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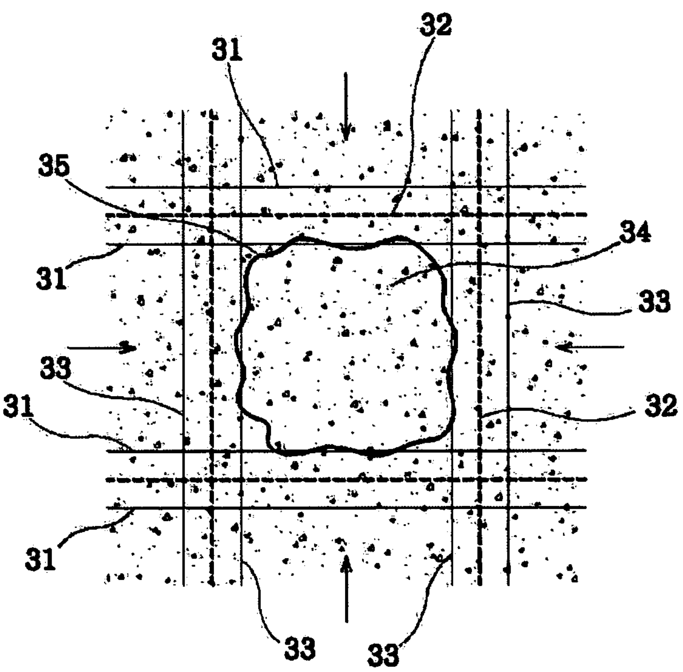
(54) **Method for manufacturing three-dimensional fabric and three-dimensional fabric**

(57) A method for manufacturing a three-dimensional fabric and a three-dimensional fabric using the same are provided. The method includes the steps of: selecting at least more than one yarn (32, 31) among nylon6, nylon66 and a super high tenacity yarn (33) to be used as a warp yarn and a filling yarn; weaving the selected warp and filling yarns to produce a basis fabric with ripstops (34); inserting the basis fabric into a dyer and dyeing the basis fabric by providing a predetermined concentration of a dye at a predetermined temperature for a predetermined period, so that a special pattern and a color are expressed on the basis fabric because of a difference in density, material characteristic and thermal transformation temperature between the warp yarn and the filling yarn; and drying the dyed basis fabric for a predetermined period at room temperature to make the ripstops (34), the pattern and the color clear without deformation.

Fig. 8



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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a method for manufacturing a fabric, and more particularly, to a method for manufacturing a three-dimensional fabric on which various three-dimensional patterns and colors are presented by using a thermal transformation difference between yarns arising during a dyeing of a basis fabric woven with the yarns having a different density and material characteristic under a certain dyeing condition and to a three-dimensional fabric using the same.

Description of the Related Art

[0002] Generally, one representative pleating process in a fabric woven with yarns like nylon proceeds with using a designated machine to give pleats to a dyed fabric. That is, for the pleating process, there are upper and lower rollers of which outer surfaces are shaped respectively in a positive pattern and a negative pattern and one of which is equipped with a heating device, and as a woven fabric passes through a space between the upper roller and the lower roller, pleats are formed on the woven fabric.

[0003] FIG. 1 illustrates a typical woven fabric on which pleats are formed by employing the above described pleating process. Especially, the woven fabric is typically produced by interlacing yarns of nylon6 (N6/210D = 210D/34F) 101, which is a common type of nylon, as a warp yarn and a filling yarn. Through this interlacing of the nylon6 yarns 101, a basis fabric 102 is produced. Also, because of this interlacing of the filling yarns and the warp yarns over and under each other, square-shaped ripstops (R/S) 103 are uniformly formed over the basis fabric 102.

[0004] FIG. 2 is a diagram illustrating a typical pleated fabric produced by applying the above described pleating process to the basis fabric 102. As shown, the basis fabric 102 woven with the nylon6 yarns 101 are inserted into a pleating machine to give pleats 104 with positive and negative patterns to the basis fabric 102. Therefore, around the ripstops (R/S) 103, protruded patterns are formed over the basis fabric 102, thereby producing a pleated fabric 105.

[0005] However, since a specific pleating machine is necessary to produce the pleated fabric 105, the pleating process gets complicated and, workability and productivity of the pleating process are reduced. Although there is an alternate method for giving pleats to the basis fabric 102 through dyeing and drying the basis fabric 102, the shape of the pleats 104 are not uniform, producing a poor appearance of the pleated fabric 105.

[0006] Also, the pleats 104 of the pleated fabric 105 produced by employing the pleating machine or other methods are monotonous or flat, and thus, it is limited to produce high-quality of fabrics. Furthermore, since only one type of a fabric is manufactured under a certain condition and a processing method, the manufactured fabric is limitedly applied and productivity is reduced. As a result, this conventional fabric manufacturing method and the fabric manufactured based on this method may not be sufficient to meet various demands of customers.

SUMMARY OF THE INVENTION

[0007] Accordingly, the present invention is directed to a method for manufacturing a three-dimensional fabric and a three dimensional fabric using the same that substantially obviates one or more problems due to limitations and disadvantages of the

related art.

[0008] An object of the present invention is to provide a method for manufacturing a three-dimensional fabric improved on appearance and productivity by presenting various three-dimensional patterns and colors on a basis fabric based on a difference in thermal transformation of yarns arising in the course of dyeing the basis fabric woven with the yarns having a different density and material characteristic under a certain dyeing condition.

[0009] Another object of the present invention is to provide a three-dimensional fabric using the three-dimensional fabric manufacturing method.

[0010] Additional advantages, objects, and features of the invention will be set forth in part in the description which follows and in part will become apparent to those having ordinary skill in the art upon examination of the following or may be learned from practice of the invention. The objectives and other advantages of the invention may be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

[0011] To achieve these objects and other advantages and in accordance with the purpose of the invention, as embodied and broadly described herein, there is provided a method for manufacturing a three-dimensional fabric, including the steps of: selecting at least more than one yarn among nylon6, which is a typical type of nylon, nylon66, which is reinforced nylon, and a super high tenacity yarn to be used as a warp yarn and a filling yarn; weaving the selected warp and filling yarns to produce a basis fabric on which a plurality of ripstops are formed; inserting the woven basis fabric into a dyeing machine and dyeing the basis fabric by providing a predetermined concentration of a dye at a predetermined temperature for a predetermined period, so that a special pattern and a color are presented on the basis fabric because of a difference in density, material characteristic and thermal transformation temperature between the warp yarn and the filling yarn; and drying the dyed basis fabric for a predetermined period at room temperature to make the ripstops, the pattern and the color clear without being deformed.

[0012] According to another aspect of the present invention, there is provided a three-dimensional fabric, including: a warp yarn including at least more than one yarn selected among nylon6, which is a typical type of nylon, nylon66, which is reinforced nylon, and a super high tenacity yarn; a filling yarn including at least more than one yarn selected among nylon6, nylon66 and a super high tenacity yarn; and a basis fabric being woven with the warp yarn and the filling yarn, including a plurality of ripstops formed on a surface of the basis fabric and being dyed as the woven basis fabric is inserted into a dyeing machine and dyed at a predetermined temperature for a predetermined period with using a predetermined concentration of a dye, whereby a special pattern and color are presented on the surface of the basis pattern because of a different density, material characteristic and thermal transformation temperature between the warp yarn and the filling yarn constructing the ripstops.

[0013] In accordance with the present invention, based on a different density and thermal transformation temperature of each employed yarn, various patterns are naturally formed on a basis fabric during a dyeing process even without an additional mechanical process. This advanced manufacturing process provides quality-improved three-dimensional fabrics. Also, this simplified manufacturing process further provides an effect on easier workability and productivity of manufacturing the three-dimensional fabrics. Furthermore, under these effects, it is possible to reduce manufacturing costs, thereby providing high value-added three-dimensional fabrics with special patterns.

