0009] The present invention can provide hair for toys which has such repeatable play performance that hairs (filaments) can be transformed into arbitrary shapes upon application of water, the shape-transformed condition can be fixed over a long period of time by drying and the shape-transformed hairs (filaments) can optionally be restored to an original condition or transformed into different shapes.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0010] The filaments made of a resin that make up the hair for toys of the present invention are formed of a resin containing at least an alcohol-soluble resin.

[0011] As the alcohol-soluble resin, a thermoplastic alcohol-soluble nylon may preferably be used, which has superior fiber (filament)-forming properties. In particular, among alcohol-soluble nylons, a copolymer nylon containing at least nylon 6,6, a multi-copolymer nylon containing at least nylon 6 and nylon 6,6, a multi-copolymer nylon containing at least nylon 6, nylon 6,6 and nylon 610 and a multi-copolymer nylon containing at least nylon 6, nylon 6,6, nylon 610 and nylon 12 do not make use of any harmful substance such as formalin, and hence can secure a high safety when they are produced or used.

[0012] As the resin for making up the filaments, the alcohol-soluble resin may be used alone, or the alcohol-soluble resin and a resin different from the alcohol-soluble resin may also be used in the form of a blend. Such

resin different from the alcohol-soluble resin may preferably be a resin having fiber (filament)-forming properties, and may include thermoplastic resins such as polyamide resin, polyester resin and polyolefin resin.

[0013] The polyamide resin may be exemplified by nylon 6, nylon 6,6, nylon 6,9, nylon 11, nylon 12, copolymer nylon 6-12, copolymer nylon 6,9-12, and polyamide elastomers. The polyester resin may be exemplified by polyhexamethylene terephthalate, polyethylene terephthalate, polybutylene terephthalate, saturated aliphatic polyesters, and polyester elastomers. The polyolefin resin may be exemplified by low-density polyethylene, linear low-density polyethylene, high-density polyethylene, polypropylene, a polypropylene-ethylene copolymer, polyisobutylene, polybutadiene, and ethylenepropylene rubber. Any of these may be used alone or in combination.

[0014] In the case when a different resin is blended, the alcohol-soluble resin may be contained in the resin in an amount of 10% by mass or more, preferably 30% by mass or more, and more preferably 50% by mass or more. This enables satisfaction of how well the filaments are transformed upon application of water and how well the shape-transformed condition can be fixed by drying.

[0015] The filaments made up as described above are produced in the form of multi-filaments by melt spinning making use of a melt spinning machine. This is because a bundle of filaments (fibers) can be made up in such a form that they are readily continuously set in doles or animal-shaped toys by means of a setting machine.

[0016] Here, the filaments may be circular in their cross sections or, without limitation thereto, be star-shaped, Y-shaped or of any other different shape, any of which may appropriately be selected depending on the feel, the bulkiness, the curl workability and so forth.

[0017] The filaments may each preferably have outer diameter within the range of from 30 μm to 200 μm , and more preferably from 40 μm to 120 μm . Those having an outer diameter of less than 30 μm are so thin as to have poor shape retention after they have come transformed. On the other hand, those having an outer diameter of more than 200 μm are so thick as to show the property of hair with difficulty.

[0018] The filaments may easily stick together when they are left in the state of being lapped over one another, depending on the types of the alcohol-soluble resin to be used or of the resin to be blended. In order to prevent this, the filaments may be those having the form of core-sheath type composite filaments.

[0019] Stated specifically, they are composite filaments (fibers) of a core-sheath type in which the resin containing the alcohol-soluble resin forms the core and a resin which is so composed that the filaments can not easily stick to one another is so joined as to surround the core in the shape of a sheath. In this case, the resin that forms the sheath is required to have water permeability.

[0020] Further, where the filaments can not easily stick together in the state they are lapped over one another,

depending on the types of the alcohol-soluble resin to be used or of the resin to be blended, what may be obtained are composite filaments (fibers) of a core-sheath type in which a resin containing no alcohol-soluble resin forms the core and the resin containing the alcohol-soluble resin is so joined as to surround the core in the shape of a sheath, and composite filaments (fibers) of a core-sheath type in which the resin containing the alcohol-soluble resin forms the core and the resin containing the alcohol-soluble resin is so joined as to surround the core in the shape of a sheath. Such make-up enables the alcohol-soluble resin to be contained in a smaller quantity than that in the case of single-phase filaments.

[0021] The alcohol-soluble resin to be contained in the core-sheath type composite filaments may preferably be contained in an amount of 30% by mass or more, and more preferably 50% by mass or more. This enables satisfaction of how well the filaments are transformed upon application of water and how well the shape-transformed condition can be fixed by drying.

[0022] To the filaments, a usual pigment, a fluorescent pigment, a thermochromic microcapsule pigment, a photochromic material or the like may be added to obtain filaments with various color tones.

[0023] The thermochromic microcapsule pigment may effectively be a pigment obtained by enclosing in microcapsules a reversibly thermochromic composition containing three components, an electron-donating color-developing organic compound, an electron-accepting compound and an organic compound medium which causes color-developing reaction reversibly.

