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APPARATUS FOR FORMING A SUBSTANTIALLY UNIFORM LAYER OF TEXTILE FIBRES

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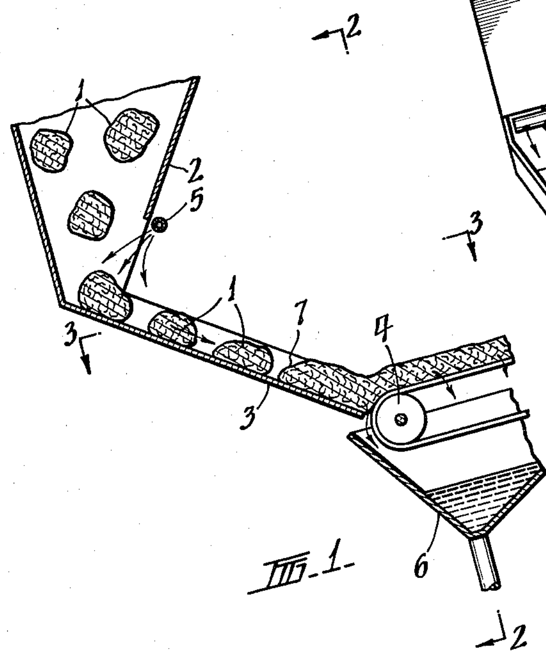

FIG. 1

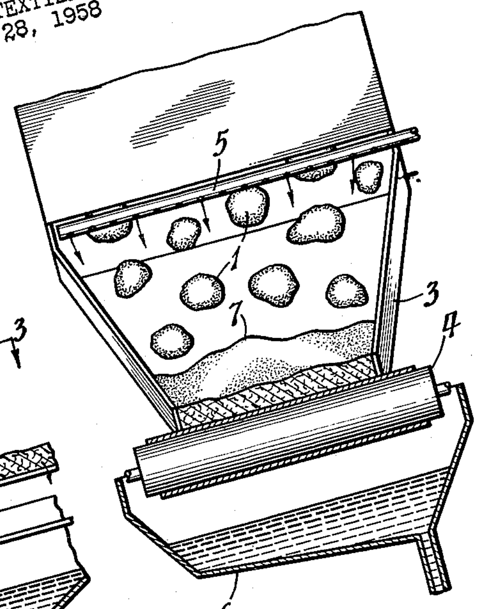

FIG. 2

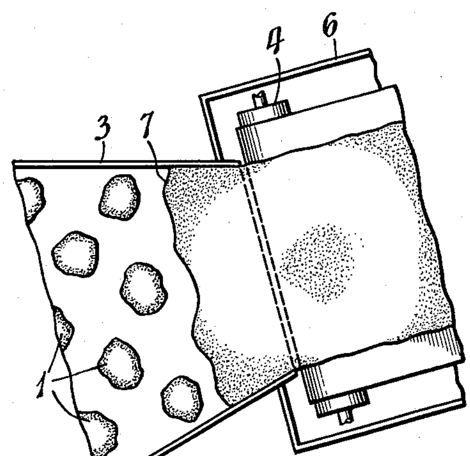

FIG. 3

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APPARATUS FOR FORMING A SUBSTANTIALLY UNIFORM LAYER OF TEXTILE FIBRES

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12 Claims. (Cl. 19—66)

This invention relates to an apparatus for feeding loose textile fibres to a conveyor (which term is to be deemed to include belt, roller, drum, lattice and the like conveyors) in the form of a substantially uniform layer. By loose textile fibres is meant fibres which have not been formed into a continuous sliver.

At the present time loose textile fibres such as wool are commonly fed to processing plants by dropping them from a hopper. In processes in which the wool is treated in the form of a layer on a moving conveyor the material is usually dropped in relatively large lumps and does not fall uniformly on to the conveyor. If an attempt is made to secure uniformity of the layer on the conveyor this is done by breaking the fibre masses down into relatively small pieces. It has been found that this, in the case of greasy wool, results in the breaking down of the staple structure and gives rise to "fuzziness" around the edges of the small pieces. Many of the loose fibres in the fuzzy regions become entangled and others which overlie each other become entangled in subsequent operations such as squeezing and jetting.

It is the object of this invention to provide an apparatus for the feeding of textile materials to a conveyor in a layer which is substantially uniform and in which the degree of fibre entanglement is reduced. The formation of such a uniform layer has been found to be particularly desirable in cases where textile materials such as wool are being passed through scouring and drying processes such as those included in the process for the solvent degreasing of wool described in Australian patent specification No. 155,186.