[0014] It is to be understood that both the foregoing general description and the following detailed description of the present invention are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this application, illustrate embodiment(s) of the invention and together with the description serve to explain the principle of the invention. In the drawings:

[0016] FIG. 1 is a diagram illustrating a woven fabric woven with a typical type of nylon;

[0017] FIG. 2 is a diagram illustrating a conventional pleated fabric;

[0018] FIG. 3 is a flowchart illustrating a method for manufacturing a three-dimensional fabric in accordance with the present invention;

[0019] FIG. 4 is a diagram illustrating a pleated fabric in accordance with the present invention;

[0020] FIG. 5 is a diagram illustrating a three-dimensional fabric in accordance with the present invention;

[0021] FIG. 6 is a main component enlarged view illustrating an enlarged portion of the three-dimensional fabric shown in FIG. 5;

[0022] FIG. 7 is a flowchart illustrating a method for manufacturing a pleated fabric in accordance with the present invention;

[0023] FIG. 8 is a main component enlarged view illustrating a state that a basis fabric gets shrunk in the course of dyeing the basis fabric in accordance with the present invention;

[0024] FIG. 9 is a diagram illustrating a pleated fabric manufactured in accordance with the method described in FIG. 7;

[0025] FIG. 10 is a flowchart illustrating a method for fabricating another three-dimensional fabric in accordance with the present invention;

[0026] FIG. 11 is a diagram illustrating a front side of a three-dimensional fabric with both-sided protrusion patterns in accordance with the present invention;

[0027] FIG. 12 is a cross-sectional view illustrating the front side of the three-dimensional fabric taken along a line of A-A' shown in FIG. 11;

[0028] FIG. 13 is a diagram illustrating a back side of the three-dimensional fabric shown in FIG. 11;

[0029] FIG. 14 is a flowchart illustrating another embodied method for manufacturing a three-dimensional fabric in accordance with the present invention;

[0030] FIG. 15 is a diagram illustrating a front side of a three-dimensional fabric manufactured in accordance with said another embodied method in FIG. 14;

[0031] FIG. 16 is a diagram illustrating a back side of the three dimensional fabric shown in FIG. 15;

[0032] FIG. 17 is a flowchart illustrating a method for manufacturing a two-toned color fabric in accordance with the present invention;

[0033] FIG. 18 is a diagram illustrating a two-toned color fabric in accordance with the present invention;

[0034] FIG. 19 is a flowchart illustrating a method for fabricating a plain fabric in accordance with the present invention;

[0035] FIG. 20 is a diagram illustrating a plain fabric in accordance with the present invention;

[0036] FIG. 21 is a flowchart illustrating a method for fabricating a dotted fabric in accordance with the present invention; and

[0037] FIG. 22 is a diagram illustrating a dotted fabric in accordance with the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0038] Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts.

[0039] FIG. 3 is a flowchart illustrating a method for manufacturing a three dimensional fabric in accordance with the present invention. Among nylon6, nylon66 and a super high tenacity yarn, at least more than one yarn is selected and used as a warp yarn and a filling yarn for producing a basis fabric. The selected warp and filling yarns are woven over and under each other, thereby forming a plurality of ripstops formed on a surface of the basis fabric. Afterwards, the woven basis fabric is inserted into a dyeing machine and then dyed as a predetermined concentration of a dye is provided at a predetermined temperature for a predetermined period, and because of a difference in density and material characteristics of the warp yarn and the filling yarn comprising each ripstop and a difference in temperature causing thermal transformation of these yarns, specific patterns and colors are presented on the basis fabric. Subsequently, the dyed basis fabric is dried for a predetermined period at room temperature to get the ripstops, patterns and colors of the dyed basis fabric clear without being deformed. As a result of these serial processes, a three-dimensional fabric is produced.

[0040] FIG. 4 is a diagram illustrating a pleated fabric in accordance with the present invention. The pleated fabric denoted with a reference numeral 10 is produced by interlacing an individual yarn of nylon66 11 and an individual super high tenacity yarn 12 as a warp yarn and a filling yarn, respectively. Especially, pleats 10a are formed naturally on a surface of a basis fabric because of a stretchability difference between the nylon66 11 and the high tenacity yarn 12 each with a different density and material characteristic and a density difference between ripstops 13 each created by the warp yarn and the filling yarn.

[0041] Also, FIG. 5 is a diagram illustrating an overall three-dimensional fabric in accordance with the present invention. FIG. 6 is a main component enlarged view illustrating an enlarged portion of the three-dimensional fabric shown in FIG. 5. The three-dimensional fabric denoted with a reference numeral 20 is produced as each warp yarn of nylon66 21 is interlaced alternately over and under each filling yarn, which is a super high tenacity yarn 23. Each additional nylon6 yarn 22 is interlaced together with each nylon66 yarn 21 and each super high tenacity yarn 23, producing the basis fabric.

[0042] That is, a plurality of diamond-shape pleats 20a are formed naturally on a surface of the basis fabric because of a stretchability difference between the nylon66 yarn 21, the nylon6 yarn 22 and the super high tenacity yarn 23 each with a different density and material characteristic and a density difference between ripstops 24 created by the warp yarns and the filling yarns.

[0043] Also, the nylon66 yarn 21, the nylon6 yarn 22 and the super high tenacity yarn 23 are dyed in a different time, and this difference in dyeing time naturally produces a plurality of two-toned color portions 25 on the surface of the basis fabric. As the name indicates, brightness of each two-toned color portion 25 is different.

[0044] FIG. 7 is a flowchart illustrating a method for manufacturing a pleated fabric in accordance with the present invention. FIG. 8 is a main component enlarged view illustrating a state that a basis fabric is shrunk during a dyeing process in accordance with the present invention. FIG. 9 is a diagram illustrating a pleated fabric manufactured by employing the described method in FIG. 7 in accordance with the present invention. The pleated fabric denoted with a reference numeral 30 is produced by a weaving of each nylon66 31, which is reinforced nylon, and each nylon6 32 as a warp yarn and each super high tenacity yarn 33 and said each nylon6 32 as a filling yarn. Through this specific weaving, the basis fabric, i.e. the pleated fabric 30, has a structure of triple-thread ribs in a protruded ripstop shape as illustrated in FIG. 8.

[0045] Such basis fabric is then inserted into a dyeing machine for polyester called a rapid and dyed at a temperature ranging from approximately 115 °C to approximately 120 °C for approximately 5 hours. In the course of this dyeing process, each initially square-shaped ripstop 34 gets protruded because of a difference in density, material characteristics and thermal transformation temperature between the warp yarn and the filling yarn constructing the individual ripstop 34, thereby forming uniformly sized ruffle patterns 35 on the basis fabric.

[0046] That is, the basis fabric including the nylon66 yarns 31, the nylon6 yarns 32 and the super high tenacity yarns 33 is dyed at high temperature inside of the polyester dyeing machine. At this time, the super high tenacity yarns 33 and the nylon66 yarns 31 of which melting point and softening point are high maintain a square-shape of an outer portion of each ripstop 34 constructed in the triple-thread rib structure. In the meantime, as the nylon6 yarns 32 of which melting point and softening point are low are shrunk inwardly, each ripstop 34 gets protruded.

[0047] Hence, as described above, density, strength and thermal transformation temperature of the nylon66 yarns 31, the nylon6 yarns 32 and the super high tenacity yarns 33 are different even though these yarns are the same nylon family and, employing such yarns as the warp yarns and the filling yarns of the basis fabric results in transformation of these yarns under a specific dyeing period and a dyeing temperature, and as a result of the transformation, pleats 30a are formed on the basis fabric, producing the pleated fabric 30. The pleats 30a are particularly formed to have the uniformly sized ruffled patterns 35 as the square-shaped ripstops 34 get protruded.

[0048] FIG. 10 is a flowchart illustrating a method for manufacturing another three-dimensional fabric in accordance with the present invention. Herein, said another three-dimensional fabric is produced by interlacing each warp yarn including a nylon66 yarn 41 and a nylon6 yarn 42 (refer to Figs. 11 and 13) alternately over and under each filling yarn including the nylon6 yarn 42 (refer to Figs. 11 and 13). This interlacing of the warping yarns and the filling yarns produces a basis fabric with a ripstop shape.

[0049] Such basis fabric is inserted into a dyeing machine and then dyed as a predetermined concentration of a dye is provided consistently at a predetermined temperature for a predetermined period. In particular, since the warp yarns and the filling yarns constructing the ripstops have different densities, strength levels, dyeing temperatures and shrinkage levels caused by thermal transformation, various three-dimensional patterns appear on both front and back sides of the basis fabric.

[0050] With reference to Figs. 11 to 13, more detailed description of said another three-dimensional fabric will be provided hereafter. Specifically, the illustrated three-dimensional fabric has protruded patterns on both sides.

[0051] As described above, at the fabric dyeing stage, the basis fabric woven with the warp yarns and the filling yarns is inserted into a dyeing machine for polyester called a rapid and then dyed at a temperature ranging from approximately 115 °C to approximately 120 °C for approximately 5 hours. Under this specific dyeing condition, a concentration of a dye is adjusted to present two-toned shadow ripstops 43 on a surface of the basis fabric.

[0052] Shrinkage resulted from thermal transformation of the nylon6 yarn 42 and a low level of shrinkage of the nylon66 41 at high temperature cause square-shaped protrusion patterns 44 with small tucks to be formed on a front side 40 of the basis fabric and uniform dot patterns 45 on a back side 40' of the basis fabric in the direction of the filling yarn and the warp yarn. This both-sided three-dimensional fabric is specifically for use in a rapid dye.

[0053] Thus, the both-sided three-dimensional fabric for use in a rapid dye produced as being inserted into the polyester dyeing machine gives three-dimensionality by being formed with the square-shaped protrusion patterns 44 on the front side 40 and the uniform dot patterns 45 on the back side 40', and luxuriousness and softness of the both-sided three-dimensional fabric are accomplished through special brightness of the two-toned shadow ripstops 43 and shrunk shape.

[0054] FIG. 14 is a flowchart illustrating another embodied method for manufacturing a three-dimensional fabric in accordance with the present invention. Figs. 15 and 16 are diagrams respectively illustrating front and back sides of the three-dimensional fabric manufactured in accordance with the said another embodied method.