[0024] As the microcapsules, those having particle diameter within the range of from 1 μm to 30 μm , and preferably from 5 μm to 15 μm may be used, which may be incorporated in the resin in an amount of from 0.5% by mass to 40% by mass, and preferably from 1% by mass to 30% by mass. If they are mixed in an amount of less than 0.5% by mass, it is difficult to make any sharp thermochromic effect visible. If they are in an amount of more than 40% by mass, they are in excess, and may cause aftercolor when the pigment is in a color extinguished state.

[0025] The photochromic material may effectively be a photochromic compound such as a spiroxazine type compound, a spiropyran type compound or a diarylethene type compound.

[0026] Further, a general-purpose plasticizer of various types, as exemplified by phthalic acid type, aliphatic dibasic ester type, phosphoric ester type, epoxy type, phenol type and trimellitic acid type compounds, may be mixed so as to provide the filaments with flexibility. calcium carbonate, magnesium carbonate, titanium oxide, talc or the like may also be added in order to improve workability, physical properties and so forth.

[0027] The present invention provides hair for toys which has a function that, as described above, filaments can be shape-transformed upon application of water while showing flexibility, and the shape can be retained

by drying the shape-transformed filaments as they stand fixed to the desired shape, where the shape transformation and fixation can be achieved by a simple method, i.e., by the application of water, and further the filaments having retained that shape can be released from their fixed shape upon application of water so as to be transformed into, and fixed to, any desired different shapes, thus having the utility of repeatability.

[0028] The filaments are shape-transformed upon application of water while showing their flexibility, and the shape into which the filaments have been transformed is fixed upon drying. This is presumed to be due to the fact that the alcohol-soluble resin is so rich in hydrophilicity that the filaments may come to lose its crystalline structure upon absorption of water and come to have a low modulus in flexure while keeping their flexibility, and the filaments come again crystallized upon drying to increase in the modulus in flexure, where the shape-transformed condition of the filaments is retained while keeping them hardened.

[0029] Further, the hair for toys of the present invention has such play performance that, after its filaments have been transformed into a desired shape, water is applied thereto, whereupon this shape can be retained even when a fixture is removed before drying. This is presumed to be due to the fact that the filaments absorb water in the state a strain coming from stress is applied thereto, whereupon they come shifted to the direction where the molecules relax the strain, so that the shape into which the filaments have been transformed can be retained.

[0030] Of the above core-sheath type composite filaments, composite filaments the resin of the core of which is a resin capable of undergoing plastic deformation at a temperature of 50°C or less and the resin of the sheath of which is an alcohol-soluble resin has such repeatable play performance that the filaments can be transformed into arbitrary shapes upon application of water, the shape-transformed condition can be fixed before drying and at the same time the shape-transformed condition can be fixed over a longer period of time by drying, and the shape-transformed filaments (hairs) can optionally be restored to an original condition or transformed into different shapes.

[0031] The resin that makes up the core is formed of the resin capable of undergoing plastic deformation at a temperature of 50°C or less. Such a resin may include a resin made up of a thermoplastic resin (A) and a thermoplastic polymer (B) having glass transition temperature within the range of from 0°C or more to 50°C or less, which resins have been melted in an integral form in a proportion of (A):(B) of from 95:5 to 1:99.

[0032] The thermoplastic resin (A) may include polymers selected from any of polyamide type thermoplastic elastomers including polyamide resins such as nylon 6, nylon 6,6, nylon 12, nylon 6,9, nylon 612, copolymer nylon 6-6,6, copolymer nylon 6-12, copolymer nylon 6-6,6-12 and copolymer nylon 6,9-12, polyester resins such as polyethylene terephthalate and polybutylene

terephthalate, acrylonitrile-styrene copolymer resin, acrylonitrile-butadiene-styrene copolymer resin, polycarbonate resin, vinylidene chloride-vinyl chloride copolymer resin, copolymer acrylonitrile resin and polyamide-polyether block copolymer resin; styrene type thermoplastic elastomers such as styrene-butadiene block copolymer resin; polyolefin type thermoplastic elastomers such as polypropylene-ethylene propylene rubber block copolymer resin; polybutadiene type thermoplastic elastomers; polyester type thermoplastic elastomers; and thermoplastic elastomers such as ethylene-vinyl acetate type copolymers.

[0033] In order to retain graceful flexibility over a long period of time, it is desirable to use the thermoplastic elastomer, where the filaments are prevented from losing their gracefulness with time to become hard in quality.

[0034] The thermoplastic polymer (B) may include saturated polyester resins, acrylate resins, methacrylate resins, vinyl acetate resins, polyamide resins, epoxy resins (uncured products), hydrocarbon resins, soft vinyl chloride resins, ethylene-vinyl acetate copolymer resins, vinyl chloride-vinyl acetate copolymer resins, vinyl chloride-acrylate copolymer resins, styrene resins, and acrylate-styrene copolymer resins.

