United States Patent

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[33] **Great Britain**
[31] **46,678/67**

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[54] **CONTROLLING THE WASH LIQUID TEMPERATURE WHILE PREPARING PARCHMENTISED WEBS**
3 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** **8/118,**
8/119, 8/115.5, 8/151, 162/187, 8/137, 68/9

[51] **Int. Cl.** **D21h 5/08,**
D06m 1/14

[50] **Field of Search** 8/119, 118,
151, 137; 68/9

[56] **References Cited**

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ABSTRACT: A fibrous web is parchmentized by drawing the web from a parchmentizing bath and passing it through successive washing positions and the feature of the invention resides in maintaining at a substantially constant level the temperature of the washing liquid at the first washing position.

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SHEET 1 OF 2

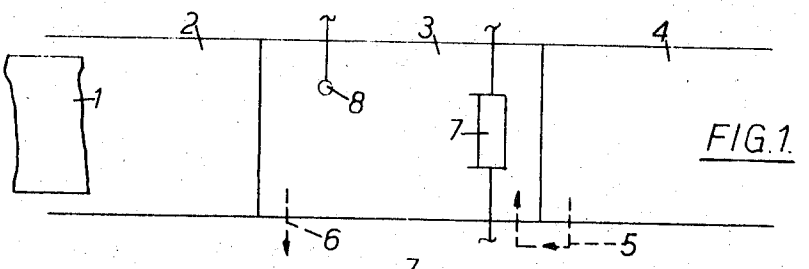

FIG. 1.

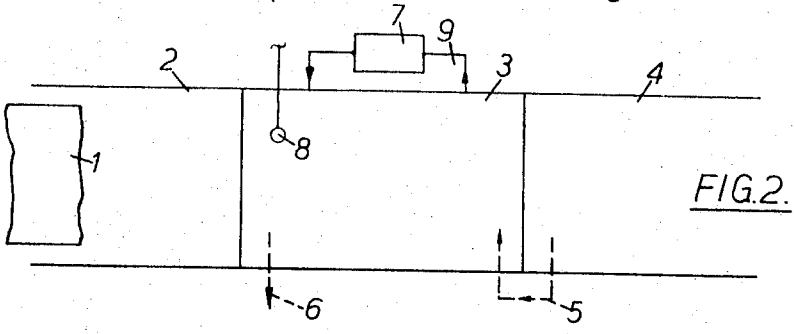

FIG. 2.

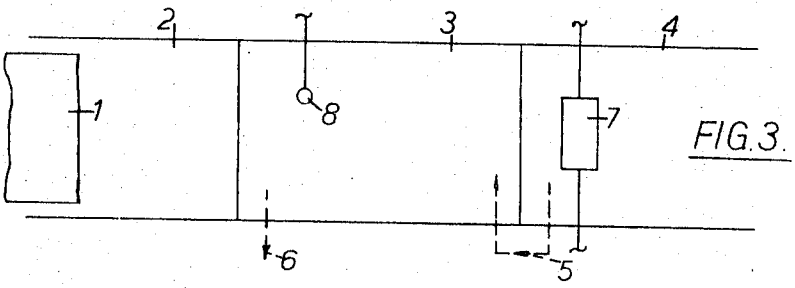

FIG. 3.

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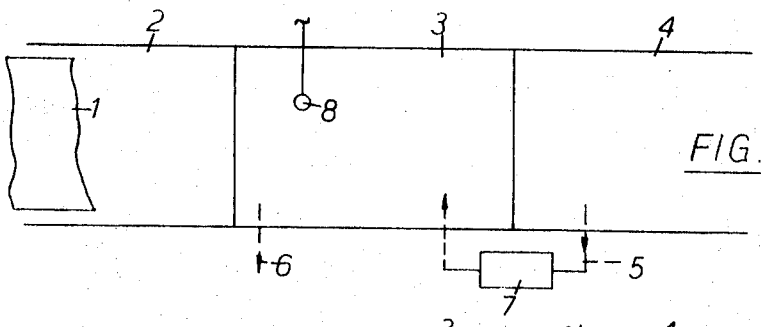

FIG. 4.

