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APPARATUS AND PROCESS FOR CONTINUOUSLY FEEDING AND
SPRAYING WOOD WOOL AND LIKE MATERIALS

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2 Sheets-Sheet 1

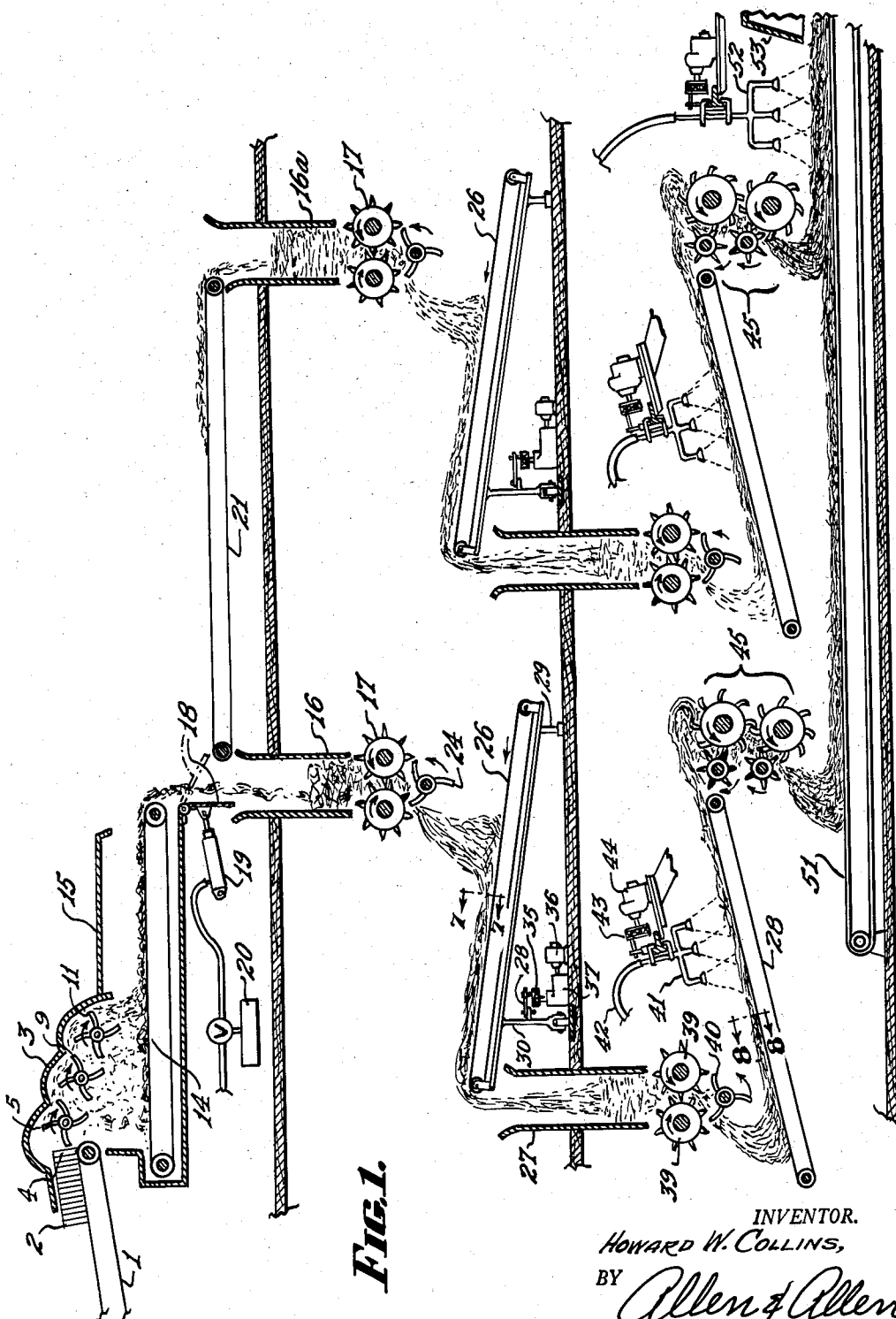


Fig. 1.