[0035] Of the above thermoplastic polymer (B), those having a glass transition temperature of from 0°C or more to 50°C or less, preferably from 10°C to 50°C, more preferably from 20°C to 40°C, and still more preferably from 30°C to 40°C, are effective. In particular, saturated polyester resins, acrylate resins, vinyl chloride-vinyl acetate copolymer resins and styrene resins are preferred.

[0036] Any thermoplastic polymer (B) having glass transition temperature within the above range may be selected, and this enables the hair for toys to have such function that the hairs (filaments) are transformed into arbitrary shapes by heating it at temperature within living temperatures, or the vicinity thereof, or by using a known hairstyle transforming jig or any appropriate stress-providing transforming means, and the shape-transformed condition is retained, and enables infants and so forth to play while changing hairstyles simply and easily.

[0037] Here, the thermoplastic polymer (B) is selected from polymers having chemical structure different from the thermoplastic resin (A), where a state in which the thermoplastic polymer (B) is dispersed in the thermoplastic resin (A) or a state in which the former is dispersed in and compatibilized with the latter mixedly brings out the above function effectively.

[0038] The thermoplastic resin (A) and the thermoplastic polymer (B) may effectively be blended in a proportion of (A):(B) of from 95:5 to 1:99 (mass ratio), preferably from 90:10 to 1:99, and more preferably from 90:10 to 10:90. A system in which the thermoplastic polymer (B) is less than 5% by mass may insufficiently make the filaments operate in virtue of their coming to have a low modulus in flexure when treated to be transformed.

[0039] Here, the thermoplastic resin (A) and the thermoplastic polymer (B) may each be used not alone but

in combination of two or more.

[0040] As the resin capable of undergoing plastic deformation at a temperature of 50°C or less, a shape memory resin may be used which is chiefly composed of polyurethane resin, polyester resin, polyolefin resin, vinyl chloride resin, styrene-butadiene copolymer resin, polynorbornene resin, crystalline diene copolymer resin, fluorine resin, polyisoprene resin or the like.

[0041] The resin capable of undergoing plastic deformation at a temperature of 50°C or less may further include thermoplastic resins such as polyolefin resin, acrylate resin, methacrylate resin, polyester resin, polyamide resin, vinyl acetate resin, ethylene-vinyl acetate copolymer resin, vinyl chloride resin, vinylidene chloride resin and chlorinated polyolefin resin; and thermoplastic elastomers such as polyolefin, styrene, polyester, polyurethane, polyamide and polybutadiene, any of which may be used.

[0042] As the resin that makes up the sheath, the alcohol-soluble resin described previously may be used, and a resin different from the alcohol-soluble resin may further be used in the form of a blend. In the case when such a different resin is used, the alcohol-soluble resin may be contained in the resin in an amount of 1% by mass or more, preferably 5% by mass or more, and more preferably 10% by mass or more. This enables satisfaction of how well the filaments are transformed upon application of water and how well the shape-transformed condition can be fixed by drying.

[0043] Here, where an alcohol-soluble nylon is used as the alcohol-soluble resin, the different resin to be used in combination may preferably be a copolymer polyamide resin. This is because the resin has a good compatibility because of the like polyamide structure and at the same time the resin blended has a high water absorption and a superior flexibility.

[0044] In the composite filaments (fibers) made up as described above, the resin (core) capable of undergoing plastic deformation at a temperature of 50°C or less is covered with the alcohol-soluble resin (sheath). Hence, the composite filaments have such function that the filaments are transformable into arbitrary shapes upon application of water, where, before drying, the shape-transformed condition can be fixed unless any external force is applied, in virtue of the core resin capable of undergoing plastic deformation at a temperature of 50°C or less, and the condition in which the filaments have been transformed into a shape like that of permanent waves is permanently fixed upon drying of the sheath resin.

[0045] Further, the hair for toys is provided in which the hairs (filaments) having retained that shape can be released from their fixed shape upon application of water so as to be transformed into, and fixed to, any desired different shapes, thus having the utility of repeatability.

[0046] Thus, the composite filaments (hairs) made up as described above have the function to maintain over a long period of time the shape brought by their transformation which function is superior to that of hairs made

up of single-phase filaments formed of the resin capable of undergoing plastic deformation at a temperature of 50°C or less, and also have the function to maintain the shape brought immediately after their transformation which function is superior to that of hairs made up of single-phase filaments formed of any resin with which the shape-transformed condition brought upon absorption of water can be retained by drying.

10 EXAMPLES

[0047] The hair for toys of the present invention is described below in greater detail by giving Examples. The present invention is by no means limited by these Examples. Formulation in Examples is shown as part(s) by mass.

Example 1

20 Production of hair for toys:

[0048] 99 parts of terpolymer nylon 6-6,6-610 as an alcohol-soluble resin and 1 part of a brown colorant were mixed, and the mixture obtained was spun at 180°C from spinning dies having 24 ejection orifices, by using a general-purpose melt spinning machine, followed by stretching to obtain brown multi-filaments (hair for toys) made up of 24 filaments of about 80 μm each in diameter.

