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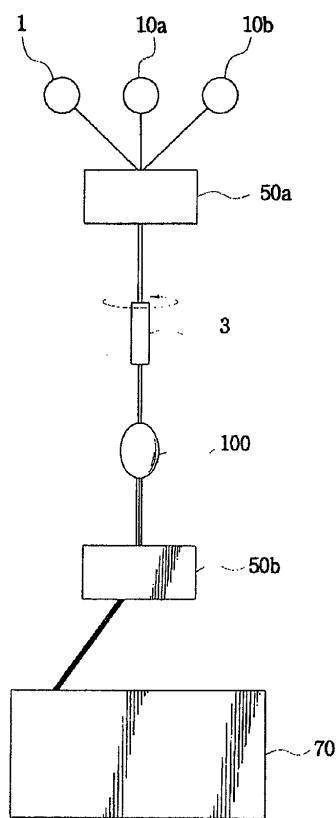
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(54) Compound yarn with high absorbency and fabric made therefrom

(57) Disclosed is a compound yarn with high absorbency, which is manufactured by twisting and compounding a plurality of yarns, and a fabric made therefrom. The compound yarn is characterized in that a core yarn (1) of a polyester false twist yarn is compounded with floating yarns (10a, 10b) selected from the group consisting of a PET/nylon split yarn, a polyester false twist yarn and a natural fiber, around the core yarn (1), in which one strand of the core yarn (1) is compounded with 5 or fewer strands of the floating yarns (10a, 10b), and then the resulting yarn is compounded with a binder yarn (100) of a polyester filament. Such a compound yarn of the invention imparts a high absorbency to a yarn or its fabric, thereby being applied for manufacture of clothes including bath robes, daily products including general cleaners such as washcloths and hair towels, and other cleaning cloths.

Fig. 1



Description

[0001] The present invention relates to a compound yarn, and more particularly to a compound yarn manufactured by compounding a plurality of yarns containing heterogeneous raw materials so as to exert high moisture absorbency, and a fabric made therefrom. The fabric of the invention has a fine surface from which the compound yarn protrudes, and macroscopically, a uniform checkered figuration is formed over the fabric surface, thereby achieving excellent absorbency.

[0002] Generally, absorption or hygroscopicity (hereinafter, commonly called "absorbency") of fibers refers to the absorbent capacity. It is an important functionality by which a variety of fluid substances, including sweat perspired from human body, can be quickly absorbed, lowering temperature and humidity of the skin, thereby imparting pleasantness to a wearer's body.

[0003] Such a benefit of absorbency has been expressed by mainly employing fibers from wool, rayon and cotton, which have an intrinsic moisture absorbency, to manufacture threads of fabrics with good absorbency.

[0004] However, these natural raw materials have many disadvantages when they are applied to meet varying purposes, in terms of wrinkle resistance, shrinkage resistance, washability, dyeing property, insect resistance, anti-microbial property and durability, which are attributable to characteristics of the materials. In other words, those natural materials are limited in a range of their applications. When they are employed in applications other than cloths, for example, cleaning clothes and dishwashing cloths, lint generation which is particular to short staple fibers becomes a great source of user dissatisfaction (it looks unsanitary).

[0005] Moreover, the characteristics of natural fibers make it difficult to develop a variety of forms of fiber materials, limiting the development of diversified fabric articles.

[0006] Accordingly, with an aim of substituting or improving the fabric articles mainly employing natural raw materials with good absorbency, many different researches and developments on the usage of synthetic fibers have been attempted since the 1990s. As a part of the accomplishments, substituted fabric articles with good absorbency, which employ synthetic fibers having superior absorbency to natural raw materials, were developed, and their real applications have been achieved in certain fields.

[0007] Some prior art fabrics have attempted to overcome drawbacks of natural fibers. One example is described in Korean Patent Laid-open No.93-10258. According to the reference, a first component containing a mixture of 90 to 99.5 weight % polyamide and 0.5 to 10 % polyethyleneterephthalate (PET) and a second component containing PET only are subjected to melt-compound spinning and reeling, producing undrawn yarns with varying cross-sections. The undrawn yarns are then drawn and heat fixed, obtaining a compound fiber with a pinwheel figured cross-section. The compound fiber of a weft yarn and a PET fiber of a warp yarn are woven, and are subjected to scouring and alkaline finishing, followed by washing and dyeing. The fabric thus made achieves heterogeneity in its fiber's section and modification on the fabric surface, providing absorbency and quick drying, pleasant texture.

