

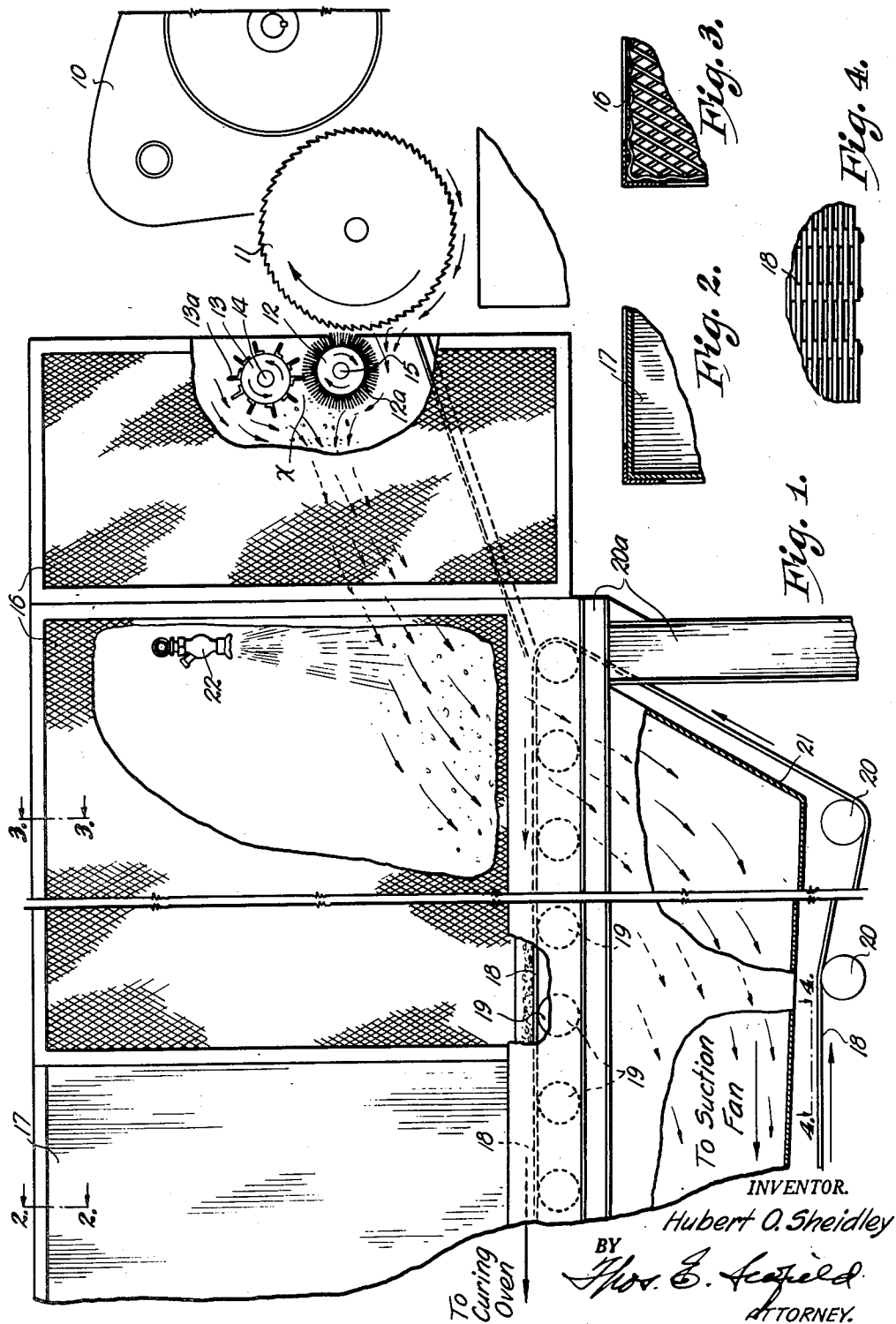
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METHOD AND APPARATUS FOR MANUFACTURING FIBROUS MATS

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METHOD AND APPARATUS FOR MANUFACTURING FIBROUS MATS

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This invention relates in general to the manufacture of fibrous mats, and it deals more particularly with improvements in a method and apparatus for transferring fibers from a garnett or carding machine onto a traveling conveyor, whereby the fibrous web laid up on the conveyor is of distinctly different character than the web emerging from the garnett or carding machine but embodies advantages that derive in part from the garnetting or carding which the fibers have undergone.

