Oct. 1, 1935. R. M. GREENLEAF 2,015,893

DRYING CLEAN WOOL

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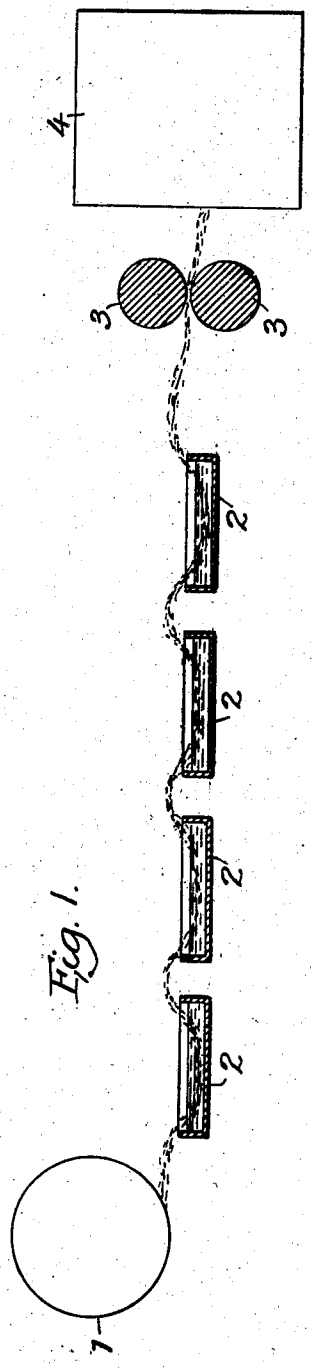


Fig. 1.

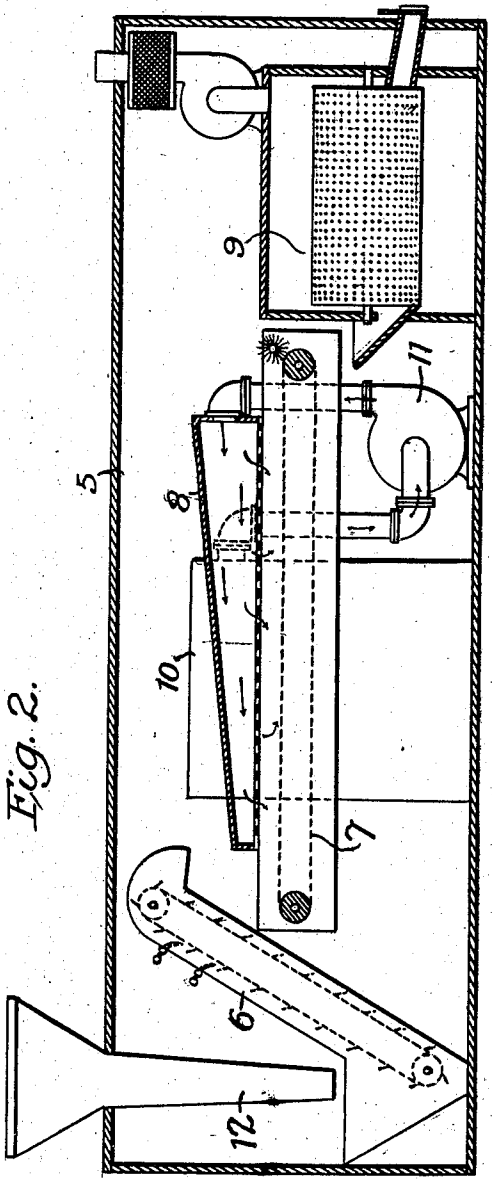


Fig. 2.

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DRYING CLEAN WOOL

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Application July 25, 1932, Serial No. 624,618

6 Claims. (Cl. 34—24)

This invention is a novel process for and method of drying clean wool to properly condition it for use in worsted mills, and, more especially, in woolen mills where the moisture content in the wool must be less than in worsted mills.

