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(54) **CLOTH ON WHICH AN OPTICALLY READABLE MARK IS PROVIDED, AND ITS
MANUFACTURING**

STOFF, DER MIT EINER OPTISCH LESBAREN MARKIERUNG VERSEHEN IST UND DESSEN
HERSTELLUNG

TISSU AVEC IMPRESSION D'UNE MARQUE OPTIQUEMENT LISIBLE, ET FABRICATION DE CE
TISSU

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JP-A- 3 001 159 **JP-T- 2 504 322**

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Description

The present invention relates to fiber cloth such as a woven fabric, knitted fabric or nonwoven fabric, printed with an optically readable symbol capable of serving as an identification mark.

The information to be recorded as an identification mark in the present invention includes various data such as a maker's name, commodity item code, processing method, washing method, handling method, size, color and date of manufacture respectively stated by the maker concerned, or such data as a dealer code, price and other purchase data respectively stated by the dealer concerned, or identification data concerning customers, etc. Furthermore, other information useful for respective business areas can also be stated.

Moreover, the mark may represent the information to identify the owner, holder or depositor, etc. of the fiber cloth concerned or of the clothing, bedding or any other commodity to which the fiber cloth is attached by bonding or sewing, etc.

An optically readable identification mark capable of representing all of the above is a bar code.

Hereinafter, woven fabrics, knitted fabrics, nonwoven fabrics, etc. are all generally referred to as "fiber cloth". The present invention relates to fiber cloth with an optically readable symbol printed on it, in a manner such that the optically readable symbol can be accurately read without any error and that even if the fiber cloth is repeatedly subjected to washing and wearing, the mark can highly durably remain to allow reading and identification, without immediate loss of such capabilities. The present invention also relates to a production process thereof.

The distribution industry now resorting to the POS (point of sales) system widely uses bar code symbols for identifying individual articles.

For example, dealers read bar codes to avoid the key entry into registers or to promptly identify sales tendencies for inventory control and sales results control, etc.

However, if identification bar codes are printed on fabrics, clothes, sewn products of beddings, etc., the conventional fiber cloth allows only deformed printing, unclear printing or printing low in optical density, to inconveniently lower the resolution for reading by bar code readers. Thus, the patterns obtained by printing bar codes on fiber cloth are apparently different from those obtained by printing on paper and films now most frequently used as optical recording media.

The reading accuracy and/or reading error rate of an optical reader significantly depends on the printing quality, and so, fiber cloth with any optically readable mark recorded on it has not yet been practically used because of such disadvantages as lack of clarity, low density and low resolution.

It has been proposed to coat cloth with a polymer or to use a film, but these methods have a serious defect in that the cloth becomes hard. Furthermore, generally fiber cloth is often washed 50 to 70 times, and the washing causes the coating to peel or leaves wrinkles, making the printed bar codes unreadable by bar code readers any more.

The conventional fiber cloth has associated with it a disadvantage in that the bar code cannot be clearly printed (unlike paper) and so cannot be instantaneously or accurately read by an optical reader.

Therefore, at present, bar codes are popularly used for printing on paper and films.

Thus, bar codes are now mainly used for disposable goods. For example, in the laundry industry, it is practised to use tags with identification bar codes for laundry name identification, customers control, laundry agents control, etc. More specifically, in practice, a laundry agent attaches a piece of paper with a bar code recorded on it to any part of every article submitted by a customer for cleaning, so that the article cleaned by the laundry located at any other place may be correctly returned to the laundry agent concerned. The piece of paper with a bar code recorded on it is used only once and then torn away; since the article to be cleaned does not have such paper attached originally, it is not required. However, it is troublesome to attach a piece of paper with a bar code recorded on it whenever an article to be repeatedly cleaned is submitted to a laundry agent.

Therefore, if a piece of fiber cloth can be provided with a bar code which can be accurately read and endure frequent cleaning, then this will be very useful.

If a piece of fiber cloth with a bar code recorded on it is attached at a suitable place, like a label, it is not necessary to attach a bar code recorded medium made of paper whenever the article is submitted for cleaning. Pieces of fiber cloth are softer to touch, more durable and stronger so as more easily to withstand cleaning and are more easily attached to clothes, etc. than pieces of paper and films.

Furthermore, as general practice in the respective steps of distribution, fabrics, clothes and sewn products of beddings, etc. have bar code labels attached to identify maker's names, brands, material qualities, prices, etc., and the attaching work is also very troublesome. Thus, in this case also, if bar code labels once attached can be used permanently to some extent, the troublesome work can be eliminated.

From this viewpoint, research has been conducted in an attempt to provide a practical method of printing bar codes on fiber cloth.

For example, DE-A-3739095 which represents the closest prior art describes a process for stamping bar codes on a textile fabric using a series of parallel stamping elements each providing the smallest width required and located

so as to provide multiples of this width as desired. The process allows the marking operation to be flexible. As a fabric suitable for marking, JP-A-60-119249 discloses a woven fabric having a weft yarn denier of 50-300 d with a monofilament size below 5 d and a warp yarn denier of e.g. 75 d and a monofilament size of 3.75 d.