This application is a continuation-in-part of my co-pending application Serial No. 611,118, filed August 16, 1945, now abandoned.

In carding and garnetting machines employed to separate fibers and comb them into a uniform lay, the fibers advance through the machine and finally emerge on a rather slowly turning doffer roll, this final roll having a plurality of pin-like projections which comb through the fibers, aligning the strands parallel to the direction of the travel of the pins. As the fibers leave the machine on the doffer roll, they lay in a blanket-like web about a portion of the periphery of the roll, carded, combed and aligned; and, as it reaches a particular point, this blanket customarily is stripped from the roll by a fixedly positioned comb or brush and transferred substantially intact onto an adjacent traveling conveyor, or to other equipment which carries the blanket away for further processing.

Now, the fibrous blanket thus removed from the doffer roll of a garnett or carding machine is of relatively high density, due to the fibers lying close together with little air space between them. What strength it has is mainly in the direction of the length of the web, since the fibers are aligned predominantly in this direction. Also the web has little or no springiness or resilience; once compressed, the fibers remain matted down and compacted, so the web has relatively poor dimensional stability.

It is an object of the present invention, by way of contrast, to produce a relatively low density fibrous mat whose strength is substantially uniform in all directions and whose dimensional stability is excellent, the mat being capable, after compression, of springing resiliently back to its original thickness when the compressive force is removed. A collateral object therefore is to provide a simple, effective and economical method and apparatus for completely reorienting the carded fibers as received from the doffer roll of a garnett or carding machine, and processing

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them in such a way as to obtain a mat of the type desired.

To this end, an important feature of the invention resides in the provision of a method and apparatus for (1) generating an air stream which proceeds away from the doffer roll along a predetermined course, and (2) sweeping the fibers from the doffer roll directly into the air stream in such a fashion that the fibers are separated from one another and thus are individually air-borne by said air stream away from the doffer; at a point sufficiently remote from the doffer roll to insure appreciable free travel of the individual fibers in air, the air stream is directed through a reticulate conveyor whereby the entrained fibers pile up in haphazard jackstraw fashion against the conveyor, forming a light, open mat wherein the fibers are heterogeneously disposed with respect to all planes.

A further feature of the invention resides in the provision of a method and apparatus for spraying or otherwise introducing into the air stream which proceeds away from the doffer roll, a liquid or dry powdered binding material adapted to coat and/or co-mingle with the air-borne fibers traveling toward the conveyor; at least part of the binder is retained in the mat formed by piling up of the fibers on the conveyor, so that, upon subsequent curing of the binder, the fibers are secured to one another at their intersections in the haphazard arrangement in which they were deposited on the conveyor, uniting them into an integrated mat which, despite the "openness" of its construction, has excellent strength and dimensional stability.

In carrying out my invention I utilize a rotary brush roll to sweep the fibers from the doffer roll of the garnett or carding machine. I am aware that brush rolls or so-called "stripper" rolls have been employed in the past to remove the fibrous web from the doffer roll and transfer it substantially intact (i. e., as a blanket) to a conveyor or the like, but my brush roll is turned at considerably higher speed than has heretofore been the practice and serves a different purpose. It is its function not merely to remove the fibrous web from the doffer, but, in sweeping the fibers from the doffer roll, to separate them from one another and discharge the fibers individually into space. Due to the high speed of its rotation, my brush roll generates a considerable peripheral air stream tending to proceed around the roll in the direction of its rotation, and a salient feature of the invention resides in utilizing this air stream,

in part, to carry away the fibers flung from the brush due to centrifugal force.

An important object of the invention is to provide means for intercepting and diverting a portion of the peripheral air stream of my brush roll, to cause the air-borne fibers to proceed away from it and the doffer roll along a single predetermined path. A related object is to generate a second air stream and utilize this both to effect the diversion of the peripheral air stream of the brush roll and also to insure complete discharge of the individual fibers from the brush roll, overcoming any tendency that may exist for a residuum of fibers to cling to the bristles thereof.

According to the invention, I generate a second air stream flowing counter-current to the peripheral air stream of the brush roll and merge the two streams in a particular zone adjacent the periphery of the brush roll to form a united air stream carrying the fibers away from the roll along said predetermined path.

