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MANUFACTURE OF PULP

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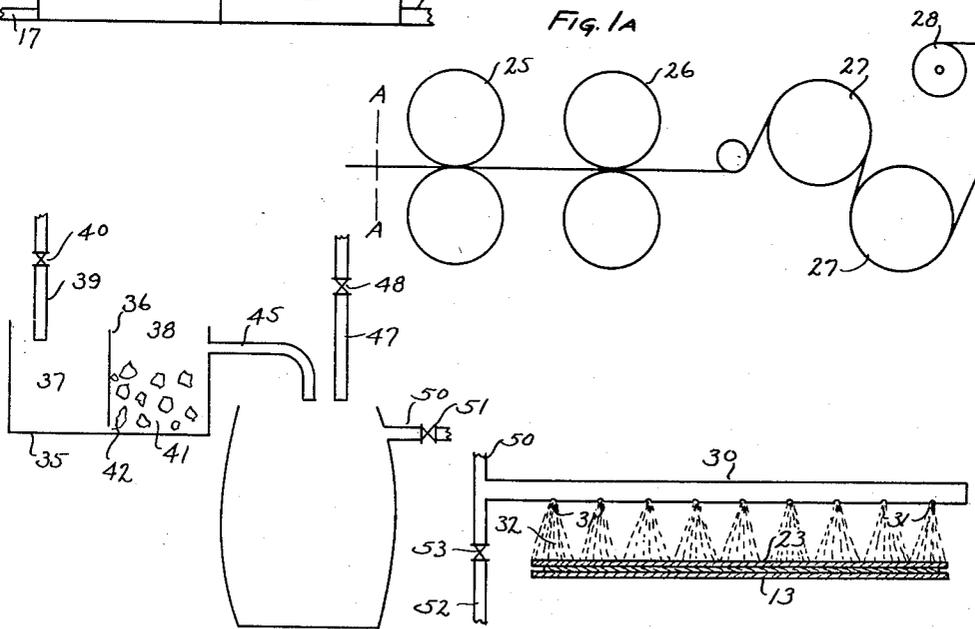
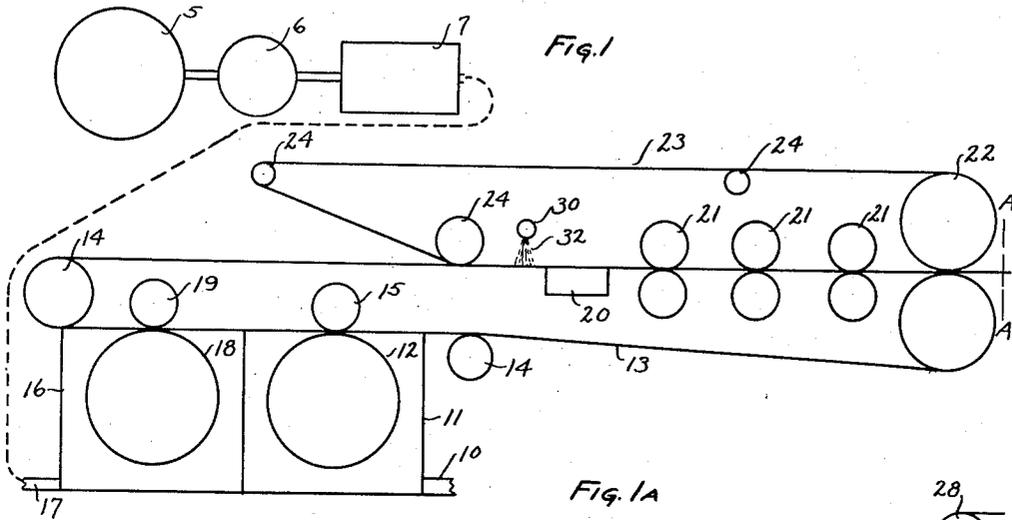


Fig. 2

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MANUFACTURE OF PULP

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This invention relates to the treatment and drying of fibrous materials, and particularly to the drying of pulp to be used in the manufacture of paper.