[0055] An interlacing of nylon66 and nylon6 yarns 41 and 42 as a warp yarn and the nylon6 yarns 42 as a filling yarn produces a basis fabric, which is subsequently inserted into a dyeing machine for nylon called a jigger and then dyed at a temperature of approximately 100 °C for 7 hours. Also, a concentration of a dye is adjusted to obtain two-toned shadow ripstops 43. Further, shrinkage caused by thermal transformation of the nylon6 yarns 42 and a low level of shrinkage of the nylon66 yarn 41 at high temperature results in formation of uniform square-shaped protrusion patterns 44 on a front side 50 of the basis fabric and sharp dot patterns 45 on a back side 50' of the basis fabric in the direction of the warp yarn and the filling yarn, thereby producing a three-dimensional fabric for use in a jigger dye.

[0056] Hence, the square-shaped protrusion patterns 44 and the sharp dot patterns 45 formed respectively on the front side 50 and the back side 50' of the three-dimensional fabric gives neatness of the produced fabric. Also, brightness of the two-toned shadow ripstops 43 provides an effect on uniformity of the three-dimensional fabric.

[0057] For these reasons, each of the nylon6 yarns 42 shrunk as being sensitive to heat and each of the nylon66 yarns 41 lowly shrunk at high temperature are woven alternately over and under each other producing the woven basis fabric. In the course of dyeing the basis fabric by being inserted into a polyester dyeing machine or a nylon dyeing machine, thermal transformation takes place, causing shrinkage of the basis fabric. That is, during the dyeing process, the nylon6 yarns 42 get shrunk, while the nylon66 yarns 41 get protruded toward a surface of the basis fabric as the nylon66 yarns 41 are thermal-resistant. This protrusion creates the two-toned shadow ripstops 43 and simultaneously the square-shaped protrusion patterns 44 and the dot patterns 45 on the front side 50 and the back side 50' of the three-dimensional fabric, respectively.

[0058] FIG. 17 is a flowchart illustrating a method for manufacturing a two-toned color fabric in accordance with the present invention. FIG. 18 is a diagram illustrating a tow-toned color fabric using the method described in FIG. 17. As for the two-toned color fabric denoted with a reference numeral 60, a basis fabric is first woven by using both of nylon66 yarns 61 and nylon6 yarns as a warp yarn and as a filling yarn. Then, the basis fabric is inserted into a nylon dyeing machine called a jigger, and a dyeing process is carried out at a temperature of approximately 100 °C for approximately 7 hours. At this time, a dye has a low concentration. Especially, the nylon66 yarn 61 and the nylon6 yarn 62 creating a ripstop shape have a different degree of dye absorption, and this dye absorption difference specifically produces two-toned color ripstops 63.

[0059] In other words, the two-toned color fabric 60 is produced based on a dyeing time difference between the nylon66 yarn 61 and the nylon6 yarn 62 and a dye concentration difference. The nylon6 yarn 62 of which dyeing time is short is dyed in a dark color, whereas the nylon66 yarn 61 of which dyeing time is long is dyed in a bright color. This temporal dyeing visually gives a two-tone effect.

[0060] FIG. 19 is a flowchart illustrating a method for manufacturing a plain fabric in accordance with the present invention. FIG. 20 is a diagram illustrating a plain fabric manufactured in accordance with the method described in FIG. 19. The plain fabric is denoted with a reference numeral 70. A basis fabric of the plain fabric 70 is produced by weaving yarns of nylon66 61 and nylon6 as a warp yarn and as a filling yarn and then, the basis fabric is placed into a nylon dyeing machine, i.e., the jigger. A dyeing process is carried out at a temperature of approximately 100 °C for approximately 7 hours with use of a high concentrated dye. Through this dyeing process, a number of plain ripstops 71 are formed on the woven basis fabric.

[0061] That is, the plain fabric 70 is produced based on a dyeing time difference between the nylon66 yarn 61 and the nylon6 yarn 62 and a dye concentration difference. The use of the highly concentrated dye makes the nylon66 yarns 61 and the nylon6 yarns 62 absorb the same amount of the dye, thereby forming the plain ripstops 71 with a delicate color and consistency. These effects on the plain ripstops 71 give softness of the plain fabric 70.

[0062] FIG. 21 is a flowchart illustrating a method for manufacturing a dotted fabric in accordance with the present invention. FIG. 22 is a diagram illustrating a dotted fabric manufactured using the method described in FIG. 21 in accordance with the present invention. Herein, the dotted fabric is denoted with a reference numeral 80. A basis fabric of the dotted fabric 80 is produced by weaving yarns of nylon66 61 and nylon6 as a warp yarn and as a filling yarn. Then, the basis fabric is inserted into a dyeing machine for polyester, i.e., the rapid, and then subjected to a dyeing process at a temperature of approximately 115 °C to approximately 120 °C for approximately 5 hours. Because of difference densities, material characteristics and thermal transformation temperatures between the nylon66 yarn 61 and the nylon6 yarn 62, a number of dots 80a are formed on respective crossing points of these nylon66 and nylon6 yarns 61 and 62 and simultaneously, square-shaped ripstops get protruded producing a number of protrusion ripstops 81.

[0063] That is, the dotted fabric 80 is manufactured based on the density and thermal transformation temperature difference between the nylon66 yarn 61 and the nylon6 yarn 62. Thus, typically shaped ripstops by these nylon66 and nylon6 yarns 61 and 62 are intentionally protruded during the dyeing process to form the protrusion ripstops 81. Also, the plurality of dots 80a are formed at outer crossing points of the protrusion ripstops 81, giving three-dimensionality of the basis fabric.

[0064] The formation of the three-dimensional fabric with various patterns is grounded on the fact that each yarn has a different density, material characteristic and thermal transformation temperature. In more detail, nylon6 (N6/210D = 210D/34F) has a range of strength from approximately 4.5 g/d to approximately 5.0 g/d, a thermal transformation temperature of approximately 150 °C to approximately 160 °C under a test method ASTM, D-648 °C and 4.6 kgf/cm^2 and a melting point of approximately 215 °C to approximately 220 °C under the test method ASTM, DSC °C. Also, nylon66 (N280D/68F) has a range of strength from approximately 8.5 to 9.0 g/d, a thermal transformation temperature of approximately 230 °C to approximately 240 °C under the test method ASTM, D-648 °C and 4.6 kgf/cm^2 and a melting point of approximately 250 °C to approximately 260 °C under the test method ASTM, DSC °C.

[0065] Furthermore, super high tenacity yarn (N210D/24F) has a range of strength ranging from approximately 7.0 g/d to approximately 7.2 g/d, a thermal transformation temperature of approximately 170 °C to approximately 180 °C under the test method ASTM, D-648 °C and 4.6 kgf/cm^2 and a melting point of approximately 215 °C to approximately 220 °C under the test method ASTM, DSC °C.

[0066] Accordingly, since the three-dimensional fabric with various patterns are manufactured by using the nylon6 yarn, nylon66 yarn and super high tenacity yarn each with a different density, strength and thermal transformation temperature as warp and filling yarns, various types of ripstops are formed through transformation of these yarns depending on a dyeing time, a dyeing temperature and a dyeing condition. These various types of ripstops make it possible to manufacture numerous types of three-dimensional fabrics with different patterns and colors.

[0067] Based on a different density and thermal transformation temperature of each employed yarn, various patterns are naturally formed on a basis fabric during a dyeing process even without an additional mechanical process. This advanced manufacturing process provides quality-improved three-dimensional fabrics. Also, this simplified manufacturing process further provides an effect on easier workability and productivity of manufacturing the three-dimensional fabrics. Furthermore, under these effects, it is possible to reduce manufacturing costs, thereby providing high value-added three-dimensional fabrics with special patterns.

[0068] It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention. Thus, it is intended that the present invention covers the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

Claims

1. A method for manufacturing a three-dimensional fabric, comprising the steps of:

   selecting at least more than one yarn among nylon6, which is a typical type of nylon, nylon66, which is reinforced nylon, and a super high tenacity yarn to be used as a warp yarn and a filling yarn;
   weaving the selected warp and filling yarns to produce a basis fabric on which a plurality of ripstops are formed;
   inserting the woven basis fabric into a dyeing machine and dyeing the basis fabric by providing a predetermined concentration of a dye at a predetermined temperature for a predetermined period, so that a special pattern and a color are presented on the basis fabric because of a dif-

ference in density, material characteristic and thermal transformation temperature between the warp yarn and the filling yarn; and
drying the dyed basis fabric for a predetermined period at room temperature to make the ripstops, the pattern and the color clear without being deformed.

2. The method of claim 1, wherein the weaving of the nylon66 as a warp yarn and the super high tenacity yarn as a filling yarn results in formation of natural pleats on a surface of the basis fabric during the dyeing because of a stretchability difference between the nylon66 and the super high tenacity yarn and a density difference between the ripstops.