JP-U-89-013575 proposes the provision an optically readable mark pattern by sewing or embroidering a desired pattern readable by an optical reader using a thread with a color different from that of the fabric. However, in this method, since the pattern edge form is decided by the fineness (thickness) of the embroidery thread itself, the thread must be made smaller in diameter, and to realize this, a complicated apparatus must be used with along time taken for making the fine thread. Furthermore, sewing or embroidering is disadvantageous in view of productivity. Moreover, this method cannot provide a particularly fine pattern, so the volume of information which can be expressed as a mark is limited.

Bar codes are generally used for control of large quantities of articles, and customers in these areas are not prepared at all to accept any method of low productivity like embroidery.

If there are labels with identification bar codes recorded on them, which can be repeatedly used, they may also be put to valuable use in other industries and areas. However, so far such identification bar code labels that can be repeatedly used, are high in legibility accuracy and low in reading error rate, and can contain a large volume of information have, to date, not be available.

The technical problem addressed by the present invention is the realization of media on which a mark is recorded which can be used permanently to some extent even if repeatedly used through cleaning or so frequently used that "crumpling" is likely and which is good in productivity without negating the intention to reduce the cost by using the mark.

The present invention addresses the problem of overcoming the various difficulties outlined above by providing a medium bearing an optically readable mark printed thereon with good printing quality which allows various identification codes to be clearly printed for use in respective industries, can be used very durably and allow accurate reading by optical readers with no more than a few errors.

The optically readable mark on a cloth in accordance with the present invention may be a bar code which can be optically read by corresponding optional readers, which are not especially limited in standards.

A solution to the problems described above can be achieved using a cloth printed with an optically readable symbol and comprising a water jet punched fiber cloth composed mainly of very fine fibers of 1 to 0.00001 denier.

The printed symbol may be a bar code which provides information recorded, for example, by thick black lines, thin black lines and white lines between them, over a narrow area, and to make the code legible, it is especially important that the mark is good in clarity and resolution. Thus, bar codes are very suitable for exhibiting the effect of the present invention.

In the present invention, since the fibers constituting the fiber cloth are sufficiently fine, the fiber cloth is uniform, flat and compact in its surface structure, and so, an identification mark can be printed clearly and can be accurately read by an optical reader.

Furthermore, if the cloth is pressed by water-jet punching to be flattened on the surface, it becomes more uniform and flat in the surface structure, to be more suitable as identification mark recorded fiber cloth to be read by an optical recorder.

The present invention also provides the following process for preparing a cloth printed with an optically readable bar code.

The process for preparing a cloth printed with an optically readable symbol of the present invention comprises the steps of water-jet punching a fiber cloth mainly composed of very fine fibers of 1 to 0.00001 denier and printing on a surface thereof an optically readable symbol.

The process may be applied, in particular, to filter cloth.

The symbol is applied to the surface of the cloth by a printing method which may be an ink jet method.

A portion of the cloth printed with the optically readable symbol may be covered with a triazine derivative based resin and/or a melamine derivative based resin.

Embodiments of the invention will now be described with reference to the accompanying drawings in which:

Fig. 1 (a) is an expanded schematic longitudinal sectional model view showing a cloth bearing an optically readable bar code, which cloth is a highly dense woven fabric composed of very fine fibers of 1 denier or less in single fiber fineness. As can be seen from this model, many very fine fibers are compactly assembled and the surface of the woven fabric is very flat.

Fig. 2 (a) is an expanded schematic longitudinal sectional model view showing a woven fabric outside the invention made of ordinary thick fibers and low in density. As can be seen from this model, the surface of the fabric is very undulating.

Fig. 3 (a) is an expanded schematic longitudinal sectional model view showing fine quality paper such as copy paper used for a copier or heat transfer paper used for a heat transfer printer. The surface is of course very smooth compared to fiber cloth.

Figs. 1 to 3 (b) are plan views showing portions of the fabric, having a bar code recorded thereon, shown in Figs.

1 to 3 (a) respectively, as models.

In the optically readable mark recorded cloth of the present invention, the method for preparing fibers of 1 denier or less is not especially limited, and can be selected from various conventional very fine fiber production techniques. For example, composite fibers formed by two mutually arranged high polymers, which are generally called island-in-sea type composite fibers can be used to form the cloth, or furthermore composite fibers, in which the islands are furthermore formed by island-in-sea type composite fibers, can also be used. In this case, the sea component used may be able to be separated away by a solvent or decomposing agent, or may be splittable fibers consisting of two components. Moreover, the very fine fibers can also be prepared directly by spinning under appropriate conditions.

Several methods are already known to prepare such fibers of 1 to 0.00001 denier, and for example, the methods described in "Chemistry and Manufacturing Industry (in Japanese), vol. 36, P.521-523" (1983, issued by Japanese Chemistry Association) can be suitably used in the present invention.