30 Production of doll:

[0049] The multi-filaments thus obtained were set in a head of a doll, made of a plastic material, by a known means and then this head was combined with a trunk to obtain a doll.

[0050] Water was applied to the hair of the doll by using a sprayer, and this hair was coiled around a cylindrical hair curler of 9 mm in diameter and then dried. Thereafter, the curler was removed, whereupon the hair came to stand curled in the same diameter as the curler, and this shape was retainable over a long period of time like that of permanent waves.

[0051] Next, water was again applied to the hair standing curled, by using a sprayer, and this hair was brushed while extending it in straight lines, whereupon the hair returned to the initial one standing straight.

[0052] Such changes in shape took place upon application of water, and the shape changed was fixable when the hair was dried, thus the hair enjoyed repeatable play performance.

[0053] The doll hair standing dried was also coiled around a cylindrical hair curler of 9 mm in diameter. Thereafter, water was applied thereto by using a sprayer, whereupon the hair came to stand curled in the same diameter as the curler even when the curler was removed in the state the hair was undried. This hair was dried as it was, whereupon it came to have the same hardness as that before the water was applied, and this shape was

retainable over a long period of time like that of permanent waves.

Example 2

Production of hair for toys:

[0054] 10 parts of tetrapolymer nylon 6-6,6-610-12 as an alcohol-soluble resin, 89 parts of copolymer nylon 6-12 as a resin different from the alcohol-soluble resin and 1 part of a brown colorant were mixed, and the mixture obtained was spun at 180°C from spinning dies having 24 ejection orifices, by using a general-purpose melt spinning machine, followed by stretching to obtain brown multi-filaments (hair for toys) made up of 24 filaments of about 80 μm each in diameter.

Production of doll:

[0055] The multi-filaments thus obtained were set in a head of a doll, made of a plastic material, by a known means and then this head was combined with a trunk to obtain a doll.

[0056] Water was applied to the hair of the doll by using a sprayer, and this hair was coiled around a cylindrical hair curler of 9 mm in diameter and then dried. Thereafter, the curler was removed, whereupon the hair came to stand curled in the same diameter as the curler, and this shape was retainable over a long period of time like that of permanent waves.

[0057] Next, water was again applied to the hair standing curled, by using a sprayer, and this hair was brushed while extending it in straight lines, whereupon the hair returned to the initial one standing straight.

[0058] Such changes in shape took place upon application of water, and the shape changed was fixable when the hair was dried, thus the hair enjoyed repeatable play performance.

[0059] The doll hair standing dried was also coiled around a cylindrical hair curler of 9 mm in diameter. Thereafter, water was applied thereto by using a sprayer, whereupon the hair came to stand curled in the same diameter as the curler even when the curler was removed in the state the hair was undried. This hair was dried as it was, whereupon it came to have the same hardness as that before the water was applied, and this shape was retainable over a long period of time like that of permanent waves.

Example 3

Preparation of reversibly thermochromic microcapsule pigment:

[0060] A reversibly thermochromic composition made up of 2 parts of 1,2-benz-6-diethylaminofluorane, 6 parts of 1,1-bis(4-hydroxyphenyl)-n-octane and 50 parts of stearyl caprate was made into microcapsules by epoxy

resin/amine interfacial polymerization to obtain a reversibly thermochromic microcapsule pigment of 10 to 20 μm in average particle diameter.

[0061] The microcapsule pigment obtained was colorless at 34°C or more and came reversibly changed into pink color at 28°C or less.

Production of hair for toys:

[0062] 3 parts of the microcapsule pigment and 97 parts of terpolymer nylon 6-6,6-610 as an alcohol-soluble resin were mixed, followed by melt-mixing at 180°C by means of an extruder to obtain a reversibly thermochromic resin composition.

[0063] The reversibly thermochromic resin composition obtained was colorless at 34°C or more and came reversibly changed into pink color at 28°C or less.

[0064] Then, this resin composition was spun at 180°C from spinning dies having 24 ejection orifices, by using a general-purpose melt spinning machine, followed by stretching to obtain multi-filaments (hair for toys) made up of 24 filaments of about 80 μm each in diameter.

Production of doll:

[0065] The multi-filaments thus obtained were set in a head of a doll, made of a plastic material, by a known means and then this head was combined with a trunk to obtain a doll.

[0066] The hair of the doll took on pink in an environment of a room temperature of 25°C, where water was applied thereto by using a sprayer, and this hair was put between corrugated plates having ridges at intervals of 10 mm and then dried. Thereafter, the plates were removed, whereupon the hair came to stand waved in the same shape as the corrugated plates, and this shape was retainable over a long period of time like that of permanent waves.

[0067] Next, water was again applied to the hair standing waved, by using a sprayer, and this hair was brushed while extending it in straight lines, whereupon the hair returned to the initial one standing straight.

[0068] Such changes in shape took place upon application of water, and the shape changed was fixable when the hair was dried, thus the hair enjoyed repeatable play performance.