Hitherto, the desirability in such a process of obtaining a substantially uniform layer of wool which is relatively free from fibre entanglement has not been fully appreciated. It has been found, however, that the production of a uniform layer can lead to substantial advantages in terms of both the cost and efficiency of processing. With a more uniform layer, higher throughput rates can be used for a given efficiency of treatment. Thus, for a given plant, output is increased and operating costs are correspondingly reduced, or for a given throughput rate a smaller plant of reduced capital cost can be used. As an example, consider the treatment of wool in the solvent degreasing process mentioned above. In this process, greasy wool is carried on a porous conveyor beneath jets of solvent and/or water, the combined solvent and hydromechanical action of which removes the contaminating wax, suint and dirt from the wool. If the layer is non-uniform, some parts will be thicker than others and for efficient cleaning the maximum rate of wool throughput will be that at which the thickest parts are satisfactorily cleaned. At this rate, the thinner parts will be subjected to an unnecessary amount of cleaning action, and to this extent the process can be considered inefficient. If now the layer is made quite uniform with a thickness equal to the maximum thickness of the non-uniform layer, a much greater quantity will be treated in the same time, and each portion of the wool will have just the right amount of treatment. The efficiency will therefore be improved and throughput increased. It is obvious, too, that the uniformity of treatment is improved with a uniform layer. Furthermore, where the wool is subjected to disturbing forces such as the jets in the aforementioned solvent degreasing process or the current of air in a drying oven, the fibre movement is less with a close-packed uniform layer where the fibres are mutually supporting than with a non-uniform layer, so that fibre entanglement is reduced.

As another example, consider the expression of liquid from wet wool by passing through squeeze rollers. If the layer is uneven, the high spots will be efficiently squeezed, whereas the laterally adjacent low spots will not be subjected to the full pressure of the rolls. Hence the proportion of liquid carried forward by the wool will be greater than if the layer were uniform and each portion of wool were squeezed to the same degree. Again, a uniform layer gives more efficient treatment, more uniform treatment and a greater throughput.

As a third example, consider the drying of wool in the type of oven in common industrial use, where a stream of hot air passes through the wool mass as it moves through the oven on a porous conveyor. If the wool layer is uneven, most of the air will pass through the thinner parts which offer least resistance. These parts will therefore be overdried, whereas the thicker parts will be underdried. Once more, a uniform layer will give the advantages described in the two previous examples.

Fibre entanglement is important in the initial stages of wool processing because of its effects on subsequent processes. Entangled fibres break in the carding process, giving a higher proportion of short fibres and a lower proportion of long fibres than unentangled wool. In the subsequent combing process, the short fibres are separated as noil and the long fibres as top, the value of the top being very considerably greater than that of the noil. The degree of entanglement therefore has a substantial effect on the economics of wool processing and should, wherever possible, be reduced to a minimum.

The present invention provides an apparatus for feeding loose textile fibres to a conveyor to form a substantially uniform layer, in which the individual masses of fibres are consolidated before proceeding on to or through the conveyor.

More particularly there is provided according to the invention an apparatus for feeding loose textile fibres to a conveyor to form a substantially uniform layer which comprises wetting the fibres and allowing them to slide down an inclined surface to the conveyor. Preferably the fibres are washed down the inclined surface in a stream of liquid.

The invention also provides apparatus for feeding loose textile fibres to a conveyor which comprises an inclined chute adapted to convey the fibres from a storage to the conveyor and means at or near the top of the chute to supply liquid to the fibres to wet them.

Apparatus for use in carrying the invention into effect for the supplying of a uniform layer of wool to a solvent degreasing plant of the type described in Australian patent specification No. 155,186 will now be more fully described by way of example with reference to the accompanying drawings in which:

Figure 1 is a cross-sectional view of apparatus for carrying out the invention,

Figure 2 is a cross-sectional view on the line 2—2 in Figure 1, and

Figure 3 is a plan view on the line 3—3 in Figure 1.

In this form of apparatus, loose greasy wool 1 is fed from a hopper 2 to an open, inclined, sheet-metal chute with converging sides 3 which leads to the primary porous conveyor 4 of the solvent degreasing plant. Located across the top of the chute 3 is a pipe 5 which is perforated and from which liquid is sprayed on to the wool leaving the hopper and entering the chute. Below the porous conveyor 4 is a trough 6 into which liquid from the chute and from the wool on the porous conveyor may drain.

In operation, the wool passing from the hopper on to the chute is wetted by the spray and tends to consolidate and is washed down the chute by the liquid from the spray. When the wet wool reaches the porous conveyor its travel is temporarily arrested causing the wet wool to be dammed up and to consolidate into a mass which builds up along the chute for some distance as shown at 7. It will be noticed, in Figure 1, that the bottom of the chute terminates at a point below the upper surface of the conveyor. This assists in the damming up of the wet wool as the end of the conveyor acts as a wall against which the wool falls. Conditions are such that the porous conveyor acts as a dam for the wool but not for the liquid and the wool builds up in a layer in the trough for a distance of one to two feet from the bottom. The whole or a substantial part of the liquid stream is directed on to the top of the wool as it moves down the trough so that it is well wetted before joining the layer at the bottom. Additional wetting takes place in the layer by virtue of the liquid stream running through the layer before escaping through the porous conveyor, so that when the wool is picked up by the conveyor it is thoroughly wetted. In the wet form, the wool consolidates to a considerable extent, the consolidation being increased by the action of the liquid stream flowing through the layer at the bottom of the trough, and by the pressure of the upper part of the layer on the lower.