The very fine fibers of 1 to 0.00001 denier of a cloth in accordance with the present invention are not limited to those having a circular cross sectional form, and their cross section can be of any form selected from, for example, a triangle, square, ellipse and polygon. Flat forms such as an ellipse or rectangle as cross sectional forms are rather preferable for the same single fiber fineness since surface flatness can be improved.

A preferable fineness range of the very fine fibers is 0.5 to 0.001 denier in view of production convenience, cost and the intended effect of the present invention, and according to findings by the inventors, a more preferable range is 0.2 to 0.005 denier, the best range being 0.1 to 0.01 denier.

The very fine fibers can be made of, for example, a polyester polyamide, acrylate or polyphenylene sulfide. Considering durability, and the printing method to be used such as ink jet method, impact print method or heat transfer method as described later, polyester fibers, polyamide fibers and acrylic fibers are preferable. Above all, polyester fibers are especially preferable in view of the high color fastness and dimensional stability attainable.

The cloth of the present invention bearing the optically readable symbol printed on it is required only to be a fiber cloth which can be any of woven fabric, knitted fabric and nonwoven fabric. Unlike copy paper it is not hard or stiff. However, any paper-like finished nonwoven fabric, woven fabric or knitted fabric can also be used if it is soft to some extent, not being hard or stiff.

The fabric can be prepared by any conventional method. In the case of woven fabric, the weave can be plain weave, twill weave, satin weave, or double weave or a weave derived from the foregoing. In the case of knitted fabric, the knit can be warp knit or weft knit. Furthermore, a raised fabric can be used. In the case of nonwoven fabric, this can be prepared, for example, by a general spun bond method, flash spinning method or melt blow spinning method, and furthermore, a raised nonwoven fabric can also be used.

When the cloth of the present invention bearing the optically readable symbol printed thereon is a woven or knitted fabric, the numbers of warp and weft threads, and the numbers and density of component fibers are essential factors to obtain the preferable effect of the present invention. The product of the numbers of the component fibers for warp and weft should be preferably 5,000,000 fibers/cm² or more, and the product of the numbers of warp and weft threads woven or knitted should be preferably 1,000 threads/cm² or more, more preferably 2,000 threads/cm² or more. Especially when these values are satisfied, the printing efficiency of a coloring agent on the woven or knitted fabric is very high, and a very practical optical density and clear pattern boundaries of the identification mark can be secured.

Similarly, also in the case of nonwoven fabric, it is preferable to have a very compact and flat surface structure, and specifically, according to findings by the inventors, a nonwoven fabric of 0.15 g/cm³ or more in apparent density is preferable, though not limited to this range. If the apparent density is in this range, any ordinary spun bond nonwoven fabric, calendered short-fiber nonwoven fabric or nonwoven fabric treated by water jet punching can be favorably used. A nonwoven fabric with a very rugged surface formed by extreme embossing is suitable for the present invention.

The apparent density of a cloth in accordance with the present invention is expressed by the following equation:

$$\begin{aligned} &\text{Apparent density (g/cm}^3\text{)} \\ &= \text{Unit weight (g/cm}^2\text{)}/\text{Thickness (cm)} \end{aligned}$$

The reason for the above is described below in detail with reference to drawings for the case of a woven fabric.

Fig. 1 (a) is an enlarged schematic longitudinal sectional model view showing a cloth bearing a optically readable bar code recorded thereon and formed by a high density woven fabric composed of very fine fibers of 1 denier or less in single fiber fineness in conformity with the present invention. It shows, as a model, a structure in which many very fine fibers are assembled and that the surface of the woven fabric is very flat.

Fig. 2 (a) is an enlarged schematic longitudinal sectional model view showing a woven fabric using ordinary fibers thick in single fiber fineness and coarse in density not in conformity with the present invention. It shows, as a model, a structure in which the surface of the woven fabric is very rugged.

Fig. 3 (a) is an enlarged schematic longitudinal sectional model view showing fine quality paper such as copy paper used for a copier or heat transfer paper used for a heat transfer printer. The surface is, of course, very smooth compared to fiber cloth.

Figs. 1 to 3 (b) are respectively model plan views of portions bearing a bar code recorded thereon.

In the drawings, symbol 1 1 denotes the warp of the woven fabric; 2, the weft; 3, fine quality paper; and 4, 4', colored portions.

As shown in Fig. 2 (a), in the case of a woven fabric using fibers thick in single fiber fineness and coarse in density, the rugged surface produces voids 5 in the colored portions and spots 6 in the portions not to be colored, as shown in Fig. 2 (b), not allowing optical reading.

On the other hand the cloth of the present invention bearing an optically readable symbol recorded thereon, prepared using very fine fibers, has a peculiar flat surface structure as shown in the model of Fig. 1 (a), which is a smooth surface close to that of the generally often used fine quality paper as shown in Fig. 3, and almost satisfactory printing as shown in Fig. 1 (b) can be achieved.