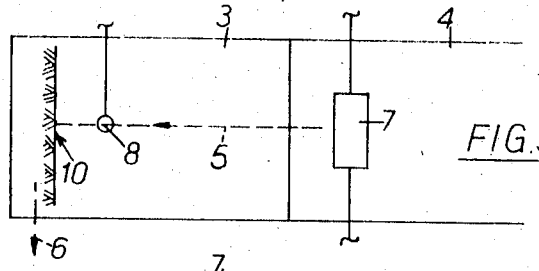

FIG. 5.

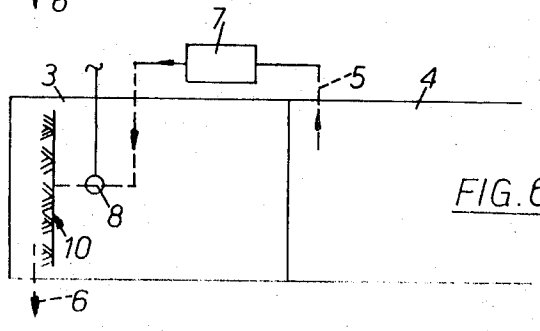

FIG. 6.

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CONTROLLING THE WASH LIQUID TEMPERATURE WHILE PREPARING PARCHMENTISED WEBS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a method of preparing parchmentized fibrous webs, which usually are those made on a papermaking machine particularly for the production of vegetable parchment or vulcanized fiber but which may be nonwoven webs or webs woven by textile processes. The constituent fibers are primarily natural cellulose from vegetable materials including wood or cotton, regenerated cellulose, or synthetic polymers, or mixtures of such materials.

2. Description of the Prior Art

As is well understood, parchmentizing is usually effected by passing the web of raw material through a parchmentizing liquid which usually is sulfuric acid but which may be any of the acid, neutral or alkaline liquids known to parchmentize at suitable times, concentrations, and temperatures. Following parchmentizing the web is washed with successively more dilute aqueous solutions of the substance used for parchmentizing and care must be taken to avoid the development of insufficient strength in the wet web during parchmentizing such as may cause breaks in the web and interrupt production. The washing is usually effected by a series of successive baths containing the washing liquid and pairs of press rollers are located between the baths to draw the web and reduce the quantity of liquid carried from one bath to the next by the web. The washing baths are usually operated according to the countercurrent flow principle to concentrate the liquid for subsequent recovery and reuse. The first washing bath therefore contains the most concentrated liquid and also contains dispersed and dissolved material lost from the web and which causes material known as black amorphous scale during recovery by evaporation, and the discoloring of the recovered acid. This scale is difficult and costly to remove.

All the chemical substances used to produce parchmentizing generate heat on dilution and the temperature of the washing liquid at the first washing position if not controlled, depends on the volume, the temperature, and the concentration of liquid carried by the web from the parchmentizing bath, as well as the temperature, the flow rate, and concentration of the washing liquid. Since the ambient conditions, the linear speed and basis weight of the web will also produce effects, the temperature of the washing liquid at the first washing position may vary considerably, the temperature and variations thereof increasing as the linear speed of the web is increased. It has been found that the variations of washing liquid temperature which occur at the first washing position have an adverse effect on the properties of the product and it is a main object of the invention to reduce these adverse effects.

SUMMARY

According to the invention there is provided a method of preparing a parchmentized fibrous web in which the web is drawn from a parchmentizing bath and is passed to successive washing positions, characterized by the step of maintaining the temperature of the washing liquid applied to the web at the first washing position at a substantially constant level.

It has been found that by controlling the temperature of the washing liquid at the first washing position the properties of the product may be varied. Further advantages are reduced cost by operation at a higher linear speed of the web without loss of product quality due to reduction of material lost at the first washing position, to fewer breaks in the web during the process, and to increased efficiency in acid recovery due to the formation of less black amorphous scale. As is well understood, in the recovery plant associated with the parchmentizing process to recover the strong acid the discoloration thereof is removed by an oxidation reaction, for example by the addition thereto of an oxidizing agent such as potassium permanganate or nitric acid, and a further advantage of the invention is that less of such an agent is required than is the case with the previously known parchmentizing processes.