Example 4

Production of hair for toys:

[0069] As a core material 100 parts of an alcohol-soluble resin tetrapolymer nylon 6-6,6-610-12 and as a sheath material a mixture of 99 parts of a polyamide elastomer with a shore hardness of 55 and 1 part of a brown colorant were used, and these were spun at 200°C from spinning dies having 18 ejection orifices, by using a composite filament spinning machine and in such a way that

the core/sheath ratio came to be 6/4, to obtain composite filaments (hair for toys) having core/sheath structure, of 70 μm each in diameter.

Production of doll:

[0070] The composite filaments thus obtained were set in a head of a doll, made of a plastic material, by a known means and then this head was combined with a trunk to obtain a doll.

[0071] Water was applied to the hair of the doll by using a sprayer, and this hair was coiled around a cylindrical hair curler of 9 mm in diameter and then dried. Thereafter, the curler was removed, whereupon the hair came to stand curled in the same diameter as the curler, and this shape was retainable over a long period of time like that of permanent waves.

[0072] Next, water was again applied to the hair standing curled, by using a sprayer, and this hair was brushed while extending it in straight lines, whereupon the hair returned to the initial one standing straight.

[0073] Such changes in shape took place upon application of water, and the shape changed was fixable when the hair was dried, thus the hair enjoyed repeatable play performance.

[0074] The doll hair standing dried was also coiled around a cylindrical hair curler of 9 mm in diameter. Thereafter, water was applied thereto by using a sprayer, whereupon the hair came to stand curled in the same diameter as the curler even when the curler was removed in the state the hair was undried. This hair was dried as it was, whereupon it came to have the same hardness as that before the water was applied, and this shape was retainable over a long period of time like that of permanent waves.

Example 5

Production of hair for toys:

[0075] As a core material a mixture of 99 parts of linear low-density polyethylene and 1 part of a brown colorant, as a sheath material a mixture of 10 parts of an alcohol-soluble resin terpolymer nylon 6-6,6-610 and 89 parts of copolymer nylon 6-12 as a resin different from the alcohol-soluble resin were used, and these were spun at 180°C from spinning dies having 18 ejection orifices, by using a composite filament spinning machine and in such a way that the core/sheath ratio came to be 5/5, to obtain composite filaments (hair for toys) having core/sheath structure, of 90 μm each in diameter.

Production of doll:

[0076] The composite filaments thus obtained were set in a head of a doll, made of a plastic material, by a known means and then this head was combined with a trunk to obtain a doll.

[0077] Water was applied to the hair of the doll by using a sprayer, and this hair was coiled around a cylindrical hair curler of 9 mm in diameter and then dried. Thereafter, the curler was removed, whereupon the hair came to stand curled in the same diameter as the curler, and this shape was retainable over a long period of time like that of permanent waves.

[0078] Next, water was again applied to the hair standing curled, by using a sprayer, and this hair was brushed while extending it in straight lines, whereupon the hair returned to the initial one standing straight.

[0079] Such changes in shape took place upon application of water, and the shape changed was fixable when the hair was dried, thus the hair enjoyed repeatable play performance.

[0080] The doll hair standing dried was also coiled around a cylindrical hair curler of 9 mm in diameter. Thereafter, water was applied thereto by using a sprayer, whereupon the hair came to stand curled in the same diameter as the curler even when the curler was removed in the state the hair was undried. This hair was dried as it was, whereupon it came to have the same hardness as that before the water was applied, and this shape was retainable over a long period of time like that of permanent waves.

Example 6

Production of hair for toys:

[0081] 60 parts of copolymer polyamide resin (melting point: 155°C) as a thermoplastic resin (A), as a thermoplastic resin (B) 39 parts of polyester resin having a glass transition temperature of 36°C, and 1 part of a brown colorant were mixed to obtain a resin for making up the core.

[0082] Meanwhile, 100 parts of an alcohol-soluble resin (terpolymer nylon 6-6,6-610) was obtained as a resin for making up the sheath.

[0083] The resin for making up the core and the resin for making up the sheath were fed to a core-forming extruder and a sheath-forming extruder, respectively, and these were spun at 190°C from spinning dies having 20 ejection orifices, by using a composite filament spinning machine and in such a way that the core/sheath ratio came to be 5/5 (volume ratio), to obtain brown hair for toys (composite filaments) made up of 20 filaments of 90 μm each in diameter.

Production of doll:

[0084] The hair for toys thus obtained was set in a head of a doll, made of a plastic material, by a known means and then this head was joined with a trunk to obtain a doll.

[0085] This hair of the doll had rigidity, and was unable to be curled by merely coiling it around a hair curler. Water was applied to this hair by using a sprayer, whereupon the hair came to have flexibility to come plastically de-

formable.

[0086] Further, this hair was heated to 36°C or more by hand touching, whereupon the hair came more flexible. In this state, the hair was coiled around a cylindrical hair curler of 9 mm in diameter and then dried. Thereafter, the curler was removed, whereupon the hair came to stand curled in the same diameter as the curler, and this shape was retainable over a long period of time like that of permanent waves.