3. The method of claim 1, wherein the weaving of the nylon66 and the nylon6 as a warp yarn and the super high tenacity yarn and the nylon6 as a filling yarn results in formation of natural diamond-shaped pleats on a surface of the basis fabric during the dyeing because of a stretchability difference between the nylon66, the super high tenacity yarn and the nylon6 and a density difference between the ripstops.

4. The method of claim 1, wherein during the dyeing of the nylon66, the nylon6 and the super high tenacity yarn, a natural two-toned color with different brightness is presented on a surface of the basis fabric because of a dyeing time difference between the nylon66, the nylon6 and the super high tenacity yarn.

5. The method of claim 1, wherein for the dyeing of the woven basis fabric, the woven basis fabric is inserted into a polyester dyeing machine and dyed at a temperature ranging from approximately 115 °C to approximately 120 °C for approximately 5 hours, and during the dyeing, the ripstops get protruded because of a difference in density, material characteristic and thermal transformation temperature between the warp yarn and the filling yarn constructing the individual ripstop, thereby producing uniformly sized ruffle patterns on a surface of the basis fabric.

6. The method of claim 1, wherein the weaving of the nylon66 and the nylon6 as a warp yarn and the nylon6 as a filling yarn results in formation of various three-dimensional patterns on front and back sides of the basis fabric because of a different density, strength, dyeing temperature, thermal transformation temperature and shrinkage level caused by thermal transformation between the nylon66 and the nylon6 during the dyeing of the basis fabric.

7. The method of claim 6, wherein the basis fabric is inserted into a polyester dyeing machine and dyed at a temperature ranging from approximately 115 °C to approximately 120 °C with adjusting a concentration of a dye, whereby a two-toned shadow ripstops obtained as different brightness is created on the ripstops of the basis fabric are formed on a surface of the basis fabric.

8. The method of claim 7, wherein shrinkage caused by thermal transformation of the nylon6 and a low level of shrinkage of the nylon66 at high temperature cause formation of squared-shaped protrusion patterns with small tucks on the front side of the basis fabric and uniform dot patterns on the back side of the basis fabric in the direction of the warp yarn and the filling yarn.

9. The method of claim 6, wherein the basis fabric is inserted into a nylon dyeing machine and dyed at a temperature of approximately 100 °C with adjusting a concentration of a dye, whereby a two-toned shadow ripstops obtained as different brightness is created on the ripstops of the basis fabric are formed on a surface of the basis fabric.

10. The method of claim 9, wherein shrinkage caused by thermal transformation of the nylon6 and a low level of shrinkage of the nylon66 at high temperature cause formation of uniform squared-shaped protrusion patterns on the front side of the basis fabric and protruded dot patterns on the back side of the basis fabric in the direction of the warp yarn and the filling yarn.

11. The method of claim 1, wherein the weaving of the nylon66 and the nylon6 as a warp yarn and as a filling yarn results in formation of a special three-dimensional pattern on the basis fabric because of a different density, strength, dyeing temperature, thermal transformation temperature and shrinkage level caused by thermal transformation between the nylon66 and the nylon6 during the dyeing of the basis fabric.

12. The method of claim 11, wherein the basis fabric is inserted into a nylon dyeing machine and dyed at a temperature of approximately 100 °C for approximately 7 hours with use of a lowly concentrated dye, whereby two-toned color ripstops are formed on the basis fabric because of a difference in dye absorption between the nylon 66 and the nylon6.

13. The method of claim 11, wherein the basis fabric is inserted into a nylon dyeing machine and dyed at a temperature of approximately 100 °C for approximately 7 hours with use of a highly concentrated dye, whereby uniform plain ripstops are formed on the basis fabric.

14. The method of claim 11, wherein the basis fabric is inserted into a polyester dyeing machine and dyed at a temperature ranging from approximately 115 °C to approximately 120 °C for approximately 5 hours, whereby protrusion ripstops are formed on the basis fabric as a number of dots are formed individually at crossing points of the warp yarns and the filling yarns.

15. A three-dimensional fabric, comprising:

a warp yarn including at least more than one yarn selected among nylon6, which is a typical type of nylon, nylon66, which is reinforced nylon, and a super high tenacity yarn;
a filling yarn including at least more than one yarn selected among nylon6, nylon66 and a super high tenacity yarn; and
a basis fabric being woven with the warp yarn and the filling yarn, including a plurality of ripstops formed on a surface of the basis fabric and being dyed as the woven basis fabric is inserted into a dyeing machine and dyed at a predetermined temperature for a predetermined period with using a predetermined concentration of a dye, whereby a special pattern and color are presented on the surface of the basis fabric because of a different density, material characteristic and thermal transformation temperature between the warp yarn and the filling yarn constructing the ripstops.

16. The three-dimensional fabric of claim 15, wherein the weaving of the nylon66 as a warp yarn and the super high tenacity yarn as a filling yarn results in formation of natural pleats on a surface of the basis fabric during the dyeing because of a stretchability difference between the warp yarn and the filling yarn and a density difference between the ripstops.

17. The three-dimensional fabric of claim 15, wherein the weaving of the nylon66 and the nylon6 as a warp yarn and the super high tenacity yarn and the nylon6 as a filling yarn results in formation of natural diamond-shaped pleats on a surface of the basis fabric during the dyeing because of a stretchability difference between the warp yarn and the filling yarn and a density difference between the ripstops.

18. The three-dimensional fabric of claim 15, wherein during the dyeing of the warp yarn and the filling yarn, a natural two-toned color with different brightness is presented on a surface of the basis fabric because of a dyeing time difference between the warp yarn and the filling yarn.

19. The three-dimensional fabric of claim 15, wherein the basis fabric is inserted into a polyester dyeing machine and dyed, whereby the ripstops get protruded because of a difference in density, material characteristic and thermal transformation temperature between the warp yarn and the filling yarn constructing the individual ripstop, thereby producing uniformly sized ruffle patterns on a surface of the basis fabric.

20. The three-dimensional fabric of claim 15, wherein the weaving of the nylon66 and the nylon6 as a warp yarn and the nylon6 as a filling yarn results in formation of various three-dimensional patterns on front and back sides of the basis fabric because of a different density, strength, dyeing temperature, thermal transformation temperature and shrinkage level caused by thermal transformation between the nylon66 and the nylon6 during the dyeing of the basis fabric.

21. The three-dimensional fabric of claim 20, wherein the basis fabric is inserted into a polyester dyeing machine and dyed, whereby a two-toned shadow ripstops obtained as different brightness is created on the ripstops of the basis fabric are formed on a surface of the basis fabric.

22. The three-dimensional fabric of claim 21, wherein shrinkage of the nylon6 and a low level of shrinkage of the nylon66 cause formation of squared-shaped protrusion patterns with small tucks on the front side of the basis fabric and uniform dot patterns on the back side of the basis fabric in the direction of the warp yarn and the filling yarn.

23. The three-dimensional fabric of claim 20, wherein the basis fabric is inserted into a nylon dyeing machine and dyed, whereby a two-toned shadow ripstops obtained as different brightness is created on the ripstops of the basis fabric are formed on a surface of the basis fabric.

24. The three-dimensional fabric of claim 23, wherein shrinkage of the nylon6 and a low level of shrinkage of the nylon66 cause formation of uniform squared-shaped protrusion patterns on the front side of the basis fabric and protruded dot patterns on the back side of the basis fabric in the direction of the warp yarn and the filling yarn.

25. The three-dimensional fabric of claim 15, wherein the weaving of the nylon66 and the nylon6 as a warp yarn and as a filling yarn results in formation of a special pattern on the basis fabric because of a different density, strength, dyeing temperature, thermal transformation temperature and shrinkage level caused by thermal transformation between the nylon66 and the nylon6 during the dyeing of the basis fabric.

26. The three-dimensional fabric of claim 25, wherein the basis fabric is inserted into a nylon dyeing machine and dyed with use of a lowly concentrated dye, whereby two-toned color ripstops are formed on the basis fabric because of a difference in dye absorption between the nylon 66 and the nylon6.

27. The three-dimensional fabric of claim 25, wherein the basis fabric is inserted into a nylon dyeing machine and dyed with use of a highly concentrated dye, whereby uniform plain ripstops are formed on the basis fabric.

28. The three-dimensional fabric of claim 25, wherein the basis fabric is inserted into a polyester dyeing machine and dyed, whereby protrusion ripstops are formed on the basis fabric as a number of dots are formed individually at crossing points of the warp yarns and the filling yarns.