[0008] Korean Pat. Laid-open No. 89-017419 describes a method of manufacturing a synthetic fabric with good water repellency, moisture transpiration and waterproofing properties. According to the reference, a polyester yarn having a total fineness of 50 to 150 denier and a single yarn fineness of less than 2.0 denier is employed as a warp yarn, while a micro fiber having a single yarn fineness of less than 0.2 denier, the single yarn being split from a conjugate yarn having a total fineness of 50 to 150 denier, the conjugate yarn being made by a process of conjugate-spinning of polyamide and polyester, is employed as a weft yarn. A fabric with twill weave is made therefrom. The resulting fabric is subjected to a process to raise fibers, scouring and dyeing, followed by a step for affording water repellent property and a step of embossing.

[0009] Another example is described in Korean Pat. Laid-open No.96-007864. According to the reference, nylon and polyester are conjugate-spun and the conjugate yarn is split to obtain a split super fine yarn having a fineness of 0.1 denier or less, serving as a first material. Nylon or polyester multi yarns serve as a second material. The first and second materials are employed to make a double-faced weave, at a incorporation ratio of 50:50 to 80:20. The resulting fabric is subjected to dyeing treatment, thereby completing manufacture of a cleaning cloth, after which the cleaning cloth can be shrunk by more than 50 %.

[0010] In addition, Japanese Pat. Laid-open Publication No. Heisei 9-279476 discloses a method of manufacturing a polyamide hollow fiber with fine porosity, which is obtained by alkaline finishing a conjugate construct containing alkali-soluble polyester and polyester/nylon. Japanese Pat. Laid-open Publication No. Heisei 7-003638 discloses a method for manufacturing a conjugate fiber fabric having good split effectiveness, in which the conjugate yarn of polyester/nylon is subjected to alkaline finishing under a certain prescribed condition.

[0011] Japanese Pat. Laid-open Publication No. Heisei 8-27626 discloses a fiber containing 70 to 50 wt% polyamide and 30 to 50 wt% polyester, which is spun and woven into a fabric, followed by alkaline finishing. The patent presents a possibility of manufacturing a fabric for clothes with functionalities such as light weight, absorbency and water retention capability.

[0012] Meanwhile, interest in sports and leisure is recently increasing, and a higher quality of fabric is needed to

meet consumer demands for a pleasant feeling to the skin, with respect to fabric materials. Indeed, a demand for clothes with varying functionalities including quick absorption and transpiration of sweat generated upon doing exercise is growing. For example, as for bath clothes (robes, towels, etc), softness of feeling upon contact with the skin is demanded. For these reasons, there is a need to develop fabric articles providing softer textures and higher absorbency than conventional fabric articles.

[0013] Therefore, the present invention has been made in view of the above problems, and it is an object of the present invention to provide a compound yarn with high absorbency in which the absorbency is improved, compared to conventional articles.

[0014] It is another object of the present invention to provide a fabric with high absorbency, made from the compound yarn, which has a pleasant feeling upon contact with the skin.

[0015] In accordance with one aspect of the present invention, the above and other objects can be accomplished by the provision of a compound yarn manufactured by compounding a plurality of single yarns containing heterogeneous raw materials.

[0016] The compound yarn with high absorbency according to the invention is a common compound yarn manufactured by twisting and compounding a plurality of single yarns. Around one strand of polyester false twist yarn, 5 or fewer strands of floating yarns selected from the group consisting of a PET/nylon split yarn, a polyester filament false twist yarn, or a natural fiber, are compounded, and then compounded with a PET binder yarn to manufacture a compound yarn of the invention.

[0017] In accordance with another aspect of the present invention, there is provided a fabric manufactured from the compound yarn with high absorbency.

[0018] The fabric with high absorbency according to the invention includes a woven fabric or knitted fabric, having at least two layers. At least one face of the fabric is made from the compound yarn, and the resulting fabric is subjected to alkaline finishing.

[0019] The fabric thus manufactured has a relatively wide air-retaining layer inside and/or on the surface of the fabric. Accordingly, it is evaluated as a material with good properties of absorption and transpiration of moisture.

