March 4, 1958 A. H. ZEIGLER 2,825,094

METHOD FOR DRYING ANIMAL GLUE

Filed June 25, 1954

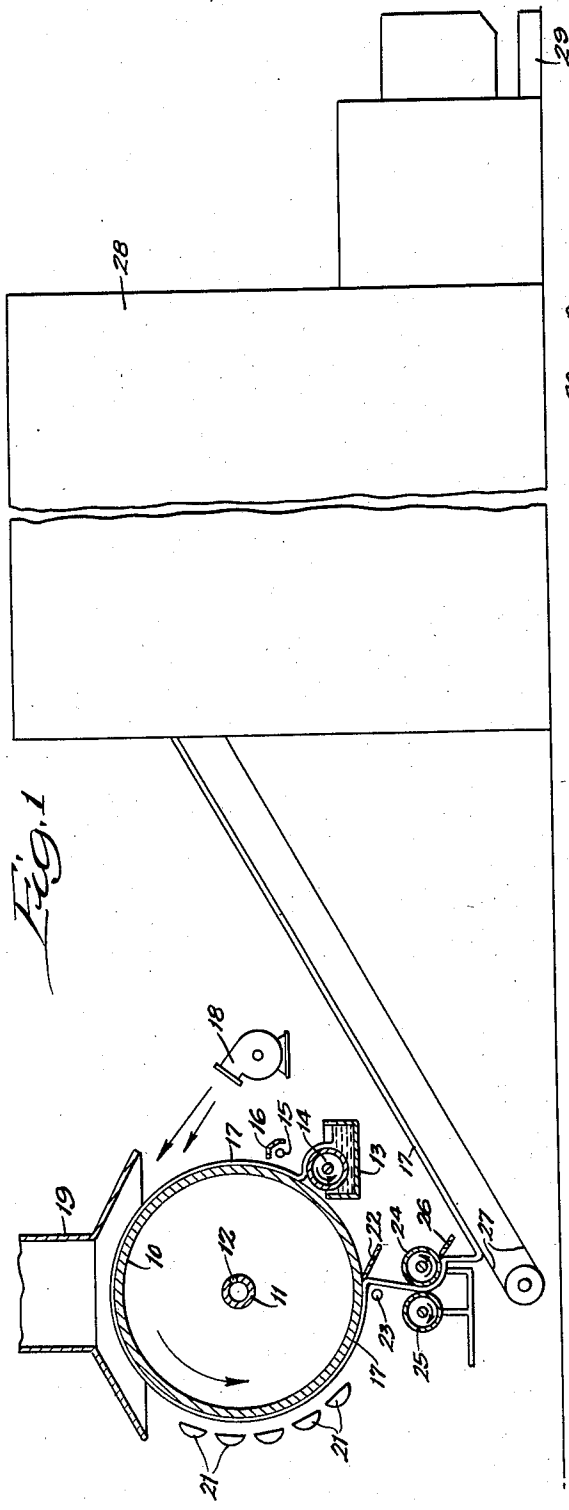


Fig. 1

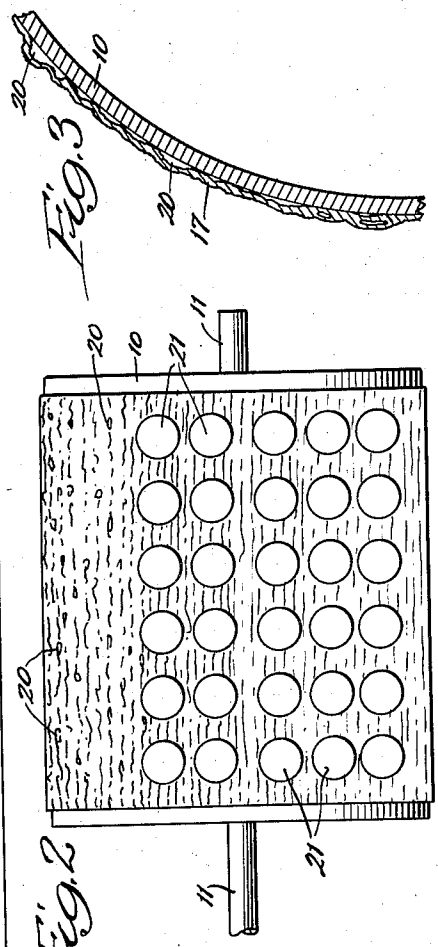


Fig. 2

Fig. 3

INVENTOR:
Albert H. Zeigler,
BY
Carl C. Batz
ATTORNEY.

United States Patent Office

2,825,094

Patented Mar. 4, 1958

2,825,094

METHOD FOR DRYING ANIMAL GLUE

Albert H. Zeigler, Wilmette, Ill., assignor to Armour and Company, Chicago, Ill., a corporation of Illinois

Application June 25, 1954, Serial No. 439,213

2 Claims. (Cl. 18—57)

This invention relates to a method for drying animal glue, and more particularly, to a method for drying an aqueous glue liquor wherein the glue liquor is applied to an internally heated roll to evaporate water therefrom and to form the glue into a continuous sheet. This general method of drying glue is described in my prior Patent No. 2,556,954, and the present application discloses an improvement on the method therein described.

