April 11, 1950 D. MISCALL 2,503,629

WEB CARRIER AND METHOD OF MAKING SAME

Filed June 23, 1948

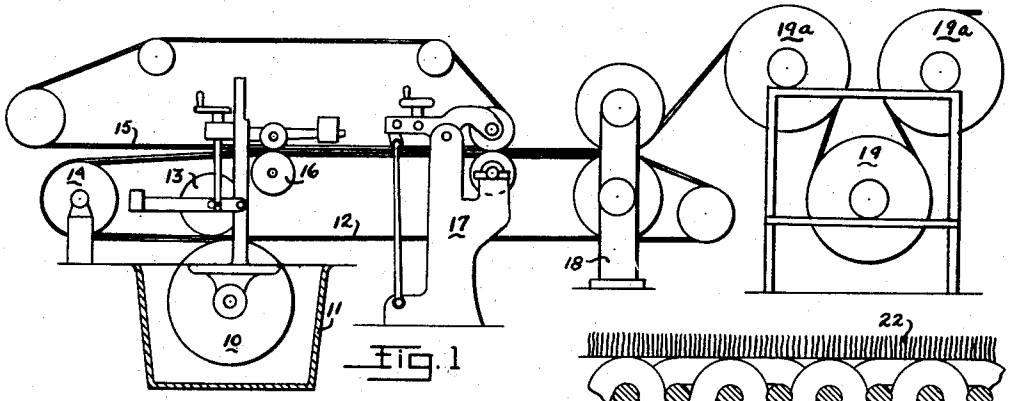


Fig. 1

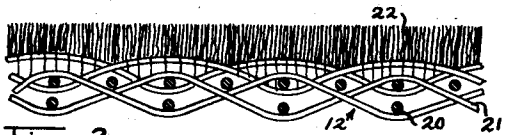


Fig. 2

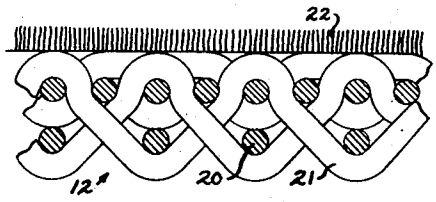


Fig. 3

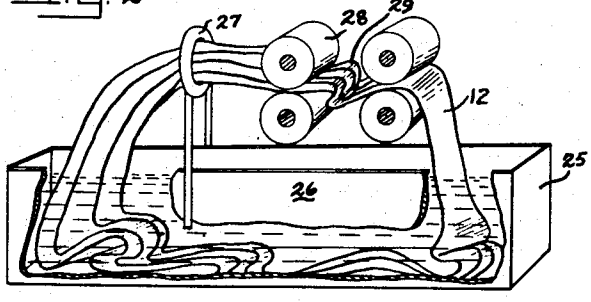


Fig. 4

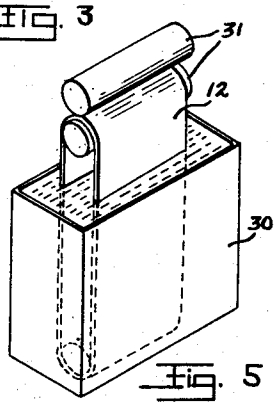


Fig. 5

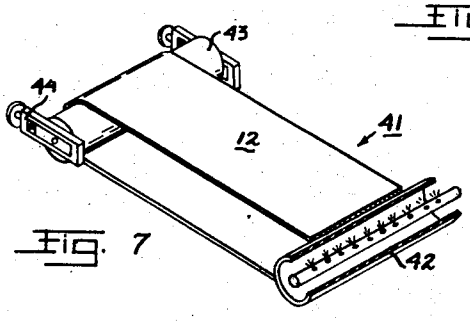


Fig. 7

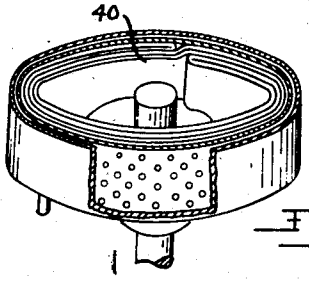


Fig. 6

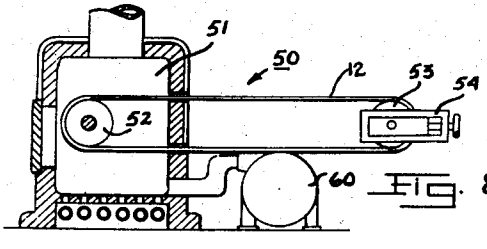


Fig. 8

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WEB CARRIER AND METHOD OF MAKING SAME

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Application June 23, 1948, Serial No. 34,794

6 Claims. (Cl. 28—74)

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This invention relates to paper making machines and particularly to the endless web or felt that is employed in the machine in various parts thereof as a part of the apparatus used to convey a wet web of paper from the web forming device to and through the couch and press rolls, and then to the driers.

