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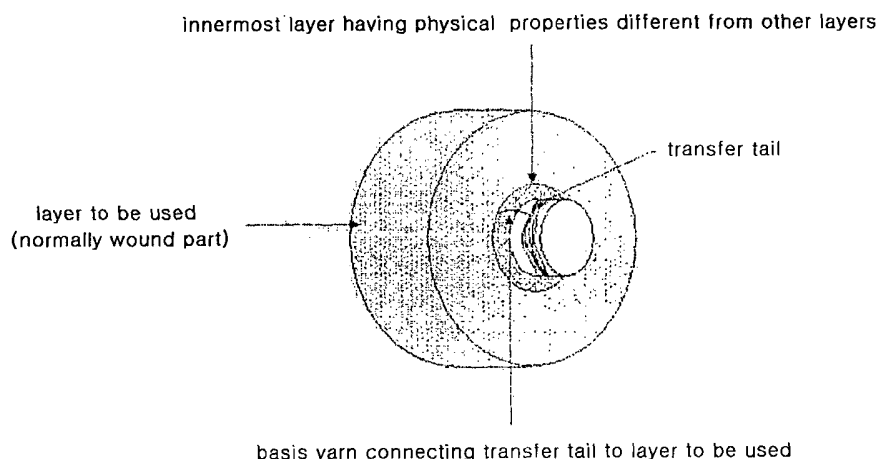
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(54) Title: ELASTOMERIC FIBER PACKAGE IN WHICH PHYSICAL PROPERTIES ARE MINIMALLY DIFFERENTIATED
AMONG LAYERS AND BETWEEN TRANSFER TAIL AND SPOOL AND METHOD FOR PREPARING THE SAME



(57) Abstract: Disclosed is an elastomeric fiber package which has a transfer tail between an innermost layer and a normally wound part of the package and which is produced through a direct or one-step winding process and a method of producing the same. In the elastomeric fiber package, an interlayer difference in physical properties of external, middle, and internal layers of the package is minimized in a post-process, interlayer variation in unwinding tensions is small, and it is possible to conduct continuous unwinding through connection of the transfer tail, thereby assuring consistent quality and improved productivity of post-process goods.

**ELASTOMERIC FIBER PACKAGE IN WHICH PHYSICAL
PROPERTIES ARE MINIMALLY DIFFERENTIATED AMONG
LAYERS AND BETWEEN TRANSFER TAIL AND SPOOL AND
METHOD FOR PREPARING THE SAME**

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Technical Field

The present invention relates, in general, to an elastomeric fiber package and a method of producing the same and, more particularly, to an elastomeric fiber package and a method of producing the same, in which a transfer tail is interposed between an innermost layer and a normally wound part of the package, thus a difference in physical properties of external, middle, and internal layers of the package is minimized, unwinding in a post-process is excellent, physical properties of post-process products are consistent, and productivity of the post-process products is improved.

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Background Art

Having excellent elasticity and resilience, elastomeric fiber is used as material for many products requiring elasticity, for example, material for industry, medicine, or clothes. Particularly, elastomeric fiber having large fineness of 100 denier or more is used for various applications, such as raschel, sateen, power nets, narrow fabrics, stocking bands, or diapers.

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Typically, elastomeric fiber is provided in the form of package, and is used after it is unwound from the package. To maintain predetermined unwinding tension when it is unwound, physical properties of external, middle, and
5 internal layers of the package must be uniform and unwindings of the layers must be similar to each other. These properties are earnestly required in an OETO (over-end-take-off) or OETF (over the end take-off feeder) process, which have recently been employed in post-process
10 companies to improve productivity rather than in a RTO (rolling-take-off) process which is a typical process for unwinding the elastomeric fiber.

Conventionally, an auto-exchange process has been used to improve productivity during the winding of the
15 elastomeric fiber. However, there has been no method effective in preventing a difference in physical properties between the innermost layer and other layers of the package, thus the innermost layer having significantly different physical properties was usually not used even
20 though a small loss occurred. The disuse of the innermost layer of the package in the post-process is permissible in the unwinding step of the RTO process in which post-process machines are frequently stopped while the package is replaced. However, in the OETO process in which, after the
25 innermost layer of the package is used, an outermost layer of a previously prepared adjacent package is used employing a transfer tail connected to the packages without stopping the post-process machines, the innermost layer, having

relatively significantly different physical properties, and the transfer tail are inevitably used, thus the physical properties of the post-process products which employ the elastomeric fiber having nonuniform physical properties are
5 unavoidably inconsistent.

