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METHOD AND APPARATUS FOR DRYING GLUES

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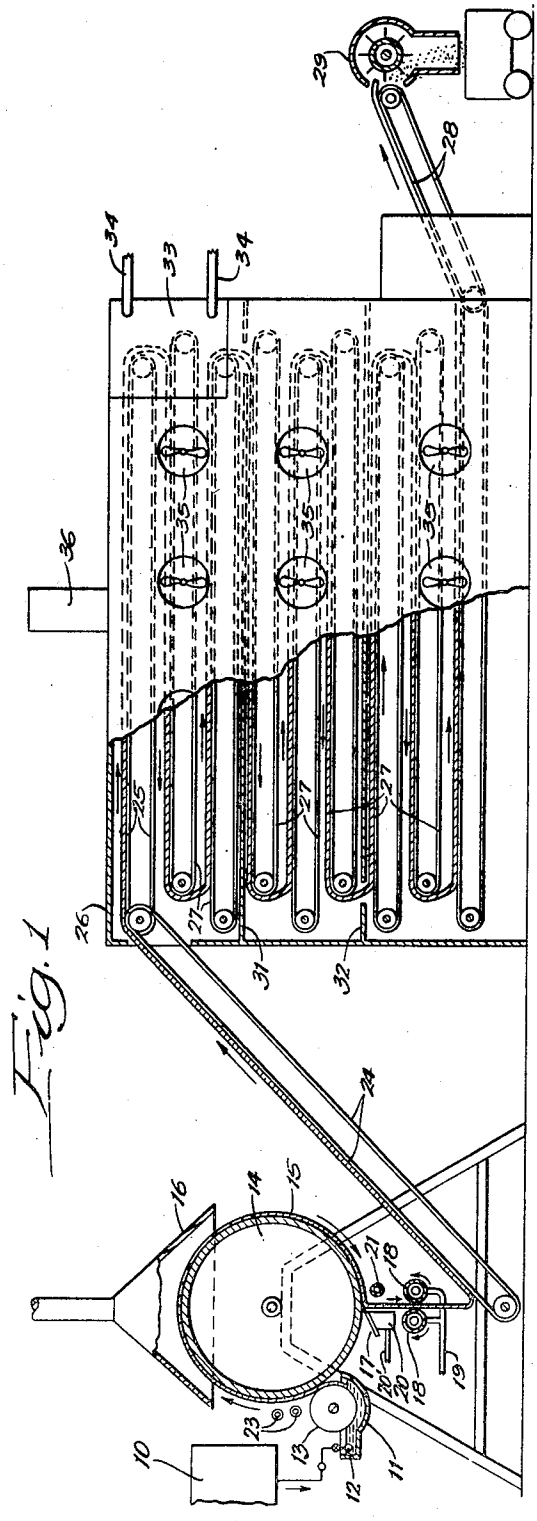


Fig. 1

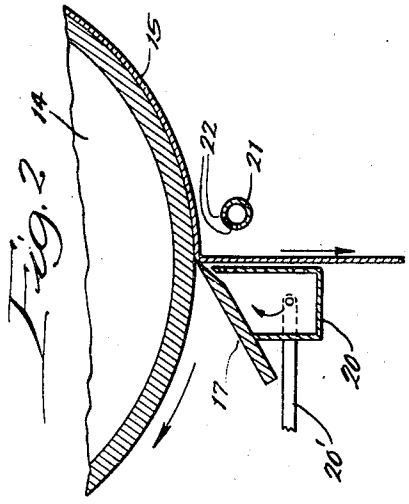


Fig. 2

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METHOD AND APPARATUS FOR DRYING GLUES

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Continuation of application Serial No. 584,002, March 21, 1945. This application April 20, 1949, Serial No. 88,544

7 Claims. (Cl. 18—15)

1

This application relates to method and apparatus for drying glue and more particularly to the continuous drying of concentrated glue liquor to commercial dryness, which is a continuation of applicants' copending application Serial No. 584,002, filed March 21, 1945, now abandoned.