In addition, if paper is bent and creased by a force acting from outside, the print at the crease is liable to come off disadvantageously, and so paper cannot be said to be highly durable. However, the cloth composed of very fine fibers of the present invention is flexible and the individual fibers are colored, to form a mark. Therefore, the deterioration of printing quality by bending can be inhibited, and even if some fibers are damaged or removed, they less affect the entire mark, to ensure high durability.

If cloth is formed by using mainly very fine fibers of 1 to 0.00001 denier, the fibers are very compactly put together in a sectional structure showing little clearance between them. Furthermore, if the fiber cloth has an external pressure applied on the surface, the very fine single fibers are arranged to be further flat and more compact, to make the surface structure of the fiber cloth flat and densely packed, and a coloring agent can be effectively transferred onto the surface. A pattern with a density and boundaries practically close to those of fine quality paper can be obtained.

Thus, to enhance the compactness, the woven or knitted fabric or nonwoven fabric as described above can be treated by a liquid columnar flow jetted at a high pressure from pores, so-called water jet punching. Such water jet punching can make the cloth structure more compact and cause at least some of very fine fibers to intertwine with each other structurally, for inhibiting the deformation of the fiber cloth, and therefore this process step allows a fabric excellent in form stability to be obtained. The fabric treated by water jet punching is less liable to be deformed in printed lines and remains clear for a long time, and since the fibers are single filaments, the fabric is advantageously less liable to be disordered in texture and selvage.

As described above, we have found that fiber cloth sufficiently small in the fineness of its member fibers, and high in density and compactness is, if pressed on the surface by a water-jet treatment, uniform in surface structure, very flat and very compact, being optimum as fiber cloth for recording optically readable marks.

Thus, the cloth of the present invention bearing an optically readable symbol printed thereon is high in density and very effective in directly obtaining a pattern clear at edges, like fine quality paper and films popularly used as conventional optical recording media, and is also particularly excellent in durability. Furthermore, since the fiber cloth mainly composed of very fine fibers is very soft, it can be applied not only to personal belongings but also to general clothes, etc., to greatly affect future living culture and clothing culture.

The cloth of the present invention bearing an optically readable symbol printed thereon can be applied to various identification mark recording methods such as electrophotography, heat transfer method, ink jet method, electrostatic method and impact method, respectively using any printer, and also use of various stamps and plates, with far more excellent printing quality achieved compared to ordinary fiber cloth.

The cloth of the present invention can be any integral part of clothes, bedding and various other fiber products, or be attached as identification mark labels.

If any transfer agent or ink resistant against processing is used, the optically readable mark recorded cloth can be repeatedly used for a long time through processing. For example, even if it is used for clothes and bedding as labels for control by customers and laundry agents in the laundry industry, it will certainly bring about a revolution in the control system. In particular, recording by ink jet printing can be preferably used.

The reason why ink jet printing can be preferably used for recording is that if a dye is used as the ink, the ink is deposited on the surfaces of fibers and additionally inside the fibers by way of dyeing for printing the intended mark. Thus, a very durable mark can be easily printed. If the ink jet printing is used, it is preferable to pretreat the cloth using a size containing a metal salt for preventing the spreading of the ink.

The above mentioned resistance against processing refers to the property that the cloth bearing the optically readable mark printed thereon does not deteriorate or is not discolored so much as to make illegible the bar code even if it is bleached, dried etc. in processing or placed in an ordinary service environment such as wind, rain, water and rough handling.

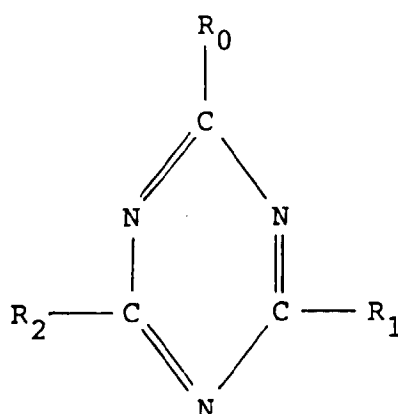
If a fluorescent identification mark is formed, it can be recorded without anyone having to be especially conscious of the color and pattern of the cloth or mark position, and so the applicable range will be able to be further expanded.

If higher heat resistance is required for repeated pressing at high temperatures as in the laundry industry, it is preferable to cover the surface of the very fine fibers in the portion have the optically readable mark printed thereon, with a triazine derivative based resin and/or a melamine derivative based resin.

The triazine derivative based resin covering can be achieved, for example, by depositing an aqueous solution containing a triazine derivative compound described below and an inorganic acid or an organic acid or any of their salts, onto the cloth, and heat-treating the cloth in an atmosphere of 40% or more in relative humidity with at least 25% of water contained in the cloth.

The melamine derivative based resin covering can be achieved, for example, by depositing an aqueous solution containing a melamine derivative compound described below, an anionic surfactant and an acid catalyst, onto the cloth, and heat-treating in the presence of moisture.

