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METHOD OF PRODUCING A HOMOGENEOUS MIXTURE OF DIFFERENT KINDS OF FIBERS

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FIG. 1

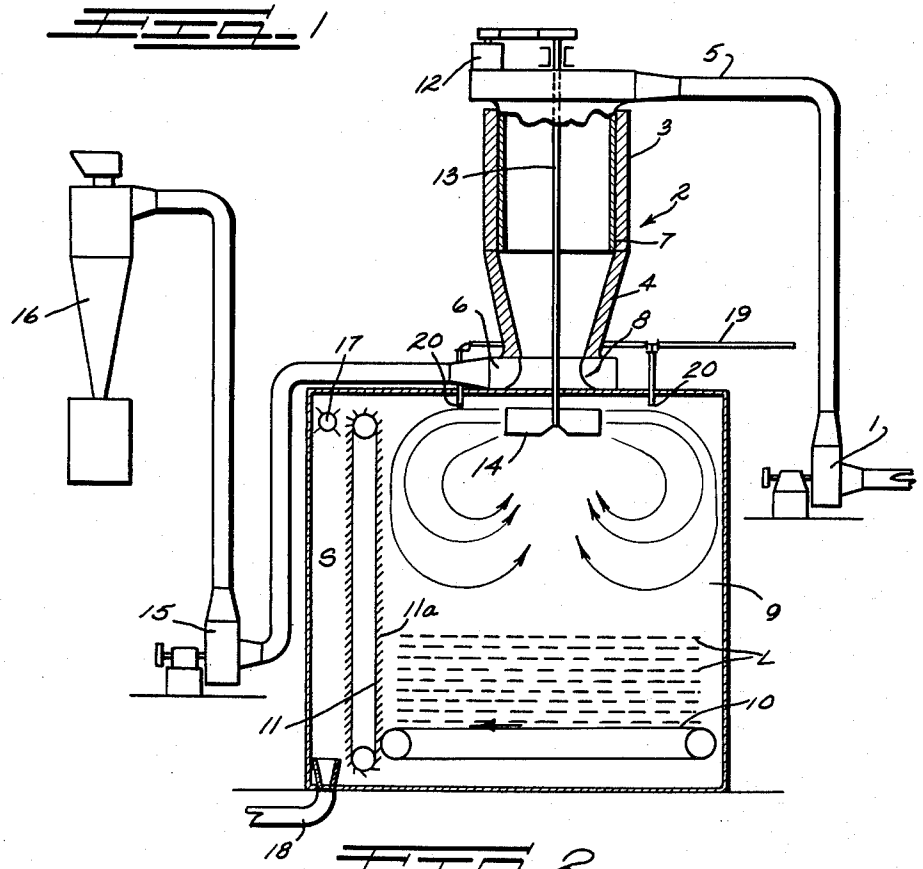
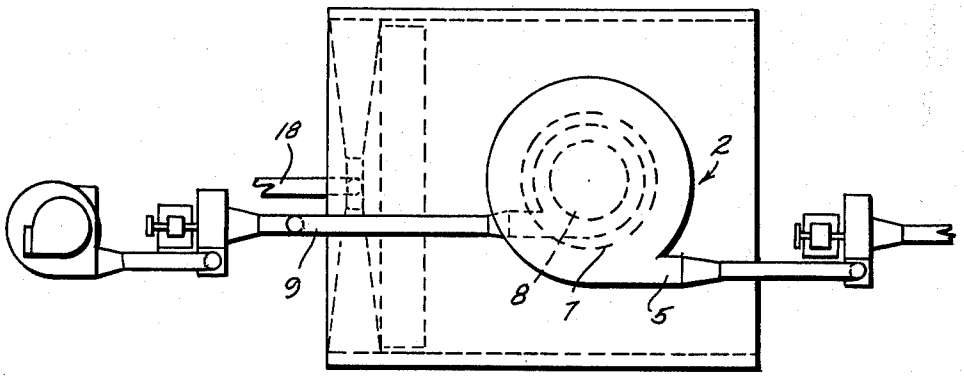


FIG. 2



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METHOD OF PRODUCING A HOMOGENEOUS MIXTURE OF DIFFERENT KINDS OF FIBERS

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This invention relates to a method of and an apparatus for producing a homogeneous mixture of different kinds of fibers, and more particularly for the mixing of natural and artificial fibers that are to be used in the textile industries in the manufacture of both woven and non-woven cloth.