Fig. 1

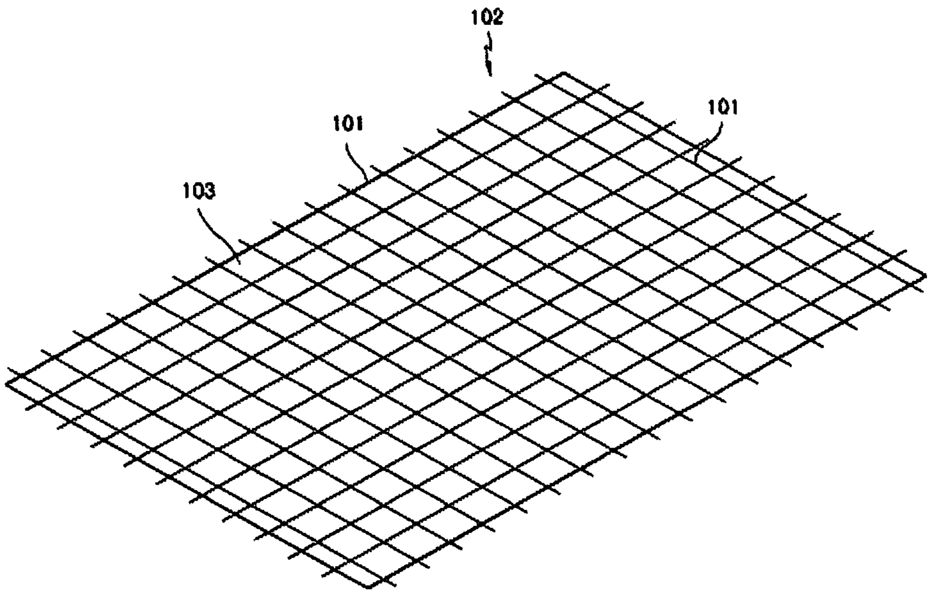

Fig. 2

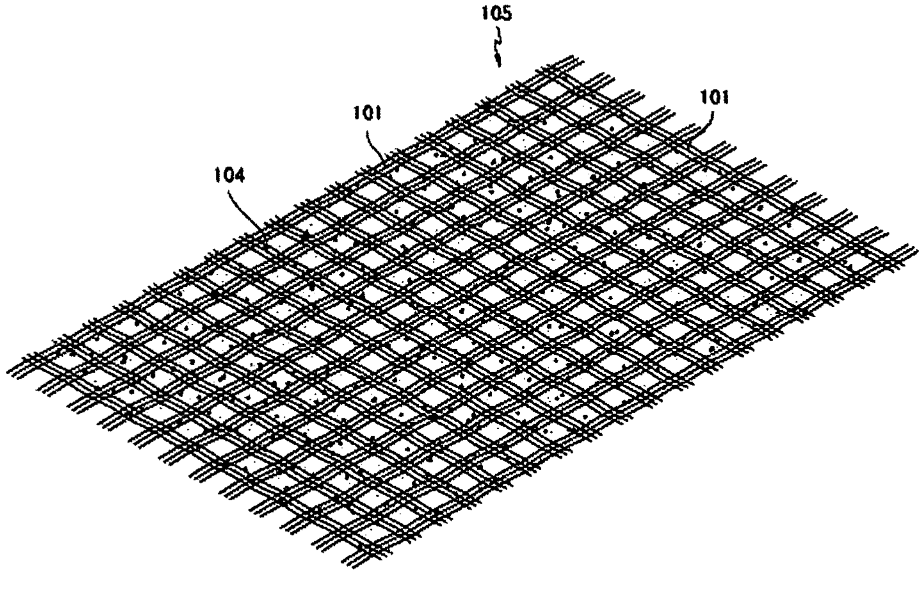

Fig. 3

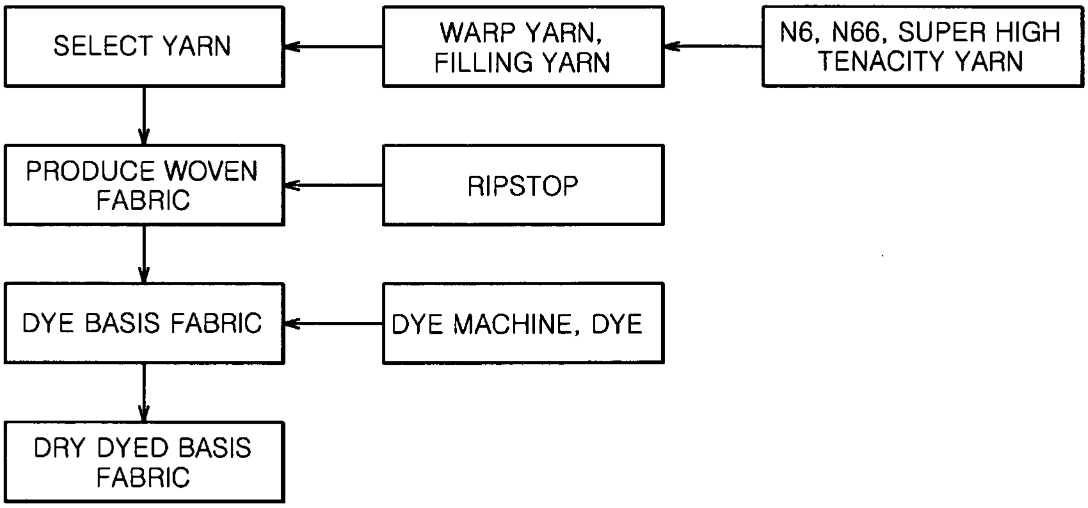
SELECT YARN
WARP YARN, FILLING YARN
N6, N66, SUPER HIGH TENACITY YARN
PRODUCE WOVEN FABRIC
RIPSTOP
DYE BASIS FABRIC
DYE MACHINE, DYE
DRY DYED BASIS FABRIC

Fig. 4

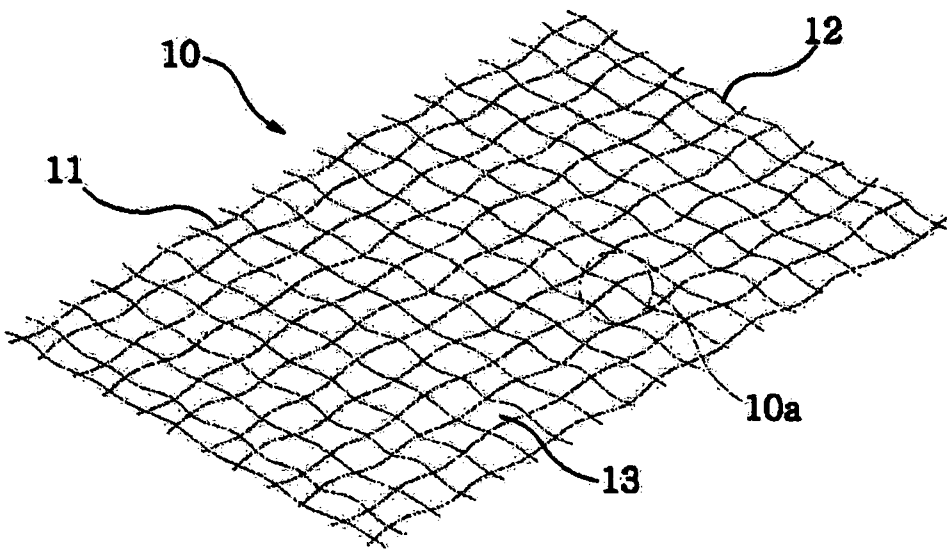
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Fig. 5

