United States Patent [19]

Kai

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[54] **ROLL MADE OF NON-WOVEN CLOTH**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** **161/36**, 29/125, 29/132

[51] **Int. Cl.** **B21b 31/08**

[58] **Field of Search** 29/132, 125; 161/36

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Assistant Examiner—Edith L. Rollins
Attorney, Agent, or Firm—Kurt Kelman

[57] **ABSTRACT**

Fiber yarns such as polyester, nylon, and acrylicare mixed with, cotton or wool and resinous finder, and heat treated to make a non-woven cloth. The non-woven cloth is cut into disc elements which are stacked onto a shaft made of steel, plastics or wood. The laminated non-woven cloth elements are axially pressed together to form a roll having a Poisson's ratio of 0.5 and a shearing stress of 1200 kg/cm².

2 Claims, 4 Drawing Figures

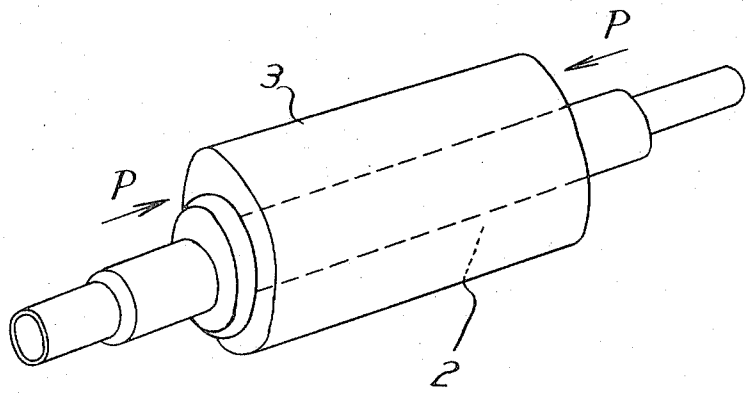


Fig. 1

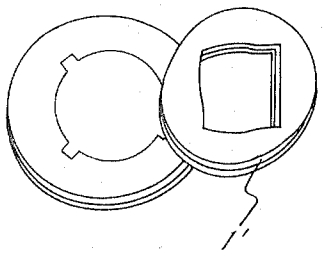


Fig. 2

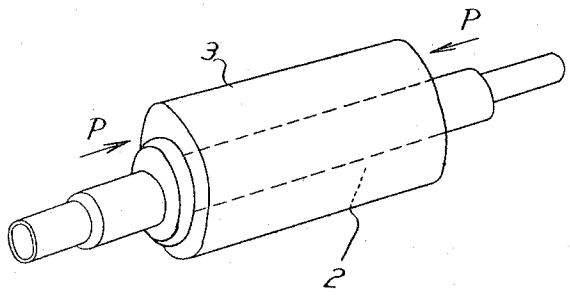


Fig. 3

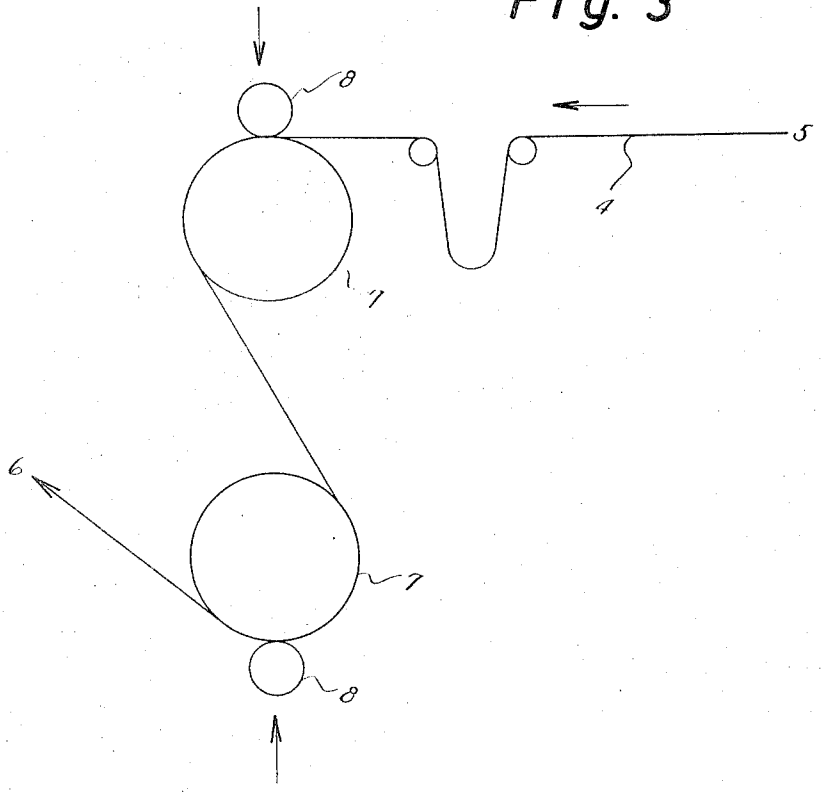
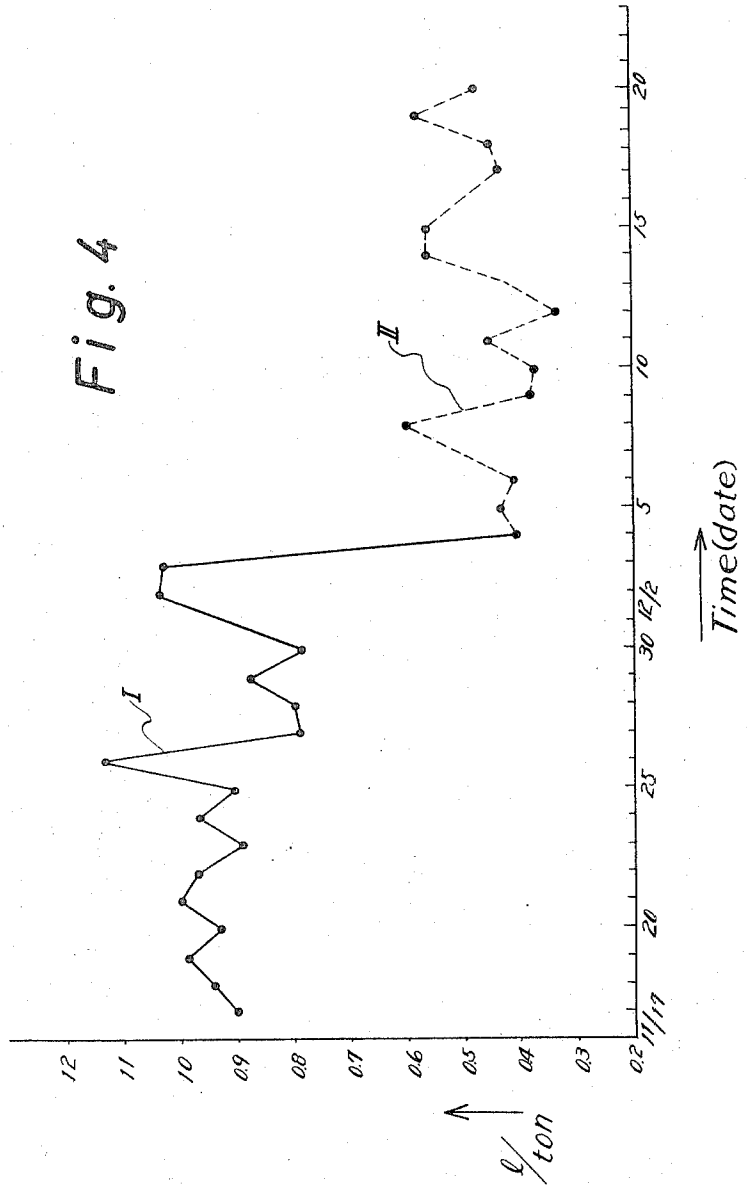


Fig. 4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ROLL MADE OF NON-WOVEN CLOTH

BACKGROUND OF THE INVENTION

This invention relates to rolls made of non-woven cloth in which high molecular material fiber yarns such as polyester, nylon, acrylic and polypropylene are bound with natural fiber yarn such as rayon, cotton and wool by a resineus binder and heat treatment. The non-woven cloth is cut to in a desired size, is laminated or stacked onto a shaft made of iron, plastics or wood and is axially pressed together to form a roll.