Felts that are used on wet pulp handling machines such as paper making machines and the like, are notorious for their relatively short life, the life of the average wool fabric felt being as little as a few hours, but seldom extending beyond a few weeks, such as six or seven weeks. These felts or web carriers are subject to much abrasion and/or chemical action in the various machines in which they are used.

In using web carriers in wet pulp handling machines, such as paper making machines, it is essential that the webs have a satisfactory tensile strength since they are subject to much stress and stretching in the machines. Also, it is essential that the wet web carriers shall have a high degree of porosity to allow water to drain freely through the web carrier as the carrier, or felt, passes through the various press rolls of the paper making machines. Further, it is also necessary that the web carriers shall be easy to clean since the web carriers fill up with foreign matter and small fibers of pulp which must regularly be removed in an effort to maintain satisfactory removal or drainage of water from the wet pulp so the speed of the machine will not be reduced because of insufficient water removal from the wet pulp.

In manufacturing wet web carriers for paper making machines and the like, it is well-known that only the highest quality wool fibers are used. These are the most expensive wool fibers obtainable and thus the life of the felts or wet web carriers is a substantial factor in the cost of producing paper and other articles made from wet pulp.

It is, therefore, an object of this invention to provide a wet web carrier or felt for use in paper making machines and the like which will have a greater life and yet will maintain all the necessary characteristics of the usual papermakers felts that are constructed from all wool fibers or from wool fiber base materials.

It is, therefore, another object of the invention to provide a wet web carrier or felt which will have a high degree of tensile strength and which will withstand abrasion and chemical action for longer periods of time than the usual paper makers felts without in any way impairing

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the rate at which water can be removed from the paper pulp through the wet web carriers.

It is also another object of the invention to provide a wet web carrier or felt which is easier to clean than the usual papermakers felts and which will not fill up with foreign matter as rapidly as the usual papermakers felts, and which will stay cleaner longer, thus requiring less often cleaning of the felts. By providing such a felt the down time of a paper making machine is greatly reduced, and in many instances prevented entirely, thus providing a definite economic advantage in the operation of the machine continuously for the production of a greater amount of paper in the same length of time.

These and other objects of the invention are accomplished by impregnating the wet web carrier consisting of a wool fiber base with an alkylated melamine-formaldehyde condensation product and curing the resin in the felt. While the alkylated melamine-formaldehyde resins are particularly advantageous, however, other melamine resins may be used with satisfaction. To obtain the alkylated melamine resins, they are reacted with a primary alcohol such as methyl alcohol, ethyl alcohol, butyl alcohol and others in a manner well known to those skilled in the art. The melamine resins are applied to the felts or wet web carriers as a solution using a suitable liquid vehicle to carry the resin. It has been found that wet web carriers or felts consisting of a wool fiber base after treatment with the resins referred to have a better life average tensile strength than untreated wool fiber base felts and will withstand abrasing and chemical action for a much longer time.

The rate at which water is removed from the wet pulp carried by the web carrier is not affected during the entire service life of the felt, and in fact the water drainage rate is actually improved. Also, the felts do not tend to fill up with foreign matter as quickly as untreated papermakers felts, and after cleaning remain cleaner for a greater length of time. The surface characteristics of the felt and fibers therein are improved to prevent accumulation of dirt and foreign matter by wedging in of the dirt, surface attraction, chemical reaction, puncture and abrasive wear.

These and other advantages are directly attributable to the impregnation of the felts with an alkylated melamine-formaldehyde resin cured in the wet web carrier or felt.

For a full and more complete understanding of the invention, reference may be had to the

following description and accompanying drawings wherein:

Figure 1 is a schematic illustration of a paper making machine on which a wet web carrier of this invention is used.

Figure 2 is a schematic cross-sectional view of a wet web carrier illustrating generally the construction of such carriers.

Figure 3 is a cross-sectional view of the wet web carrier of Figure 2 illustrating the compactness of the weave of such carrier.