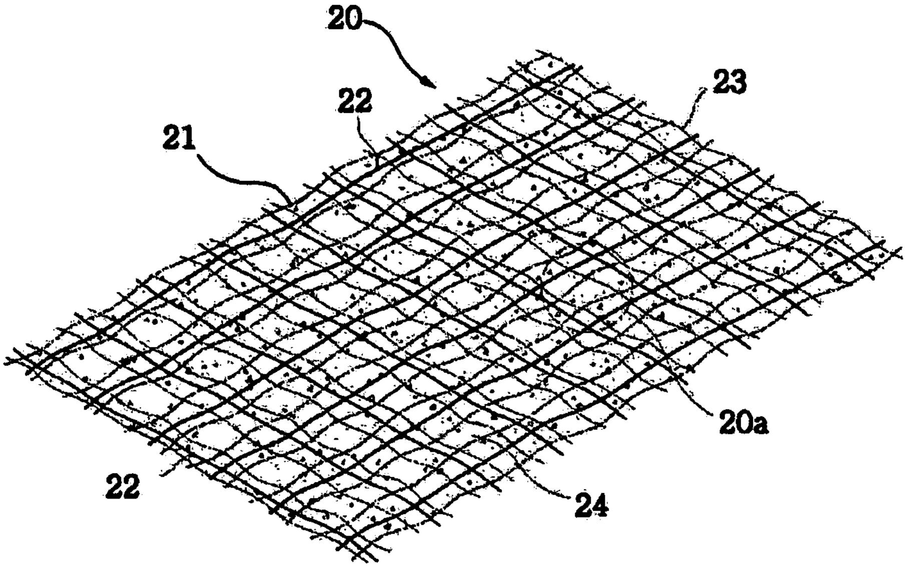

Fig. 6

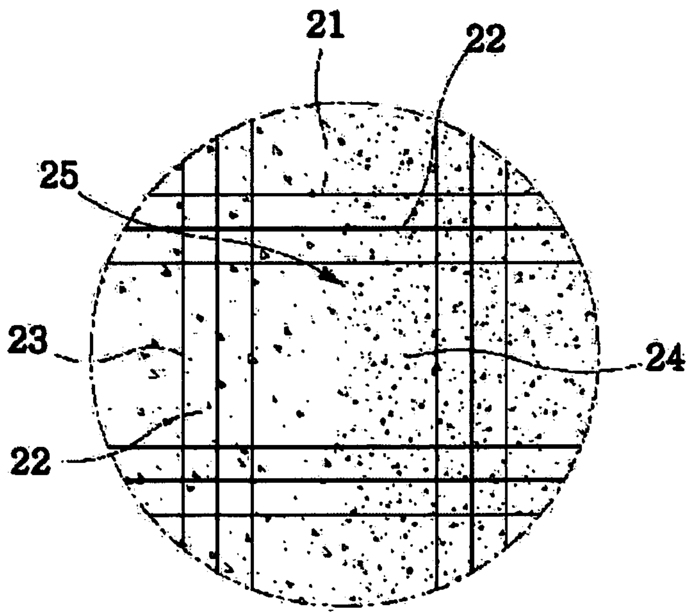

Fig. 7

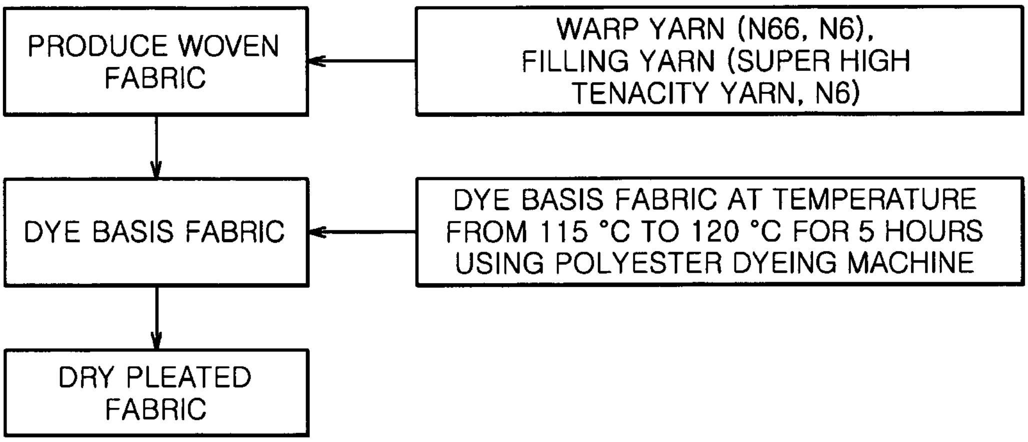
PRODUCE WOVEN FABRIC
WARP YARN (N66, N6), FILLING YARN (SUPER HIGH TENACITY YARN, N6)
DYE BASIS FABRIC
DYE BASIS FABRIC AT TEMPERATURE FROM 115 °C TO 120 °C FOR 5 HOURS USING POLYESTER DYEING MACHINE
DRY PLEATED FABRIC

Fig. 8

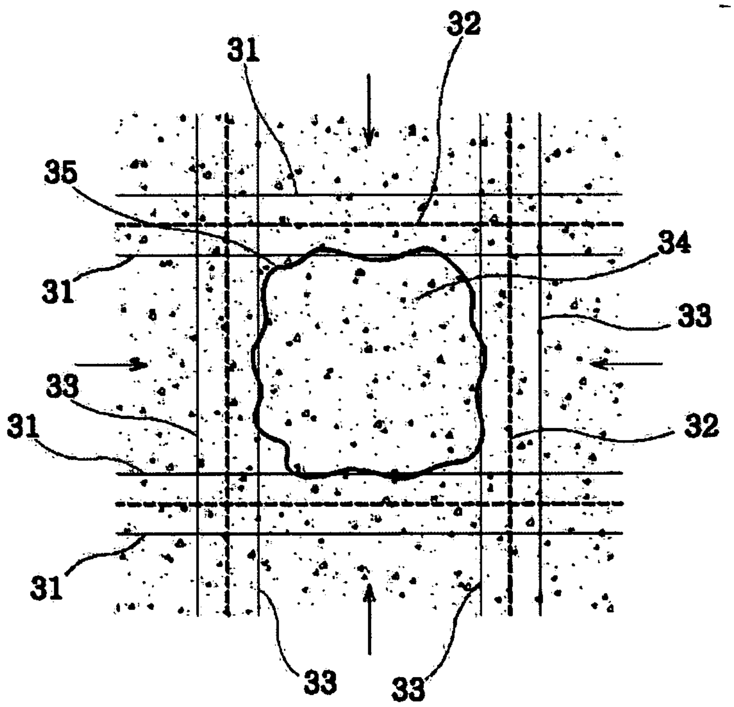
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Fig. 9

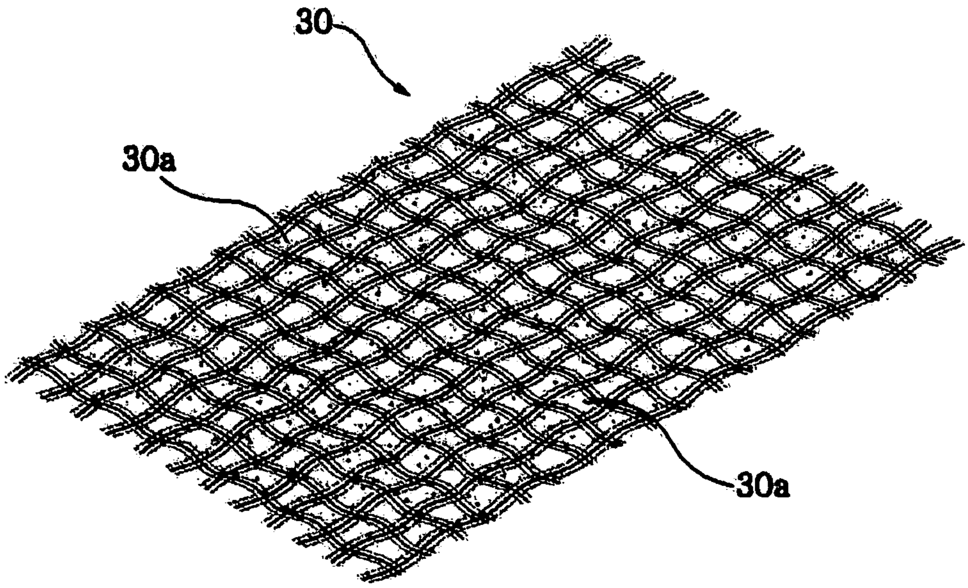
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Fig. 10

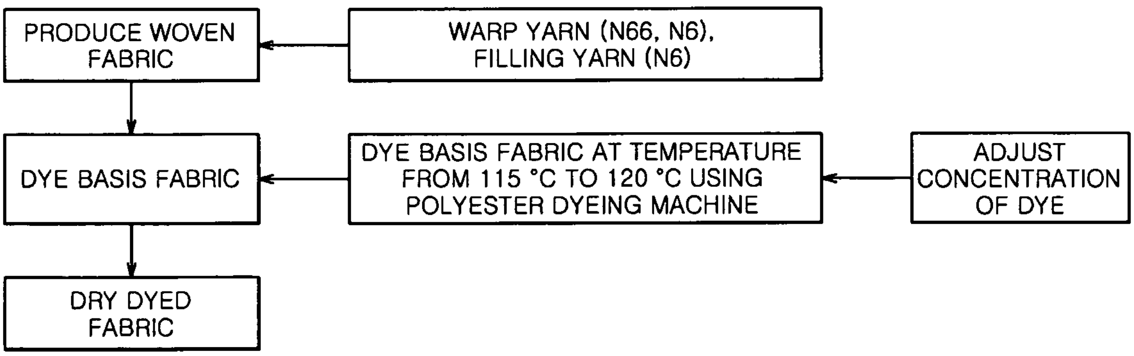
PRODUCE WOVEN FABRIC
WARP YARN (N66, N6), FILLING YARN (N6)
DYE BASIS FABRIC
DYE BASIS FABRIC AT TEMPERATURE FROM 115 °C TO 120 °C USING POLYESTER DYEING MACHINE
ADJUST CONCENTRATION OF DYE
DRY DYED FABRIC