An important feature resides in the provision of a wind roll positioned adjacent to the brush roll and rotated to generate a peripheral air stream intercepting and merging with the peripheral air stream of the brush roll to form the aforementioned united air stream.

Other and further objects of the invention, together with the features of novelty whereby the objects are achieved, will appear in the following description.

In the accompanying drawings which form a part of the specification and are to be read in conjunction therewith, and in which like reference numerals indicate like parts of the various views:

Fig. 1 is a fragmentary side elevational view of the discharge and of a garnetting machine where the fibers are discharged from the machine through air onto an endless conveyor belt,

Fig. 2 is a view taken along the line 2—2 of Fig. 1 in the direction of the arrows,

Fig. 3 is a view taken along the line 3—3 of Fig. 1 in the direction of the arrows, and

Fig. 4 is a view taken along the line 4—4 of Fig. 1 in the direction of the arrows.

The method and apparatus will be explained in connection with the production of a bonded mat of glass fibers produced for insulating purposes, the fibers being bound together by phenol formaldehyde or other suitable binders so that the mat will have dimensional stability and great tensile strength. Such application, however, is not to be interpreted as limiting the invention to use with this particular class of fiber or binder.

To produce a mat of this character, glass textile fibers of relatively fine gauge are processed through a chopper which reduces the length of the fibers to a maximum of approximately 10 inches, and an average of from 3 inches to 5 inches. These chopped fibers are then processed through a picket which separates the individual fibers from each other. The picked material is then processed through a garnett machine where the fibers are further separated and divided into individual strands, the strands being laid up in parallel rows upon the rolls. On completion of their travel through the garnett machine, a portion of which is diagrammatically shown at 10, the fibers are removed from the final doffer roll 11 by a rotary brush roll 12. As applied to the removal of glass textile fiber from the final doffer or discharge roll of the garnett machine, the brush roll is approximately 6 inches in diameter and is clothed with natural, synthetic, or wire bristles

extending radially from the periphery of the roll with approximately 100 points per square inch and driven in the direction of the arrows at a speed of approximately 1500 R. P. M. The brush roll is so located with regard to the doffer roll that the ends of the wire bristles barely contact with the wire clothing or pin-like projections which extend from the surface of the doffer roll. It will be noted that the doffer and brush rolls rotate in the same direction.

The brush points pick the fibers from the doffer roll and project them through the air due to centrifugal force generated by the brush in its rotation. To control the movement of these fibers and prevent them from being thrown back onto the doffer roll, a wind roll 13 is positioned above the brush roll, the axes of the doffer roll, brush roll and wind roll being parallel. The drive of the separate rolls has been omitted from the drawing in the interest of simplicity. Longitudinal vanes 13a extending radially from the surface of the wind roll create an air stream which is indicated by the arrows. This air stream merges with the air stream set up by the brush roll between the brush roll and wind rolls. The fibers swept from the doffer roll and projected from the bristles of the brush roll are caught up and suspended in the merged air streams. The wind roll may be of any suitable construction, with metal or wooden vanes attached to a central cylinder 13 mounted upon a supporting shaft 14. The bristles 12a are mounted on a cylindrical roll 12 carried by shaft 15. The vanes 13a of the wind roll produce a fan or blower effect as the wind roll is rotated. Satisfactory results have been obtained by rotating the wind roll at approximately 2000 R. P. M., somewhat in excess of the speed of the brush roll. Rotating in an opposite direction to the brush roll, it produces an air stream which balances the air stream of the brush roll giving the spilling action at the point of impact between the two air currents. This projects the fibers tangentially from the bristles of the brush roll into a forming section.

The forming zone or section comprises an enclosure consisting of screen panels 16 and solid panels 17 placed on opposite sides of an endless chain belt or reticulate conveyor 18 running over upper rolls 19 and lower rolls 20. The forming section and the rolls which carry the endless belt 18 are mounted on a frame 20a. Beneath the belt and forming section is a suction box 21 at one end of which is a suction fan, not shown. The fan draws the merged air streams and fibers swept from the doffer roll onto the chain belt. Air is also drawn by the fan through the screened paneling 16 causing the fiber to be distributed in a uniform layer over the surface of the traveling belt. Since the belt travels along the bottom of the forming section in the direction of the arrows a uniform layer of fiber is deposited on the belt. In the forming section or cabinet which surrounds the belt are a plurality of jets or sprays 22 which disperse a liquid bonding substance into the fibrous mass. Due to the air flotation and mixture of the binder with the fiber as it is deposited on the belt the individual fibers will receive a coating on all sides due to the movement and rotation of the fibers in the turbulent air stream. Whether wet binder or a dry powdered binder be used, the fibers are coated by the time they are deposited haphazardly onto the belt by the action of the suction fan which draws the air through the belt and discharges it

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through suction box 21. Some of the binder, of course, is lost through the belt to the suction fan, but the fibers piling up on the belt form a filter which traps a sufficient proportion of the binder to insure adequate bonding of the fibers together.