At present it is customary after scouring and washing the wool to pass it through squeeze rolls to remove most of the excess water, and after passing the squeeze rolls the wool is placed in a "drier" where it is subjected to heat or hot air at a temperature of about 140° F. to remove excess moisture. It is practically impossible to keep the temperature in the drier uniformly at 140°, and if the temperature rises above 140° F. it injures the wool. A great deal of difficulty has been experienced in properly conditioning the wool in the drier and it is troublesome because overheat will injure the wool and too low heat will not remove the moisture or require too long a time for its removal.

If wool is to be used immediately after it is cleaned it is necessary to remove excess moisture and if the clean dried wool is allowed to stand, it may adsorb moisture from the air or lose moisture which may make it necessary to condition it before passing it to the mills.

The degree to which the wool must be dried depends upon whether the wool is to be used in a worsted mill or in a woolen mill. For a worsted mill the moisture content of the wool may be from 25% to 35%. For a woolen mill the moisture content of the wool should not exceed 20%.

The object of the present invention is to avoid the use of a heated drier, and to remove the excess moisture from clean wool by a very simple and expeditious cold process.

In my process the clean wool after passing the squeeze rolls is exposed to a temperature of approximately zero Fahrenheit (say from plus 15° F. to minus 30° F.) which will rapidly freeze the excess moisture on the wool, but not freeze the wool fibres. The wool would be exposed to this freezing temperature for a short time, say one to twenty minutes, sufficient to freeze the moisture adhering to the wool fibres; and the wool is then subjected to mechanical agitation or beating whereby the ice spicules or particles are dusted off of the wool fibres. The degree and rate of drying would depend upon the time of exposure and amount of mechanical agitation given to the wool.

Preferably during the freezing step the wool is subjected or exposed to high velocity low temperature air jets while supported on a wire screen, the rapidly moving air vibrating the wool and carrying off some of the ice spicules or particles.

In the accompanying drawing, Fig. 1 represents diagrammatically the apparatus at present commonly employed for washing and drying wool; and Fig. 2 represents diagrammatically a freezing and separating apparatus which I preferably employ in lieu of the drier in carrying out my invention.

Ordinarily in common practice the wool is first passed through a grease wool duster or opener, indicated at 1 in Fig. 1, and then passed through one or more scouring bowls indicated at 2, wherein it is scoured and washed, and the scoured wool is then passed between squeeze rolls 3 whereby much of the free water or moisture is removed. Heretofore the moist wool passes from the squeeze rolls into a drier 4, wherein it is dried to the desired degree by means of heated air as above explained.

In my invention I dispense with this drier 4 and pass the wool from the squeeze rolls 3 into a refrigerating chamber 5 (see Fig. 2) wherein a temperature of about 0° F. is maintained. The chamber may be refrigerated by any suitable means which will maintain a low temperature therein. In this chamber the wet wool is opened up by an opener or feeder 6 of any suitable construction, and fed onto an endless belt 7 preferably of wire fabric over which is mounted a hood 8 with perforations or air jets impinging on the wool as it passes along on the belt. If sufficient agitation is provided by the air jets, the wool will lose its ice crystals and be dried without further mechanical agitation and may be discharged out of the freezing chamber from the belt, but to hasten the operation or where some shortening of the fibre is not important as in the manufacture of woolens the frozen wool may be delivered from the belt to a "duster" or "picker" machine 9 of any suitable construction and from this duster the dried wool is discharged out of the freezing chamber by any suitable means. The air for agitating the wool on the belt is supplied by a blower 11 mounted within the freezing chamber.

The wool may be introduced into the feeder 6 through a chute 12. The air may be refrigerated by a suitable refrigerating apparatus indicated at 10 and forced into the hood by a blower 11. No claim is made herein for the apparatus as that forms the subject-matter of my companion application Serial No. 624,619, filed July 25, 1932.

In this apparatus the passage of the wool

through the freezing chamber takes very little time and by reason of the low temperature in the freezing chamber and the agitation of air the wool is quickly freed of the excess moisture and there is no possibility of injury to the wool such as would result from the use of heat or the ordinary driers, and the wool can be dried by my process more economically without injury to the wool fibres than can be accomplished by the ordinary drier.