FIG. 1 illustrates the production of an elastomeric fiber package employing a conventional auto-exchange process. Referring to FIG. 1, when the elastomeric fiber is wound through the conventional process, the winding is
10 conducted so that a package which is fully wound to a predetermined winding amount is formed around a paper tube 2 fitted around one spindle 1 which is negatively rolled while it is in contact with a winder head or an upper friction roller (FIG. 1A). The spindle 1 is automatically
15 shifted to a lower part of the winder, and another spindle around which an empty paper tube is fitted at the lower part of the winder is shifted to an upper part of the winder (FIGS. 1B and 1C). After the positions of two spindles are exchanged with each other, a plate-type fiber
20 cutting device 4 which is provided at a side of the winder is moved between two spindles to cut the elastomeric fiber (FIG. 1D). Thereafter, the elastomeric fiber which is supplied to the upper part of the winder is automatically wound around the empty paper tube which is newly situated
25 at the upper part of the winder (FIG. 1D). The auto-exchange process has an advantage in that it is possible to continuously replace the packages without stopping a spinning assembly, such as the winder. However, in this

process, in order to successfully cut the yarn, higher yarn tension is needed during the fiber cutting in comparison with the normal winding of elastomeric fiber. When the yarn tension is increased, the difference in rotation rates of the spindle around which the full winding is fitted and the spindle around which the empty paper tube is fitted increases during the auto-exchange process, thus a middle bunch which is formed on the outermost layer of the package fully wound (the middle bunch is removed in the course of sorting the package fully wound, and then given to the post-process companies), and the innermost layer of the elastomeric fiber package, which is wound around the empty paper tube in the early step, have higher winding shrinkage and modulus in comparison with the remaining layers of the package, which are normally wound. Hence, the auto-exchange process has a fatal disadvantage in that an interlayer difference occurs in physical properties. Therefore, there is a need to develop a technology of minimizing a difference in physical properties of the innermost layer and the other layers of the elastomeric fiber package in order to conduct the unwinding using the OETO process.

Furthermore, when the elastomeric fiber package is unwound using the RTO process, a transfer tail capable of connecting the packages to each other is unnecessary. However, in the OETO process, it is necessary to provide the transfer tail to the package so as to conduct spool-to-spool transfer without stopping machines. To produce the conventional transfer tail, a portion for collecting

elastomeric fibers, which is provided at an upper part of a fiber cutting device of a winder, is slightly modified. After the cutting device is provided between two spindles, the collected elastomeric fibers are shifted toward a front side of the winder to an end of an empty paper tube or a slit groove. However, in the conventional OETO process, the transfer tail must be formed in the winder during an auto-exchange process, thus, as described above, the innermost layer of the package has higher modulus and winding shrinkage in comparison with the normally wound part, resulting in an interlayer difference in physical properties. Accordingly, any difference in physical properties of the transfer tail and the other layers must be avoided in order to effectively use the OETO process.

In the current fiber industry, a method of producing a package using a rewinding technology is generally employed with respect to elastomeric fiber and hard fiber. In the rewinding technology, the package produced through a direct or as-spun process is additionally rewound using a separate rewinder. Through the rewinding, an internal layer and an external layer of a conventional wound product are exchanged with each other, and the winding is conducted at a lower constant winding tension and a lower rate in comparison with direct winding, so that the rewound package has uniform unwinding tension of the internal, middle, and external layers, and good unwinding in a post-process. As well, since the rewinder mostly produces goods through a manually doffing process, a transfer tail may be easily

formed by a user's hand in the early stage of the rewinding, thus it is possible to form the transfer tail which does not have different physical properties from a normally wound part. However, the rewinding process is
5 disadvantageous in that the production cost is much higher due to an enormous additional cost incurred by the purchase and operation of a separate rewinder in comparison with the package produced using the direct process, thus, undesirably, it does not meet the recent trend toward power
10 saving and improvement in cost competitiveness.

Summary of Invention

Accordingly, the present invention has been made keeping in mind the above problems occurring in the prior art, and an object of the present invention is to provide
15 an elastomeric fiber package in which an interlayer difference in physical properties of external, middle, and internal layers of the package is minimized, interlayer variation in unwinding tension is small, and consistent quality and improved productivity of post-process goods are
20 assured.

Another object of the present invention is to provide a method of producing an elastomeric fiber package, in which a difference in physical properties of external, middle, and internal layers of the package and a difference
25 in physical properties of a transfer tail and the internal layer of the package are minimized through a one-step winding process so as to make the physical properties of

post-process goods consistent, and in which unwinding in an OETO process is the same as that of an elastomeric fiber rewinding product created through a conventional two-step process. Thereby, it significantly contributes to improved processability and reduced cost.