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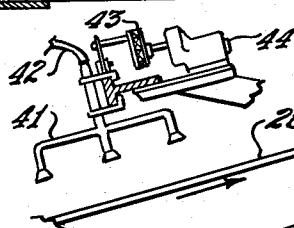
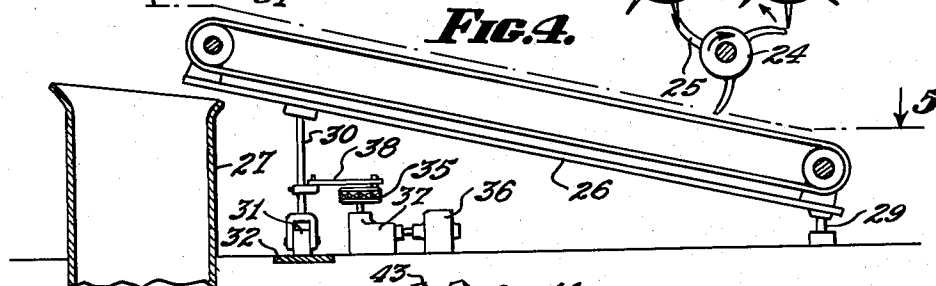
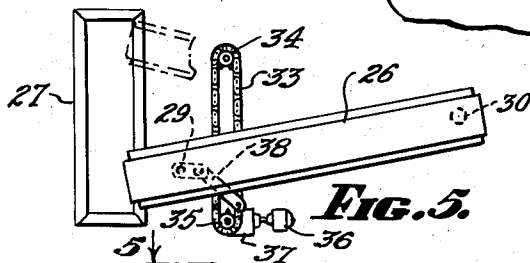
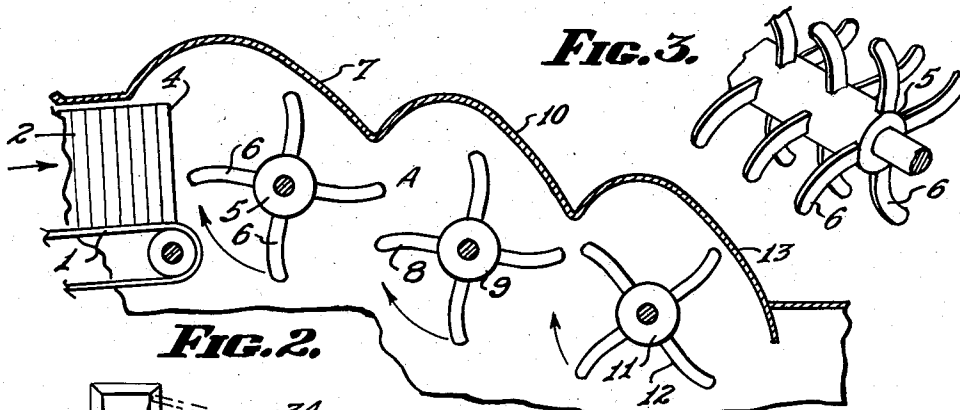
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APPARATUS AND PROCESS FOR CONTINUOUSLY FEEDING AND SPRAYING WOOD WOOL AND LIKE MATERIALS

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Application May 13, 1954, Serial No. 429,455

4 Claims. (Cl. 154—101)

My invention relates to the formation of panels of wood wool or excelsior bonded together with a cementitious material, and relates specifically to the feeding and spraying of the wood wool prior to the compacting of the wood wool and cementitious material and its formation into panels, all in a continuous operation.