For most effective operation the opener or feeder 6 and the duster or picker 9 are located inside of the refrigerating chamber.

The wool on belt 7 is preferably subjected to a current or jets of cold refrigerated air directed thereagainst by the hood 8 so as to agitate the wool thereon and insure freezing of the exterior moisture adhering to the wool, and by the time the wool reaches the discharge end of the belt all the moisture on the wool will be frozen and partly or wholly removed to the desired moisture content. Some of the ice spicules or particles will be separated from the wool during its travel over the belt by the action of the cold air jets directed thereagainst by hood 8 and will be deposited in a chamber below the belt or disposed of in some other suitable manner.

The wool which passes from the freezing belt into the beater or duster 9 has the ice spicules or particles of frozen water adhering to the wool mechanically separated from the wool fibres and the wool may be discharged from the duster outside of the freezing chamber. The clean wool free of undesirable excess moisture is ready for immediate use in the mill or for storage.

In some cases the opener belt might be extended sufficiently to permit the freezing to be effected thereon and the refrigerated wool delivered direct from the opener belt to the duster. This might be possible if the opener conveyor belt were made longer, or a lower temperature was used, or the opener operated at a slower speed, and the foreign matters in the wool of small size, or where two or more of the above conditions exist.

Where the conveyor discharges into a dusting machine of the batch type, i. e., operating intermittently, some means such as a hopper with a feed device should be interposed between the conveyor and the inlet into the duster, so that the conveyor or freezing belt can operate continuously and a batch of material accumulated and fed into the dusting machine in accordance with the intermittent operation thereof.

I claim:—

1. The process of dewatering washed wool after it has passed through the squeeze rolls; consisting in spreading the wool, then exposing it for a short time to a low temperature sufficient to freeze the water adhering to the wool fibres, and subjecting the fibres to cold air currents to separate the loose ice spicules or particles therefrom.

2. The process of drying wool after the same has been washed and free water removed; consisting in distributing the wool onto a conveyor, subjecting it to a sufficiently low temperature to freeze the moisture adhering thereto, subjecting the fibres to cold air currents to separate the loose ice spicules or particles therefrom, and finally subjecting the wool to mechanical agitation to separate from the wool ice spicules or particles adhering thereto.

3. The process of dewatering washed wool after it has passed through the squeeze rolls; consisting in spreading the wool, then exposing it for a short time to a low temperature sufficient to freeze the water adhering to the wool fibres, and subjecting the fibres to refrigerated air currents in a closed air circuit to separate the loose ice spicules or particles therefrom.

4. The process of drying wool after the same has been washed and free water removed; consisting in distributing the wool onto a conveyor, subjecting it to a sufficiently low temperature to freeze the moisture adhering thereto, subjecting the fibres to refrigerated air currents in a closed air circuit to separate the loose ice spicules or particles therefrom, and finally subjecting the wool to mechanical agitation to separate from the wool ice spicules or particles adhering thereto.

5. The process of treating wool fibres, consisting in distributing the fibres onto a conveyor, subjecting them to refrigerated air currents in a closed air circuit of sufficiently low temperature to freeze the extraneous moisture or matter adhering to the wool fibres and remove ice spicules or particles loosened from the wool, and finally subjecting the refrigerated wool fibres to mechanical agitation to separate the extraneous refrigerated matters adhering thereto.

6. The process of drying wool fibres, consisting in distributing the fibres onto a conveyor within a refrigerating chamber, subjecting the wool on the conveyor to the direct action of refrigerated air currents in a closed air circuit of sufficiently low temperature to freeze the extraneous moisture adhering to the wool fibres and loosen ice spicules from the fibres, and discharging the refrigerated wool fibres from the conveyor into a mechanical agitator whereby while the wool is maintained in refrigerated condition the ice spicules and particles adhering to the fibres are separated therefrom.

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