June 2, 1942. J. S. RYAN 2,284,848

METHOD AND APPARATUS FOR DRYING GLUE

Filed June 7, 1938

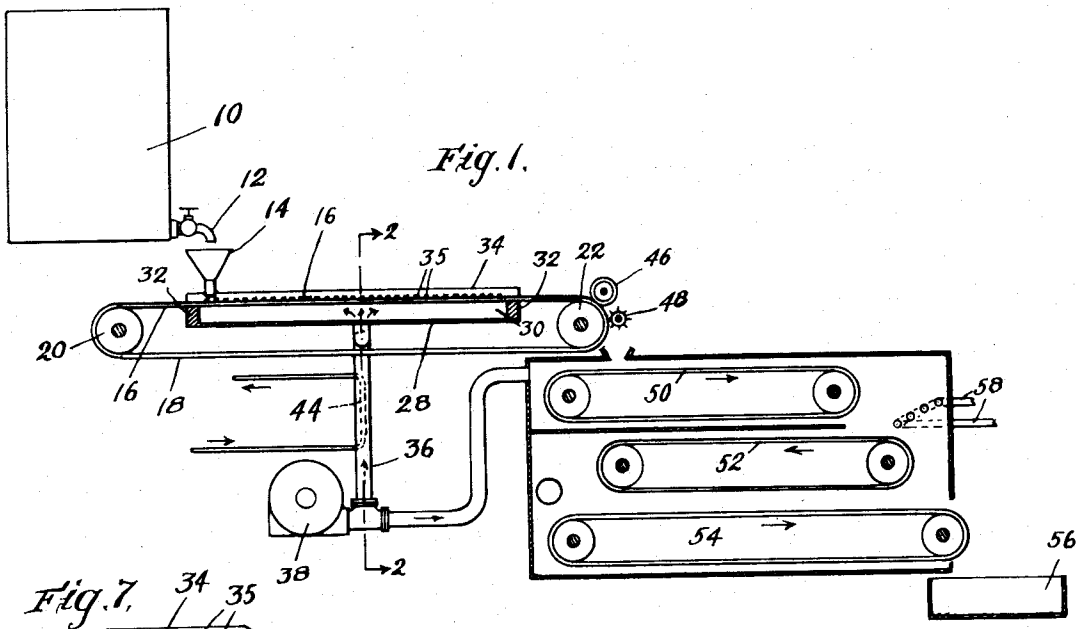


Fig. 1.

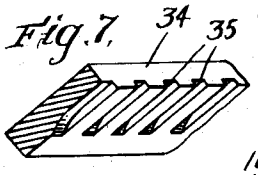


Fig. 7.

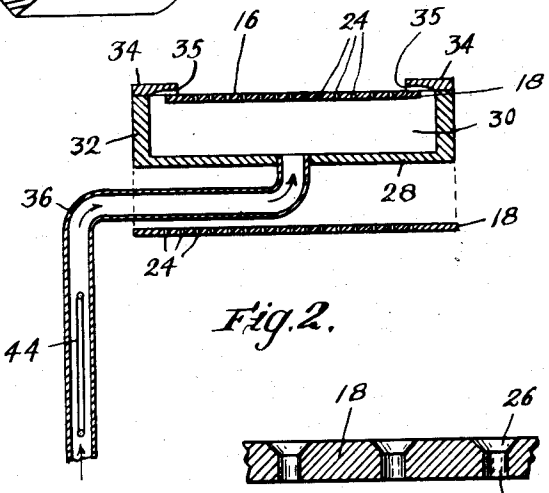


Fig. 2.

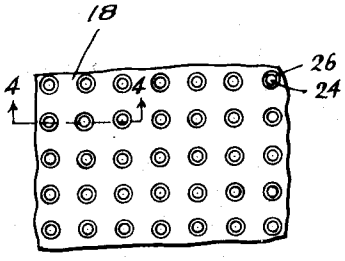


Fig. 3.

Fig. 4.

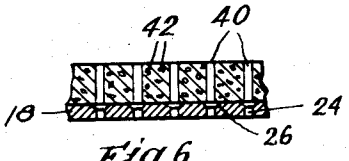


Fig. 6.

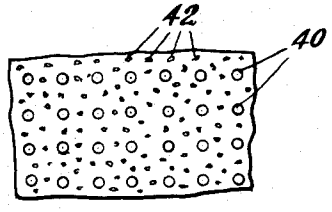


Fig. 5.

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UNITED STATES PATENT OFFICE

2,284,848

METHOD AND APPARATUS FOR DRYING GLUE

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Application June 7, 1938, Serial No. 212,281

7 Claims. (Cl. 159—8)

This invention relates to the manufacture of glue and particularly to the rapid jelling of the initially liquid glue solution.