Fig. 11

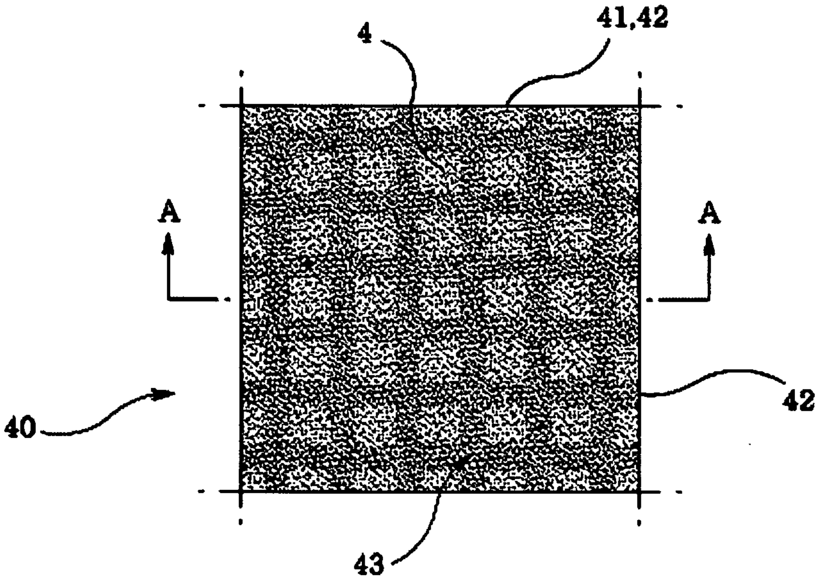

Fig. 12

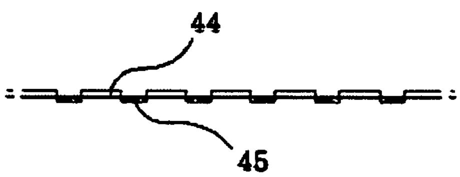

Fig. 13

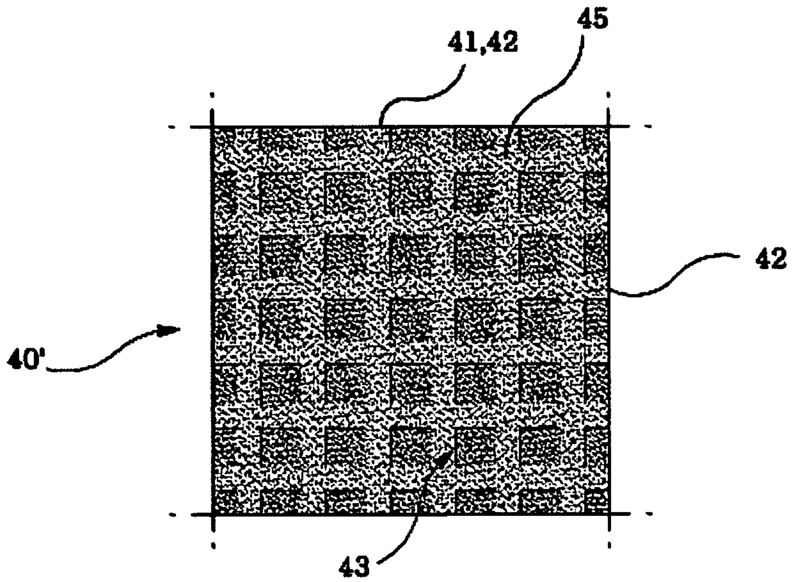
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Fig. 14

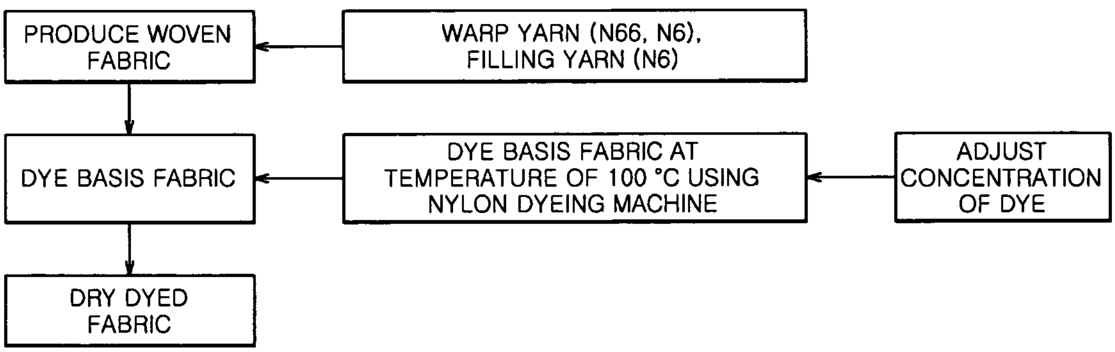
PRODUCE WOVEN FABRIC
WARP YARN (N66, N6), FILLING YARN (N6)
DYE BASIS FABRIC
DYE BASIS FABRIC AT TEMPERATURE OF 100 °C USING NYLON DYEING MACHINE
ADJUST CONCENTRATION OF DYE
DRY DYED FABRIC

Fig. 15

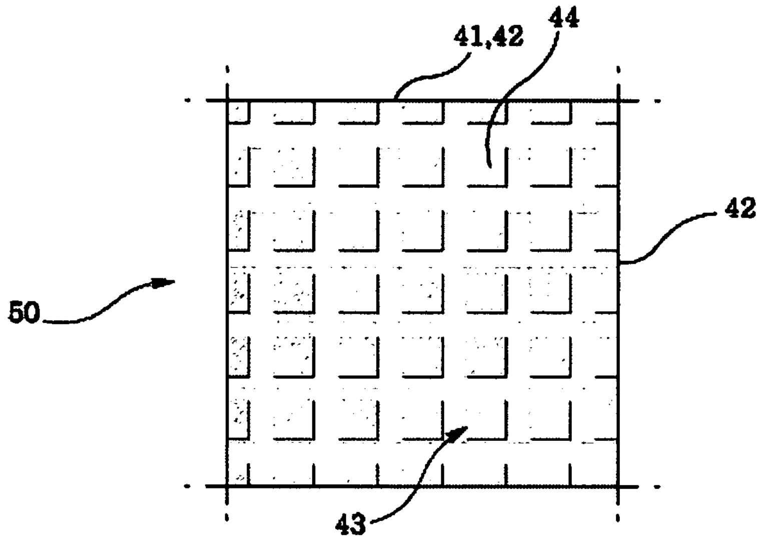

Fig. 16

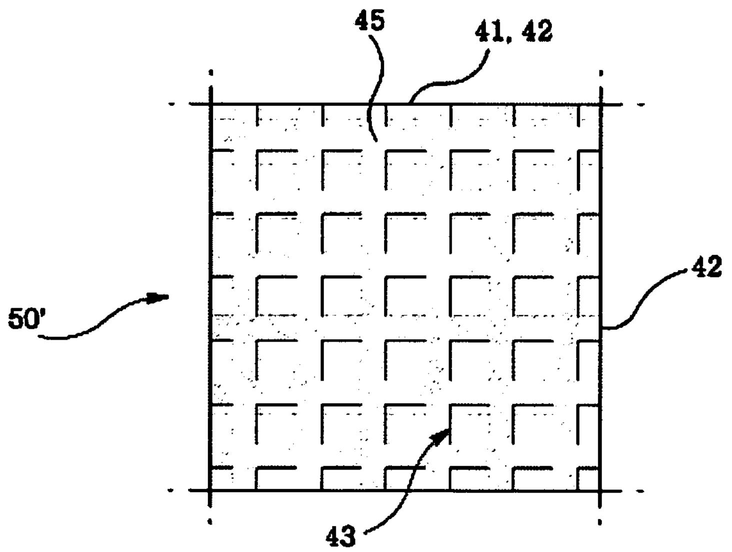

Fig. 17

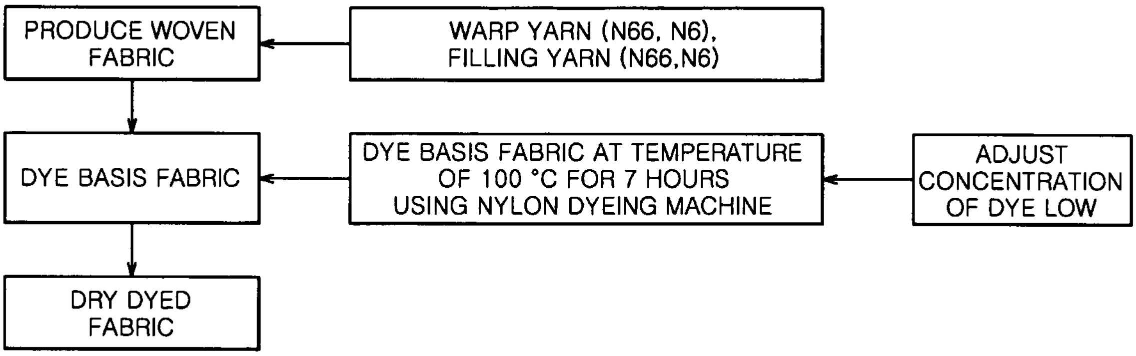
PRODUCE WOVEN FABRIC
WARP YARN (N66, N6), FILLING YARN (N66,N6)
DYE BASIS FABRIC
DYE BASIS FABRIC AT TEMPERATURE OF 100 °C FOR 7 HOURS USING NYLON DYEING MACHINE
ADJUST CONCENTRATION OF DYE LOW
DRY DYED FABRIC