Figures 4 to 7, inclusive, illustrate generally the steps of a process for treating the wet web carriers, in which Figure 4 illustrates a fulling step, Figure 5 illustrates an impregnation step, Figure 6 illustrates the step of extracting excess resin solution from the felt, Figure 7 illustrates a drying step, while Figure 8 illustrates a step of curing the resin in the felt.

In Figure 1 there is illustrated a cylinder type of paper making machine in which wet web carriers are used for conducting a wet web of pulp through the various steps of processing the paper pulp and for conducting the paper pulp to a drier. It will also be understood that under certain conditions web carriers are also used on the driers, and that under these circumstances it is also essential that the rate of passage of moisture through the felt be exceedingly high and be substantially constant to provide for satisfactory drying of the paper web at a high rate of speed.

fiber base or all wool threads. Interwoven between the warp threads are the woof threads 21 to give the desired surface finish to the felt. These woof threads 21 are also of a wool fiber base, or of all wool fiber. Many felts are used in an unnapped condition, but also many of them are napped in a manner illustrated at 22. The felt 12 can be woven on any conventional weaving machine, according to the weave desired and can be subsequently napped to obtain a desired surface finish according to the use to which the felt is put.

In producing a felt satisfactory for use on a paper making machine of the kind illustrated in Figure 1, after the felt 12 is woven, it is fulled or shrunk in a fulling machine 25 as diagrammatically illustrated in Figure 4. Generally, this fulling operation consists of wetting the felt in any satisfactory solution, such as in the tank 26 and causing the felt to be passed through an eye 27 which squeezes the felt together transversely, that is across the width of the felt, to tend to shrink the felt in width. It may then be passed through a pair of squeeze rolls 28 and delivered to a trap 29 which bunches the felt together lengthwise tending to shrink the felt in its longitudinal direction. This fulling operation is continued until the felt is of a desired size and density, usually about 100% shrinkage or fulling being obtained in the average felt. This compacts the felt to the condition illustrated in Figure 3.

from 2½% to 15% of resin in the felt after curing as based on dry weight of the felt.

After the felt is extracted to a wet pick up of approximately 30% to 50% as based on the dry weight of the felt, it is then dried on a suitable drying apparatus 41, such as shown in Figure 7, until the pick up of the felt is approximately 15% of the dry weight of the felt.

In the drying apparatus 41, shown in Figure 7, there is provided a heating drum 42 over which the felt 12 passes and a drum 43 which acts as a stretching drum to stretch the felt to a predetermined length. The drum 43 is adjustably carried on suitable supports 44 so that the felt 12 can be stretched to a predetermined length concurrently with drying of the felt. The drying operation is carried out at a temperature below the curing temperature of the resin, and preferably at temperatures of 150° F. to 250° F., and more particularly at 250° F. to obtain the maximum rate of drying of the felt without causing any curing of the resin in the felt.

After drying the felt, the resin in the felt may then be cured to a water insoluble condition in a curing apparatus such as that illustrated in Figure 8. In the curing apparatus 50 there is illustrated a heating chamber 51 having a drum 52 therein over which the felt 12 passes. A drum 53 is positioned outside the heating chamber 51 and is adjustably carried on supports 54. The drums 52 and 53 are suitably driven to cause the felt to pass through the heating chamber 51 a sufficient length of time so that curing can be carried out at temperatures of 280° F. to 330° F. but preferably at a temperature of 300° F. with the felt passing through the heating chamber a sufficient length of time that all parts of the felt are cured at that temperature for approximately ten minutes, heated air being continuously circulated by the blower 60. After curing the resin retained in the felt will be approximately 5% of the weight of the felt as based on the original dry weight of the felt when the impregnating solutions referred to previously are used.

It will be understood, however, that the drying and curing steps shown in Figures 7 and 8 can be carried out in a single apparatus such as that of Figure 8 with the drying step being performed first at the lower temperature and thereafter elevating the temperature in the apparatus to obtain the desired curing.

It has also been found desirable to provide for relaxing of the felt during the curing operation to obtain a more positive predetermined length of the felt. When the drying and curing is carried out in a single machine, after the drying operation is completed, the felt can be relaxed by proper adjustment of the stretching roll so that just sufficient tension is maintained on the felt to cause it to drive over the carrying rolls through the heating apparatus. If the drying and curing is carried out in two different devices, then when the felt is placed in the curing apparatus, it will not be stretched as tightly over the curing drums as it was in the drying apparatus. This provides the necessary relaxation of the felt so that it will cure to a fixed length that will remain substantially constant during the service life of the felt.