According to an aspect of the present invention provided in order to accomplish the above objects, the present invention provides an elastomeric fiber package which is produced through a direct or one-step winding process. The elastomeric fiber package comprises an innermost layer; a transfer tail connected to the innermost layer at an end thereof; and a normally wound part which is connected to the other end of the transfer tail and has desired physical properties.

According to another aspect of the present invention provided in order to accomplish the above objects, the present invention provides a method of producing an elastomeric fiber package. The method comprises a first step of automatically exchanging a position of a bobbin holder which has a full winding wound in a normal winding amount with a position of a bobbin holder which has an empty paper tube; a second step of winding an elastomeric fiber around the empty paper tube for a short time in an early stage after the automatic exchanging of the positions; a third step of forming a transfer tail by winding the elastomeric fiber; and a fourth step of again winding the elastomeric fiber around the package having the transfer tail formed thereon at a normal winding rate.

Detailed Description of Invention

Hereinafter, a detailed description will be given of the present invention, referring to the drawings.

Illustrative, but non-limiting examples of elastomeric fiber available to the present invention include polyether-based elastomeric fiber, polyester-based elastomeric fiber, and polyamide-based elastomeric fiber. For convenience of understanding, the description will be given in conjunction with a polyether-based urethane urea elastomeric fiber.

As known in the art to which the present invention belongs, organic diisocyanate and polymer diol react with each other to produce a polyurethane precursor, and it is dissolved in an organic solvent and then reacts with diamine and monoamine, thereby producing a segmented polyurethane urea polymer which is capable of being used to produce the elastomeric fiber of the present invention.

Organic diisocyanate used in the present invention is exemplified by diphenylmethane-4,4'-diisocyanate, hexamethylene diisocyanate, toluene diisocyanate, butylene diisocyanate, and hydrogenated P,P-methylene diisocyanate. Examples of polymer diol may include polytetramethylene ether glycol, polypropylene glycol, and polycarbonate diol. Diamine is used as an extending agent of a chain, and is exemplified by ethylene diamine, propylene diamine, and hydrazine. Furthermore, monoamine is used as a terminating agent of the chain, and is exemplified by diethyl amine,

monoethanol amine, and dimethyl amine.

In addition to the components described above, an additive may additionally be used in a polymer so as to improve its physical properties, and is exemplified by a UV
5 stabilizing agent, an antioxidant, a NOx gas yellowing prevention agent, an adhesion prevention agent (for example, magnesium stearate), a dye promoting agent, and a chlorine-resistant agent.

In the present invention, the polymer to which the
10 components as described above are added is aged and defoamed for a predetermined time, and spun using a spinning block and a spinneret which are operated at predetermined pressure into a spin tub. An organic solvent is vaporized using air or nitrogen at a high temperature of
15 about 250°C, and the dried elastomeric fiber is discharged from the high temperature spin tub and then wound around a paper tube of a winding device so as to have predetermined stretchability and relaxation using drawing/winding devices which are provided under the spin tub.

20 In the present invention, in the course of winding the elastomeric fiber, it is possible to modify a partition board operation method in such a way that a partition board for forming a transfer tail is additionally attached to a winder so as to nicely form a transfer tail. As well, it is
25 possible to modify a winder operation program in such a way that, after the rate of the winder reaches a normal rate (about 10 sec or so), a winder head (that is to say, a friction roller) is separated from a winding spindle while

the partition board is operated, and descends after the transfer tail is formed, so that the friction roller again comes into close contact with the winding spindle.

FIG. 2 illustrates the production of an elastomeric fiber package according to the present invention. With reference to FIG. 2, first, an auto-exchange process is conducted through a conventional procedure in which the positions of bobbin holders each having a full winding wound in a normal amount and an empty paper tube are automatically exchanged using a conventional process (FIG. 2A). Subsequently, the elastomeric fiber is wound around the empty paper tube for a very short time (about 10 sec or so) (FIG. 2B). During the auto-exchange process, the bobbin holder having the full winding and the empty paper tube is operated at a rate that is about 5 - 30 % faster than a normal winding rate so as to easily cut the elastomeric fiber, and rates of the bobbin holders are typically set different from each other so as to increase stretchability of the elastomeric fiber by about 10 - 30 % in comparison with normal winding. Therefore, in order to reduce the rates of the bobbin holders each having the empty paper tube which starts to conduct the winding after the auto-exchange process to the normal rotation (winding) rate, a time of about 10 sec or so is necessary. At this stage, the elastomeric fiber wound around the empty bobbin has higher modulus and winding shrinkage and lower elongation in comparison with other parts normally wound, thus final goods having inconsistent physical properties are