In accordance with the present invention, the mixing of different kinds of fibers is accomplished by means of a pneumatic system in combination with mechanical conveyors. The respective different kinds of fibers are first weighed out, or otherwise measured, into separate lots, or batches, in the proportion of each fiber that is desired in the final mixture. These separate lots of the respective fibers are then successively carried through a system by a combination of pneumatic and mechanical conveyor means. While suspended in a gaseous fluid, such as air, the fibers are first subjected to a de-dusting operation, and then caused to descend slowly, while being gently agitated and laterally dispersed within a confined space, until the fibers are deposited upon a supporting surface.

The supporting surface is provided by an endless belt-type of conveyor arranged for lateral, horizontal movement when driven, but stationary during the deposition of the fibers on its upper supporting surface. All of the fibers of one kind in a measured lot are first deposited on said supporting surface as a layer of loosely piled fibers, and then the remaining lots of the respective fibers to be mixed are successively carried through the same cycle of de-dusting and depositing of the fibers in successive, similar layers superimposed one above the other.

In addition to the horizontal conveyor near the bottom of the confined space referred to, there is a vertical conveyor arranged at one side of such space and with the lower end of its upwardly traveling flight in close proximity to the discharge end of the horizontally traveling conveyor. With the two conveyors in operation, incremental portions of the fibers in the superimposed layers for the full vertical height of said layers are carried upwardly by the vertically traveling conveyor and for removal from the confined space and discharge into a mixing and collecting zone, from which the now uniformly mixed fibers of kinds selected are conducted to carding or web-making machines, or to storage for subsequent use.

My invention also contemplates the application to the fibers while in a gas-suspended state of a liquid treating agent by spraying or atomizing the treating agent into the upper portion of the same confined space through which the fibers gently descend. Among such liquid treating agents may be mentioned fiber lubricants, anti-static reagents and other textile finishing agents.

As will be apparent to those skilled in the art from the more complete description of the invention that is to follow, my invention enables the thorough mixing of fibers of different kinds of predetermined portions with the expenditure of a minimum amount of mechanical energy and little or no human energy.

It is therefore an important object of this invention to provide an improved method of and apparatus for producing extremely uniform mixtures of various kinds of fibers, whether artificial or natural, or combinations

thereof, within closely controlled limits as to the respective proportions of such fibers in the final mixture.

Other features, objects and advantages of the instant invention will become apparent to those skilled in the art from the following detailed disclosure thereof and the accompanying drawings forming a part hereof.

On the drawings:

FIGURE 1 is a more-or-less schematic, elevational view partly in section of apparatus embodying my invention and suitable for carrying out the method of such invention; and

FIGURE 2 is a top plan view, also somewhat schematic, of the apparatus shown in FIGURE 1.

In FIGURE 1, the reference numeral 1 indicates a motor-driven blower, into the intake of which is drawn air and fibers in admixture. From the discharge side of the blower 1, a pipe or conduit 5 conveys the gas-suspended stream of fibers upwardly and over into the top of a dust eliminator, indicated generally by the reference numeral 2. Said dust eliminator 2 comprises an upper cylindrical shell 3 and a lower funnel-shaped shell 4 joined to the lower end of said shell 3 and converging downwardly therefrom. At the throat, or constricted portion, 8 of the funnel-shaped shell 4 there is connected an exhaust conduit 6 that leads off tangentially from said throat 8. Similarly, as also shown in FIGURE 2, the conduit 5 is connected to the upper portion of the dust eliminator 2 in a tangential fashion.

