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London WC2B 6HP (GB)(54) **INK RIBBON BASE FABRIC AND PRODUCTION METHOD THEREOF.**

(57) This invention relates to a base fabric for an ink ribbon for an impact type printer such as a serial dot printer and an inline printer and a method of manufacture thereof.

To be more specific, the base fabric for an ink ribbon is made of polyamide multifilament, and the fabric is characterized in that it has wrinkles of class 3 or more defined by the level according to JIS L1096. In addition, the method of making the base fabric for an ink ribbon is characterized in that, in a method of manufacturing it by scouring, drying and heat setting a base fabric made of polyamide multifilament, said scouring is a jet flow scouring and said heat setting is carried out under such tension that wrinkles of class 3 or more be left.

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Technical Field

This invention relates to a base fabric for an ink ribbon for use in impact-type printers such as serial dot printers and line printers, and a method for its manufacture.

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Back Ground Art

Referring to ink ribbons for use in impact-type printers, recently, the use of conventional spool-type ink ribbons has decreased, and the use of cassette-type ink ribbons in which a long tape type ink ribbon is folded and housed in a cassette and melt-bonded (adhered) by an ultrasonic welder at both ends to produce an endless ribbon, has increased.

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This ink ribbon for a cassette has the drawback of generating uneven printing called graphic spots in which dark spots are generated at the folded portions of the ink ribbon.

In particular, in recently developed dot printers such as those with 24 pins and 48 pins, this uneven printing is a serious problem and an improvement of the ribbon in terms of the level of graphic spots has been strongly desired.

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As methods of improving the fabric in terms of the level of graphic spots, JP-A-3-34883 and JP-A-3-73378 propose method of producing weave constructions respectively, of a fancy plain weave and of weave constructions other than a plain weave including twill and satin.

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However, regardless of these proposals, the occurrence of graphic spots varies according to the viscosity and the amount of ink, the density of the ink ribbon in the cassette, and the improvement required has not yet been achieved, still leaving a serious problem.

Disclosure of Invention

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This invention proposes a method of manufacturing an ink ribbon which has especially excellent properties such as good ink absorbability and freedom from graphic spots.

This invention adopts the following method for achieving these purposes.

That is, the base fabric of this invention for ink ribbon is made of polyamide multifilament, and characterized in that said base fabric has wrinkles of class 3 or more defined by the level determined according to the method of JIS L 1096. In addition, this fabric can be manufactured by a method of manufacturing a base fabric for an ink ribbon comprising scouring, drying and heat setting a base fabric made of a polyamide multifilament, in which method said scouring is a jet flow scouring and said heat setting is carried out under such tension that wrinkles of class 3 or more are left.

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This invention was achieved as a result of intensive study for obtaining a base fabric which does not cause graphic spots, and it was found that certain kinds of wrinkle function particularly effectively, and further, that such kinds of wrinkle are formed by jet flow scouring, and this wrinkle has a close relationship with the improvement of the fabric in terms of the level of graphic spots.

That is, the inventors realized that wrinkles, which traditionally have not been desired, have a particularly important function concerning the level of graphic spots, and after intensive investigation, found that a base fabric which has wrinkles of class 3 or more defined substantially by the determination of wrinkle level based on JIS L1096 (6.23) shows great improvement. As to the wrinkle level, although the level higher than class 3, namely class 2 or 1, shows better results for reducing graphic spots, fabrics having more wrinkles are inferior in their appearance, and it is preferable to use a base fabric having a wrinkle level of class 3 to class 2.

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This fabric which has such a specified level of wrinkles, can be manufactured by crumpling. The crumpling can be achieved by a mechanical crumpling, wrinkle-forming process, or by a fluid (preferably with air or water). However, in an industrial process, it is achieved economically by carrying out it simultaneously with jet flow scouring. Jet flow scouring of a base fabric for an ink ribbon is disclosed in JP-A-59-127789 and JP-A-61-104882, however, these documents do not teach anything about a method of and conditions for improving the fabric in terms of the level of graphic spots.

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Hereunder, this invention is described with reference to jet flow scouring as an example. However, such reference to a first aspect of this invention, it is not limited to the product of a process carried out according to the following description.

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The above described jet flow scouring is carried out under relaxed conditions such as by means of a jet flow dyeing machine or washer. In these scouring methods, preferably, by scouring with hot water at above 60°C and under 135°C, and lowering the temperature at a rate of 10°C/min or less, the above described specified wrinkles can be formed, and in addition, by this wrinkling, a base fabric for an ink ribbon with

excellent performance which does not show graphic spots can be supplied. A specific character of these wrinkles is that they include wrinkles oriented in the lengthwise direction.

The base fabric for an ink ribbon manufactured by the above described scouring method is not only free from graphic spots, owing to the large shrinkage which occurs during the scouring-drying step and the increased void ratio in the base fabric, but also has good affinity to ink and excellent ink absorbability, and further, the surface of the base fabric becomes dense, and it is possible to supply a base fabric which has a hot-melt bonding portion with good durability.