Glues are generally made by preparing a glue solution or liquor which is concentrated until it contains about fifteen percent (15%) to forty-eight percent (48%) solids or about fifty-two percent (52%) to eighty-five percent (85%) moisture. This concentrated liquor is then dried according to one of several available methods to produce a relatively dry and hard flake or powder in which form the glue is marketed.

One method heretofore employed for drying the concentrated liquor consists in forming the liquor into sheets which are dried on racks or frames. This method requires a long period of time for the drying involving large and relatively expensive drying rooms. Furthermore, the glue is very apt to become contaminated by foreign matter such as dirt, wood splinters or bits of wires from the frames and may be otherwise affected by bacterial growth during the extensive drying period, resulting in a drop in jelly strength and viscosity. These latter tests are used as a measure of the quality of the glue produced.

Another method of drying heretofore practiced consists in applying the concentrated liquor to a heated drying roll on which it is substantially completely dried and then scraping the glue therefrom in the form of powder and flakes. In this method the rapid drying rate required to produce substantially complete dryness causes a fluffy structure due to entrapped air so that the resulting glue product is difficult to dissolve and causes a serious lumping or foaming.

In glue manufacture, it is conventional practice to define the jelly strength and viscosity as determined by standard tests. Since glue is a colloidal material its quality, i. e., its jelly strength and viscosity, are affected by temperature, bacterial growth, time of heating, and various other factors. It is one of the principal objects of the present invention to provide a glue drying method and apparatus in which these factors are controlled to provide maximum jelly strength and viscosity with a minimum of contamination or of exposure to conditions which would promote bacterial growth.

It is another object of the present invention to provide a method of and apparatus for drying glue which produces a glue product which is readily and quickly soluble, which contains no

2

entrapped air, which is free from contamination by foreign materials or bacteria and in which the drop in jelly strength and viscosity is held to a minimum.

Another object is to provide a glue drying method and apparatus in which the glue is dried in a continuous film. According to one important feature the film is partly dried on a drying roll and is further dried to the desired moisture content after removal from the roll.

Still another object is to provide a glue drying method and apparatus in which a glue film is dried on a roll to form a self supporting, flexible film which is removed from the roll under tension.

Still another object is to provide a glue drying method and apparatus in which the glue film is removed from the roll by a knife and steam is applied to the inner surface of the film adjacent the knife.

A still further object of the invention is to provide a glue drying method and apparatus in which air is blown on the outside of the film adjacent its point of removal from the roll to cool the film and increase its tensile strength.

The above and other objects and advantages of the invention will be more readily apparent from the following description when read in connection with the accompanying drawing, in which—

Figure 1 is a diagrammatic elevation with parts in section of apparatus embodying the invention and

Figure 2 is an enlarged partial section through the roll and the knife of Figure 1.

As shown in Figure 1 concentrated glue liquor is supplied from a vat or container 10 to a feed tank 11 in which the liquor level is maintained constant as, for example, by a float 12. A feed roll 13 dips into the liquor in the tank 11 so that a film of liquor is formed on its outer surface. The feed roll runs in contact with the periphery of a drying roll 14 which may be heated by circulation of steam or other heating fluid therethrough to form a film of concentrated glue liquor on the outer surface of the drying roll as indicated at 15. Fumes or vapor rising from the drying roll may be collected in a hood 16 and removed by an exhaustor fan or the like, not shown.

The concentrated liquor supplied to the tank 11 may be any conventional glue liquor and may have, for example, a solid content of approximately fifteen percent (15%) to forty-eight percent (48%) and a moisture content in the range between about fifty-two percent (52%) and eighty-five percent (85%). The drying roll 14 is heated to such a temperature and is run at such

a speed that the moisture content in the film 15 is reduced to the range of approximately forty percent (40%) to twelve percent (12%) by the time the film has travelled around with the roll to the lower part of the roll. At this time the glue is quite viscous though still relatively fluid and is in the form of a self-supporting relatively tenacious film.

At the lower part of the drying roll 14 the glue film is removed from the roll by a scraper blade or knife 17 extending across the width of the roll and engaging its periphery at the bottom part thereof. The blade 17 scrapes the film from the roll without breaking it, this being possible due to the flexible character of the film at this point.