[0087] Next, water was again applied to the hair standing curled, by using a sprayer, and this hair was brushed while extending it in straight lines, whereupon the hair returned to the initial one standing straight. Here, the hair was heated to 36°C or more by hand touching, whereupon the hair was readily able to return to the one standing straight.

[0088] Incidentally, where the water is applied to the hair, then the hair is coiled around the curler and thereafter the curler is removed before the hair is dried, the hair comes to stand curled in the same diameter as the curler unless any external force is applied, and the condition where it stands curled upon drying is retainable over a long period of time. Thus, the hair can satisfy such play performance that it is curled without relying on drying.

[0089] Further, where the water is applied to the hair, then the hair is coiled around the curler and thereafter the curler is removed before the hair is dried, the hair standing thus curled may be brushed in that state while extending it in straight lines, whereupon the hair can be made to return to the initial one standing straight.

[0090] Such changes in shape took place upon application of water, and the shape changed was fixable when the hair was dried, thus the hair enjoyed repeatable play performance.

[0091] The doll hair may also, after water has been applied thereto, be coiled around a hair curler to curl the hair. Besides, the hair standing dried may be coiled around a hair curler and thereafter water may be applied to curl the hair.

Example 7

Production of hair for toys:

[0092] 70 parts of a polyamide elastomer (melting point: 160°C) as a thermoplastic resin (A), as a thermoplastic resin (B) 29 parts of a 3:1 mixture of a polyester resin having a glass transition temperature of 40°C and a polyester resin having the same of -20°C (T_g after mixing: 25°C), and 1 part of a black colorant were mixed to obtain a resin for making up the core.

[0093] Meanwhile, 10 parts of an alcohol-soluble resin (terpolymer nylon 6-6,6-610) and 90 parts of a resin (copolymer nylon 6-12) different from the alcohol-soluble resin were mixed to obtain a resin for making up the sheath.

[0094] The resin for making up the core and the resin

for making up the sheath were fed to a core-forming extruder and a sheath-forming extruder, respectively, and these were spun at 190°C from spinning dies having 20 ejection orifices, by using a composite filament spinning machine and in such a way that the core/sheath ratio came to be 8/2 (volume ratio), to obtain black hair for toys (composite filaments) made up of 20 filaments of 90 μm each in diameter.

10 Production of doll:

[0095] The hair for toys thus obtained was set in a head of a doll, made of a plastic material, by a known means and then this head was joined with a trunk to obtain a doll.

15 **[0096]** This hair of the doll had rigidity, and was unable to be curled by merely coiling it around a hair curler. Water was applied to this hair by using a sprayer, whereupon the hair came to have flexibility to come plastically deformable.

20 **[0097]** Further, this hair was heated to 25°C or more by hand touching, whereupon the hair came more flexible. In this state, the hair was coiled around a cylindrical hair curler of 9 mm in diameter and then dried. Thereafter, the curler was removed, whereupon the hair came to stand curled in the same diameter as the curler, and this shape was retainable over a long period of time like that of permanent waves.

25 **[0098]** Next, water was again applied to the hair standing curled, by using a sprayer, and this hair was brushed while extending it in straight lines, whereupon the hair returned to the initial one standing straight. Here, the hair was heated to 25°C or more by hand touching, whereupon the hair was readily able to return to the one standing straight.

30 **[0099]** Incidentally, where the water is applied to the hair, then the hair is coiled around the curler and thereafter the curler is removed before the hair is dried, the hair comes to stand curled in the same diameter as the curler unless any external force is applied, and the condition where it stands curled upon drying is retainable over a long period of time. Thus, the hair can satisfy such play performance that it is curled without relying on drying.

35 **[0100]** Further, where the water is applied to the hair, then the hair is coiled around the curler and thereafter the curler is removed before the hair is dried, the hair standing thus curled may be brushed in that state while extending it in straight lines, whereupon the hair can be made to return to the initial one standing straight.

40 **[0101]** Such changes in shape took place upon application of water, and the shape changed was fixable when the hair was dried, thus the hair enjoyed repeatable play performance.

45 **[0102]** The doll hair may also, after water has been applied thereto, be coiled around a hair curler to curl the hair. Besides, the hair standing dried may be coiled around a hair curler and thereafter water may be applied to curl the hair.

Example 8

Preparation of reversibly thermochromic microcapsule pigment:

[0103] A reversibly thermochromic composition made up of 2 parts of 1,2-benz-6-diethylaminofluorane, 6 parts of 1,1-bis(4-hydroxyphenyl)-n-octane and 50 parts of stearyl caprate was made into microcapsules by epoxy resin/amine interfacial polymerization to obtain a reversibly thermochromic microcapsule pigment of 10 to 20 μm in average particle diameter.

[0104] The microcapsule pigment obtained was colorless at 34°C or more and came reversibly changed into pink color at 28°C or less.

Production of hair for toys:

[0105] 3 parts of the microcapsule pigment, 60 parts of a copolymer polyamide resin (melting point: 155°C) as a thermoplastic resin (A) and as a thermoplastic resin (B) 37 parts of a polyester resin having a glass transition temperature of 36°C were mixed to obtain a resin for making up the core.