The mat moves with the belt 18 to a point of transfer to a steel flight conveyor which passes through a conventional curing or drying oven. Such an oven conveyor commonly has positioned thereabove a second conveyor also passing through the oven, the flights of which are in a parallel plane to those of the conveyor on which the mat is carried through the oven. The oven conveyors are adjustable upwardly and downwardly with respect to each other so that the space between their flights may be varied to govern and control the thickness and density of the mat. In other words, by regulating the distance between the flights of the respective conveyors, it is possible to compress the mat structure to any desired degree during the period it is in a formative state or while in transit through the oven.

In the oven the mat is exposed to sufficient heat when a thermo-plastic binder is used to cause it to soften and flow. When a thermo-setting binder is employed, the heat of the oven is regulated to cure the binder during its passage through the oven to a degree that the fibers of the mat are bonded into an integral structure. Methods of oven drying and curing thermo-plastic and thermo-setting binders are well known to the art.

Returning to my brush roll-wind roll assembly, it will be seen that this carries out the removal of the fibers from the doffer or fiber discharge roll of the garnett or carding machine in unique fashion, whereby the carded fibers are separated from one another and are individually air-borne from the machine onto conveyor 18, a method which combines the advantages of carding or garnetting the fibers with the advantages of forming the final mat by air flotation direct from the garnett or carding machine.

The speed of the brush and wind rolls is important, as are also the position of the two rolls relative one another and the opposite directions of their rotation; it is by virtue of their opposite rotation and their closely spaced relationship that the peripheral air streams tending to travel around the rolls in opposite direction merge and form a united air stream proceeding away from the rolls along a path substantially normal to a plane through the axes of the two rolls, as shown.

It has previously been indicated that the brush roll turns at high speed, whereby the fibers tend to be flung from it by centrifugal force. But for the peripheral air stream of this roll and the presence of the wind roll, the fibers would be flung tangentially from the brush roll in many directions, the course or trajectory of any particular fiber being dependent upon the point in the rotation of the roll at which it escaped from the bristles. While I do not wish to be limited to any particular theory of operation, it appears that the peripheral air stream of the brush roll serves to retain and carry the outwardly discharged fibers close to the tips of the bristles during their travel from the doffer roll along the underside of the brush roll to the point of merger with the peripheral air stream of the wind roll, whereupon they are, of course, diverted along the path of the merged air stream as described. If the wind roll is eliminated, it has been found that a large proportion of the fibers escape from the portion of the peripheral air streams of the brush

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roll lying immediately adjacent the tips of the bristles and are flung upwardly and rearwardly (i. e., to the right in the drawing) back over the doffer roll. The wind roll, of course, prevents this and at the same time, by merger of its air stream with that of the brush roll, augments the volume of the united air stream proceeding away from the rolls. The wind roll is believed also to serve another purpose, in that in the region X where the two peripheral air streams are in direct opposition, a turbulence and compression of air appears to take place which is effective in dislodging from the bristles of the brush roll any fibers not already free of the bristles, so these, too, are carried away in the merged air stream and prevented from returning on the brush roll for further contact with the doffer.

While the invention has been described with respect to removal of fiber glass or textile glass fibers from the final doffer roll of a garnett machine, it is applicable as well to the removal of any type of fiber which is being separated by either a garnett or carding machine. Among fibers separated by machines of this type are animal fiber such as wool or hair, vegetable fiber such as flax, cotton, mineral fiber as glass, slag and the like, and synthetic fibers.

From the foregoing, it will be seen that this invention is well adapted to attain the ends and objects hereinbefore set forth together with other advantages which are obvious and which are inherent to the apparatus and process. It will be understood that certain features and sub-combinations are of utility and may be employed without reference to other features and sub-combinations. This is contemplated by and is within the scope of the claims.