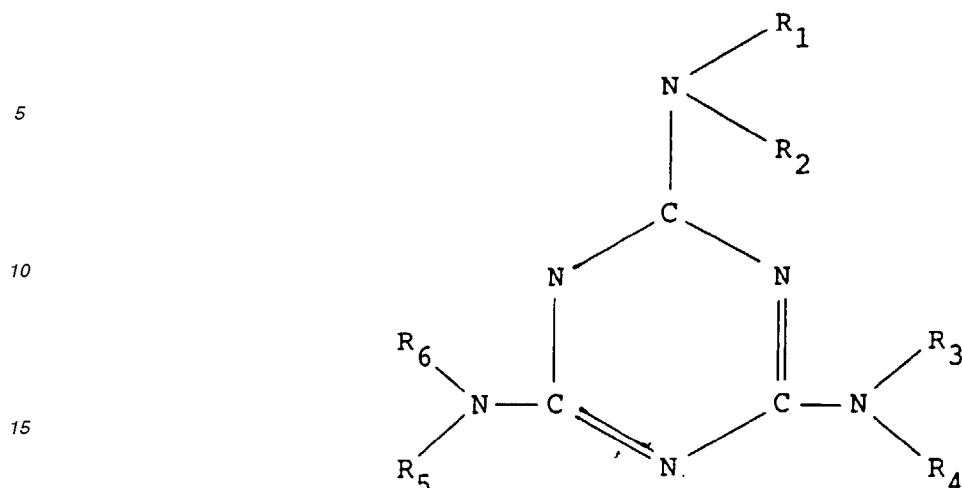
The triazine derivative compound can be selected, for example, from those represented by the following general formula:



(where R_0 to R_2 are -H, -OH, $-C_6H_5$, $-Cn_0H_{2n_0+1}$ (n_0 : is 1 to 10), $-COOCn_1H_{2n_1+1}$ (n_1 : 1 to 20), $-CONR_3R_4$, $-NR_3R_4$, where, R_3 , R_4 are -H, $-OCn_3H_{2n_3+1}$, $-CH_2OCn_3H_{2n_3+1}$, $-CH_2COOCn_3H_{2n_3+1}$ (n_3 is 1 to 20), $-CH_2OH$, $-CH_2CH_2OH$, $-CONH_2$, $-CONHCH_2OH$, $-O-(X-O)-n_4R_5$ (X is C_2H_4 , C_3H_6 , C_4H_8 , n_4 : is 1 to 1500), R_5 is -H, $-CH_3$, $-C_2H_5$, $-C_3H_7$) Furthermore, it can be also selected from the ethyleneurea copolycondensation products, dimethylolurea polycondensation products and dimethylolthiourea copolycondensation products of the compounds represented by the above general formula.

The inorganic acid can be selected, for example, from sulfuric acid, hydrochloric acid, carbonic acid and phosphoric acid. The organic acid can be selected, for example, from formic acid, acetic acid, acrylic acid, methacrylic acid, oxalic acid, malonic acid, succinic acid, malic acid, citric acid, tartaric acid, glutamic acid, aspartic acid, maleic acid, itaconic acid, methyl-fumaric acid, phthalic acid and isophthalic acid.

The melamine derivative compound can be selected, for example, from those represented by the following general formula:



20 where, R_1 to R_6 are -H, -OH, $-\text{CH}_2\text{OCH}_3$, $-\text{CH}_2\text{OC}_2\text{H}_5$, $-\text{CH}_2\text{OH}$, $-\text{CH}_2\text{CH}_2\text{OH}$, $-\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$.

The catalyst for converting the melamine derivative compound to a resin can be selected from the above mentioned inorganic acids, organic acids and their organic salts such as ammonium, sodium and potassium salts.

25 The anionic surfactant can be selected, for example, from carboxylic acid based anionic surfactants such as soap and sarcosinates, sulfate based aniline surfactants such as higher alcohol sulfates, sulfonated oils, sulfonated fatty acid esters and sulfonated olefins, sulfonate based anionic surfactants such as alkyl naphthalenesulfonates, Igepon T, Aerosol OT and ligninsulfonates, and phosphate based anionic surfactants such as higher alcohol phosphates. The anionic surfactant is not necessarily required for resinification, but if it is added to the aqueous solution, homogeneous resinification can be achieved preferably.

30 An aqueous solution containing any of the above triazine derivative compounds and melamine derivative compounds, and an acid, and preferably an anionic surfactant is deposited onto said cloth, by such means as, for example immersion, coating or spraying. The aqueous solution deposited is converted to a resin by heat treatment, for obtaining a cloth in accordance with the invention, having an optically readable symbol printed thereon, excellent in heat resistance. If heat treatment is effected at 40% or higher RH at a temperature of 40 to 140°C with water remaining in the cloth, an almost uniform film can be formed on the surface of the fibers preferably.

35 The cloth of the present invention bearing an optically readable symbol printed thereon can of course be a large piece of cloth with a mark recorded in a small portion of it, or a narrow tape or label attached to any of, for example, clothes, sewn products of bedding, or various commodities by any suitable means such as, for example, fusion or sewing.