In a common process for making glue the glue solution, usually hot and concentrated to about 20% by weight of glue stock, is flowed onto a long travelling conveyor belt and conveyed through a refrigerated tunnel for the purpose of setting or jelling the liquid sheet on the belt. The refrigerated and jelled sheet is cut into slabs and placed on individual nets for further drying. The jelled slab will withstand ordinary atmospheric temperatures without melting but will not withstand heat until it has undergone further drying. The drying process is of long duration, approximately a day. The refrigerated tunnel is expensive to install and to operate and the liquid glue has to remain in the tunnel for a considerable period of time so that the belt speed is slow or the tunnel is very long.

An object of the present invention comprises a method and apparatus for rapidly jelling the glue solution, without the use of a refrigerated tunnel so that the production of dried glue can be accelerated and the cost thereof reduced.

I have discovered that if the liquid glue solution is deposited upon a closely apertured support upwardly through the apertures of which air is blown, either at atmospheric temperature or preferably somewhat warmed, the liquid glue is almost immediately jelled or set so that it is stable at a temperature considerably above that of the atmosphere and can be subjected immediately to a heated atmosphere for further and rapid drying and the temperature of the drying air can be progressively raised as the drying progresses to hasten the drying so that a rapid production of dry glue is obtained. This process and apparatus for carrying out the process constitutes a further object of the invention.

I have also discovered that when air is blown through the liquid glue to jel it in the manner above described apertures are formed through the jelled sheet in register with the apertures of the supporting plate so that subsequent drying of the jelled glue is facilitated by reason of the passage of drying air through the apertures. Such a glue sheet and the process and apparatus for making it constitutes another object of the invention.

The glue as above described also contains a multitude of air bubbles which render the glue, either in flake or ground form, more rapidly soluble than a solid glue. The process and apparatus for making such a glue constitutes a further object of the invention.

In practice I prefer to make the apertured support for the liquid glue in the form of an endless conveyor belt and to flow the liquid glue upon the top horizontal pass of the belt where it jels as the belt advances. Such an arrangement constitutes a yet further object of the invention.

It is another object of the invention to facilitate the drying of the jelled glue by cutting the jel into relatively small particles or cubes and to convey these particles through a drying chamber through which air, and in parts thereof heated air, circulates whereby rapidly and automatically to dry the glue into a form which is useable for many purposes without further reduction in size.

Another object is generally to improve upon glue making processes and apparatus.

Fig. 1 is a diagrammatic side elevation of the apparatus embodying the present invention.

Fig. 2 is a section taken along line 2—2 of Fig. 1.

Fig. 3 is a plan detail of the top face of the apertured conveyor belt.

Fig. 4 is an enlarged sectional detail of the belt taken along line 4—4 of Fig. 3.

Fig. 5 is a plan detail of a section of the jelled glue sheet.

Fig. 6 is an enlarged cross-sectional detail of the conveyor belt and a jelled glue sheet thereon.

Fig. 7 is an enlarged detail view of a part of Fig. 2.

In accordance with the present invention the glue solution, usually hot and of around 20% consistency, is contained in a tank 10 from which it flows through the outlet 12 into a spreading trough 14 which deposits it upon the upper horizontal pass 16 of a conveyor belt 18 extended between supporting rolls 20 and 22, one of which, as the roll 22, can be the driving roll. The belt 18 is of some suitable sheet material to which the glue will not readily adhere, as, for instance, a metal sheet.

The belt is provided with a plurality of closely spaced perforations or apertures 24 which can be conveniently spaced about one-quarter of an inch apart, although the precise spacing is not important. Apertures one-sixteenth of an inch in diameter or a little larger are quite satisfactory. Preferably the apertures 24 have the enlarged counter-sunk or recessed portions 26 in the upper face of the belt. These enlargements of the apertures are helpful in introducing bub-

bles into the jelled glue sheet and in preventing the sheet from clinging to the belt.

An air box **28** is located under the horizontal pass of the perforated belt and extends under the major portion of the horizontal pass and has upstanding end walls **30** which substantially engage the under face of the horizontal pass so that the belt thus constitutes the top wall of the box. The air box also has side walls **32** which upstand beyond the long edges of the top pass of the belt and are provided with plates **34** which overlie and engage the top face of the belt pass. Thus the box is more or less sealed except for the apertures in the belt. The plates on their under faces have air grooves **35** therein which communicate with the interior of the air box and direct jets of air edgewise onto the layer of glue on the belt with sufficient force to keep the edge of the glue layer away from the edges of the plates so that glue will not adhere thereto. The box is supplied with air through a pipe **36** from a blower **38**. The air is at a pressure at least equal to the hydrostatic head of glue on the belt and preferably some pressure in excess of this. Thus the pressure of air prevents the liquid glue from flowing through the apertures of the belt. The air is forced through the liquid glue sheet under sufficient pressure to perforate the liquid sheet and rapidly sets or jels it, the glue being set or jelled a relatively few inches from the spreading trough **14**.