It has been desired for long time to obtain a roll of high coefficient of friction, large shearing stress, good heat-resistivity and strong oil-proofness which are all superior to those obtained by a rubber roll, in order to speed up the processing of iron manufacture, steel making and automobile industry.

SUMMARY OF THE INVENTION

According to this invention, the non-woven cloth elements pressed together to make a molded roll of a large coefficient of friction and high shearing stress.

The coefficient of friction obtained by the non-woven roll of the invention is remarkably high compared with that of conventional rubber rolls. The surface hardness of the non-woven roll can be made as desired due to the degree of compression applied when the laminated and mounted non-woven cloth elements are molded, on the basis of the elasticity of the material of the non-woven cloth. The construction of the non-woven cloth roll is quite uniform as well as the hardness of the roll, due to the non-directional fiber organization of the non-woven cloth. The heat-resistivity is good enough according to the material of the non-woven cloth.

The representative examples of the non-woven cloths are shown as follows:

1. A non-woven cloth is made of nylon 43 parts, cotton 18 parts, resinous binding agents 39 parts. The coefficient of water absorption is 8.2 percent, the weight per unit area 200±50 gram/m², the thickness 1.07 mm and the tensile strength 15.0kg/5cm.

2. A non-woven cloth is made of nylon 28 parts, polyester 28 parts, rayon 14 parts, resinous binding agents 30 parts. The coefficient of water absorption is 52.6 percent, the weight per unit area 180±50 gram/m², the thickness 2.60 mm and the tensile strength 5.5 kg/5cm.

The non-woven cloth roll of subject application can be utilized in manufacturing pinch rolls, such as snubber rolls, deflector rolls, tension bridle rolls, wringer rolls, squeezer rolls and wiper rolls.

An embodiment of manufacturing the non-woven roll of the present invention is explained with reference to the drawings.

BRIEF DESCRIPTION OF THE DRAWING:

FIG. 1 shows two embodiments of an element of the non-woven cloth roll of the subject invention,

FIG. 2 is a perspective view of the non-woven cloth roll of the subject invention,

FIG. 3 is a schematic arrangement of rolls used for measurement of the characteristics of the non-woven cloth roll of the subject invention, and

FIG. 4 shows the characteristic curve of the non-woven cloth roll of the subject invention. cl DESCRIPTION OF THE PREFERRED EMBODIMENTS;

In the figures, non-woven cloth elements 1 and 1' shown in FIG. 1 are of 1.07 mm to 2.60 mm thickness. The elements are cut from a sheet of cloth material and elements 1 and 1' are laminated or stacked onto a shaft 2 and pressed together in the directions of arrows P in FIG. 2. The plural shaft is made of iron, plastics or wood. These laminated or stacked elements are pressed together in the direction of the axis of shaft 2 under an average pressure of 0.8 ton/cm² and outer surface 3 of the laminated or stacked elements is abraded to form the surface of the non-woven cloth roll of the subject invention.

The main physical characteristics of the pinch roll prepared in accordance with the teaching of the subject invention are given as follows:

	For Pinch Roll	For Oiling Roll
Hardness (JISK 6301)	83° ± 2°	55° ± 5°
Poisson's ratio	0.5	0.3
Module of shearing elasticity	33	30
Coefficient of water absorption	5.8 %	50.6 %
Shearing stress	1200kg/cm²	680~720

The most distinguished features of the roll of subject invention are the large coefficient of friction and the high shearing stress.