inevitably produced when the OETO process is continuously adopted. To avoid the above problems, in the present invention, the winding is conducted through a conventional procedure for a very short time (about 10 sec or so) in the
5 early step after the auto-exchange to form an innermost layer. If the rates of the bobbin holders reach a normal winding rate (FIG. 2B), the winder head 5 is separated from the winding bobbin holder and is raised, and the partition board 7 for forming the transfer tail, which is
10 additionally provided at a side of the winder, is moved between the winder head 5 and the winding package (or the bobbin holder) so as to weakly hold the elastomeric fiber in grooves formed on an upper end thereof. Subsequently, the partition board 7 is frontwardly moved to a front end
15 or a slit of the paper tube where the elastomeric fiber is wound around the front end for a while (about 1 sec or so) to form the transfer tail (FIG. 2C). Next, the winder head 5 descends to bring again the friction roller 6 into close contact with the bobbin holder around which the package is
20 wound, and the elastomeric fiber is wound again around the package on which the transfer tail is formed at a predetermined winding rate while a traverse guide (not shown) at the winder head moves the elastomeric fiber according to a predetermined twill angle pattern, thereby
25 forming a normally wound part (FIG. 2D). If the predetermined amount of the full winding is formed through the above procedure, the auto-exchange process is conducted through the conventional procedure, thereby achieving

continuous operation without stopping machines.

Before delivery of goods, a base yarn between the transfer tail and the innermost layer of the elastomeric fiber wound during the first 10 sec is cut in the course of
5 sorting the packages, thus separating the normally wound part formed after the transfer tail from the wound part formed within the first 10 sec, thereby connecting the transfer tails in a post-process step to continuously employ the elastomeric fiber packages in the OETO process.
10 Therefore, it is possible to continuously produce consistent post-process goods because unwinding tension is uniform among external, middle, and internal layers. The elastomeric fiber which is in contact with the paper tube and wound during the first 10 sec is transferred to an
15 adjacent package and spontaneously removed in conjunction with the paper tube during replacement using a novel grey yarn package.

Referring to FIG. 3, the elastomeric fiber package of the present invention comprises an innermost layer having
20 physical properties different from other layers, which is in contact with a paper tube and which is wound during the first 10 sec, a transfer tail which is wound to have normal stretchability at a normal rate (FIG. 2D) and which is not different in physical properties from the layers other than
25 the innermost layer, and a normally wound part (internal, middle, and external layers). In detail, the elastomeric fiber package of the present invention comprises the innermost layer of about 10 - 200 g, which is different in

physical properties from the other layers, the transfer tail which is connected to the innermost layer at an end thereof, and the normally wound part which is connected to the other end of the transfer tail and has desired physical properties, and may further comprise a middle bunch which is formed on an outermost layer of the fully wound package and has physical properties different from the normally wound part. Since the middle bunch is unwound in the course of sorting goods, this portion which is different in physical properties from the normally wound part is not used by post-process companies. Since basis yarn connecting the transfer tail to the innermost layer is cut during the sorting process, the normally wound part and the transfer tail connected thereto are used, but the innermost layer having physical properties different from the normally wound part is not used by the post-process companies.

Even though the elastomeric fiber produced according to the present invention has a disused portion corresponding to the innermost layer, the weight of the normally wound part is increased by the weight of the disused portion so that the post-process companies do not suffer from disadvantages. Since the cost of the elastomeric fiber corresponding to the disused innermost layer is still lower than a rewinding cost and than a cost with respect to wastes generated in the course of forming the innermost layer which is not different in physical properties from the other layers through a manually doffing process, the elastomeric fiber of the present invention may

be sufficiently profitable goods for companies which produce the elastomeric fiber. Meanwhile, in the post-process companies, when goods of the present invention are used through an OETO process, the transfer tails are used
5 through a typical process while they are connected, and, after they are transferred to the adjacent packages, fibers remaining on the paper tube are removed in conjunction with the paper tube.

Generally, an emulsion is provided so as to prevent
10 the elastomeric fibers from being attached to each other in the package and to nicely unwind the elastomeric fibers from the elastomeric fiber package. The emulsion available to the present invention may be exemplified by a silicone-based (polydimethyl siloxane) emulsion or a nonsilicone-based
15 (hydrocarbon) emulsion. The elastomeric fiber to which the nonsilicone-based emulsion is applied can be used for some cases, such as diapers, in which silicone components must not be contained due to their characteristics.