[0020] Preferably, the fabric has two or more layers. Good absorption and transpiration of moisture is effected by an absorption layer of a certain thickness and a transpiration layer which transports outward moisture absorbed by the fabric. For this reason, two-layered fabric has functionalities such that one face of the fabric functions as an absorbent layer, while the other face as a moisture transpiration layer.

[0021] As for a knitted fabric having two layers (double knit), the compound yarn of the invention is employed to form a single knit layer (A), and a common thread or the compound yarn is employed to form another single knit layer (B). Two single knit layers (A and B) are combined. The double knit manufactured in this way is subjected to alkaline finishing.

[0022] Although the fabric having double layers is described herein, fabrics having triple or quadruple layers may also be made.

[0023] Further, in accordance with yet another aspect of the present invention, there is provided a fabric. The fabric has checkered patterns over its surface. The fabric with a checkered pattern surface has a repeating unit containing 2 to 10 strands of both a warp yarn and a weft yarn, respectively.

[0024] Such a surface structure is also attributable to surface loops (floating threads) properly fastened by a binder yarn. In addition, the surface affords an improved absorbency of the fabric, and good feeling to the touch, owing to a minimized contact area with the skin.

[0025] Additionally, in connection with a double-layered fabric, 2 to 16 strands of weft and warp yarns are regularly respectively arranged in a horizontal direction and a longitudinal direction. The horizontal direction serves as a ground weave, while the longitudinal direction serves as a protruding weave. In such a way, a certain configuration of the fabric is formed on two surfaces. That is, checkered patterns are formed. Such uneven surface improves the feeling of the fabric against the skin, as well as providing an aesthetic visual effect. Further, such a fabric can ensure a space through which fluid substances, such as sweat, generated from the skin can be quickly discharged.

[0026] The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a schematic diagram showing a process of manufacturing a compound yarn of the invention using a common twisting machine; and

Fig. 2 is a diagram showing a device for testing absorbency of a fabric.

[0027] One aspect of the invention refers to a compound yarn with an optimal absorbency, which is manufactured by compounding a plurality of heterogeneous single yarns to exert specific functionalities.

[0028] In detail, a polyester false twist yarn is employed as a core yarn. With respect to one strand of the core yarn, 5 or fewer strands of floating yarns selected from the group consisting of a PET/nylon split yarn, a polyester filament

false twist yarn, and a natural fiber, are compounded. Using a common twisting machine, surface loops are formed on the surface of the core yarn at a length of approximately 1 to 3 mm (the loop length and loops density on the surface of the core yarn can be controlled by adjusting a feeding speed of the single yarns to the supplying roller and a rotational speed of the spindle). These surface loops form an air-retaining layer. Around the resulting yarn, a PET filament binder yarn is then compounded to adequately fasten the loops (the floating yarn) protruding from the surface of the core. As a result, a compound yarn thus manufactured has a final air content rate of 5 to 45 %.

[0029] In this connection, it is preferable that 5 or fewer strands of the floating yarn are employed, with respect to 1 strand of the core yarn. If the number of strands of the floating yarn employed is 5 or more, even though the expansion capability is high, the loops protruding from the surface are too many so that the texture is not good, the appearance is poor, and lint generation increases. It is more preferable that 2 to 3 strands of the floating yarn are employed.

[0030] The compound yarn of the invention is manufactured according to a conventional process, by means of a common twisting machine illustrated in Fig. 1.

[0031] Referring to Fig. 1, two floating yarns, that is, a first floating yarn 10a and a second floating yarn 10b, are employed. A core yarn 1 and floating yarns 10a, 10b are separately fed to a supply roller 50a. The yarns are twisted and compounded, with an aid of a spindle 3 which rotates in a certain direction. The resulting yarn is compounded with a binder yarn 100 which rotates in the same direction as the spindle. In this way, the compound yarn of the invention is obtained. In Fig. 1, 50b and 70 are a roller and winder, respectively.

[0032] The core yarn, floating yarns or binder yarn employed herein are polyester filaments which are commonly called PET filament and are commercially available. Polyester filaments contain polyester or copolymers thereof having a fiber forming capability, which are represented by polyethylenephthalate (abbreviated by PET). In addition, such polyester filaments have a property of weight loss on exposure to alkali, whereby a certain weight fraction is lost during the step of dyeing finishing, contributing to an improvement of bulk capacity due to shrinkage of materials.