The dust eliminator 2 is mounted on top of and supported by an enclosing structure 9 that may suitably be rectangular or square in horizontal section and that defines an inner confined space for receiving the gas-suspended fibers exiting through the throat 8. Near the bottom of said space is a horizontally disposed endless conveyor 10, which occupies substantially the full plan area of said space and which is provided with driving means (not shown) for moving the upper run of the conveyor from one side of the space to the other, as indicated by the arrow. A vertical conveyor 11 is disposed in spaced, parallel relationship to the side of the enclosure 9 toward which the conveyor 10 travels when running. Said conveyor 11 is also provided with driving means (not shown) for moving the inner flight of the conveyor upwardly in the direction shown by the accompanying arrow. The conveyor 11 is provided with fiber-engaging means, indicated generally by the reference numeral 11*a*, which may take the form of closely spaced, relatively short pins arranged in horizontal rows and inclined upwardly on the upward moving flight of the conveyor and downwardly on the downwardly moving flight of the conveyor. A comber 17 is mounted for rotation about a horizontal axis near the top of said conveyor 11 and adjacent the path of the conveyor as it starts its downward travel. The comber 17 serves to disengage the fibers from the fiber-engaging means 11*a* to allow the fibers to drop freely downwardly, while still gas-suspended, into the vertical space S between the downwardly moving run of the conveyor 11 and the adjacent wall of the enclosure 9. From said space S, the fibers fall into a conduit 18 for pneumatic delivery to a carding machine (not illustrated), or to storage for subsequent use.

A suitable driving mechanism 12 mounted upon the top of the dust eliminator 2 is provided for driving the upper end of a vertically disposed shaft 13 extending coaxially through the shells 3 and 4 of the dust eliminator 2 and carrying a propeller, or agitator 14, at its lower free end. Said agitator 14 is driven at such a rate of speed as to gently agitate the gas-suspended fibers within the enclosure 9 to disperse the fibers laterally before the same start their descent toward the conveyor 10. Additionally, as indicated by the arrows within said enclosure

9, the agitator 14 causes a slight upward swirling of the gas-suspended fibers in the upper half of the confined space but below the level of the agitator 14.

A perforated or foraminous filter 7 is positioned within the dust eliminator 2 in spaced, conforming relationship in configuration to the shells 3 and 4 and co-extensive in height therewith. This filter 7 serves to permit dust to escape therethrough into the annular space so defined and to settle into the lower end of said space from which the tangentially connected exhaust pipe 6 conducts the dust-laden air into the suction side of an air blower 15, from which the dust-laden air is discharged into a cyclone type of dust collector 16, of conventional construction. The dust is thus eliminated from the system.

A more detailed description of the method of my invention as carried out in the apparatus thus far described is as follows:

With the blowers 1 and 15 and the agitator 14 in operation, but with the conveyors 10 and 11 not running, the first of a series of batches of fiber, each batch of the same species of fiber and in the desired proportion for that fiber in the final mix, is charged into the stream of air drawn into the suction side of the blower 1 for air-borne transportation through the conduit 5 into the upper end of the dust eliminator 2. Due to the tangential arrangement of the connection between the conduit 5 and the upper end of the dust eliminator 2, the gas-suspended fibers are given a helical or swirling motion as they enter the interior of said dust eliminator, and this motion causes the very fine, dust-like particles, or dust, itself, to pass through the foraminous filter barrier 7 and into the annular space between said filter 7 and the outer shell portions 3 and 4. From this annular space, the dust-laden air is drawn off at the bottom, also tangentially, through the exhaust pipe 6 by a blower 15 and discharged from said blower into the dust collector 16.

As the air-borne fibers descend into the interior of the space defined by the funnel-shaped shell 4 and the concentric portion of the filter 7, the speed of revolution of the air-borne fibers increases while the speed of descent of the fibers gradually decreases until the dropping speed at the throat 8 is very slow, indeed. This makes for a stronger centrifugal force acting upon the dust particles to cause them to pass through the funnel-shaped portion of the filter 7 into the exhaust pipe 6.

As the air-borne fibers descend through the throat 8 into the space confined by the enclosure 9, the action of the agitator 14 is as indicated by the arrows shown, with the result that the fibers are laterally dispersed and caused to descend, with some slight upward movement intermittently, as separate, discrete, fibers, for deposition almost in a one-by-one fashion upon the upper run of the conveyor 10.