40 For attaching by fusion, it is preferable that the cloth of the present invention bearing an optically readable bar code recorded thereon is thermally bonded, on the reverse side, for example, with a hot melt adhesive.

Embodiments of the present invention are now described below in more detail with reference to the following Examples, Example 1 of which is outside the invention but assists in an explanation thereof.

Example 1

45 Sea-island type composite fibers formed by two mutually arranged high polymers were used. In this case, the sea component was polystyrene and the island component was polyethylene terephthalate, and they were used at a ratio of islands/sea = 90/10. Each yarn was 50 deniers in total and consisted of 9 filaments, each of which contained 70 island component fibers. The yarns were used as warp and weft yarns, to obtain machine-woven taffeta of 57 warp yarns/cm and 43 weft yarns/cm.

50 The taffeta was set by 180°C dry heat, washed by trichloroethylene and dried, to obtain a woven very fine fiber fabric of 0.07 denier in single fiber fineness. The density of the fabric was 61 warp yarns/cm and 45 weft yarns/cm. Therefore, the product of the numbers of warp and weft yarns was more than 2,745 yarns/cm², and the number of fibers constituting the fabric was more than 1,089,490,500 fibers/cm².

55 The woven fabric was treated using a size containing a metal salt, for preventing blurring, and had a JAN (Japanese Article Number) bar code in conformity with JIS printed thereon by an ink jet printer using a dye. After completion of printing, the fabric was treated by steaming and washed, to obtain optically readable mark recorded cloth.

The printed bar code symbol was evaluated as to optical characteristics, and found to conform to JIS, and in

addition, no problem arose on read inspection using a bar code symbol verifier.

Example 2

The fiber cloth used in Example 1 was treated by water jet punching, and treated using a size containing a metal salt for prevention of blurring. It had an identification mark printed by an ink jet printer. The fabric had its fibers three-dimensionally intertwined and was less in flexibility, to effectively inhibit the deformation of the identification mark. It was more excellent in durability of the identification mark than the product of Example 1.

The cloth with the identification mark printed had a saturated polyester based hot melt adhesive film thermally bonded on the reverse side. It was then cut into labels, and each label was thermally bonded to the back side of a lapel of a cook's coat, and hemmed by a sewing machine. The cook's coat was washed 70 times under the conditions adopted in the ordinary laundry industry.

After 70 times of washing, the bar code could be read by a multiscan type bar code reader without any problem.

Example 3

Sea-island type composite fibers formed by two mutually arranged high polymers were used. In this case, the sea component was an alkali soluble polyester copolymer and the island component was polyethylene terephthalate, and they were used at a ratio of islands/sea = 90/10, to spin yarns. Each yarn was 50 deniers in total and consisted of 10 filaments, each of which contained 70 island component fibers. The yarns were used as warp and weft yarns, to obtain machine-woven taffeta of 57 warp/cm and 43 weft yarns/cm.

Subsequently, the sea component was removed by dissolving, to obtain a very fine fiber cloth of 0.6 denier in single fiber fineness, with 61 warp yarns/cm and 45 weft yarns/cm, to provide more than 2,745 yarns/cm² as a total of the numbers of yarns, and 1,345,000,000 fibers/cm² as a total of the number of constituent fibers.

The fabric was treated by water jet punching, to have its very fine fibers intertwined, thus being made more compact.

Subsequently the fabric had a JAN (Japanese Article Number) bar code in conformity with JIS printed thereon using an ink jet printer, steamed and washed.

Then, the fabric was immersed in an aqueous solution containing 15% of methylated trimethylolmelamine, 1% of ammonium persulfate and dinaphthylmethanedisulfonic acid as a surfactant, to have 100 wt% (based on the weight of the fabric) deposited on it, and treated at 100% RH at 105°C for 5 minutes for reaction. The fabric was further immersed in the same aqueous solution and treated for reaction again. The matter remaining unreactive was removed by soaping, and the fabric was dried, to obtain a cloth bearing an optically readable bar code.

The printed bar code mark was evaluated as to optical characteristics and found to conform to JIS. In the inspection using a code mark verifier, no problem arose.

To evaluate its heat resistance, it was washed at 50°C and pressed at 190°C for 30 seconds, and this operation was repeated several times.

The cloth could still be optically read, to show excellent heat resistance.

Thus, the cloth of the present invention bearing an optically readable symbol printed thereon can bring about a large revolution in all the industries concerned with the distribution and handling of fiber-related articles.

For example, it can be effectively used for classification and sorting in the processing of cloth, and for recording of for example, a maker's name, commodity item, pattern, size, washing method, dealer code and price, for inventory control and sales control of, for example clothes and beddings, and also for customer control in the laundry industry and the high quality clothing industry.

The present invention can be very favorably applied to control in the laundry industry, in which large quantities of many articles to be washed are to be collected by many laundry agents and transported to a laundry center and returned and distributed to the respective laundry agents.

The higher accuracy of control, automation, labor saving and higher efficiency which can be achieved by the present invention are very useful. The present invention can be applied not only to the control in the laundry industry, but also, for example, to delivery control, distribution control, storage control, classification or sorting control.