5 One of the principal objects of this invention is to prevent objectionable discoloration of pulp during drying to provide a superior pulp product having improved color and other desirable characteristics.

10 Another object of this invention is to provide a method of drying pulp which is simple and economical in operation, is readily controlled and carried out, and which serves to produce the above product.

15 Still another object of the invention is to provide apparatus for carrying out the above method.

Other objects and advantages of the invention will be apparent from the following description, the accompanying drawing and appended claims.

In the drawing in which like characters of reference designate like parts throughout the several views thereof—

25 Fig. 1 is a diagrammatic side elevational view of a portion of apparatus constructed for carrying out the method of this invention;

30 Fig. 1^a is a diagrammatic side elevational view of another portion of apparatus, Figs. 1 and 1^a being adapted to be placed end to end on the broken line A—A; and

Fig. 2 is a diagrammatic elevational view of a solution forming and applying means.

35 In the manufacture of paper, it is the general practice to prepare pulp which is thereafter generally dried for easier shipment, and utilized at the paper mill under suitable conditions to produce a paper of
40 desired characteristics. In preparing such pulp it is formed into a web, and may or may not be bleached prior to such formation, depending upon the use to which it is to be put.

45 Referring to the drawing, in which is shown a preferred embodiment of the apparatus of this invention, pulp making apparatus is illustrated in Figs. 1 and 1^a. As shown, a defibering apparatus for raw fibrous material, such as a digester, is indicat-

ed at 5 where the fibrous material is cooked with suitable chemical. The pulped material is washed in wash pans 6, and then is bleached in bleaching vats 7 where light colored pulp is being made. The resultant pulp
55 after washing is made down with water to low consistency, and a stock suspension of the fibers in water is supplied through pipe 10 to a vat 11 having a rotary perforate drum or cylindrical screen 12 dipping within the
60 stock therein. As the drum 12 rotates, a layer of fibrous material accumulates on the surface of the screen as the water in which the fibers are suspended passes therethrough, and this layer or web is transferred to a
65 traveling felt 13 supported by suitable guide rolls 14 opposite a couch roll 15. A second layer is deposited upon the first layer by a second mechanism having a vat 16 with stock inlet 17, cylinder 18 and couch roll 19. 70
It is to be understood that as many cylinders may be provided as desired to build up a web of the required thickness.

During this stage of the formation of the web, a considerable portion of the water of
75 the stock suspension is removed. The web supported between felt 13 and an upper felt 23 having suitable guide rolls 24 is conveyed over a suction box 20, through a plurality of sets of baby press rolls 21, and
80 through a pair of major press rolls 22, serving to remove sufficient water from the web to render it capable of sustaining its own weight. The web then passes through additional presses indicated at 25 and 26, and
85 thence through heated drier drums indicated at 27 to complete the drying thereof, the specific construction of these presses and drier drums with their associated conveying
90 felts and guide rolls not being illustrated as conventional constructions may be used. The dried pulp web is then wound upon a suitable reel 28, preparatory to shipment.

Difficulty is often encountered in the drying of pulp due to discoloration thereof, 95 which seriously affects the salability of the dried pulp. I have discovered that this discoloration may be prevented by controlling the character of the aqueous or liquid medium in which the fibers are suspended or