As many possible embodiments may be made of the invention without departing from the scope thereof it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim:

1. An apparatus for removing fiber from the discharging roll of a garnett or carding machine, comprising a brush roll whose axis is parallel to the discharging roll of the machine, the bristles of the brush roll substantially touching the fiber discharging roll and moving at a greater speed than the surface of the fiber discharging roll, a wind roll whose axis is parallel to that of the brush roll, said wind roll substantially touching the brush roll and rotating in an opposite direction thereto.

2. An apparatus as in claim 1 in which the wind roll is rotated at a greater speed than the brush roll.

3. A mechanism as in claim 1 in which the wind roll has a plurality of vanes adapted to create a stream of air flowing countercurrent to the air stream and fiber rotating with the brush roll, merger of the respective air streams adapted to assist in the removal of the fiber from the bristles of the brush roll.

4. The combination with a garnett or carding machine having a roll for carrying fibers, comprising a brush roll parallel and adjacent to the fiber carrying roll rotated to sweep the fibers from said fiber carrying roll, the speed of said brush roll being such as to fling the fibers away from the brush roll and a wind roll parallel and substantially touching said brush roll rotated oppositely to the rotation of said brush roll thereby to create an air stream merging with

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the air stream created by the brush roll and carrying the fibers away from the brush roll along a particular path.

5. A combination as claimed in claim 4 wherein said wind roll has longitudinal vanes extending substantially radially from the axis of the wind roll.

6. The combination with a garnett or carding machine having a roll for carrying fibers, comprising a brush roll parallel and adjacent to the fiber carrying roll rotated to sweep the fibers from said fiber carrying roll, the speed of said brush roll being such as to tend to fling the fibers away from the brush roll due to centrifugal force, and a wind roll parallel and adjacent to said brush roll rotated oppositely to the rotation of said brush roll thereby to create an air stream merging with the air stream created by the brush roll and carrying the fibers away from the brush roll along a particular path, said wind roll being so disposed with respect to the other rolls that each bristle of the brush roll must rotate at least 180° past the fiber-carrying roll before it reaches a point adjacent the wind roll.

7. A combination as in claim 6 wherein said wind roll has longitudinal vanes extending substantially radially from the axis of said roll.

8. A combination as in claim 6 wherein the speed of rotation of said wind roll exceeds the speed of rotation of the brush roll.

9. Apparatus of the character described comprising an elongate wind roll having longitudinal vanes extending substantially radially from the axis of the roll, an elongate brush roll having its axis parallel to the axis of the wind roll, means for rotating said rolls in opposite directions whereby they generate peripheral air streams tending to proceed around the respective rolls in opposite directions, said rolls positioned sufficiently close together that a portion of their respective air streams merge to form a united air stream proceeding away from the rolls in a direction substantially normal to a plane passing through the axes of the two rolls, a traveling fiber carrier adjacent said brush roll with the brush roll positioned in sweeping relation thereto, the speed of the brush roll being such as to sweep the fibers from said carrier and fling them into the air stream of the brush roll at a point ahead of the merger of that air stream with the air stream of the wind roll.

10. Apparatus as in claim 9, wherein the speed of rotation of the wind roll exceeds the speed of rotation of the brush roll.

11. Apparatus of the character described, comprising a pair of parallel rolls consisting of a brush roll and a wind roll, means for rotating said rolls in opposite directions whereby the rolls generate peripheral air streams tending to proceed around the rolls in opposite directions, said rolls positioned sufficiently close together that a portion of their respective air streams merge to form a united air stream proceeding away from the rolls in a direction substantially normal to a plane passing through the axes of the two rolls, a traveling fiber carrier adjacent said brush roll with the brush roll positioned in sweeping relation thereto, the speed of said brush roll being such as to sweep the fibers from said carrier and fling them into the air stream of the brush roll at a point ahead of the merger of that air stream with the air stream of the other roll, whereby the fibers are carried into the united air stream and are individually air-borne thereby away from

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said rolls, a reticulate conveyor positioned across the united air stream at an appreciable distance beyond the point at which the fibers enter that air stream, thereby to block the advance of the air-borne fibers and thus cause same to pile up in haphazard jackstraw fashion against the conveyor, and means for driving the conveyor in a direction transverse to the path of the united air stream to carry the fibers piled up there-against out of the range of the united air stream.