In the drying of animal glue on an internally heated roll where it is desired to remove the glue from the roll in a continuous sheet, there is a definite limit on the rate at which it has heretofore been possible to drive off the water from the glue. Too rapid evaporation of water from the surface of the glue sheet which is against the drying roll causes water vapor to accumulate between the glue sheet and the drying roll. The relatively high temperature of this trapped water vapor causes it to exert considerable force on the glue sheet, tending to separate it from the drying roll and to form bubbles or blisters in the glue sheet. These bubbles or blisters may break under the pressure of the water vapor so that holes or breaks are developed in the glue sheet. When this condition becomes extreme the entire sheet may be severed, thereby causing an interruption of the continuous process. This problem is particularly acute at high rates of production, and has proved to be a serious limitation on the feasible operating capacity of glue-drying equipment of the type illustrated and described in my prior Patent No. 2,556,954.

It is therefore a general object of this invention to provide a means and method for alleviating the above problem, and facilitating a substantial increase in the rate at which glue can be dried on an internally heated roll and removed therefrom in a continuous substantially imperforate sheet. Further objects and advantages will become apparent as the specification proceeds.

The method of this invention is illustrated in the accompanying drawing, in which—

Fig. 1 is a broken longitudinal view partly in section of apparatus embodying my invention, portions of the apparatus being indicated somewhat diagrammatically; Fig. 2, a front elevational view of the glue-drying roll of Fig. 1, showing the battery of infra-red lamps; and Fig. 3, a fragmentary enlarged sectional view showing the appearance of the glue sheet on the drying roll as it passes under the battery of infra-red lamps.

As indicated above, this invention has to do with a process for drying an aqueous animal glue liquor wherein the glue liquor is applied to an internally heated roll to evaporate water therefrom and to form the glue into a continuous sheet, and more specifically, to a method of accelerating the drying rate of the glue on said roll while maintaining the integrity of the glue sheet. In one of its phases, the method of this invention contemplates transferring heat to the under side of a portion of the glue sheet from the internally heated roll and at the same time applying radiant heat to the outer side of the glue sheet portion. This method has particular advantage and applicability when the glue sheet on the drying roll has water evaporated from its under side at a rate faster than the evaporated water can diffuse through the sheet, whereby water vapor accumulates between a portion of the sheet and the roll. When this condition occurs, it has been discovered that exposing the outside of the sheet portion to radiant heat while the under side of the sheet portion remains on the roll tends to prevent breaks or openings from developing in the sheet due to the trapped water vapor. The radiant heat reduces the surface tension of the bubbles or blisters by raising the temperature of the glue film and reducing its viscosity. The effect produces a reformation of the film from a condition of large blisters to a large number of very small bubbles with thin walls that permit rapid escape of the water vapor formed. In this way a larger area of film contact with the drum is made possible and as a consequence more effective utilization of available heat.

The method of this invention can be better understood by reference to the accompanying drawing. Looking first at Fig. 1, there is shown a glue-drying apparatus of the type which is described more fully in my Patent No. 2,556,945. The hollow drum or roll **10** is mounted for rotation upon a hollow shaft **11** provided with ports **12** for the admission of steam or other heating fluid into roll **10**. The operation of roll **10** will now be more fully described.

A pool of an aqueous animal glue liquor is maintained in vessel **13** from which it is applied to roll **10** by means of a driven roller **14**. The layer of glue deposited on the outer surface of roll **10** is given an initial hardening and supported on the roll by means of compressed air discharged through pipe **15** and merged into a continuous stream by baffle **16** which is arranged to direct the stream of air against the glue sheet **17** as it is formed on roll **10**.

Blowers **18** are also provided to direct a heavy stream of air against the glue sheet **17** on the ascending side of the roll **10**. A vent hood **19** is provided above roll **10** through which the air and evaporated water are discharged. It will be understood that any suitable means can be provided for supplying the animal glue liquor to vessel **13**. For example, the means illustrated in Patent No. 2,556,945 can be used.

After the formation of glue sheet **17** on the ascending side of roll **10**, heat is continually transferred to the glue sheet through the metal wall of roll **10**, the heat preferably being supplied by the introduction of steam into the interior of the roll. To form the glue sheet so that it can be removed continuously and in one piece from roll **10**, it is necessary to remove a considerable quantity of water from the glue as it passes around roll **10**, and the heat for this purpose is supplied by the transfer of heat from the interior of roll **10** in the manner described.