Claims

1. A cloth printed with an optically readable symbol capable of serving as an identification mark, characterised in that the cloth is a water jet punched fiber cloth composed mainly of very fine fibers of 1 to 0.00001 denier.
2. A cloth according to claim 1, which is printed with an optically readable bar code symbol.

3. A cloth according to claim 1 or claim 2, which is a woven or knitted fabric.
4. A cloth according to claim 1 or claim 2, which is a nonwoven fabric.
- 5 5. A cloth according to claim 3, wherein the woven or knitted fabric is composed mainly of yarns of very fine fibers of 1 to 0.00001 denier, and the product of the number of warps and the number of wefts is 1,000 yarns/cm² or more and the product of the number of warp fibers and the number of weft fibers is 5,000,000 fibers/cm² or more.
- 10 6. A cloth according to claim 4, wherein the nonwoven fabric has an apparent density of 0.15 g/cm³ or more.
7. A cloth according to any preceding claim, wherein at least the surface of very fine single fibers carrying an optically readable symbol is covered mainly with a triazine derivative based resin and/or a melamine derivative based resin.
- 15 8. A cloth according to any preceding claim, which can be bonded by fusion to an article to be washed.
9. An article to be washed, having bonded thereto by fusion, a cloth according to claim 8.
- 20 10. A process for preparing a cloth marked with an optically readable symbol capable of serving as an identification mark, which process comprises the steps of
- water jet punching a fiber cloth composed mainly of very fine fibers of 1 to 0.00001 denier; and printing on a surface thereof the said optically readable symbol.
- 25 11. A process according to claim 10, wherein the cloth is printed with an optically readable bar code symbol.
12. A process according to claim 10 or claim 11, wherein the printing is carried out by an ink jet printing method.
- 30 13. A process according to any one of claims 10 to 12, which comprises the additional step of covering the optically readable symbol printed on the fiber cloth with a triazine derivative based resin and/or melamine derivative based resin.

Patentansprüche

- 35 1. Mit einem als Identifizierungsmarkierung verwendbaren, optisch lesbaren Symbol bedruckter Stoff, dadurch gekennzeichnet, daß der Stoff ein wasserstrahlgeschlagener Faserstoff ist, der hauptsächlich aus sehr feinen Fasern mit 1 bis 0,00001 Denier besteht.
- 40 2. Stoff nach Anspruch 1, der mit einem optisch lesbaren Strichcodesymbol bedruckt ist.
3. Stoff nach Anspruch 1 oder 2, der ein Web- oder Wirkstoff ist.
4. Stoff nach Anspruch 1 oder 2, der ein Faservlies ist.
- 45 5. Stoff nach Anspruch 3, worin der Web- oder Wirkstoff hauptsächlich aus Garnen sehr feiner Fasern mit 1 bis 0,00001 Denier besteht und das Produkt aus der Anzahl an Kettfäden und der Anzahl an Schußfäden 1.000 Garne /cm² oder mehr beträgt und das Produkt aus der Anzahl an Kettfasern und der Anzahl an Schußfasern 5.000.000 Fasern/cm² oder mehr beträgt.
- 50 6. Stoff nach Anspruch 4, worin das Faservlies eine Stoffdichte von 0,15 g/cm³ oder mehr aufweist.
7. Stoff nach einem der vorangegangenen Ansprüche, worin zumindest jene Oberfläche aus sehr feinen Einzelfasern, die ein optisch lesbares Symbol trägt, hauptsächlich mit einem Harz auf Triazinderivatbasis und/oder einem Harz auf Melaminderivatbasis bedeckt ist.
- 55 8. Stoff nach einem der vorangegangenen Ansprüche, der durch Anschmelzen an einen zu waschenden Gegenstand gebunden werden kann.

9. Zu waschender Gegenstand, an den ein Stoff nach Anspruch 8 durch Anschmelzen gebunden ist.
10. Verfahren zur Herstellung eines mit einem als Identifizierungsmarkierung einsetzbaren, optisch lesbaren Symbol markierten Stoffes, welches Verfahren folgende Schritte umfaßt:

Wasserstrahlschlagen eines Faserstoffs, der hauptsächlich aus sehr feinen Fasern mit 1 bis 0,00001 Denier besteht; und
Aufdrucken des optisch lesbaren Symbols auf eine Oberfläche davon.

11. Verfahren nach Anspruch 10, worin der Stoff mit einem optisch lesbaren Strichcodesymbol bedruckt ist.
12. Verfahren nach Anspruch 10 oder 11, worin das Bedrucken mittels eines Tintenstrahldruckverfahrens durchgeführt wird.
13. Verfahren nach einem der Ansprüche 10 bis 12, welches den zusätzlichen Schritt des Bedeckens des auf das Fasergewebe gedruckten, optisch lesbaren Symbols mit einem Harz auf Triazinderivatbasis und/oder auf Melaminderivatbasis umfaßt.