admixed so that it will be of slight acidity or not alkaline in character when the web passes into contact with the heated driers, or is otherwise heated for drying. The liquid suspension of fibrous material at the time it is fed to the vats of the forming machine will ordinarily be alkaline in character, due to the inherent characteristics of the fibers such as results from the preliminary chemical digestion, and particularly due to the inherent hardness of the water used, as practically all water available for commercial use has appreciable quantities of alkaline reacting salts dissolved therein. In accordance with my invention, an acid reacting material is added to the liquid medium to overcome this alkalinity, and preferably for commercial practice to provide a slight acidity within a certain acidity range. Very satisfactory results are secured where the acidity is controlled to between a value of pH5 and pH7 (as expressed in the usual chemical indicia of hydrogen ion concentration). I prefer to treat this normally alkaline mixture after a considerable amount of water has been expressed therefrom to cut down the quantity of acid material needed. Very satisfactory results are secured and material economy is effected by adding the acid reacting material to the pulp web which has been formed from the dilute stock suspension and before the web is subjected to heat for drying. Of course, the control may be effected by treating the water used in the mill before use in making down the stock suspension, or by treating the dilute stock suspension, but this is necessarily expensive, and furthermore acid wash water is objectionable for certain uses in the mill.

As shown in the drawing, a pipe 30 is disposed transversely of the forming machine and is provided with a plurality of holes 31 forming a number of jets indicated at 32 whereby the acid reacting material or solution may be sprayed substantially uniformly upon the web under formation. The web at this stage of formation is of about 10% consistency, or even drier, and thus the water remaining in the stock represents quite a small proportion of the water used in the mill. The result is that relatively small amounts of the acid reacting solution need be used in order to secure the desired acidity within the pH limits above mentioned, before the web is subjected to heat for drying. For the acid reacting materials, I prefer to employ salts which have an acid reaction in solution, and of such character that the hydroxides of the bases are either soluble in water or white precipitates which do not color the pulp. Such a salt is sodium bisulfate, commonly known as "nitre cake", which is particularly suitable for this purpose because of its cheapness and the ease with which it may be handled in the solid

state and subsequently made down in solution. This salt is highly ionized in aqueous solution and has the desired acid reaction. Other alkali metal acid salts of polybasic acids, such as alkali metal bisulfites, dihydrogen phosphates, hydrogen oxalates, hydrogen citrates, hydrogen tartrates, and the like, may be effectively used for this purpose, as well as other suitable acid reacting salts of metals whose hydroxides are white precipitates, such as aluminum sulfate, aluminum chloride, and the like.

Only small amounts of the acid material need be added in commercial operation, and for better control of the addition of the material to the web I prefer to use a highly dilute solution. A preferred form of apparatus for forming and applying the solution is illustrated in Fig. 2. A solution tank 35 is provided with a central partition 36 dividing the tank into two chambers 37 and 38. A controlled stream of water is discharged into the chamber 37 from a pipe 39 having a control valve 40. Suitable quantities of solid nitre cake are placed in the chamber 38 as indicated at 41. A plurality of perforations 43 are formed through the partition 36 so that the water may pass from the chamber 37 into the chamber 38 adjacent the bottom thereof and flow upwardly through the nitre cake to form a solution thereof. This solution discharges through an overflow pipe 45 into a dilution chamber 46, which may be an open tank or vat, into which also discharges additional dilution water from a pipe 47 having a control valve 48. The dilution chamber 46 has an overflow pipe 50 with a control valve 51, whereby controlled amounts of the diluted solution are supplied to the spray pipe 30. The dilution chamber 46 is preferably elevated above the forming machine and spray pipe 30 so that a gravity feed may be secured, although a pump may be used if desired. A secondary dilution pipe 52 having a control valve 53 is tapped into the pipe 50 to additionally dilute the solution flowing from the dilution chamber 46 to the spray pipe 30.

In actual operation, very satisfactory results have been secured by diluting the nitre cake solution to as much as one part of sodium bisulfate to seven thousand parts of water, or even more, before the solution is sprayed onto the web on the forming machine, although more concentrated solutions may be used. This permits sufficient spray to be added to uniformly wet the web and distribute the acid reacting salt, while at the same time very small quantities of this salt are added so that the acidity is not raised objectionably and so that the salt is not wasted unnecessarily. As an example of actual operating conditions, with a forming machine making a web of soda pulp about 150 inches wide and running at a

speed of about 150 feet per minute, very satisfactory results have been secured by adding from two pounds of nitre cake per hour up to fifty pounds per hour depending upon the alkalinity of the stock suspension received at the forming machine. The control of the quantity of acid material added is readily affected by varying the rate of addition of the solution or the concentration of the solution, or both, by proper manipulation of the valves 40, 48, 51 and 53.