[0033] For the core yarn and floating yarns, it is advantageous that the polyester filaments have false twists of 1500 TM or more (twist/meter) for improving expansion capability of the yarns. On the other hand, a typical false twist number is 2000 TM.

[0034] As for the floating yarn of the invention, a PET/nylon split yarn is employed, and is commercially available. Nylon is polyamide polymer and is represented by nylon 6 and nylon 66. Since nylon has not a property of weight loss by alkali, only polyester are weight-reduced during the step of alkaline finishing. As a result, varying cross-sections are formed in the resulting yarns, which comprise mostly amide polymer.

[0035] The PET/nylon split yarn has 2100 to 2400 TM, upon performing a false twisting step typically at 140 to 190 °C, thereby providing a fabric article with a bulk capacity owing to twisting applied.

[0036] As for the binder yarn of the invention, a false twist yarn may be employed to increase an expansion capability and optimize loop characteristics.

[0037] For the floating fiber, known natural fibers with good absorbency, such as cotton, silk and wool may be employed.

[0038] The floating fiber should be employed at a ratio of 5 strands to 1 strand of the core yarn. The reason for this is as mentioned previously.

[0039] A second aspect of the invention refers to a woven or knitted fabric with high absorbency made from the compound yarn.

[0040] In accordance with the invention, the knitted fabric is a woven fabric or knitted fabric with at least two layers, in which at least one layer of the fabric is made from the compound yarn. The resulting fabric is subjected to a common alkaline finishing. As a result, the compound yarn which is a material yarn of the fabric has an optimal shrinkage capability, resulting in a fabric with high absorbency. It is noted that a form of the woven fabric or knitted fabric has two or more layers. The reason for this has been described previously.

[0041] Such a second aspect can be realized with a fabric with checkered patterns on its surface. The compound yarns "A" of the invention are employed as both a warp yarn and weft yarn to make a repeating unit containing 2 to 16 strands, respectively. Also, the compound yarn "A" and a common thread "B", for example, cotton, polyester and rayon, may be employed as a warp yarn and weft yarn to form a repeating unit containing 2 to 16 strands.

[0042] If the number of the threads "A" and "B" is 2 or less, it is hard to obtain a fabric with desired absorbency. On the other hand, if the number is 16 or more, the checker configuration, that is, the cell, is too large in size, decreasing a contribution to the fabric's absorbency. Further, the economic benefit is not satisfactory.

[0043] The "B" yarn may be a common yarn or the compound yarn of the invention. When using the compound yarn, the absorbency is highly improved, but economic efficiency is low.

55 Example 1: Manufacture of compound yarn and fabric

[0044] As a core yarn, a polyester filament false twist yarn with 75 denier/36 filaments (2000 TM) (Hyosung Co. Ltd., Korea) was employed. A superfine split yarn (PET/nylon split yarn) with 150D/72F (2000 TM) (Hyosung Co. Ltd., Korea)

containing 30 wt% polyamide and 70 wt% polyester was employed as a first and a second floating yarn. The floating yarns were fed to a twisting machine at a ratio of 2.5 strands, with respect to one strand of the core yarn. These yarns were compounded, resulting in generation of loops on the surface of the resulting yarn. At this time, to prevent excessive loops from forming in certain regions of the surface, a polyester filament with 75D/36F (Hyosung Co. Ltd., Korea), which is false-twisted to serve as a binder yarn, was compounded therewith.

[0045] When using a common twisting machine, the rate of yarn production is typically 6 to 12 m/min. For the yarns employed herein (a core yarn, floating yarns and a binder yarn), the feeding speed was adjusted to a reeling speed of 8 m/min, with respect to a final compound yarn. The finished final yarn (the compound yarn) has a thickness of 750D.

[0046] The twisting machine used herein is marketed under the trade name AZAKI. Using the machine, the first and second floating yarns were concurrently fed to one roller to promote gathering of the floating yarns around the core yarn.

[0047] Employing respectively 8 strands of the compound yarn thus made, as a warp yarn and a weft yarn, a fabric having two layers which has one type of repeating unit on its surface was manufactured.

[0048] The weaving machine used herein was supplied by Han Gin Machinery, Co.

15 Finishing

1. Scouring

Scouring agent: 1 g/L of Kiralon OL from BASF Co. Water purifying agent: 2 g/L of Dekol SN from BASF Co.
NaOH: 6 g/L

20 Pretreatment equipment: Rotary washer

Temperature and time: 110 °C, 20 min

Meanwhile, the agents used in the step of the scouring finishing can be adjusted to vary, in terms of their texture, hygroscopicity and a degree of lint generation of the materials.