After the first batch of the one species of fiber has been charged into the system through the operation of the blower 1, the next batch is started and so on, successively, until all of the batches of the respective kinds of fibers have been charged into the system that are to be combined in the ultimate mixture.

In this way, successive layers of the respective fibers are built up upon the upper run of the conveyor 10 while the conveyor is stationary. These layers, which are generally indicated by the symbol L, are superimposed one upon the other, with each layer substantially separate and distinct from the next adjoining layer and constituted by a single kind or species of fiber.

When the last of the individual batches of fibers has been run through the system and the piling of the respective fibers into layers has been completed, the blowers 1 and 15 and the agitator 14 are stopped, and the conveyors 10 and 11 started up. The conveyor 10 causes a movement of the entire pile of superimposed layers L of fibers slowly toward the left, as viewed in FIGURE 1, while the upward movement of the vertical conveyor 11 lifts successive increments of all of the layers of fiber

upwardly for discharge, aided by the action of the comber 17, into the space S. The downward movement of the air-suspended fibers in the space S is aided by the suction effect of a blower (not shown).

While not a necessary part of my invention, the fibers may be treated while gas-suspended within the enclosure 9 by the application thereto of any suitable treating agent, such as a textile lubricant, an anti-static agent, or the like. The treating agent is supplied under pressure through the header pipe 19 and the downwardly extending distributor pipes 20, the lower ends of which may be provided with nozzles or atomizers (not shown) for spraying or atomizing the treating liquid into the upper portion of the enclosure 9. In this way, the airborne fibers become coated by contact with the sprayed or atomized treating agent prior to the deposition of the fibers onto the upper surface of the conveyor 10 or the fibers already deposited thereon.

By carrying out the method in the manner above described, it is possible to obtain a homogeneous mixture of fibers in any desired, predetermined ratio, and it is also possible to treat the fibers uniformly with any suitable treating fluid without making such treatment a separate step apart from the mixing operation.

It will be understood that modifications and variations may be effected without departing from the scope of the novel concepts of the present invention.

I claim as my invention:

1. The method of producing a homogeneous mixture of different kinds of fibers, which comprises:
   - successively conducting selected amounts of each respective kind of fiber in a gas-suspended state into a laterally confined space,
   - gently agitating the gas-suspended fibers within said space to cause the same as discrete fibers to spread laterally, descend and be deposited as successively superimposed, laterally confined layers of said respective kinds of fibers,
   - removing upwardly incremental portions extending the full height of one side of said superimposed layers, and
   - mixing such removed portions to obtain a homogeneous mixture of all of said kinds of fibers.

2. The method as defined in claim 1, in which:
   - each selected amount of said respective kinds of fibers is first subjected, while gas-suspended, to a downwardly swirling movement against a surrounding foraminous surface to de-dust said fibers.

3. The method as defined in claim 1, in which the fibers are respectively natural and artificial fibers for use in textile manufacture.

4. The method of producing a substantially uniform mixture of different kinds of fibers, which comprises:
   - providing separate batches of the respective fibers to be mixed in predetermined amounts to give the desired proportion of each kind of fiber in the final mixture,
   - successively conveying a gas-suspension of the fibers from said respective separate batches into a de-dusting zone and thence into a lower laterally confined fiber-settling zone,
   - subjecting said gas suspension in said de-dusting zone to centrifugal movement against a surrounding filtering medium to remove dust,
   - subjecting said gas suspension in said fiber-settling zone to lateral dispersing and downwardly acting forces to effect a settling of said fibers into laterally confined superimposed layers of the respective fibers,
   - incrementally removing substantially equal widths of vertical sections of said superimposed layers, and
   - collecting the fibers of the sections so removed.

5. The method as defined in claim 4, which includes the added step of:
   - applying a liquid treating agent in sub-divided particle

form to the fibers while in gas suspension in said settling zone.

6. The method as defined in claim 4, in which:

the incremental removing step is accomplished by a simultaneous lateral movement of said superimposed layers as a whole and an upward movement of said substantially equal widths of vertical sections.

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