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PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Woven Article Useful as Mat and Tapestry

We, CHISSO CORPORATION, of No. 1 Sozecho ~~Kita-ku~~, in the City of Osaka, Japan, a Japanese Body Corporate, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

THIS INVENTION relates to woven articles suitable for use as mats or tapestries, whether plain colored or figured.

Mats made of rushes are useful materials for covering floors. Particularly they have been important in countries such as Japan because they have been used as surface parts of tatami mats. Tatami mats are made by pressing piled rice straws tightly to form usually rectangular masses of about one or two inch thickness having flat surfaces and flat bottoms of nearly 3 feet width and 6 feet length and covering the surfaces and sides of them with mats woven of dry rushes. They are laid on floor boards so as to afford a soft, easy and comfortable feeling when one stands, or squats down, or even lies upon them. Besides the surface parts of tatami, rush mats have a wide variety of uses. They are very handy as portable mats for use outdoors e.g. on beaches or hiking. They are also useful as ornamental tapestries to decorate walls. Furthermore rushes can be easily dyed in desired colors and figured rush mats are particularly attractive because of their aesthetic value. Hence the demand for rush mats, particularly figured rush mats, has been ~~increasing~~.

In spite of the increasing demand for rushes, the supply of rushes is by no means adequate. Though this is common in all natural resources, the striot climatic conditions required for planting are reducing the will of farmers for cultivation of rushes. The crop and quality of rushes vary depending upon the weather and land conditions, hence the supply of rushes is extremely unstable. Moreover in the case of colored or figured rush mats, there are several other defects in the point of coloring. Since rushes have their own inherent color, it is difficult to obtain a bright color. The fastness of colored rush is not satisfactory. Also the reduction of elasticity due to ageing is one drawback from the consumer side and the unstableness of quality is another drawback from the manufacturer side.

In order to overcome the above-mentioned drawbacks, it has been attempted to substitute rush mats with various kinds of synthetic resin such as polyvinyl chloride, polyethylene or the like. However all these attempts have not succeeded yet on account of inferior handle, feeling and appearance of synthetic materials compared with those of the long-favoured rush mats. Besides, the physical properties of synthetic materials are not satisfactory. For example since polyvinyl chloride is a heat-sensitive polymer, mats made of polyvinyl chloride contract and stiffen at low temperatures and expand and soften at high temperatures. They cannot be used at a temperature higher than about 55°—75° C. When they are used near a heating stove or the like, they are liable to deform, destroying their original woven structure and impairing their appearance. The same kinds of drawback also occur in the case of polyethylene mats. The exudation of plasticizer is also an inevitable drawback when plasticized polyvinyl chloride is used as a mat material.

The present invention consists in interlacing, in various kinds of weaving manner, wefts of fine polypropylene tube with warps of fiber threads which are thinner than the polypropylene tube, possess no substantial

[*Price 4s. 6d.*]

extent of elongation, possess rough slipless outer surfaces, and are arranged parallel and at suitable intervals.

If the outer surface of the fine polypropylene tube is provided with various kinds of longitudinal indentation the resultant woven mats resemble rush mats in appearance and handle much more strikingly.

Furthermore it is possible to make colored or figured mats by the use of colored fine polypropylene tube and by employing various weaving manners .

Polypropylene tubes useful as weft in the present invention have a size ranging from 1 to 2 millimeter in outside diameter and a wall thickness ranging from 0.1 to 0.3 millimeter. Those having an isotactic content more than 80 per cent and intrinsic viscosity as measured in tetraline at 138° C from 1.5 to 3.5 (M.W. 40,000—300,000) are suitable.

Threads useful as warps in the present invention include cotton yarn having a count from No. 5 to No. 10, hemp yarn having a count from No. 4 to No. 10, linen or ramie yarn having a count from No. 10 to No. 30, jute yarn having a count from No. 11 to No. 14. The warp threads must be thinner than the polypropylene tube in order that they are not obvious outside the surfaces of the woven mats and provide firm gripping of the weft. It is preferable that they have rather rough non-slippery outer surfaces. It is also preferable that they have not much elongation in order to avoid formation of a gap between wefts or deformation of individual wefts. The elongation should not exceed 10%.

As for the method of weaving, it is carried out based upon the same principle as that used commonly in the weaving of fabrics but the machine can be much simpler. Though it is general practice that a long endless yarn is used as weft in the common weaving of fabrics, in the present invention it is preferable that a length of weft is about the width of mat i.e. polypropylene tubes having a certain length corresponding to the width of mats are sent in each shuttle movement.

The invention is illustrated by the accompanying drawing, in which:—

Figure 1 is a plan view of an article embodying the invention;

Figure 2 is a section on line II—II of Figure 1;

Figure 3 shows an individual polypropylene tube as used in the article of Figure 1, of smooth surface;

Figures 4 to 6 correspond to Figures 1 to 3 respectively but illustrate the use of longitudinally indented polypropylene tube; and

Figure 7 is a plan view of a figured article.