20

Brief Description of Drawings

FIG. 1 illustrates the production of elastomeric fiber employing a conventional auto-exchange process;

FIG. 2 illustrates the production of an elastomeric fiber package according to the present invention; and

25 FIG. 3 schematically illustrates the elastomeric fiber package according to the present invention.

*Description of reference numerals for main parts of

Drawings*

- 1: cylinder
2: paper tube
3: elastomeric fiber package
4: fiber cutting device
5: winder head
6: friction roller
7: partition board for forming a transfer tail

Preferable Examples for Invention

The constitution and effect of the present invention may be described in detail through the following examples and comparative examples which are set forth to illustrate, but are not to be construed as the limit of the present invention.

EXAMPLE 1

518 g of diphenylmethane-4,4'-diisocyanate and 2328 g of polytetramethylene ether glycol (molecular weight 1800) were reacted with each other at 85°C for 90 min while being agitated in a nitrogen atmosphere to produce a polyurethane precursor containing isocyanate at both ends thereof. The polyurethane precursor was cooled to room temperature, and 4846 g of dimethylacetamide was added and dissolved therein to produce a polyurethane precursor solution. Subsequently, a solution in which 36.9 g of ethylenediamine, 11.4 g of propylenediamine, and 5.9 g of diethylamine were dissolved in 720g of dimethylacetamide was added to the polyurethane precursor solution at 10°C or lower to produce a segmented

polyurethane polymer solution.

Additives including poly(N,N-diethyl-2-aminoethyl methacrylate) as a dye promoting agent, a dulling agent, magnesium stearate as an adhesion prevention agent, an
5 antioxidant, and a heat-resistant stabilizing agent were added to the polymer. The resulting polymer was aged and defoamed for a predetermined time, subjected to a dry spinning process to vaporize dimethylacetamide at a spinning temperature of 250°C, and stretched at a
10 predetermined draw ratio to produce a polyurethane urea elastomeric fiber cheese of 720 d in a winding amount of 3 kg.

When the set amount of 3 kg was achieved, a bobbin holder around which a full winding and an empty paper tube
15 were fitted was operated at a rate that was about 5 - 30 % faster than a normal winding rate so as to easily cut the elastomeric fiber. Typically, rates of the bobbin holders were set different from each other so as to increase the stretchability of the elastomeric fiber by about 10 - 30 %
20 in comparison with normal winding, and the bobbin holder around which the full winding was fitted descended to a lower part of a winder and the bobbin holder around which the empty bobbin was fitted was raised to an upper part, so that they were exchanged in position with each other.
25 Thereafter, a partition board for cutting the elastomeric fiber was provided between the two bobbin holders to cut the elastomeric fiber. Subsequently, the elastomeric fiber was wound around the empty paper tube for the early step

(about 10 sec or so) after the auto-exchange through a typical process, and a winder head was separated from the winding bobbin holder when the rate of the bobbin holder reached a normal winding rate, and was raised. The
5 partition board for forming a transfer tail, which was additionally provided at the side of the winder, was moved between the winder head and the winding package (or the bobbin holder) so as to weakly hold the elastomeric fiber in grooves formed on an upper end thereof. Subsequently,
10 the partition board was frontwardly moved to a front end or a slit of the paper tube where the elastomeric fiber was wound around the front end for a while (about 1 sec or so) to form the transfer tail. Next, the winder head was lowered to again bring the friction roller into close
15 contact with the bobbin holder around which the package was wound, and the elastomeric fiber was again wound around the package on which the transfer tail was formed at a normal winding rate while a traverse guide at the winder head moved the elastomeric fiber according to a predetermined
20 twill angle pattern. Unwinding tension and uniformity were evaluated using the resulting elastomeric fiber package, and the resulting elastomeric fiber package was loaded on a unwinding device for OETO to evaluate its usefulness in a process of producing a diaper. The results are described in
25 the following Table 1.

EXAMPLE 2

An elastomeric fiber package of 720 d was produced through the same procedure as example 1 except that a silicone-based emulsion was supplied using a Kissing roller so that a FOY (finish on yarn) level was about 0.8 %.
5 Physical properties of the resulting product were evaluated through the same method as in example 1, and the results are described in the following Table 1.

COMPARATIVE EXAMPLE 1

10

An elastomeric fiber package was produced through the same polymerization and spinning procedures as example 1 except that winding was conducted using a conventional auto-exchange process instead of using the winding process
15 of the present invention. The package of 720 d was rewound using a typical rewinder to prepare a product. The physical properties of the product were evaluated through the same method as in example 1, and the results are described in the following Table 1.