To improve the ribbon in terms of the level of graphic spots, it is preferably to carry out scouring at 60-135°C, more preferably 80-125°C. At a temperature lower than 60°C, freedom from graphic spots is difficult to attain, and at a temperature higher than 135°C, the polyamide fiber deteriorates and its durability is apt to be lowered. On the other hand, it is preferable that the time for jet flow scouring is 2 minutes or more, in view of the effectiveness of improving the ribbon in terms of the level of graphic spots. Additionally, it is preferable that the rate at which the temperature is lowered is 10°C/min or less, more preferably 5°C/min or less, particularly, 2°C/min or less. A rate of more than 10°C/min is not preferable since this leaves wrinkles which render the ribbon poor in practical use. When lowering the temperature at a rate of 10°C/min or less, although weak wrinkles are left, they cause substantially no trouble in practical use. This is one of the characteristic features of the appearance of the base fabric of this invention for an ink ribbon.

It is preferable to carry out drying after the jet flow scouring process at 100°C or more and under no tension. It is preferable that the tension is as low as possible because the bulkiness of the fabric is lowered by the tension. The fabric is heat set with a pin tenter after drying. However, care should be taken because the level of the wrinkles becomes low, the bulkiness is lowered, and the level of graphic spots becomes worse, if the tension is too high. In any event, it is important for solving the problem of graphic spot generation to heat set under such tension that the level of graphic spots is class 3 or higher.

In a case where this invention is applied, although the amount of shrinkage is large, it is easy to design the woven density of the product, taking into account this shrinkage in advance, by weaving at a slightly lower woven density.

As the polyamides stated for use in this invention, polyamides such as Nylon 66, Nylon 6 and Nylon 46 can be used. Among them, Nylon 66 having a viscosity in sulfuric acid of more than 2.8 is particularly preferred in view of the durability of the base fabric for an ink ribbon.

In the fabric for the base fabric for an ink ribbon the above fibers constitute the warp and weft. The monofilament denier of this synthetic filament yarn is preferably 0.4~4 denier, more preferably 0.8~3 denier.

This yarn is preferably a multifilament yarn having a total denier of 5~100, more preferably of 5~70 denier, because well-balanced products, as between the thickness of the base fabric and the ink absorbability, can be manufactured. As to the woven density of these base fabrics, although a warp density of 150~400 yarn/inch and a weft density of 100~250 yarn/inch is preferably adopted, this invention is not limited to these densities. It is preferable that the filament yarn has a low twist lower than 400T/m.

As to the weave construction of the base fabric, a plain construction, satin construction, twill construction, and variations of these constructions can be used, but this invention is not limited to these constructions.

The base fabric for an ink ribbon obtained by the jet flow scouring under the conditions specified for this invention is excellent in ink absorbability and very good having regard to the graphic spot level because the monofilament in the yarn is unfastened, compared to that obtained by ordinary scouring, and it is suitable and advantageous for use in a serial dot printer and line printer with 24 pins and 48 pins which is widely used recently.

The base fabric obtained as described above is made into an ink ribbon by appropriately adding conventional oil based ink, namely, an oil based ink which contains 3 wt% or more pigment and 8 wt% or more dye and has a viscosity of 650 cps (20°C) or more.

In addition to the above, these base fabrics for an ink ribbon may be further processed according to circumstance, such as high pressure fluid treatment, plasma treatment, surface active agent treatment and resin treatment.

Best Mode for Carrying Out the Invention

Although this invention is described in detail below, the understanding of this invention is not limited by these examples.

(1) The graphic spots were evaluated according to the following method.

An ink ribbon (10m length) made as described above was housed in a cassette for a 9 pin dot printer (M-1550 sold by Tokyo Denki), and the cassette was installed in the above printer, and a "solid" (continuous) print was applied such that there were no apparent spaces between the dots. The strength of the graphic spots was evaluated with the naked eye.

The standard of evaluation was as follows.

- ○ : no graphic spot is observed
- : almost no graphic spot is observed
- △ : weak graphic spots are observed
- X : dark graphic spots are observed
- X X : very dark graphic spots are observed

(2) On the other hand, the "wrinkles" in the examples were evaluated by the following method.

They were assessed according to the wrinkle evaluation after washing test (6.23) of the Test Method of General Textiles defined in JIS L1096. That is, in the test method, samples were evaluated as they were without washing. However, in the determination standard of the test method, in class 1, the samples which had an appearance which were the same as that of level 1 of the replica of DP-1 were classified as level 1, and other samples with worse appearances were classified in a class lower than class 1.

Examples 1 to 10, Comparative examples 1 and 2

A plain weave fabric was woven with 40 denier/34 filaments of Nylon 66 which had a viscosity of 2.85 in sulfuric acid and, with 280T/M additional twist in the warp and without additional twist in the weft.

The fabric was treated by jet flow scouring under the conditions shown in Table 1, and finished by heat setting, and the fabrics shown in Table 1 were thus prepared. On the other hand, Comparative example 2 was carried out by a procedure in which jet flow scouring was replaced by conventional scouring.