In one embodiment of the invention the first washing position is a bath containing the washing liquid, the web is passed through the washing liquid, and the temperature of the washing liquid is maintained at the substantially constant level by thermostatically controlled heat exchange means immersed in the washing liquid in the bath.

In another embodiment of the invention the first washing position is a bath containing the washing liquid, and washing liquid is extracted from the bath and is recirculated to the bath, and the temperature of the washing liquid is maintained at the substantially constant level by washing liquid recirculated to the bath through thermostatically controlled heat exchange means. In another embodiment the washing liquid may be caused to flow to the bath at the first washing position from a second bath at a second washing position and the temperature of the washing liquid in the bath at the first washing position is maintained at the substantially constant level by thermostatically controlled heat exchange means immersed in the liquid in the second bath. Alternatively, the washing liquid may be caused to flow to the bath at the first washing position from a second bath at a second washing position and the temperature of the washing liquid in the bath at the first washing position is maintained at the substantially constant level by thermostatically controlled heat exchange means located at a position between the position at which the liquid leaves the second bath and the position at which it enters the bath at the first washing position.

The method may include the step of agitating the washing liquid in the bath at the first washing position to equalize the temperature of the washing liquid in the bath.

In another embodiment of the invention the washing liquid is applied to the web by spraying means at the first washing position, the washing liquid is delivered to the spraying means from a collecting trough at a second washing position, and the temperature of the washing liquid applied to the spraying means is maintained at the substantially constant level by thermostatically controlled heat exchange means immersed in the liquid in the collecting trough.

In a still further embodiment of the invention the washing liquid is applied to the web by spraying means at the first washing position, the washing liquid is delivered to the spraying means from a collecting trough at a second washing position, and the temperature of the washing liquid applied to the spraying means is maintained at the substantially constant level by thermostatically controlled heat exchange means at a position between the position at which the liquid leaves the collecting trough and the spraying position for the first washing position.

The temperature of the washing liquid at the first washing position may be maintained at a substantially constant level of the order of 15° C.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. 1 to 6, in plan views, diagrammatically illustrate methods according to the invention.

In the drawings like reference numerals indicate like or similar parts.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1, a parchmentized fibrous web 1 is drawn from a parchmentizing bath 2 and is passed around rollers, not shown, to successive first and second washing positions 3,4. In this embodiment of the invention the first washing position is a bath containing the washing liquid and the web 1, in known manner, has washing liquid applied thereto by passing the web through the washing liquid. Liquid flows, as indicated at 5, from a bath at the second washing position to the bath at the first washing position and acid recovery is effected, in known manner, as indicated at 6, and temperature of the washing liquid in the bath 3 is maintained at a substantially constant level by heat exchange means 7 which is immersed in the washing liquid in the bath at the first washing position and which is thermostatically controlled by a thermostat 8. The

heat exchange means 7, and thermostat 8 may be of any suitable known kind and per se form no part of the present invention. For example, the heat exchange means may consist of a submerged coil of suitable material through which a heated or a cooled fluid is passed.

If desired, as illustrated in FIG. 2, the washing liquid is extracted from the first bath 3 and is recirculated to the bath 3, as diagrammatically shown at 9, and the temperature of the liquid in the bath 3 is maintained at a substantially constant level by the entry into the bath of liquid treated by the heat exchange means 7 under control of the thermostat 8. The method illustrated in FIG. 3 is similar to that illustrated in FIG. 1 but differs therefrom in that the heat exchange means 7 is immersed in the bath at the second washing position. The method illustrated in FIG. 4 is similar to that of FIG. 3 but differs therefrom in that the heat exchange means 7 is located at a position between the position at which the liquid leaves the bath of the second washing position and that at which it enters the bath at the first washing position. If desired, the controlling heat exchange means 7 instead of being at the position shown in FIGS. 1 and 2 may be located in line 5, as indicated in FIG. 4, and there may be effected by a jacket, not shown, which surrounds a pipe carrying the liquid from the second to the first washing positions and through which heated or cooled fluid is passed.