[0106] Meanwhile, 100 parts of an alcohol-soluble resin (terpolymer nylon 6-6,6-610) was obtained as a resin for making up the sheath.

[0107] The resin for making up the core and the resin for making up the sheath were fed to a core-forming extruder and a sheath-forming extruder, respectively, and these were spun at 190°C from spinning dies having 20 ejection orifices, by using a composite filament spinning machine and in such a way that the core/sheath ratio came to be 5/5 (volume ratio), to obtain hair for toys (composite filaments) made up of 20 filaments of 90 μm each in diameter.

[0108] The filaments were colorless at 34°C or more and came reversibly changed into pink color at 28°C or less.

Production of doll:

[0109] The hair for toys thus obtained was set in a head of a doll, made of a plastic material, by a known means and then this head was joined with a trunk to obtain a doll.

[0110] This hair of the doll took on pink in an environment of a room temperature of 25°C and had rigidity, and this was unable to be curled by merely coiling it around a hair curler. Water was applied to this hair by using a sprayer, whereupon the hair came to have flexibility to come plastically deformable.

[0111] Further, this hair was heated to 36°C or more by hand touching, whereupon the hair came more flexible and at the same time turned colorless. In this state, the hair was put between corrugated plates having ridges at intervals of 10 mm and then dried. Thereafter, the plates were removed, whereupon the hair came to stand waved in the same shape as the corrugated plates, and this

shape was retainable over a long period of time like that of permanent waves.

[0112] Next, water was again applied to the hair standing waved, by using a sprayer, and this hair was brushed while extending it in straight lines, whereupon the hair returned to the initial one standing straight. Here, the hair was heated to 36°C or more by hand touching, whereupon the hair turned colorless and at the same time was readily able to return to the one standing straight.

[0113] Incidentally, where the water is applied to the hair, then the hair is put between corrugated plates and thereafter the corrugated plates are removed before the hair is dried, the hair comes to stand waved in the same shape as the corrugated plates unless any external force is applied, and the condition where it stands waved upon drying is retainable over a long period of time. Thus, the hair can satisfy such play performance that it is waved without relying on drying.

[0114] Further, where the water is applied to the hair, then the hair is put between corrugated plates and thereafter the corrugated plates are removed before the hair is dried, the hair standing thus waved may be brushed in that state while extending it in straight lines, whereupon the hair can be made to return to the initial one standing straight.

[0115] Such changes in shape took place upon application of water, and the shape changed was fixable when the hair was dried, thus the hair enjoyed repeatable play performance.

[0116] The doll hair may also, after water has been applied thereto, be put between the corrugated plates to wave the hair. Besides, the hair standing dried may be put between the corrugated plates and thereafter water may be applied to wave the hair.

Example 9

Production of hair for toys:

[0117] 60 parts of 35 mol% isophthalic acid modified polybutylene terephthalate (melting point: 168°C) as a thermoplastic resin (A), as a thermoplastic resin (B) 39 parts of an acrylic resin having a glass transition temperature of 35°C and 1 part of a blonde colorant were mixed to obtain a resin for making up the core.

[0118] Meanwhile, 25 parts of an alcohol-soluble resin (tetrapolymer nylon 6-6,6-610-12) and 75 parts of copolymer nylon 6-12 as a resin different from the alcohol-soluble resin were mixed to obtain a resin for making up the sheath.

[0119] The resin for making up the core and the resin for making up the sheath were fed to a core-forming extruder and a sheath-forming extruder, respectively, and these were spun at 190°C from spinning dies having 20 ejection orifices, by using a composite filament spinning machine and in such a way that the core/sheath ratio came to be 8/2 (volume ratio), to obtain blonde hair for toys (composite filaments) made up of 20 filaments of 90

μm each in diameter.

Production of doll:

[0120] The hair for toys thus obtained was set in a head of a doll, made of a plastic material, by a known means and then this head was joined with a trunk to obtain a doll.

[0121] This hair of the doll had rigidity, and was unable to be curled by merely coiling it around a hair curler. Water was applied to this hair by using a sprayer, whereupon the hair came to have flexibility to come plastically deformable.

[0122] Further, this hair was heated to 35°C or more by hand touching, whereupon the hair came more flexible. In this state, the hair was coiled around a cylindrical hair curler of 9 mm in diameter and then dried. Thereafter, the curler was removed, whereupon the hair came to stand curled in the same diameter as the curler, and this shape was retainable over a long period of time like that of permanent waves.

[0123] Next, water was again applied to the hair standing curled, by using a sprayer, and this hair was brushed while extending it in straight lines, whereupon the hair returned to the initial one standing straight. Here, the hair was heated to 35°C or more by hand touching, whereupon the hair was readily able to return to the one standing straight.

[0124] Incidentally, where the water is applied to the hair, then the hair is coiled around the curler and thereafter the curler is removed before the hair is dried, the hair comes to stand curled in the same diameter as the curler unless any external force is applied, and the condition where it stands curled upon drying is retainable over a long period of time. Thus, the hair can satisfy such play performance that it is curled without relying on drying.