In order to prevent the film or sheet of glue from collecting or piling up at the knife edge a pair of calender rolls 18 are provided directly below the knife 17 through which the film is fed as indicated in Figure 1. The calender rolls 18 engage the opposite sides of the glue film and calender it to a uniform thickness. At the same time, the rolls 18 are driven to maintain the glue film under tension so that it will be pulled away continuously from the blade 17. Preferably the rolls 18 are cooled as by circulating a cooling medium therethrough through a pipe 19.

To cool the film and to insure that it will have sufficient tensile strength not to break under the pull of the rolls 18, one or more compressed air pipes 21 may be mounted adjacent the knife 17 formed with openings 22 therein through which compressed air may be blown on the outside of the glue film 15 adjacent the knife. The compressed air serves to harden the outer surface of the film and to cool it somewhat thereby increasing its tensile strength so that it can be drawn from the roll in a continuous sheet without breaking. The air serves the further purpose of removing bubbles from the glue. In the case of certain glues such as hide glues which tend to bubble considerably and which do not adhere well to the drying roll, one or more additional compressed air pipes may be provided, as shown at 23 adjacent the feed roll 13 to blow air against the film of glue immediately after it is applied to the drying roll. This air assists in removing bubbles from the glue film while it is still quite fluid and also holds the film against the drying roll until it has had an opportunity to adhere properly thereto.

In order to prevent the glue from sticking to the knife blade and collecting thereon, the inner side of the glue film is subjected to steam adjacent the blade. As shown, a humidity chamber 20 is mounted beneath the blade 17 and is open at its top. Steam is supplied to the chamber 20 through a pipe 20' which may terminate in a perforated steam header on the interior of the chamber. During operation, steam from the chamber 20 rises under the knife and flows against the inner surface of the glue film adjacent the knife to maintain the film surface wetted so that it will not stick to the knife. If desired, the chamber may be perforated adjacent the film as shown to direct additional steam against the inner film surface until it passes the lower edge of the chamber. Addition of steam to the inner surface of the film is particularly important at the start of a run to keep the knife free of glue, and, after the run is well started, the supply of steam may, in many cases, be shut off. However, with some types of glue it may be necessary to supply steam continuously to the inner surface of the film to prevent it from sticking to the knife.

After leaving the calender rolls 18 the glue film drops onto a conveyor belt 24 which carries it up onto a conveyor belt 25 in a drying oven or chamber 26. From the belt 25 the glue film is fed continuously over a series of conveyor belts 27 in the drying chamber and finally emerges from the chamber on a conveyor belt 28 which feeds it to a breaker 29. By the time the film leaves the drying compartment its moisture content has been reduced to approximately 10% to 12% which is within the commercial range of dryness and the film is relatively stiff so that it can be broken into flakes by the breaker 29. The glue can be marketed in the form of such flakes if desired, or the flakes can be ground to granular or powdered forms.

The drying compartment is divided by horizontal partitions 31 and 32 into an upper drying zone, an intermediate drying zone, and a lower drying zone. Heat is supplied to the drying compartment by any desired heating means as indicated at 33 supplied with steam or the like through pipes 34. Air may be circulated through the several drying zones by fans 35 and conducted from the oven by a stack 36. Preferably the upper drying zone is maintained at a temperature of approximately 100–110° F., the second or intermediate drying zone to 140–180° F. and the third drying zone at a temperature of 180–220° F. We have found that these temperatures in a drying oven of the type indicated produce a highly satisfactory and properly dried glue film although other temperatures could be used as determined by experiment to produce the proper degree of dryness. Since the film is dried quickly in the drying compartment there is little opportunity for contamination by collection of dirt or by bacterial growth and no treatment of the air, other than heating is required. This is a distinct advantage over previously known methods in which it was necessary to condition the air to prevent contamination of the glue.