In my recently issued Patent 2,655,458, dated October 13, 1953, and entitled Method of Forming Wood Wool Panels, I have taught a continuous process of forming panels of wood wool and magnesium cement in which the saturated wood wool is formed in a layer on a continuously moving support and passed through a current of heated air and then passed between continuously moving compressing surfaces to compress it to a predetermined density. The preheating of the material prior to its passage between the compressing surfaces serves to supplement the exothermic heat developed by the reaction of the magnesium cement to a point where the cement will not set before the layer passes between the compressing surfaces but will set sufficiently to hold the layer against expansion before it passes from beyond the compressing surfaces and into the dryers.

A principal problem in carrying out the method of my aforementioned patent lies in the feeding, distribution and coating of the wood wool fibres in a quantity sufficient to meet the demands of a continuous operation, and it is to the solutions of this problem that the instant invention is directed.

It is a principal object of my invention to provide apparatus and procedures for the handling of wood wool fibres, starting with the baled fibres as they are received for processing and culminating with a uniform mat of fibres completely coated with the cementitious material and ready for compressing and drying.

It is a further object of my invention to provide continuously operating apparatus capable of breaking open the bales of material, fluffing the fibres, establishing a uniform flow of the fluffed material and depositing it in a uniform manner on a conveying means, coating the fibres with a cementitious material without destroying the fibres, and depositing the coated fibres on the continuously moving web which carries them through the compressing and drying means disclosed in my aforementioned patent.

Yet a further object of my invention is the provision of improved bale breaking means for opening the bales and initially fluffing the fibres and of means co-acting with the bale breaker and fibre fluffing means to uniformly and continuously gather the fibres and feed them to a picking cylinder and work roll arrangement which causes the fibres to be completely coated with the wet cementitious slurry without the flooding of the fibres with slurry.

These and other objects of my invention which will appear hereinafter or which will be apparent to the skilled worker in the art upon reading these specifications, I accomplish by that construction and arrangement of parts and by those procedures of which I shall now describe an exemplary embodiment.

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Reference is now made to the figures of the drawings wherein:

Figure 1 is a somewhat diagrammatic elevational view with parts in section of continuously acting apparatus in accordance with my invention.

Figure 2 is an enlarged fragmentary elevational view with parts in section of the bale breaking section of the apparatus.

Figure 3 is a partial perspective view of the beater roll for the bale breaker.

Figure 4 is an elevational view with parts in section of the surge hopper and feed roll and beater arrangement for establishing a uniform flow of material.

Figure 5 is an elevational view taken along the line 5—5 of Figure 4.

Figure 6 is a partial elevational view with parts in section illustrating the manner in which the fibres are sprayed with cementitious material and passed to the cylinder and working roll combination acting to uniformly coat the fibres.

Figures 7 and 8 are sectional views taken along the lines 7—7 and 8—8 of Figure 1, respectively, illustrating the relative widths of the oscillating conveyor and collecting belt.

Referring now to Figure 1 of the drawings, I have therein illustrated a delivery conveyor 1 which delivers bales 2 of wood wool to the bale opener 3. The usual bale opener operates on the principle of a rotating beater shearing the compacted fibres in the bale across a rigid frame member. This rugged treatment has a tendency to break up the fibres and unduly shorten them with a consequent loss of strength.

In accordance with my invention, the successive layers in the bale are tossed upwardly and directed laterally into one or more beaters which serve to fluff up the fibres. Thus, as best seen in Figure 2, the layers 4 of the bale 2 are contacted and thrown upwardly by the beater 5 having arms 6 preferably arranged in the manner best seen in Figure 3. The beater serves to throw the fibres upwardly where they strike the curved shield 7 and are thrown laterally into the arms 8 of beater 9, the beater 9 being provided with a shield 10 against which the fibres are thrown as the beater rotates in the direction of the arrow A. This combination of beater and shield may be repeated in series until the compressed fibres have reached the desired fluffy stage. Thus one or more additional beaters 11 having arms 12 may be provided, as found necessary. The beater 11 will be provided with a suitable downwardly directed shield 13 which will serve to direct the fibres downwardly where they will be collected upon a conveyor 14 (Figure 1).