For example, the glue liquor containing from 55 to 80% water may be applied to roll **10** by driven roller **14**, while it is desired to reduce the moisture content of the glue sheet to from 16 to 25% before removing it from the roll. However, this presents a problem, as described above, for high production rates. While large amounts of heat can rapidly be transferred to the glue sheet **17** from the interior of roll **10**, a too rapid transfer of heat causes water vapor to accumulate between the glue sheet and the surface of the roll. This may cause the formation of bubbles or blisters, such as those designated by the number **20** in Figs. 2 and 3. The trapped water vapor will exert considerable pressure against the glue sheet and cause it to pull away from roll **10** in the manner illustrated more clearly in Fig. 3.

To overcome this problem and permit higher rates

of production to be achieved, there is provided in accordance with the present invention a battery of infra-red lamps **21** mounted adjacent roll **10** on the descending side thereof, and arranged to direct radiant heat against the outer surface of glue sheet **17** as it passes beneath the lamps. In other words, the rotation of roll **10** carries the glue sheet **17** past lamps **21** while heat is transferred to the glue sheet from the interior of roll **10**. The effect of the conduction heating of the inner surface of sheet **17** and the radiant heating of its outer surface is illustrated in Figs. 2 and 3. By continuing to heat the trapped water vapor beneath sheet **17** while softening sheet **17** by radiant heat, the evolution of the water vapor through the glue sheet is promoted, while at the same time large tears are prevented from developing in the glue sheet. The infra-red lights keep the outer surface of the glue sheet soft enough to allow the escape of small bubbles of vapor, thereby preventing the formation of large blisters.

Any suitable means can be provided for removing glue sheet **17** from roll **10**. In the illustration given, there is provided a doctor knife **22** which is arranged to scrape the glue sheet free from the surface of roll **10**. If desired, means can be provided for heating doctor knife **22** and it is preferred to provide means for cooling the opposite side of the glue sheet, such as a perforated pipe **23** arranged to direct streams of cool air on the separated glue sheet.

After being removed from roll **10**, the glue sheet **17** is passed between calendar rolls **24** and **25**, which are preferably brine cooled. Rolls **24** and **25** are constructed of materials so that the glue sheet adheres preferentially to roll **24** from which it is removed by doctor knife **26** and deposited on a continuous conveyor **27**. Conveyor **27** carries the glue sheet **17** to an apron-type air dryer **28** within which the glue sheet is reduced to its final moisture content before being discharged into outlet chute **29**.

This invention can be further illustrated by the following specific examples.

Example 1

An animal glue liquor of 38½% solids was applied to a drying roll in the manner illustrated in Fig. 1 and formed into a sheet thereon. The roll was heated internally with steam at 229° F., and the glue sheet as removed at the knife contained 21.8% water. Infra-red heaters of the tube-type (Chromlox heaters) were used to maintain the outer surface of the glue sheet on the descending side of the roll at 170° F. As removed at the knife, the glue sheet was substantially free of tears or breaks. When the infra-red heaters were shut off, the outside of the glue film on the descending side of the roll dropped to 140° F., and large blisters began to form in the glue sheet.

Example 2

Following the same procedure of Example 1, an aqueous glue liquor of 39% solids was formed into a sheet on a roll heated internally with steam at 236.8° F. The surface temperature of the glue film on the descending side of the roll where it was subjected to radiation from infra-red heaters was 172° F. When the infra-red heaters were shut off, the surface temperature of the glue film adjacent the heaters dropped to 142° F.

While in the foregoing specification this invention has been described in relation to a specific embodiment thereof and many details have been set forth in connection with this embodiment, it will be apparent to those skilled in the art that the invention is susceptible to other embodiments and that many of the details set forth herein can be varied considerably without departing from the basic concepts of the invention.

I claim:

1. In a method for drying an aqueous animal glue liquor wherein the glue liquor is applied to an internally heated roll to form the glue into a continuous sheet, the steps of heating the under side of said sheet by contact with said internally heated roll and evaporating water from the under side of said sheet at a rate faster than the evaporated water can diffuse through said sheet, whereby water vapor accumulates between a portion of said sheet and said roll, and then thereafter exposing the outer side of said sheet portion to radiant heat while the under side thereof remains on said roll to soften said sheet portion and promote the diffusion of the accumulated water vapor.

2. A method for drying an aqueous animal glue liquor, comprising applying said glue liquor to a hollow rotating roll at one position while supplying steam to the interior of said roll to form a glue sheet thereon, transferring heat to the under side of a portion of said glue sheet as it moves from said one position to evaporate water therefrom at a rate faster than the evaporated water can diffuse through said sheet, whereby water vapor accumulates between said sheet portion and said roll, thereafter from another position directing infra-red radiant heat against the outside of said sheet portion while its under side remains on said roll to soften said sheet portion and promote the diffusion of the accumulated water vapor, and then removing a continuous substantially imperforate glue sheet from said roll.

References Cited in the file of this patent

UNITED STATES PATENTS

2,320,513	Drummond	June 1, 1943
2,439,802	Francis	Apr. 20, 1948
2,556,954	Zeigler et al.	June 12, 1951