The thickness of the sheet and of the resulting flakes delivered by the breaker 29 can be controlled by spacing the feed roll 13 and drying roll 14 and the calendar rolls 18 to produce substantially any desired thickness. Preferably the thickness does not substantially exceed $\frac{1}{32}$ of an inch since a film much thicker than this will not dry completely through without undesirable case hardening interference. The film can be made as much thinner as desired. Due to the manner of drying the film on the roll 14 to a partially dried condition and subsequently further drying it to the limits of commercial dryness, no air is entrapped in the film, so that a solid uniform flake which is readily soluble in water is produced. There is no opportunity for contamination of the glue by dirt during the drying operation since the glue does not adhere to any parts of the apparatus and since the apparatus is not in contact with other materials than the glue film itself. Furthermore, since the entire drying operation is completed in a relatively short amount of time, approximating one hour, there is little opportunity for bacterial growth or for drop in gel strength and/or viscosity. Therefore, a clean very uniform glue product is produced.

Although the process has been described completely above, we have found that the drying step may be omitted in many cases and that the glue sheet may be broken after leaving the roll 14 without additional drying. When the speed of rotation and the temperature of the roll and the film thickness are so adjusted that the moisture content of the film is reduced to 12% to 16% by

the time film reaches the scraper, we have found that the film can still be removed from the roll under tension without breaking up. After cooling, however, the film is brittle enough to be broken in the breaker 29 and can be fed directly to the breaker without going through the drying compartment.

The term "glue" as used herein is intended to include the gelatin materials whether or not they have adhesive properties and whether they be edible or inedible.

While one embodiment of the invention has been shown and described in detail herein, it is to be understood that this is illustrative only and is not intended as definition of the scope of the invention, reference being had for this purpose to the appended claims.

We claim:

1. In a process for drying glue in which a film of glue liquor is supplied to a heated drying roll and the film, after the removal of some moisture therefrom, is removed from the roll under tension and at an angle to said roll, the step of directing a stream of air against said angle portion of the film.

2. In a method for drying glue in which glue liquor is supplied to a heated drying roll to form a film on said roll and in which the film is drawn in a sheet from said roll after the partial removal of moisture therefrom, the step of directing a stream of compressed air against one side of said film at the point where the film of glue is removed from the roll to surface-harden the outer portion of said film at such point of separation.

3. In a method of drying glue in which a film of glue liquor is supplied to a rotating heated roll to form a film thereon and in which said film, after the extraction of moisture therefrom, is scraped from said roll to provide a sheet depending at an angle from said roll and in which said sheet is drawn under tension from said roll, the step of directing a stream of compressed air against one side of said film where it forms an angle with said roll.

4. In a method of drying glue, which comprises supplying a film of glue liquor to a rotating heated roll and in which a knife is employed to scrape said film from said roll after the removal of some moisture from said film and in which the film is drawn from said roll under tension and at an angle thereto, the steps of applying steam to the edge of said knife on one side of the film at the point where said film leaves said roll, and simultaneously applying a stream of air to an area of the film on the opposite side of said film where it forms an angle with said roll.

5. Glue-drying apparatus, comprising a heated drying roll, means for rotating said roll, means for supplying a continuous film of glue liquor to the roll, a knife supported with the edge thereof adjacent said roll to scrape partially dried film therefrom, chilled rollers supported for engagement with said film sheet leaving said roll, means for rotating said rollers to draw said film sheet under tension from said roll, and an air discharge pipe supported between said chilling rollers and said drying roll and equipped with perforations for directing air against a surface of said film sheet opposite said knife edge.

6. Glue-drying apparatus, comprising a rotating heated roll, means for supplying glue liquor to said roll to form a film thereon, a knife supported near the bottom of said roll for scraping the partially dried film therefrom, a pair of tension rollers supported for engagement with said film leaving said roll, means for rotating said rollers, means for chilling said rollers, a steam pipe supported under said knife for discharging steam adjacent the edge of said knife, and an air pipe supported on the other side of said film opposite said steam pipe and between said chilling rollers and said drying roll and provided with perforations for directing compressed air against the other side of said film at the point where it leaves said roll.

7. In a process for drying glue in which a film of glue liquor is supplied to a heated drying roll and the film, after the removal of some moisture therefrom, is engaged on its outer side with an edge to remove the film from the roll, said film depending from said roll and providing an inside angle portion thereof opposite said edge, the step of directing a stream of air against the inside angle portion of the glue film opposite said edge.

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