As will be apparent from Figure 1, some of the fibres will fall from each of the beaters 5, 9, and 11, and consequently the conveyor 14 will be of a length to underlie the entire series constituting the bale opener. Preferably the conveyor 14 will be enclosed in a housing 15 to prevent undue scattering of the fibres.

The mat resulting from my opener will be more uniform than those heretofore obtained because the successive wafers or layers, as they are thrown from the bale, are slowed up in their progression through each beater. Where one is attempting to start with fibres compressed in a bale and form a uniform mat, it is very important that a uniform line of fluffed up fibres flow from the bale breaker or opening device; for otherwise the non-uniformities carry through into the finished product.

Even after the fibres have been fluffed up by the bale breaker the fibres discharged from the end of conveyor are in bunches and, due to the intermittent feeding of the bales, occur at a non-uniform and intermittent rate.

In order to establish a uniform flow of material, I have

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found it desirable to feed the fibres in a double line, employing pairs of feeding, spraying and coating means. Thus from the conveyor 14 the fibres are fed into the surge hoppers 16 and 16a which terminate at their lower ends in the feed roll and beater members 17. While for many uses a single line will suffice, I prefer to provide a dual line particularly where it is desired to ultimately form a relatively thick mat of coated fibres. By dividing the fibres between the two lines they can be more conveniently handled and coated with cementitious material, as will become apparent hereinafter.

The surge hoppers can be conveniently fed from the conveyor 14 by means of a tiltable platform 18 actuated by means of cylinder 19 which is in turn controlled by a timer 20. When in the position illustrated in full lines, the fibres falling from the conveyor 14 will enter the mouth of the underlying surge hopper 16. After a suitable time interval the timer 20 will serve to actuate the cylinder 19 which moves the tiltable platform 18 to the position illustrated in dotted lines, whereupon the fibres are fed to the transfer conveyor 21 which transports the fibres to the surge hopper 16a. It will be understood that the platform 18 will move between its two positions at uniform intervals, thereby feeding a substantially equal amount of fibres to each of the surge hoppers.

The fibres are fed from the bottom of the surge hoppers by means of feed rolls 22 having spikes 23 extending radially outwardly therefrom in interdigitating relation, as best seen in Figure 4. The feed rolls thus feed the material to a beater 24 having arms 25 which serve to further fluff the material and separate the batches in which it tends to collect. As indicated by the arrows, the feed rolls are so rotated as to pass the fibres between them; and the beater therebeneath is preferably moved in a counterclockwise direction.

From the beaters 24 the fibres are fed onto the oscillating conveyors 26 which discharge into gravity chutes 27 which are of a width equivalent to the width of the mat or web of material to be ultimately formed. From the chutes 27 the material is deposited upon collecting belts 28 which are also the width of the mat or web to be formed. The oscillating conveyors 26 are pivoted at one end, as at 29, and arranged to travel at their opposite ends on the supporting legs 30 having wheels 31 which are preferably supported on plates 32. The oscillating conveyors may be conveniently oscillated by means of endless chains 33 which pass about spaced apart sprockets 34 and 35 the latter of which may be driven by means of motors 36 through transmissions 37. Arms 38 are pivoted at one end to the conveyors 26 and pivotally connected at their opposite ends to the chains 33, the chains thus serving to drive the conveyors through the arms 38. As best seen in Figure 5, each conveyor 26 will be oscillated from the position shown in dotted lines to the position shown in full line, thereby evenly distributing the fibres across the chute 27. The diameters of sprockets 34 and 35 will be of a size to provide the required dwell at the opposite sides of the chute. The relative widths of the oscillating conveyors 26 and collecting belts 28 can be observed by comparing Figures 7 and 8 of the drawings. It may be also observed that the oscillating conveyors are generally horizontally disposed, being inclined slightly from their pivoted receiving ends to their discharge ends, and the mechanisms require a minimum amount of floor space. This is in contrast to the co-called "camel's back" conveyors in general use and which require a large amount of floor space and are additionally awkward in operation.