25 2. Alkaline finishing

NaOH: 6 %

Equipment: fluid alkaline finishing (batch process)

30 3. Dyeing

The alkali-finished fabric was washed, and dyed under the following conditions.

Pigments: 1 % Lumacron Yellow Brown S-ER, 2.5 % Nylosan Red N-2RBL

Temperature and time: 120 °C, 5 hrs

Dispersing agent: 2 g/L of VGT from Myoung Sung Chemical Co., Japan

35 Humectant: FC-226 from 3M Co.

Dyeing equipment: Jet Dyeing M/C

4. Dry

Charging agent: PERMOLUS M from ICI Co., UK

40 Temperature and time: 170 °C, 60 sec

Equipment: 8 CHAMBER GAS-type STENTER

[0049] The drying step following the dyeing finish is performed at typically 150 to 190 °C to make the humectant, which was used in the dyeing step, cured and penetrated.

[0050] To provide desired functionalities in the drying step, anti-microbial and aromatic finishing processes can be concurrently performed.

Example 2

50 [0051] A compound yarn and a fabric were manufactured according to the same method as Example 1, except that the fabric weave is a satin weave.

Example 3

55 [0052] A compound yarn and a fabric were manufactured according to the same method as Example 1, except that the floating yarn was a polyester filament false twisted yarn 75D (Hyosung Co. Ltd., Korea).

Example 4

[0053] The compound yarn 300D, manufactured in Example 1, and a polyester false twist yarn 150D were employed to alternatively arrange respectively 8 strands of the yarns as the warp yarn and the weft yarn. The similar conditions as in Example 1 were adopted to manufacture a compound yarn and a fabric.

Comparative Example 1

[0054] A compound yarn and a fabric were manufactured according to the same method as Example 1, except that the compounding strand ratio of the core yarn to the floating yarn was 1 : 1.5, and the binder yarn was not compounded.

Comparative Example 2

[0055] A PET/nylon split yarn with 150D/72F (2000 TM) (Hyosung Co. Ltd., Korea) and a common polyester false-twisted yarn 150D were simply compounded to manufacture a thread. The thread thus obtained was woven and was subjected to finishing processes under the same conditions as in Example 1.

Comparative Example 3

[0056] A common cotton yarn (30S) only was employed, and the yarn was woven and was subjected to finishing processes under the same conditions as in Example 1.

Table: Fabric properties

Parameter	Absorbent capacity (g)	Dryness (%)	Appearance	Lint generation
Specimen				
Example 1	5.02	94	□	□
Example 2	4.31	69	□	□
Example 3	3.45	79	□	□
Example 4	4.09	64	□	□
Comp. Ex 1	4.68	72	□□	□□
Comp. Ex 2	2.65	66	□	○
Comp. Ex 3	2.89	46	○	X

Note: The evaluation is as follows: □: very good, ○: good,

□□: moderate, X: poor.

[0057] As shown in the above Table, the fabrics manufactured according to the Examples exhibit superior absorbency and dryness, compared to the fabrics of the comparative examples.

[0058] Also, it can be seen that in terms of appearance and lint generation, the fabrics of the Examples are superior to those of the comparative examples. Especially, as for the fabric of the comparative example 2, which was woven by employing only cotton yarn, as observed with naked eyes, lint generation was the most severe.

[0059] As for the fabric of the comparative example 1, which was woven by employing a polyester filament false-twisted yarn and PET/nylon split yarn as a core yarn and floating yarn, respectively, without a binder yarn, its absorbency and dryness were moderate, but poor appearance and relatively high lint generation were seen.

[0060] The fabric of the comparative example 2, which was manufactured by simply compounding a polyester filament false twist yarn and PET/nylon split yarn, without any consideration of a core yarn or floating yarn, the appearance was not bad but its absorbency and lint generation was very poor, compared to the fabrics of the Examples.

[0061] To test absorbency of fabrics, a method which is disclosed in Korea Pat. Application No.10-2000-57595 was used and described below.

[0062] The inventors used an absorbency-measuring device which is schematically illustrated in Fig. 2. As shown in Fig. 2, the device consists of an electronic scale 101, a reservoir containing fluid 102, a funnel 105 with a glass filter 104, and a channel for transporting fluid 103 by which the reservoir and funnel are connected.