The direction of the liquid stream at the top of the trough is substantially parallel to the sides of the trough, but at the bottom the direction of the stream is determined by the contour of the upper edge of the consolidating layer. If therefore the layer builds up on one side only of the trough, a diversion of the liquid stream is caused by the build up and the following pieces of wool are carried down to the depleted portion of the layer. By this means, the consolidating layer is maintained in a uniform condition across the width of the trough at the point of transfer to the porous conveyor.

It is found in practice that short period variations in the feed rate of wool to the top of the trough are automatically compensated by corresponding variations in the length of the consolidating layer in the trough. If the feed rate is momentarily increased, the layer builds up in the trough to a greater distance and, if the feed rate is decreased, the size of the layer will be temporarily reduced. Even though these variations are taking place, the porous conveyor continues to take off wool at a substantially uniform rate, so that a layer of substantial uniformity is maintained on the conveyor despite considerable variations in the feed of wool to the trough.

It is also found that a wide range of feed rates can be used without special adjustment of the liquid stream rate or the conveyor speed. At low feed rates, the average size of the consolidating layer at the bottom of the trough is relatively small, the degree of consolidation is less and the thickness of the uniform layer produced on the porous conveyor is small. At high feed rates the average size of the consolidating layer is greater, with corresponding increases in the degree of consolidation and thickness of layer produced. Feed rates varying from 600 to 1200 pounds per hour have been used without the necessity for adjusting liquid flow or conveyor speed.

Use of the apparatus above described has resulted in a substantial increase in the efficiency of wool scouring and in a reduction in the degree of fibre entanglement. For example in a solvent degreasing plant at the Commonwealth Scientific and Industrial Research Organization's Wool Textile Research Laboratory at Geelong,

Victoria, Australia, wool throughput rates before the installation of this device were limited to 300–400 pounds per hour of greasy wool, depending on the type of wool being treated. After the installation of a feeding trough constructed according to the invention throughput rates were increased to 600–900 pounds per hour, the degree of cleaning being equivalent to that produced at the lower feed rate without the trough. When this wool was carded and combed, the tear (i.e. the ratio of top to noil) was improved, in comparison with the same type of wool solvent degreased without feeding according to this invention.

In processes, such as the scouring of greasy wool with solutions of soap and soda, the wool is already entangled to a considerable degree before it is formed into a layer for feeding to squeeze rolls or dryers and the use of the present invention will not greatly reduce fibre entanglement. It will however result in greater efficiency of the process as is the case with the solvent degreasing process.

We claim:

1. Apparatus for forming a substantially uniform layer of textile fibres, comprising a conveyor, an inclined chute terminating closely adjacent to said conveyor and adapted to convey fibres to the conveyor, means near the top of the chute to supply liquid to the fibres, and means to permit excess liquid to escape from the chute and from the fibres as they pass on to the conveyor, the conveyor and the chute being arranged relative to each other so that the movement of the fibres along said chute has a component in the direction of movement of said conveyor and so that said conveyor causes the fibres to dam up on the chute before passing onto the conveyor.

2. Apparatus as in claim 1; wherein said conveyor is porous.

3. Apparatus as in claim 2; wherein the lower end of the inclined chute is lower than the upper surface of the conveyor.

4. Apparatus as in claim 1; wherein the lower end of the inclined chute is lower than the upper surface of the conveyor.

5. Apparatus as in claim 1; wherein the sides of the chute converge towards the lower end thereof.

6. Apparatus as in claim 1; wherein the conveyor is porous, and the sides of said chute converge towards the lower end of the latter.

7. Apparatus as in claim 1; wherein the lower end of the inclined chute is lower than the upper surface of the conveyor, and the sides of said chute converge towards the lower end of the latter.

8. Apparatus as in claim 1; wherein said conveyor is porous and the lower end of the inclined chute is lower than the upper surface of the conveyor, and wherein the sides of said chute converge towards the lower end of the latter.

9. Apparatus for forming a substantially uniform layer of textile fibres, comprising an inclined chute, means delivering textile fibres to said chute at the upper end of the latter, means supplying liquid to the fibres near the top of said chute, and a conveyor including a conveying surface moving longitudinally in the direction away from the lower end of said inclined chute and guide means for said conveying surface disposed adjacent said lower end of the chute and directing the conveying surface from a level below that of the lower end of said chute to a level above that of said lower end of the chute so that said conveying surface extends across said lower end of the chute and causes the fibres to dam up on the chute before passing onto said conveying surface.

10. Apparatus as in claim 9; wherein said conveying surface is porous.

11. Apparatus as in claim 10; wherein said conveying surface is spaced a small distance from said lower end

of the chute to permit excess liquid to drain from said chute.

12. Apparatus as in claim 9; wherein said chute has sides which converge towards the lower end of the chute.

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