Fig. 5 illustrates a fragment of jelled glue formed by the action of the air jets. The air jets form apertures or passages **40** vertically through the sheet of glue, the passages being in register with the apertures in the belt and being generally circular in cross section although somewhat irregular. The apertures are entirely open through the jelled sheet. Numerous air bubbles **42** are formed and retained in the jelled sheet. The air that blows through the belt can be at atmospheric temperature or it can be at some moderately elevated temperature as produced, for instance, by the steam heating coil **44** located in the air pipe **36**.

The glue is set or jelled before it reaches the end of the top pass of the conveyor belt and the air passing through the apertures in the jelled sheet dry it substantially while on the belt, so that the sheet can be subjected to further forced drying immediately.

The apertured sheets of jelled glue can be formed into slabs and removed from the perforated belt and stacked on nets in a drying chamber in the usual manner or preferably the jelled glue sheet is cut into small pieces and dried automatically on conveyor belts which is permitted because of the higher melting temperature of the glue jelled as herein described.

In accordance with the present process the jelled glue sheet on the belt passes under a series of slitting discs **46** where it is formed into separate narrow strips lengthwise of the belt. The strips then pass to a chopping roll **48** where they are cut into small cubes and fall onto the top pass of an uppermost conveyor belt **50** which deposits them at the end of the pass upon the top pass of an intermediate belt **52**. From said belt they ultimately fall upon the top pass of a lower belt **54** which deposits the dried glue particles in a receptacle **56**.

The belts travel alternately in opposite directions and currents of air are passed over the particles of glue on the belts supplied by any suitable source as the aforesaid blower **38**. The air current passing over certain of the belts can be heated as from the steam coils **58**.

With the above described process the glue is jelled much more rapidly than with the refrigerated tunnel process and dried to such an extent that the sheet can be broken up into small particles and dried rapidly in an entirely automatic manner so that a large production of glue at no manual handling expense is obtained.

I claim:

1. The method of jelling and drying glue which comprises forming a liquid glue solution in a continuous manner into a thin liquid sheet, maintaining the sheet under conditions permitting jelling of the sheet, hastening the jelling by blowing cooling air through the sheet as it is formed to jel the glue and form perforations in the jelled sheet, cutting the jelled perforated glue sheet in a continuous manner into fragments, and drying the perforated fragments in a continuous manner.

2. The method of drying glue which comprises applying glue liquid in a liquid sheet on a supporting surface and keeping the liquid sheet in position on the surface by a blast of air substantially coextensive with the length of the liquid sheet directed against the edge of the sheet and drying the glue by blowing air through the sheet.

3. Glue treating apparatus comprising a travelling belt, means for depositing a sheet of glue liquid on the belt, and means for directing blasts of air parallel with the belt substantially coextensive with the length of the liquid sheet and inwardly thereof and edgewise against the liquid sheet to prevent it from spreading on the belt and drying the glue by blowing air through the sheet.

4. The method of drying glue which comprises applying a sheet of liquid glue to a supporting surface and preventing the liquid glue sheet from spreading on the support by directing blasts of air substantially coextensive with the length of the liquid sheet parallel with the sheet and inwardly against the edges of the liquid sheet and directing a blast of air through the sheet to dry the glue.

5. The method of jelling a glue solution which consists in forming the liquid glue solution in a thin sheet, and maintaining the sheet under conditions permitting the sheet to cool and ultimately jel while hastening the jelling by passing blasts of cooling air through the sheet.

6. The method of jelling a glue solution which consists in forming the liquid glue solution in a thin sheet, and maintaining the sheet under conditions permitting the sheet to cool and ultimately jel while hastening the jelling by passing blasts of cooling air through the sheet until the sheet jels and the perforations through the sheet formed by the air blasts become permanent.

7. The method of jelling a glue solution which consists in forming the liquid glue solution in a thin sheet, and maintaining the sheet under conditions permitting the sheet to cool and ultimately jel while hastening the jelling by passing blasts of cooling air through the sheet until the sheet jels and the perforations through the sheet formed by the air blasts become permanent, and then drying the jelled perforated sheet.

JAMES S. RYAN.