[0063] With a computer system, the amounts of fluid absorbed per one second are calculated. The position of the funnel 105 was adjusted to make a fluid surface in the reservoir 102 and an expected surface on which a specimen tested is placed, (that is, an upper surface line of the glass filter 104 in the funnel) be on the same line. In this state, the funnel position is fixed. After setting a difference of water pressure to a value 0, the specimen is supposed to exert its absorbency by itself. A cylindrical load (not illustrated) with a diameter of 5 cm was placed on the specimen to give a certain load at each test, to tightly adhere the specimen to the glass filter 104, ensuring even absorption. The procedure is described in detail below.

- 1) The specimen is shaped as a circle with a diameter of 5 cm, and weighed.
- 2) After zeroing the electronic scale, a computer program which provides measurements of the fluid amounts absorbed from the fabric, and which is connected with the electronic scale, is executed.
- 3) Once the specimen is placed on the glass filter, the starting point of absorption is automatically detected, and the amounts of fluid absorbed are recorded at intervals of one second.
- 4) When no more absorption occurs, the time point is checked, and the test is terminated; the specimen is removed from the glass filter; moisture is supplied to the reservoir at an amount which is the amount consumed through absorption by the specimen, followed by initializing the test condition, that is, setting the value zero (This is performed in order to prevent errors due to a difference of water pressure when a fluid volume is changed).
- 5) The amounts of fluid absorbed, with successive values measured in a real time every second, are calculated.
- 6) The amount of fluid absorbed for 10 sec is calculated.
- 7) The absorbency (g) of the specimen is determined as the average of 5 individual absorbencies for a given specimen.

[0064] To test dryness of the specimens, when each specimen of 5 cm diameter reached the maximal water content, the specimen was kept under a condition of 25 °C and 60 % RH, for 6 hrs. Dryness of the specimens was evaluated on the basis of weight decrease rate (%).

[0065] The appearance and lint generation of the fabrics were evaluated by observation with naked eyes.

[0066] Heretofore, a woven fabric having a repeating unit containing respectively 8 strands of a warp yarn and weft yarn was tested. However, a variety of applications may be accomplished by employing 2, 4, 6 strands or the like.

[0067] Further, threads containing other materials may be employed as a warp yarn or a weft yarn within a repeating unit. That is, the compound yarn of the invention and a common yarn containing respectively 8 strands are alternately arranged. In this way, a variety of fabric articles can be manufactured.

[0068] In a variety of weaves, including basic weaves such as a plain weave, twill weave, and satin weave, and modified weaves, fabrics with high absorbency can be manufactured.

[0069] As apparent from the above description, the present invention provides a compound yarn with excellent absorbency and dryness, which can be employed as a material with absorption and quick dryness. Also, a fabric made from the compound yarn with high absorbency can be applied to manufacture clothes including bath robes, daily products including general cleaners such as washcloths and hair towels, and other cleaning cloths.

[0070] Further, the compound of the invention generates little lint, so it can be used for the manufacture of towels which clean dishware and mirrors.

[0071] Although the preferred embodiments of the present invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope of the invention as disclosed in the accompanying claims.

Claims

1. A compound yarn with high absorbency, which is manufactured by twisting and compounding a plurality of yarns, **characterized in that** a core yarn (1) of a polyester false twist yarn is compounded with floating yarns (10a, 10b) selected from the group consisting of a PET/nylon split yarn, a polyester false twist yarn and a natural fiber, around the core yarn (1), in which one strand of the core yarn (1) is compounded with 5 or fewer strands of the floating yarns (10a, 10b), and then the resulting yarn is compounded with a binder yarn (100) of a polyester filament.
2. A fabric with high absorbency, which is woven or knitted fabric having at least two layers, in which at least one layer of the fabric is made from the compound yarn as set forth in claim 1, and the resulting fabric is subjected to alkaline finishing.

EP 1 312 706 A1

3. The fabric as set forth in claim 2, wherein at least one layer of the fabric contains the compound yarn as set forth in claim 1, in which the compound yarn is employed as a warp yarn and a weft yarn in a repeating unit over the fabric surface, containing respectively 2 to 16 strands of the compound yarn.