Revendications

1. Tissu imprimé d'un symbole optiquement lisible pouvant servir de marque d'identification, caractérisé en ce que le tissu est un tissu de fibres perforé au jet d'eau, composé principalement de fibres très fines de 1 à 0,00001 denier.
2. Tissu selon la revendication 1 qui est imprimé d'un symbole d'un code-barres optiquement lisible.
3. Tissu selon la revendication 1 ou la revendication 2 qui est une étoffe tissée ou tricotée.
4. Tissu selon la revendication 1 ou la revendication 2 qui est une étoffe non tissée.
5. Tissu selon la revendication 3 où l'étoffe tissée ou tricotée se compose principalement de fils de fibres très fines de 1 à 0,00001 denier et le produit du nombre des chaînes et du nombre des trames est de 1 000 fils/cm² ou plus et le produit du nombre des fibres de chaîne et du nombre des fibres de trame est de 5 000 000 de fibres/cm² ou plus.
6. Tissu selon la revendication 4 où l'étoffe non tissée a une densité apparente de 0,15 g/cm² ou plus.
7. Etoffe selon toute revendication précédente où au moins la surface des fibres individuelles très fines portant un symbole optiquement lisible est couverte principalement d'une résine à base d'un dérivé de triazine et/ou d'une résine à base d'un dérivé de mélamine.
8. Tissu selon toute revendication précédente qui peut être collé par fusion à un article à laver.
9. Article à laver auquel est collé par fusion un tissu selon la revendication 8.
10. Procédé de préparation d'un tissu marqué par un symbole optiquement lisible pouvant servir de marque d'identification, lequel procédé comprend les étapes de :
perforer au jet d'eau un tissu de fibres composé principalement de fibres très fines de 1 à 0,00001 denier ; et
imprimer sur une surface ledit symbole optiquement lisible.
11. Procédé selon la revendication 10, où le tissu est imprimé d'un symbole d'un code-barres optiquement lisible.
12. Procédé selon la revendication 10 ou la revendication 11, où l'impression est effectuée par une méthode d'impression au jet d'encre.
13. Procédé selon l'une quelconque des revendications 10 à 12 qui comprend l'étape additionnelle de couvrir le symbole optiquement lisible imprimé sur le tissu de fibres d'une résine à base d'un dérivé de triazine et/ou d'une résine

à base d'un dérivé de mélamine.

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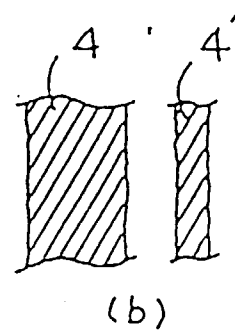
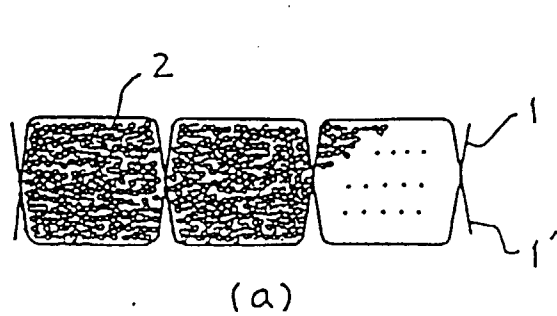


Fig. 1

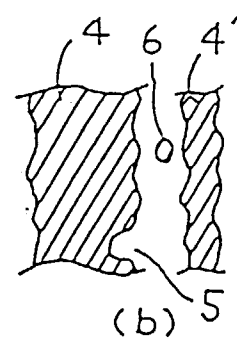
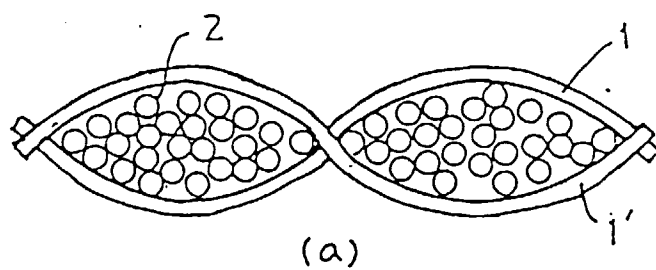


Fig. 2

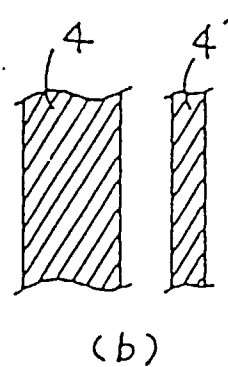
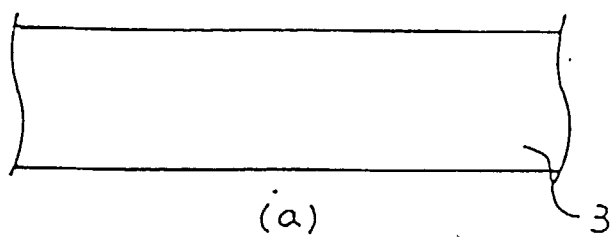


Fig. 3