20

COMPARATIVE EXAMPLE 2

An elastomeric fiber package was produced through the same polymerization and spinning procedures as example 1
25 except that a silicone-based emulsion was supplied employing a Kissing roller instead of using the winding process of the present invention so that the FOY level was about 0.8 %. The elastomeric fiber package of 720 d thus

produced was rewound using a typical rewinder to prepare a product. The physical properties of the product were evaluated through the same method as in example 1, and the results are described in the following Table 1.

5

COMPARATIVE EXAMPLE 3

An elastomeric fiber package was produced through the same polymerization and spinning procedures as example 1 except that the winding was conducted using a conventional auto-exchange process instead of the winding process of the present invention. In the auto-exchange process, a bobbin holder around which a full winding and an empty paper tube were fitted was operated at a rate that was about 5 - 30 % faster than the normal winding rate so as to easily cut an elastomeric fiber. The bobbin holder around which the full winding was fitted and the bobbin holder around which the empty paper tube was fitted were exchanged in position with each other while the stretchability of the elastomeric fiber was increased by about 10 - 30 % in comparison with normal winding. A partition board which was provided at the side of a winder was moved between the two bobbin holders so as to weakly hold the elastomeric fiber in grooves formed on an upper end thereof. Subsequently, the partition board was frontwardly moved to a front end or a slit of the paper tube where the elastomeric fiber was wound around the front end for a while (about 1 sec or so) to form a transfer tail. Next, a winder head descended to bring a

friction roller into close contact with the empty paper tube, so that the elastomeric fiber was wound while a traverse guide at the winder head moved the elastomeric fiber according to a predetermined twill angle pattern, thereby creating a product in a predetermined winding amount. The physical properties of the product were evaluated through the same method as in example 1, and the results are described in the following Table 1.

10

COMPARATIVE EXAMPLE 4

An elastomeric fiber package was produced through the same procedure as in comparative example 3 except that a silicone-based emulsion was supplied using a Kissing roller so that the FOY level was about 0.8 %. The physical properties of the package were evaluated through the same method as in example 1, and the results are described in the following Table 1.

20

TABLE 1

	Samples to be evaluated	FOY level	Laboratory evaluation			Evaluation for availability to production of diapers (unwinding using an OETO process)		
			Unwinding tensions of parts constituting package			Unwinding using an OETO process	Success ratio of transferring between packages	Diaper power (Leg part)
			External layer	Middle layer	Internal layer and transfer tail			
Ex.1	Direct 720d (no emulsion)	0%	Ave.:9g Var.:2g	Ave.:10.5g Var.:2g	Ave.:11.5g Var.:2.5g	Fiber cutting 0.8 times/day	95% or more(fair)	Ave.:113g Var.:1.5g
Ex.2	Direct 720d using	0.8%	Ave.:7g Var.:1g	Ave.:8g Var.:1g	Ave.:9g Var.:0g	Fiber cutting	93% or more(fair)	Ave.:110g Var.:1.2g

	emulsion)					0.5 times/day		
Co. Ex.1	Rewinding 720d (no emulsion)	0%	Ave.:6g Var.:1g	Ave.:6.5g Var.:1g	Ave.:7.5g Var.:2g	Fiber cutting 1.1 times/day	95% or more(fair)	Ave.:108g Var.:1.2g
Co. Ex.2	Rewinding 720d (using emulsion)	0.8%	Ave.:5.5g Var.:1g	Ave.:5.5g Var.:1g	Ave.:6.5g Var.:1.5g	Fiber cutting 1.5 times/day	93% or more(fair)	Ave.:106g Var.:1.0g
Co. Ex.3	Using conventional method. Direct 720d(no emulsion)	0%	Ave.:9.2g Var.:2g	Ave.:10.4g Var.:2.3g	Ave.:12.4g Var.:4.4g	Fiber cutting 13.3 times/day	Less than 88%(poor)	Ave.:114g Var.:3.2g
Co. Ex.4	Using conventional method. Direct 720d (using emulsion)	0.8%	Ave.:7.4g Var.:1.3g	Ave.:8.5g Var.:1.1g	Ave.:10.1g Var.:3.8g	Fiber cutting 9.8 times/day	Less than 83%(poor)	Ave.:112g Var.:2.1g

Ave.: average

Var.: variation

[Evaluation of physical properties]

* FOY (finish on yarn) level: wt % of emulsion
5 applied to the elastomeric fiber based on the weight of the
elastomeric fiber

* Unwinding tensions of parts constituting the
package: Since BISFA or the like did not suggest a
standardized method of evaluating unwinding tension, an
10 average and a variation of unwinding tensions were
evaluated when external, middle, and internal layers of the
package were unwound through an OETO process using a
Rothschild F-Meter Winder R1083 device. Whether an absolute
value (average) is high or low is not important, but
15 uniformity (variation) among the external, middle, and
internal layers and within one layer is important.
Furthermore, the unwinding tension means downstream

characteristics exhibited as combinations of intrinsic modulus and winding shrinkage of the elastomeric fiber, and adhesion strength between yarns.