[0125] Further, where the water is applied to the hair, then the hair is coiled around the curler and thereafter the curler is removed before the hair is dried, the hair standing thus curled may be brushed in that state while extending it in straight lines, whereupon the hair can be made to return to the initial one standing straight.

[0126] Such changes in shape took place upon application of water, and the shape changed was fixable when the hair was dried, thus the hair enjoyed repeatable play performance.

[0127] The doll hair may also, after water has been applied thereto, be coiled around a hair curler to curl the hair. Besides, the hair standing dried may be coiled around a hair curler and thereafter water may be applied to curl the hair.

Example 10

Production of hair for toys:

[0128] 100 parts of a polyurethane type shape memory resin having a glass transition temperature of 10°C was

obtained as a resin for making up the core.

[0129] Meanwhile, 100 parts of an alcohol-soluble resin (tetrapolymer nylon 6-6,6-610-12) and a brown colorant were mixed to obtain a resin for making up the sheath.

[0130] The resin for making up the core and the resin for making up the sheath were fed to a core-forming extruder and a sheath-forming extruder, respectively, and these were spun at 200°C from spinning dies having 20 ejection orifices, by using a composite filament spinning machine and in such a way that the core/sheath ratio came to be 5/5 (volume ratio), to obtain brown hair for toys (composite filaments) made up of 20 filaments of 90 μm each in diameter.

15 Production of doll:

[0131] The hair for toys thus obtained was set in a head of a doll, made of a plastic material, by a known means and then this head was joined with a trunk to obtain a doll.

[0132] This hair of the doll had rigidity, and was unable to be curled by merely coiling it around a hair curler. Water was applied to this hair by using a sprayer, whereupon the hair came to have flexibility to come plastically deformable.

[0133] In this state, the hair was coiled around a cylindrical hair curler of 9 mm in diameter and then dried. Thereafter, the curler was removed, whereupon the hair came to stand curled in the same diameter as the curler, and this shape was retainable over a long period of time like that of permanent waves.

[0134] Next, water was again applied to the hair standing curled, by using a sprayer, and this hair was brushed while extending it in straight lines, whereupon the hair returned to the initial one standing straight.

[0135] Incidentally, where the water is applied to the hair, then the hair is coiled around the curler and thereafter the curler is removed before the hair is dried, the hair comes to stand curled in the same diameter as the curler unless any external force is applied, and the condition where it stands curled upon drying is retainable over a long period of time. Thus, the hair can satisfy such play performance that it is curled without relying on drying.

[0136] Further, where the water is applied to the hair, then the hair is coiled around the curler and thereafter the curler is removed before the hair is dried, the hair standing thus curled may be brushed in that state while extending it in straight lines, whereupon the hair can be made to return to the initial one standing straight.

[0137] Such changes in shape took place upon application of water, and the shape changed was fixable when the hair was dried, thus the hair enjoyed repeatable play performance.

[0138] The doll hair may also, after water has been applied thereto, be coiled around a hair curler to curl the hair. Besides, the hair standing dried may be coiled around a hair curler and thereafter water may be applied to curl the hair.

Claims

1. Hair for toys which comprises hair constituted of filaments made of a resin;
the resin comprising an alcohol-soluble resin. 5
2. The hair for toys according to claim 1, wherein the alcohol-soluble resin is contained in the resin in an amount of 10% by mass or more. 10
3. Hair for toys which comprises hair constituted of filaments made of a composite resin made up of a core and a sheath;
at least one of the resin of the core and that of the sheath comprising an alcohol-soluble resin. 15
4. The hair for toys according to claim 3, wherein the resin of the core is a resin capable of undergoing plastic deformation at a temperature of 50°C or less and the resin of the sheath is an alcohol-soluble resin 20
5. The hair for toys according to claim 4, wherein the resin of the core is a resin in which a thermoplastic resin (A) and a thermoplastic polymer (B) having glass transition temperature within the range of from 0°C to 50°C have been melted in an integral form in a proportion of (A):(B) of from 95:5 to 1:99 25
6. The hair for toys according to claim 4, wherein the resin of the core is a shape memory resin. 30
7. The hair for toys according to any one of claims 4 to 6, wherein the alcohol-soluble resin is contained in the resin of the sheath in an amount of 1% by mass or more. 35
8. The hair for toys according to any one of claims 1 to 7, wherein the alcohol-soluble resin is an alcohol-soluble nylon. 40
9. The hair for toys according to claim 8, wherein the alcohol-soluble nylon is a copolymer nylon containing at least nylon 6,6.
10. The hair for toys according to claim 9, wherein the alcohol-soluble nylon is any of a multi-copolymer nylon containing at least nylon 6 and nylon 6,6, a multi-copolymer nylon containing at least nylon 6, nylon 6,6 and nylon 610 and a multi-copolymer nylon containing at least nylon 6, nylon 6,6, nylon 610 and nylon 12. 45
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REFERENCES CITED IN THE DESCRIPTION

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