Fig. 18

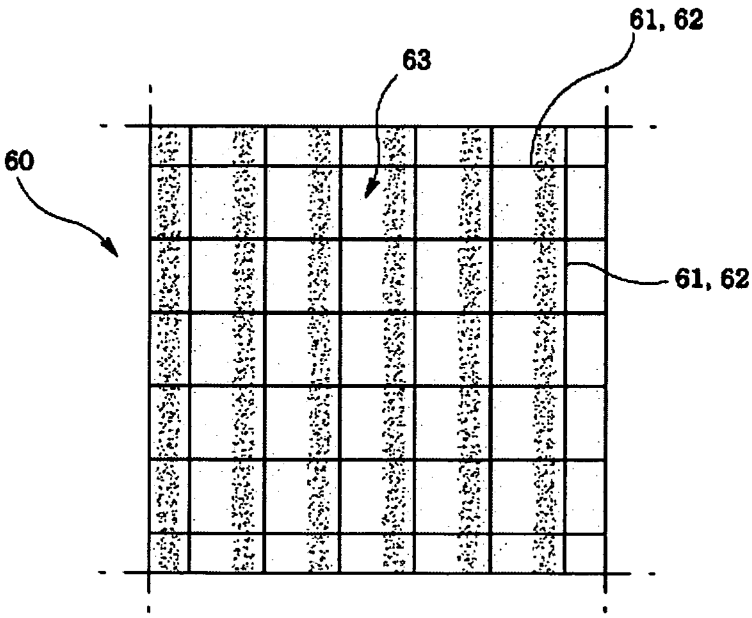
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Fig. 19

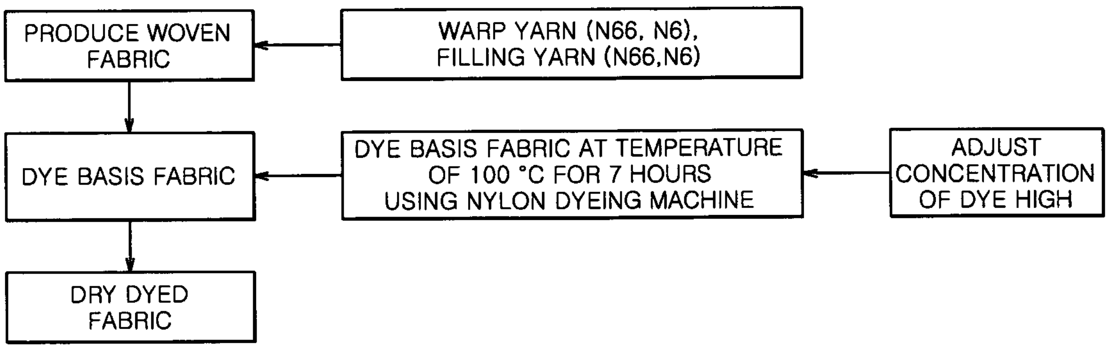
PRODUCE WOVEN FABRIC
WARP YARN (N66, N6), FILLING YARN (N66,N6)
DYE BASIS FABRIC
DYE BASIS FABRIC AT TEMPERATURE OF 100 °C FOR 7 HOURS USING NYLON DYEING MACHINE
ADJUST CONCENTRATION OF DYE HIGH
DRY DYED FABRIC

Fig. 20

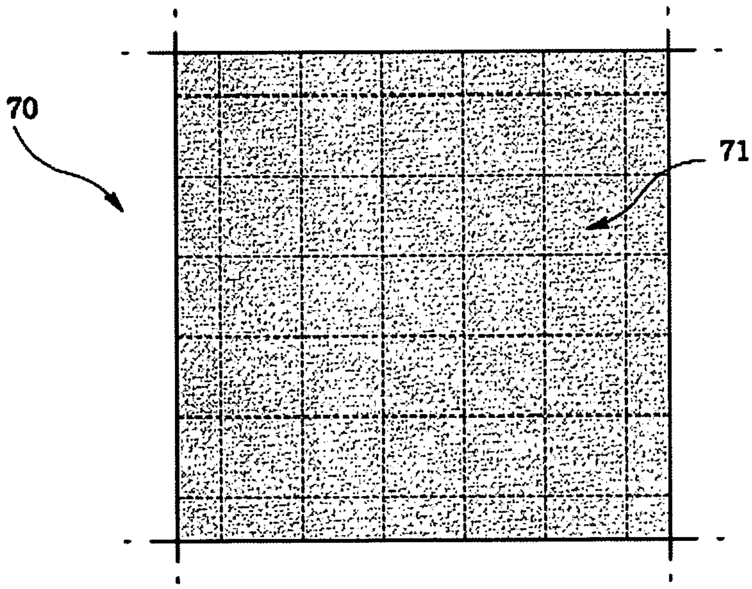
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Fig. 21

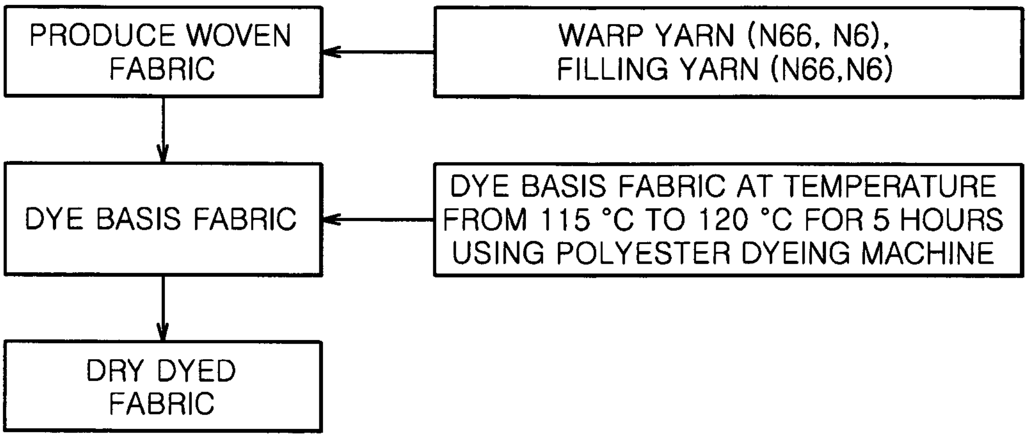
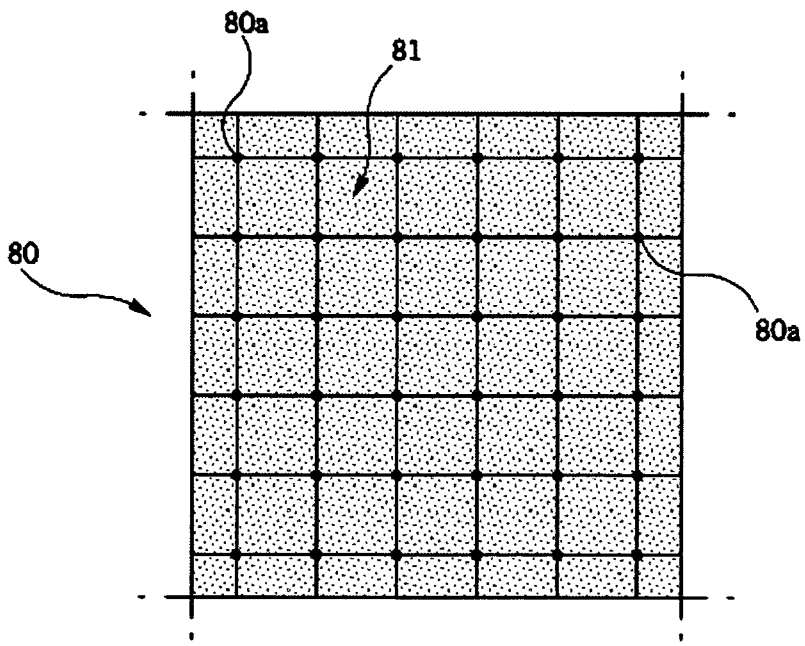

PRODUCE WOVEN FABRIC
WARP YARN (N66, N6), FILLING YARN (N66,N6)
DYE BASIS FABRIC
DYE BASIS FABRIC AT TEMPERATURE FROM 115 °C TO 120 °C FOR 5 HOURS USING POLYESTER DYEING MACHINE
DRY DYED FABRIC

Fig. 22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European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 05 00 8135

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	GB 925 129 A (ALLIED CHEMICAL CORPORATION) 1 May 1963 (1963-05-01) * page 1, lines 11-86 * * page 2, lines 43-52 *	1-28	
A	GB 765 882 A (BRITISH NYLON SPINNERS LIMITED) 16 January 1957 (1957-01-16) * page 2, lines 43-84 *	1-28	
A	GB 643 386 A (CHRISTIAN BENER) 20 September 1950 (1950-09-20) * page 1, lines 60-69 * * page 2, lines 28-47; claims 1,3 *	1-28	
A	GB 1 064 827 A (IMPERIAL CHEMICAL INDUSTRIES LIMITED) 12 April 1967 (1967-04-12) * page 2, lines 17-59 * * page 3, lines 54-58 *	1-28	TECHNICAL FIELDS SEARCHED (IPC)
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A	FR 2 840 625 A (SOFILETA) 12 December 2003 (2003-12-12) * page 2, lines 10-31; figure 1 *	1-28	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	14 December 2005	Bichi, M

CATEGORY OF CITED DOCUMENTS

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EPO FORM 1503 03.82 (P04C01)

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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