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Fig. 1

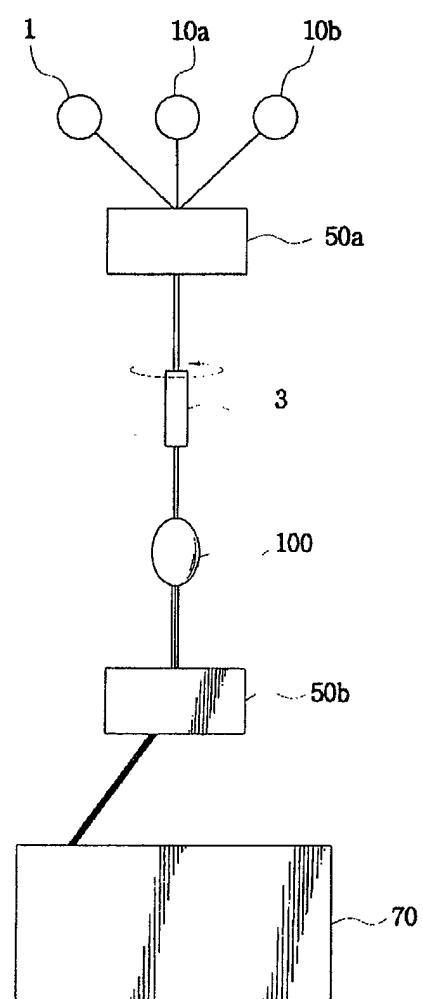
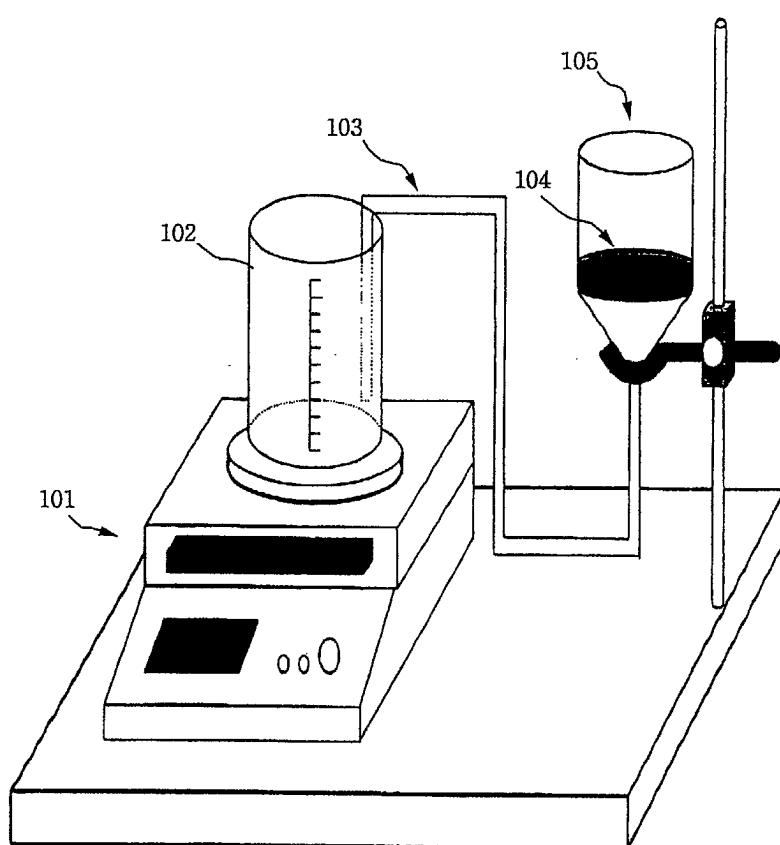


Fig. 2





DOCUMENTS CONSIDERED TO BE RELEVANT									
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)						
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A	JP 57 011229 A (TEIJIN LTD) 20 January 1982 (1982-01-20) * abstract *	1,2	TECHNICAL FIELDS SEARCHED (Int.Cl.7) D02G						
<p>The present search report has been drawn up for all claims</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">Place of search</td> <td style="width: 33%;">Date of completion of the search</td> <td style="width: 34%;">Examiner</td> </tr> <tr> <td>THE HAGUE</td> <td>14 February 2003</td> <td>D'Souza, J</td> </tr> </table> <p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>				Place of search	Date of completion of the search	Examiner	THE HAGUE	14 February 2003	D'Souza, J
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ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

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