Following the process of treating the wet web carriers or felts set forth herein, the cured resin content of the felt is approximately 5% by weight as determined by the dry weight of the untreated felt. However, the cured resin content of the felt can be carried from 2½% to 15% by weight

of the dry weight of the felt and still give satisfactory results without affecting the flexibility of the felt by the resin content.

The wet web carriers or felts that are to have a napped surface receive the napping treatment in a suitable machine after they have been impregnated with the various solutions and extracted to the desired wet pick up. Thus, the napping operation is carried out while the felt is wet.

The cured resin in the felt does not substantially affect the softness of the nap of a felt even though curing occurs after the napping. Thus, a soft surface finish can be imparted to a felt. Also, it has been found that the resin content of the felt, rather than tending to fill the felt to reduce the rate of water drainage through the felt as would be expected by the addition of a resin to the felt, actually increases the water drainage through the felt and produces a felt in which the water drainage is substantially constant throughout the life of the felt.

This is considered to be largely brought about by the fact that the resin treatment of the fulled felt causes the wool threads and fibers to maintain their original shape during the entire life of the felt regardless of the repeated pressure applications that are given to the felt in its passage through a paper making machine or other wet pulp handling machine. Also, the felt is more resistant to abrasive wear and chemical action to the extent that the service life of the felt is usually doubled under most all conditions of operation of the felt in a paper making machine.

As a factor in the processing of the felt, it has been determined that if the pH of the wool is brought to approximately seven before placing the felt in the impregnating bath that the life of the impregnating bath is increased. Also, it has been found preferable to adjust the pH of the resin solution or mixture to a value of eight.

It will be understood that while there have been described certain specific embodiments of my invention, it is not intended thereby to have it limited or circumscribed by the particular details of product proportions, procedures, materials or conditions herein described in view of the fact that this invention is susceptible to modifications according to individual preference and conditions without departing from the spirit of this disclosure and the scope of the annexed claims. This application is a continuation-in-part application of my copending application Serial No. 635,024, filed December 14, 1945.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A process of making felts for paper-making machines and the like consisting of, weaving a fabric belt from warp and woof threads consisting of a wool fiber base, fulling the woven fabric belt to a stabilized shrink proof state, impregnating the fulled fabric belt with an alkylated melamine formaldehyde resin solution to deposit in the belt 2½ to 15% of resin by weight based on the dry weight of the belt, and subjecting the impregnated fulled fabric belt to an elevated temperature to cure the resin in the belt, whereby the water drainage is maintained substantially constant throughout the life of the felt.

2. A process of making felts for paper-making machines and the like consisting of, weaving a fabric belt from warp and woof threads consisting of a wool fiber base, fulling the woven fabric

belt to a stabilized shrink proof state, impregnating the fulled fabric belt with an alkylated melamine formaldehyde resin solution, removing excess solution so as to deposit in the belt substantially 5% of resin by weight based on the dry weight of the belt, and subjecting the impregnated fulled fabric belt to an elevated temperature to cure the resin in the belt, whereby the water drainage is maintained substantially constant throughout the life of the felt.

3. A process of making felts for paper-making machines and the like consisting of, weaving a fabric belt from warp and woof threads consisting of a wool fiber base, adjusting the pH value of the felt to approximately 7, fulling the woven fabric belt to a stabilized shrink proof state, impregnating the fulled fabric belt with an alkylated melamine formaldehyde resin solution to deposit in the belt 2½ to 15% of resin by weight based on the dry weight of the belt, and subjecting the impregnated fulled fabric belt to an elevated temperature to cure the resin in the belt, whereby the water drainage is maintained substantially constant throughout the life of the felt.

4. A process of making felts for paper-making machines and the like consisting of, weaving a fabric belt from warp and woof threads consisting of a wool fiber base, fulling the woven fabric belt to a stabilized shrink proof state, impregnating the fulled fabric belt with an alkylated melamine formaldehyde resin solution so as to deposit in the belt 2½ to 15% of resin by weight based

on the dry weight of the belt, drying the fulled and impregnated belt at approximately 150° F. to 250° F., and curing the resin in the felt at a temperature of 280 F. to 330° F., whereby the water drainage is maintained substantially constant throughout the life of the felt.

5. A papermakers felt consisting of a woven wool fiber base, which felt is made according to the process set forth in claim 1.

6. A papermakers felt consisting of a woven wool fiber base, which felt is made according to the process set forth in claim 4.

DARWIN MISCALL.

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