The bath at the first washing position may include stirring devices, or other means, not shown, of agitating the washing liquid in the bath to equalize the temperature of the washing liquid in the bath.

FIG. 5 diagrammatically illustrates an alternative method according to the invention whereby the washing liquid at the first washing position 3 is applied to the web by being sprayed on to the web 1 by a spraying device 10. The washing liquid flows, as indicated at 5, to the spraying device from a collecting trough at the second washing position 4 and the heat exchanger 7 is immersed in the liquid contained in the collecting trough at the second washing position and is controlled by the thermostat 8 in line 5. The method illustrated in FIG. 6 is similar to that of FIG. 5 but differs therefrom in that the heat exchange means 7 is located at a position between the position at which the liquid leaves the collecting trough at the second washing position 4, and that at which it enters the spraying device 10.

It is found that the greatest advantage is obtained by the first 10° of cooling and the advantage is greater as the temperature increases. For example, a greater advantage is achieved by cooling from 40° to 30° C. than is obtained by cooling from 30° to 20° C. The preferred temperature of the liquid in the first washing bath is +15° C. but it may be as low as −15° C. The benefits of the invention increase with the machine speed because this increases the volume entering the first washing position and hence the temperature of the liquid in the first position. The temperatures mentioned above are typical for web speeds of up to 50 to 120 meters per minute but the web speed may be up to 250 meters per minute.

One example of the process according to the invention is as follows:

Base paper consisting of 100 percent bleached sulfate wood pulp containing proportions of virgin pulp, 36 percent softwood and 64 percent hardwood with a basis weight of 53 g.s.m. was subjected to parchmentizing with 68.7 percent sulfuric acid for 5 seconds at 20° C. The concentration of the first washing bath was 33.7 percent sulfuric acid.

By reducing the temperature of the liquid at the first washing bath from 50° C. to 12° C. parchment properties were affected as follows:

	Percentage Change
Reduction in light scattering coefficient	33
Increase in wet tensile strength	22
Increase in dry tensile strength	16

The temperature decrease also reduced the number of pinholes per square meter from 300 to zero and correspondingly increased the resistance to grease absorption.

In a laboratory experiment where shrinkage was controlled, reducing the temperature decreased the cellulose loss to the bath, resulting in an increase in substance of nearly 4 percent.

I claim:

1. In a process for parchmentizing a fibrous web, which process utilizes a countercurrent washing operation, the improvement which consists of controlling the amount of cellulose degradation products resulting from acid, neutral, or alkaline hydrolysis produced by the washing liquid in a first wash bath by maintaining the temperature of washing liquid in the first wash bath at a substantially constant level by
   1. including heat exchange means directly in the washing liquid in the first wash bath,
   2. recirculating the washing liquid in the first wash bath through a heat exchange means,
   3. including heat exchange means in a second wash bath and passing washing liquid from the second wash bath to the first wash bath connected in series therewith, or
   4. passing washing liquid from a second wash bath through a heat exchange means to the first wash bath connected in series with the second wash bath.

2. The process according to claim 1 including the step of equalizing the temperature of the washing liquid in the first wash bath by agitating the washing liquid.

3. In a process for parchmentizing a fibrous web, which process utilizes a countercurrent washing operation in which washing liquid is sprayed on to the web by a spraying device and is collected in a first wash bath, the improvement which consists of controlling the amount of cellulose degradation products resulting from acid, neutral, or alkaline hydrolysis produced by the washing liquid collected in the first wash bath by maintaining the temperature of washing liquid issuing from the spraying device at a substantially constant level by
   1. including heat exchange means in a second wash bath and passing washing liquid from the second wash bath to the spraying device, or
   2. passing washing liquid from a second wash bath to the spraying device through heat exchange means.

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