Of course the acidity of the liquid medium may be provided by the addition of an acid, such as a very dilute sulfuric acid. However, this is difficult to control, and in commercial operation excess quantities of acid are apt to be added which increases the acidity of the liquid medium to a value materially lower than pH5, with the result that the pulp is deleteriously affected with consequent deterioration in strength and other characteristics of the final product. Where the acidity of the aqueous medium is maintained within the limits above mentioned, a white pulp product having improved color and other characteristics superior to pulp made from the same materials by the heretofore known processes is obtained. An acid salt whose solution has a relatively small acidity value is therefore preferred for this use, whereby the danger of harmful results from the addition of excess quantities of the salt is minimized.

While the method and product herein described, and the form of apparatus for carrying this method into effect, constitute preferred embodiments of the invention, it is to be understood that the invention is not limited to this precise method, product and form of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. In the treatment of fibrous material in which the material is first defibered and suspended in a liquid medium, and the mass then dried, the method which comprises maintaining the fibrous mass being dried of a character controlled as to its acidity.

2. The method of preparing pulp which comprises treating the fiber containing material to defiber it, suspending the separated fibers in a liquid medium, drying the mixed mass to remove water from the fibers, and maintaining the fibrous mass within a controlled range of acidity while the mass is being dried.

3. In the preparation of pulp to be used in the manufacture of paper, the method of preventing objectionable discoloration thereof which comprises drying a fibrous mass formed from a stock suspension of fibers in a liquid medium, and regulating during the drying thereof the pH value of liquid

medium mixed with the fibers to maintain a slight acidity thereof between pH5 and pH7.

4. In the preparation of pulp to be used in the manufacture of paper, the method of preventing objectionable discoloration thereof which comprises drying a fibrous mass formed from a stock suspension of fibers in a liquid medium, and adding an acid reacting material to liquid medium in which fibers are suspended to provide a slight acidity or liquid medium mixed with the fibers during the drying of the fibrous mass.

5. In the preparation of a pulp to be used in the manufacture of paper, the method of preventing objectionable discoloration thereof which comprises forming a web from a stock suspension of fibers in a liquid medium, adding an acid reacting material to the web under formation after a portion of the water has drained therefrom and before the web is subjected to heat for drying, and then heating the web to dry the same.

6. In the preparation of pulp to be used in the manufacture of paper, the method of preventing objectionable discoloration thereof which comprises forming a web from a stock suspension of fibers in a liquid medium, adding a solution of an alkali metal acid salt to the liquid medium to provide a controlled slight acidity thereof, and then completing the drying of the web.

7. In the preparation of a pulp to be used in the manufacture of paper, the method of preventing objectionable discoloration thereof which comprises forming a web from a stock suspension of fibers in a liquid medium, adding a solution of sodium bisulfate to the liquid medium to provide a controlled slight acidity thereof, and drying the web.

8. In the preparation of pulp to be used in the manufacture of paper, the method which comprises forming a traveling web from a stock suspension of fibers in water, draining a portion of the water therefrom, adding a controlled amount of a solution of an acid reacting material to the web under formation to provide a slight acidity thereof, and then completing the drying of the web.

9. In the preparation of pulp to be used in the manufacture of paper, the method which comprises forming a traveling web from a stock suspension of fibers in water, draining a portion of the water therefrom, adding a controlled amount of a dilute water solution of an acid reacting material to the web under formation to provide a slight acidity thereof, pressing the web, and then heating the web to complete the drying thereof.

In testimony whereof I hereto affix my signature.

FRANCIS G. RAWLING.