The large coefficient of friction is verified by using a testing machine of the type diagronmatically shown in FIG. 3. In FIG. 3, a steel plate 4 of 1.2 mm thickness with palm oil painted on the surface thereof is introduced at 5 and is taken out from an outlet 6 in the direction shown by the arrow. Two pairs of tension bridle rolls 7 and snubber rolls 8 are provided between 5 and 6 and steel plate 4 is passed through the nips defined by each associated roll 7 and 8. The magnitude of the tension at intake 5 is zero and at outlet 6 is 3.5 tons. Snubber rolls 8 is pressurized with a force of 3 tons as shown by arrow. The angle of deflection of the steel plate is 320° and the speed of the steel plate which passes through the rolls is 400 m/min.

The result of the test shows that the coefficient of friction in the dry state is 0.28 and that with some oil adhered it is 0.24, the difference between the two states being small compared with the difference of a conventional rubber roll which amouts to 0.1 under the condition that the coefficient of friction is 0.18 in the dry state and is 0.08 with oil adhered.

Due to the large coefficient of friction, the roll of the subject invention makes it possible to treat the steel plate or the like at a high speed without causing any slippage occuring in the steel manuacturing line and any fault such as plate break or plate fold at a high speed which usually accompanies slippage does not exist at all.

This makes the steel manufacturing line quite compact so that the number of rolls can be reduced in the plant.

The large coefficient of friction of the roll causes close adhesion of the roll to the steel plate so that when the roll is utilized as an oil squeezer roll, in the squeezing operation, the oil film deposited on the steel plate

is squeezed sufficiently to leave only a thickness of the oil film necessary for prevention of rust formation on the steel.

This elimination of excess oil film naturaly reduces the consumption of oil and also holds the steel plate rigidly.

The result of a test in which the reduction of oil consumption is verified is shown in FIG. 4, in which the ordinate denotes the oil quantity per liter which is adhered to the steel plate in ton of steel and the abscissa denotes the time.

In the figure, the full line I denotes the resultant data of the roll of the subject invention and the dotted line II denotes that of a conventional rubber roll.

The curves in FIG. 4 teach that oil quantity of the steel plate squeezed is reduced from 1 liter/ton to 0.46 liter/ton by means of the roll of the subject invention, making a reduction of 64.8 kilo liter a month with a series of lines, in which steel plate of 120 kiloton is processed a month.

When the roll of the subject invention is used as a squeeze roll provided in the outlet of a water washing line, the slippage due to hydroplaning phenomena does never occur because of the large coefficient of friction so that the water is squeezed from the steel plate to a remarkable extent.

In using the roll of the subject invention as an oiling roll, two kinds of rolls are combined to constitute a pair of rolls, in the combination the oil being applied at the inlet of the rolls and the excess part of the oil being squeezed at the outlet of the rolls so that any fault due to a trace of oil appearing in the direction of advancing the steel plate at a higher processing velocity is eliminated to fully reduce the rust. In other words, a pair of rolls with large coefficient of friction was used at the outlet to successfully improve the adhesion of the roll to the steel plate and to uniformly apply the oil onto the steel plate.

The shearing stress of the roll of the subject invention amounts, for example, to 1,200 kg/cm^2 as compared with 620 kg/cm^2 obtainable in a conventional rubber roll and, therefore, no tearing off of the roll results. This means that the full working duration of a single roll can be extended and also the expense for changing the roll is abolished.

What we claim is:

1. In a roll comprising a shaft having an axis and a plurality of annular disc elements of a non-woven fabric, the fabric consisting of yarns of fibers of a high molecular synthetic resin material and of natural fibers, and a resinous material binding the yarns together, the elements being stacked on the shaft and axially pressed together to form the roll, the improvement comprising the elements being heat treated and axially pressed together so that the roll has a Poisson's ratio of about **0.5** and a shearing stress of about 1,200 kg/cm^2.

2. In the roll of claim **1**, the roll having a hardness of 83°± 2° and a coefficient of water absorption of about 5.8 percent.

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