Referring again to Figure 1, the fibres in the chutes 27 are delivered to the collecting belts 28 by means of spiked rollers 39 and beaters 40, the latter operating in a counterclockwise direction and serving to again fluff up the fibres.

The mat of fibres deposited on collecting belts 28 are sprayed with cementitious material by means of oscil-

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lating spray heads 41 supplied with cementitious material through flexible conduits 42. The spray heads may be conveniently oscillated by means of an endless chain 43 powered from a motor 44 in much the same manner as the oscillating conveyors 26 are driven. Instead of flooding the fibres with the cementitious slurry, and thereafter compressing the fibres in a wringer-type operation to squeeze out the surplus slurry. I spray on only the amount of slurry required to completely coat the fibres, and rely upon a series of picking cylinders and working rolls to distribute the cementitious material evenly on the fibre surfaces. By doing this I am enabled to reduce the drying time to the minimum by using only the amount of water required for chemical reaction in the cement. Initially, a number of problems were encountered in attempting to do this, among them the accomplishing of adequate rubbing and coating of the fibres without destroying them, preventing the longer fibres from being deposited upon the formed mat without being fully coated, and preventing binder accumulations from dropping onto the formed mat.

I found that the above enumerated problems could be overcome by employing the cylinder and the working roll arrangements indicated generally at 45 in Figure 1, and seen in detail in Figure 6. As seen therein, a spiked feed roll 46 controls the delivery of the fibre-cement mixture to a picking cylinder 47 rotating in a counterclockwise direction and having arms 48 in interdigitating relation to the spikes carried by the feed roll 46.

The picking cylinder 47 serves to agitate the sprayed fibres and distribute the cement over them, and it then passes the fibres to another picking cylinder 49 rotating in the same direction as cylinder 47 for further working. It has been found desirable to employ an additional spiked working roll 50 to assist in the transfer of the material from the first picking cylinder to the second. This arrangement of picking cylinders and spiked rolls serves to distribute the cementitious material evenly on the fibre surfaces. It will be noted that the fibres as they are passed from the cylinder 47 travel in a direction opposite to that of the conveyor belt 28. Otherwise, the shingled structure of the successive layers that would result would be at too great an angle with the conveyor belt, causing the mat to wrinkle at the surface when compressed resulting in loss of strength because the fibres would not be parallel to the lines of stress in the finished plank or board. The second cylinder 49 provided additional working of the fibres and breaks up any accumulated bunches of binder and fibres.

From the cylinders 49 the fibres are deposited upon the final conveyor 51 where they form the mat which will be then compressed and dried. It will be apparent that the mat will be formed in two components, one from each of the conveyors 28 and associated cylinder and working roll means.

I have also found it desirable to provide an oscillating spray head 52 for lightly spraying the formed mat prior to the passage of the mat into the preheater 53.

It will be apparent from the foregoing, that by means of the procedure and apparatus just described, bales of wood wool or similar material may be continuously fed, sprayed and uniformly distributed in mats for subsequent processing.

Modifications may, of course, be made in my invention without departing from the spirit of it. Having, however, described my invention in an exemplary embodiment, what I desire to secure and protect by Letters Patent is:

1. In a device for feeding and coating wood wool and like fibrous material preparatory to forming it into panels, bale breaking means for opening and fluffing-up bales of compacted fibres, a surge hopper for receiving the fluffed-up fibres from said bale breaking means, means at the bottom of said surge hopper for continuously feeding the collected fibres therefrom, an oscillating distributing means for receiving the fibres from said surge hop-

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per and for evenly and uniformly distributing them across the mouth of a gravity chute, a gravity chute positioned to receive the fibres from said distributing means, a conveyor belt passing beneath said gravity chute, means at the lower end of said gravity chute for depositing the fibres on said conveyor belt in a relatively uniform layer, means for wetting the layer of fibres so formed with cementitious material as the layer is moved along on said conveyor belt, fibre working means at the end of said conveyor belt for working the wetted fibres to coat them individually with the cementitious material, a second conveyor belt moving beneath said fibre working means, said fibre working means acting to deposit the coated fibres on said second conveyor belt in a uniform layer for subsequent compacting and heat treatment.