With the fabrics thus obtained, the level of surface wrinkle was determined by the above method, and further, the tensile strength in the warp direction was measured. The results are shown in Table 1.

Furthermore, these fabrics were melt-cut into 13mm width and had, applied to them 22 wt%, based on the fabrics, of an oil-based ink which contained 18% dye, 5% pigment, and had a viscosity of 1800cps at 20 °C, and ink ribbons for a dot printer were thus prepared.

The strength of the graphic spots on these ink ribbons was evaluated. The results are shown in Table 1.

As can be seen from Table 1, the fabrics of Examples 1 to 10, have enough strength in the warp direction, and although the wrinkling was marked, this presented no problem in practical use, and graphic spots were at a good level. In contrast, the fabrics of Comparative examples 1 and Comparative example 2 prepared using a conventional scouring, did not have an acceptable graphic spot level, and it couldn't be said that they were suitable for ink ribbons for a dot printer with 24 pins or 48 pins.

Industrial Applicability

The base fabric of this invention for an ink ribbon is good in ink absorbability, has excellent properties

Table 1

	Scouring. Temp. (°C)	Temp. lowering rate after scouring (°C/min)	Woven density		Thickness (μm)	Tensile strength in warp direction (Kg/0.51in)	Graphic spots	Wrinkles (class)
			Warp	Weft				
Example 1	60	2	213	125	130	25.9	△	3
Example 2	80	2	214	124	133	26.6	○	2-3
Example 3	100	2	216	123	133	26.8	○○	2
Example 4	115	2	218	128	138	27.5	○○	1
Example 5	125	2	220	129	140	27.7	○○	1
Example 6	135	2	223	131	142	25.3	○○	1
Example 7	80	5	215	125	134	26.0	○	2
Example 8	80	10	215	124	132	26.3	○	1
Example 9	140	10	225	134	147	16.3	○○	1 lower
Example 10	80	15	214	125	135	25.9	○	1 lower
Comp. example 1	50	2	210	124	129	23.9	×	3.5
Comp. example 2	-	-	209	124	129	24.1	×	4

without having graphic spots, and for those reasons, can be used as a cassette type ink ribbon among ink ribbons for various types of impact printer such as a line printer or serial type printer. Ink ribbons of this invention are expected not only to be useful as ink ribbons for impact type printers, but also, especially, a big need can be expected for their use in shuttle printers or dot printers with 24 pins which can write clear characters.

Claims

1. A base fabric for an ink ribbon made of polyamide multifilament characterized in that said fabric has wrinkles of class 3 or more defined by the wrinkle level according to JIS L1096.
2. A base fabric for an ink ribbon of claim 1, wherein said wrinkle level is of class 2~3.
3. A base fabric for an ink ribbon of claim 1, wherein said wrinkles include wrinkles oriented in the lengthwise direction.
4. A base fabric for an ink ribbon of claim 1, wherein said wrinkles are formed by a jet flow scouring.
5. An ink ribbon cassette having said base fabric of claim 1 therein.
6. In a method of manufacturing a base fabric for an ink ribbon comprising scouring, drying and heat setting a base fabric made of polyamide multifilament, said method of manufacturing characterized in that said scouring is a jet flow scouring and said heat setting is carried out under such tension that wrinkles of class 3 or more be left.
7. A method of manufacturing a base fabric for an ink ribbon of claim 4, wherein said jet flow scouring is carried out with hot water at 60~135 °C, and next, the temperature is lowered at a rate of 10 °C/min. or less.
8. A method of manufacturing a base fabric for an ink ribbon of claim 4, wherein said jet flow scouring is carried out with hot water at 80~125 °C.
9. A method of manufacturing a base fabric for an ink ribbon of claim 4, wherein, successively after said jet flow scouring, said fabric is dried at a temperature of 100 °C or more under no tension.
10. A method of manufacturing a base fabric for an ink ribbon of claim 4, wherein said base fabric has a plain construction, satin construction, twill construction or a modified construction thereof.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP93/01633

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl⁵ B41J31/04

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)

Int. Cl⁵ B41J31/04

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

Jitsuyo Shinan Koho 1920 - 1992

Kokai Jitsuyo Shinan Koho 1971 - 1992

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.
Y	JP, A, 3-73378 (Atsushi Kitamura), March 28, 1991 (28. 03. 91), Line 17, upper right column, page 4 to line 5, lower left column, page 5 (Family: none)	1
Y	JP, A, 59-127789 (Toyobo Co., Ltd.), July 23, 1984 (23. 07. 84), Line 16, upper left column to line 5, lower right column, page 4 (Family: none)	1, 6
Y	JP, A, 4-357071 (Toray Industries, Inc.), December 10, 1992 (10. 12. 92), Line 46, left column, page 2 to line 31, left column, page 3 (Family: none)	6-10

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

* Special categories of cited documents:

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"&" document member of the same patent family

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