5 * Unwinding using the OETO process: The package was applied to a practical process of producing a diaper and unwound using the OETO process, and fiber cutting caused by poor unwinding was evaluated. Unwinding in the OETO process was evaluated by counting the average number of fiber cutting per day after the package was applied to one machine for producing the diaper. The operation conditions of the machine for producing the diaper were set so that the DR (draw ratio) of the elastomeric fiber was 250 % and the production rate of the diaper was about 450 pieces per minute based on a diaper for infants.

15 * Success ratio of transferring between the packages: The package was provided on a grey yarn package for unwinding using the OETO process, and connected to an adjacent package using a transfer tail. The success ratio of clean transfers in which, after one package was completely used, the other package was used without fiber cutting was evaluated. In other words, the number of successful transfers to the total number of transfers in one machine producing the diaper for one day was expressed as a percentage.

25 * Diaper power (Leg part): The elastomeric fiber was unwound through the OETO process, passed through a tension controller (BTSR manufactured by KTF, Inc.) for appropriately controlling unwinding tension, and fed into

the machine for producing the diaper to produce a leg part of the diaper. The diaper power was measured with respect to the leg part of the diaper using Instron which is a device for measuring strength and elongation. In addition to the average value, consistency is particularly important. Consistency in the diaper powers means consistency in powers of the elastomeric fibers used to produce the diaper.

As apparent from the results described in Table 1, the products of examples 1 and 2 according to the present invention had excellent unwinding and consistent physical properties that were the same as those of comparative examples 1 and 2 in which the rewinding was conducted after the winding. Furthermore, in comparative examples 3 and 4, variations of unwinding tensions of the internal layers and the transfer tails of the packages were significant due to inconsistent physical properties, and unwindings and physical properties of the products were poor.

CLAIMS

1. An elastomeric fiber package which is produced through a direct or one-step winding process, comprising:

an innermost layer;

5 a transfer tail connected to the innermost layer at an end thereof; and

a normally wound part which is connected to the other end of the transfer tail and has desired physical properties.

10 2. The elastomeric fiber package as set forth in claim 1, further comprising a middle bunch formed on an outermost layer of the fully wound package.

3. The elastomeric fiber package as set forth in claim 1, wherein an elastomeric fiber is a polyether-based elastomeric fiber, a polyester-based elastomeric fiber, or
15 a polyamide-based elastomeric fiber.

4. The elastomeric fiber package as set forth in claim 3, wherein the elastomeric fiber is a polyether-based urethane urea elastomeric fiber.

20 5. A method of producing an elastomeric fiber package, comprising:

a first step of automatically exchanging a position of a bobbin holder which has a full winding wound in a

normal winding amount with a position of a bobbin holder which has an empty paper tube;

a second step of winding an elastomeric fiber around the empty paper tube for a short time in an early stage
5 after the automatic exchanging of the positions;

a third step of forming a transfer tail by winding the elastomeric fiber; and

a fourth step of again winding the elastomeric fiber around the package having the transfer tail formed thereon
10 at a normal winding rate.

6. The method as set forth in claim 5, wherein the elastomeric fiber is wound around the empty paper tube for about 10 sec in the second step.

7. The method as set forth in claim 5, wherein a
15 partition board for forming the transfer tail, which is additionally provided at a side of a winder, is moved between a friction roller and the package rotating for about 10 sec so as to weakly hold the elastomeric fiber in grooves formed on an upper end thereof, and is frontwardly
20 moved to a front end or a slit of the paper tube, thereby forming the transfer tail in the third step.

8. The method as set forth in claim 5, further comprising cutting yarn between the transfer tail and an innermost layer during a process of sorting the package so
25 as to separate the innermost layer from a normally wound

part formed after the transfer tail is formed.