The most popular construction of weaving is 4 leaf weft twill 2/2 as shown in Figure 1 and Figure 2. This construction is most simple and most suitable for rush mats for covering tatami mats. Figure 1 is a plan view of part of a mat woven in accordance with this pattern and Figure 2 shows its cross section viewed from the direction II—II. In Figure 1 and Figure 2, the polypropylene tubes 1 have smooth surface and are woven with warp threads 2. Figure 3 is an enlarged schematic view showing one polypropylene weft tube 1 having a smooth outer surface.

When polypropylene tubes having longitudinal grooves on their outer surface are used the appearance, feel and handle resemble much more natural rush mat. Such longitudinal grooves can be readily afforded by passing extruded tubes through dies. Figure 4 and 5 show a part of mat woven in accordance with the present invention but in this case the wefts of polypropylene tube 3 have longitudinal grooves, the warp threads being shown at 4. Figure 4 is a plan view of part of the mat; Figure 5 shows its cross section view from the direction V—V. Figure 6 is an enlarged schematic view showing one polypropylene weft tube 3 having longitudinal grooves.

By changing the isotactic content, the inherent viscosity of the polypropylene, or the size and thickness of the polypropylene tubes it is possible to change the stiffness or softness of the finished mats. By the use of various kinds of modified polypropylene e.g. block copolymer or the like, the brittle point of the resultant mat can be reduced so a to permit use in a cold climate.

By changing the color of the filler used in the polypropylene tubes and by combining various kinds of interlacing of the polypropylene tubes with the warp threads, it is possible to give various kinds of figure upon the surface of mat.

Figure 7 is an illustration of such a figured mat in which 5 and 6 are polypropylene tubes and 7 are warp threads. The color of tubes 5 is different from that of tubes 6, thus showing a figure.

Since polypropylene resin stands relatively high temperatures it can be used at from 135 to 160° C, and temperature resistance to heat deformation under an applied pressure of 66 lbs/sq. inch is from 100 to 120° C), there is no fear of general or local deformation in the mats produced by the present invention. Further due to the superiority of polypropylene in elasticity or resilience, the warp threads bite the weft very firmly and do not loosen themselves in the weaving. This property is particularly important in the case of figured mats where a relatively large number of free non-embracing parts of weft against warp must be present.

Mats of the present invention do not discolor even after more than 3 years' use in sunlight whereas discoloration into slightly yellowish tones occurs after half a year's use on the surface of rush mats.

Though rush mats show, in general, unevenness both in color and weaving method,

there are no such defects in the case of the mats of the present invention.

It has been confirmed by an abrasion test that the mats of the present invention possess a strength 3.5 times that of rush mats and 2.5 times that of polyvinyl chloride mats.

It is also an advantage of the present mats that they do not absorb moisture, they are mildew resistant, easy in cleaning and possess excellent heat-insulating properties.

Furthermore the mats or tapestries produced in accordance with the present invention possess another advantage in that the ends of the mats or tapestries can be fused together by heat in order to prevent disordering of the end parts if such is required.

WHAT WE CLAIM IS:—

1. A woven article useful as a mat or tapestry consisting of wefts of thin polypropylene tubes and a ~~part~~ warp of fiber threads thinner than the polypropylene tubes.

2. A woven article as claimed in claim 1 in which the tubes have a size ranging from 1 to 2 millimetres outside diameter and a wall thickness ranging from 0.1 to 0.3 millimetre.

3. A woven article as claimed in claim 1 or 2 wherein the polypropylene tubes possess a number of small longitudinal grooves on their outer surfaces.

4. A woven article as claimed in claim 1, 2 or 3 wherein thin polypropylene tubes of different colors are used to exhibit colored figures upon the surface of said woven article.

5. A woven article as claimed in claim 1, 2, 3 or 4 wherein the fiber threads are cotton threads having from No. 5 to No. 10 count and an elongation less than 10 per cent.

6. A woven article as claimed in claim 1, 2, 3 or 4 wherein the fiber threads are hemp threads having from No. 4 to No. 10 count and an elongation less than 10 per cent.

7. A woven article as claimed in claim 1, 2, 3 or 4 wherein the fiber threads are linen or ramie having from No. 20 to 30 count and an elongation less than 10 per cent.

8. A woven article as claimed in claim 1, 2, 3 or 4 wherein the fiber threads are jute thread having No. 11 to No. 14 count and an elongation less than 10 per cent.

9. A woven article as claimed in any of claims 1 to 8 wherein the end parts of the warp and weft are fused together by heat.

10. A woven article substantially as herein described with reference to the accompanying drawings.

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