2. In a device for feeding and coating wood wool and like fibrous material preparatory to forming it into panels, bale breaking means for opening and fluffing-up bales of compacted fibres, a surge hopper for collecting the fluffed-up fibres from said bale breaking means, feeding means at the bottom of said surge hopper for continuously feeding the collected fibres therefrom, said feeding means including feed rolls and a beater, a distributing means for receiving the fibres from said surge hopper and for evenly and uniformly distributing them across the mouth of a gravity chute, said distributing means comprising a generally horizontally disposed oscillating conveyor moving back and forth across the mouth of said gravity chute, a conveyor belt passing beneath said gravity chute, means at the lower end of said chute for depositing the fibres on said conveyor belt in a relatively uniform layer, said last named means comprising feed rolls and a beater, means for wetting the layer of fibres so formed with cementitious material as the layer is moved along on said conveyor belt, said wetting means comprising at least one spray head positioned above the said conveyor belt and adapted to be oscillated back and forth across said belt, fibre working means at the end of said conveyor belt for working the wetted fibres to coat them individually with the cementitious material, said fibre working means comprising feed rolls and beaters, a second conveyor belt moving beneath said fibre working means, said fibre working means acting to deposit the coated fibres on said second conveyor belt in a uniform layer for subsequent compacting and heat treatment.

3. In a device for feeding and coating wood wool and like fibrous material, bale breaking means for opening and fluffing-up bales of fibrous material, conveying means for receiving the fluffed-up fibres from said bale breaking means, a pair of spaced apart surge hoppers, one

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of said hoppers underlying the end of said conveying means, a transfer conveyor extending between said last named hopper and the other of said hoppers, a gate for selectively directing the fibrous material from said first named conveying means to either the underlying surge hopper or to the transfer conveyor for delivery to the other of said hoppers, gate moving means for moving the said gate to alternately feed the two hoppers, means at the bottom of each of said surge hoppers for continuously feeding the collected fibres therefrom, an oscillating distributing means beneath each of said hoppers for receiving and evenly and uniformly distributing the fibres across the mouth of the gravity chute, a gravity chute positioned to receive the fibres from each of said distributing means, a separate conveyor belt passing beneath each of said gravity chutes, means at the lower end of each gravity chute for depositing the fibres therein on the underlying conveyor belt in a relatively uniform layer, means for wetting the layers of fibres so formed with cementitious material as the layers are moved along on said conveyor belts, fibre working means at the end of each of said conveyor belts for working the wetted fibres to coat them individually with the cementitious material, a second conveyor belt moving beneath both of said fibre working means, said fibre working means acting to deposit the fibres worked thereby on said second conveyor belt in a substantially uniform layer for subsequent compacting and heat treatment.

4. A process for feeding and coating wood wool and like fibrous material preparatory to forming it into panels, which comprises the steps of providing bales of compacted fibrous material, breaking open the bales and fluffing-up the fibres, collecting the fluffed-up fibres in a surge hopper, continuously feeding the fibres from the surge hopper and distributing them in an oscillatory motion across the mouth of a gravity chute, continuously removing the fibres from the bottom of the gravity chute and forming them into a relatively uniform layer, moving the layer in a path of travel and applying a cementitious slurry to the moving layer, and thereafter working the fibres to coat them individually with the cementitious slurry, and subsequently reforming the fibres into a uniform layer for subsequent compacting and heat treatment.

References Cited in the file of this patent

UNITED STATES PATENTS

1,931,570	Brown et al.	Oct. 24, 1933
2,411,559	Sonin et al.	Nov. 26, 1946
2,639,759	Simison	May 26, 1953