FIG. 1

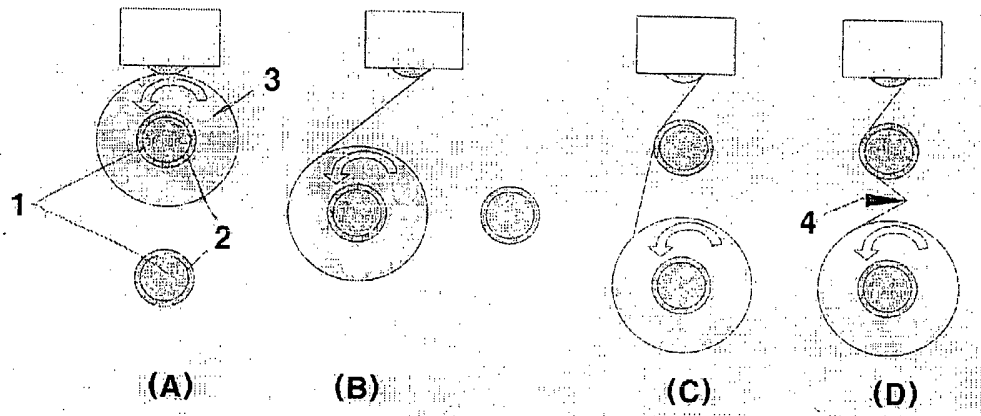


FIG. 2

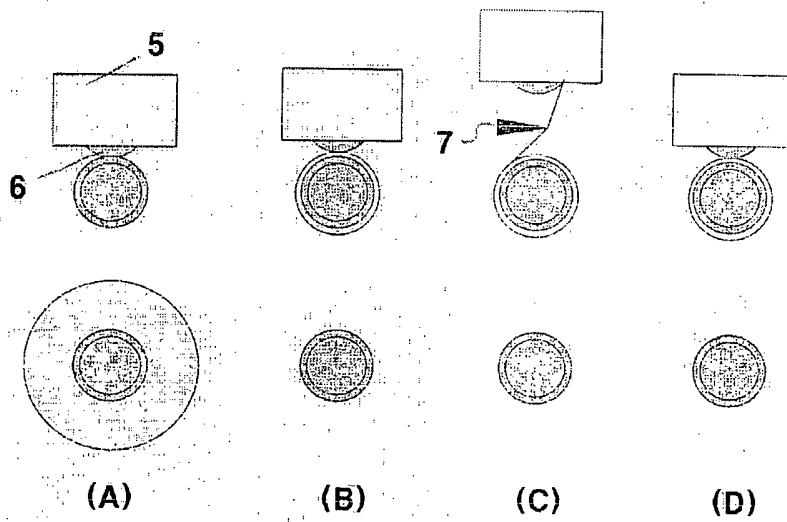
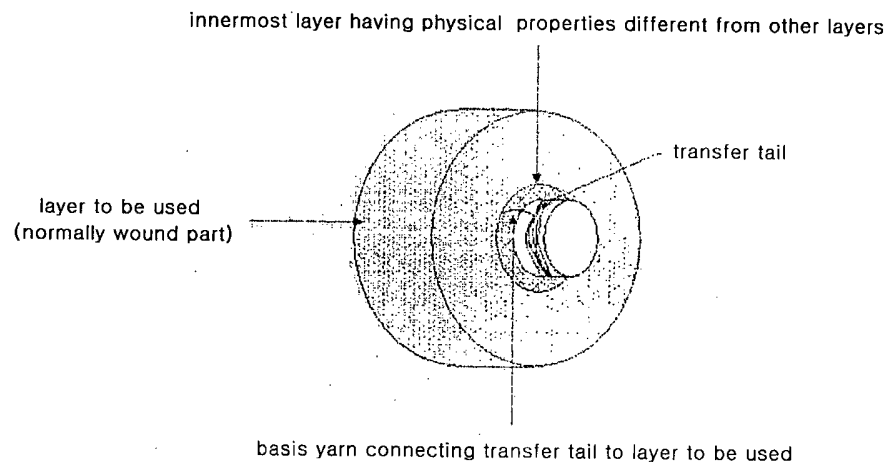


FIG.3



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2005/001079

A. CLASSIFICATION OF SUBJECT MATTER**IPC7 D01H 13/10**

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7 D01H, B65H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

KR : IPC as above

JP (utility models) : IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2004-26499 A (DU PONT TORAY CO., LTD.) 29 JANUARY 2004 See the whole document	1-8
A	US 4,058,264 A (TEIJIN LIMITED) 15 NOVEMBER 1977 See the whole document	1-8
A	US 4,105,165 A (TOYODA JIDOSHOKKI SEISAKUSHO K.K.) 08 AUGUST 1978 See the whole document	1-8
A	JP 59-36075 A (TOYODA AUTOMLOOM WORKS LTD.) 28 FEBRUARY 1984 See the whole document	1-8
A	KR 1980-1557 B (TOYOBO CO., LTD) 27 DECEMBER 1980 See the whole document	1-8

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search

29 JULY 2005 (29.07.2005)

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Name and mailing address of the ISA/KR

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MIN, Byong Yug

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/KR2005/001079

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KR 1980-1557 B	27-12-1980	NONE	