12. Apparatus of the character described, comprising a pair of parallel rolls consisting of a brush roll and a wind roll, means for rotating said rolls in opposite directions whereby the rolls generate peripheral air streams tending to proceed around the rolls in opposite directions, said rolls positioned sufficiently close together that a portion of their respective air streams merge to form a united air stream proceeding away from the rolls in a direction substantially normal to a plane passing through the axes of the two rolls, a traveling fiber carrier adjacent said brush roll with the brush roll positioned in sweeping relation thereto, the speed of said brush roll being such as to sweep the fibers from said carrier and fling them into the air stream of the brush roll at a point ahead of the merger of that air stream with the air stream of the other roll, whereby the fibers are carried into the united air stream and are individually air-borne thereby away from said rolls, a reticulate conveyor positioned across the united air stream at an appreciable distance beyond the point at which the fibers enter that air stream thereby to block the advance of the air-borne fibers and thus cause same to pile up in haphazard jackstraw fashion against the conveyor, means for driving the conveyor in a direction transverse to the path of the united air stream to carry the fibers piled up there-against out of the range of the united air stream, and means for introducing a binder into the united air stream at a point ahead of that at which the fibers pile up against said conveyor whereby said binder is co-mingled with the fibers traveling toward the conveyor.

13. Apparatus of the character described comprising a pair of parallel rolls consisting of a brush roll and a wind roll, means for rotating said rolls in opposite directions whereby the rolls generate peripheral air streams tending to proceed around the rolls in opposite directions, said rolls positioned one above the other and sufficiently close together that a portion of their respective air streams merge to form a united air stream proceeding away from the rolls in a generally horizontal direction, a traveling fiber carrier adjacent said brush roll with the brush roll positioned in sweeping relation thereto, the speed of said brush roll being such as to sweep the fibers from said carrier and fling them into the air stream of the brush roll at a point ahead of the merger of that air stream with the air stream of the other roll, whereby the fibers are carried into the united air stream and are individually air-borne thereby away from said rolls in said generally horizontal direction, means for diverting said united air stream downwardly at a point spaced laterally of said rolls, and an endless horizontal reticulate conveyor disposed below the level of said rolls, said conveyor constructed and arranged to travel across the path of the downwardly diverted air stream to receive the fibers carried thereby and transport them out of the path of said air stream.

14. Apparatus as in claim 13, having means for

introducing a binder into said united air stream at a point above said conveyor, whereby the binder co-mingles with the fibers as they are air-borne in that stream downwardly toward the conveyor.

15. Apparatus of the character described, comprising a pair of parallel rolls consisting of a brush roll and a wind roll, means for rotating said rolls in opposite directions whereby the rolls generate peripheral air streams tending to proceed around the rolls in opposite directions, said rolls positioned one above the other with their peripheries substantially touching whereby their respective air streams merge to form a united air stream proceeding away from the rolls in a generally horizontal direction, means for feeding fibers onto said brush roll at a point ahead of said merger of the air streams, the speed of said rolls and the force of the peripheral air streams generated by the rolls due to their speed being sufficient to discharge the fibers from said brush roll into said united air stream whereby they are individually air-borne by the united air stream away from said rolls in said generally horizontal direction.

16. Apparatus of the character described, comprising a pair of parallel rolls consisting of a brush roll and a wind roll, means for rotating said rolls in opposite directions whereby the rolls generate peripheral air streams tending to proceed around the rolls in opposite directions, said rolls positioned one above the other with their peripheries substantially touching whereby their respective air streams merged to form a united air stream proceeding away from the rolls in a generally horizontal direction, means for feeding fibers into said brush roll at a point ahead of said merger of the air streams, the speed of said rolls and the force of the peripheral air streams generated by the rolls due to their speed being sufficient to discharge the fibers from said one roll into the united air stream whereby they are independently air-borne by the united air stream away from the rolls in said generally horizontal direction, means for diverting said united air stream downwardly at a point spaced laterally of said rolls, and an endless horizontal reticulate conveyor disposed below the level of said rolls, said conveyor constructed and arranged to travel across the path of the downwardly diverted air stream to receive the fibers carried thereby and transport them out of the path of said air stream.

17. Apparatus of the character described, comprising a pair of parallel rolls consisting of a brush roll and a wind roll, means for rotating said rolls in opposite directions whereby the rolls generate peripheral air streams tending to proceed around the rolls in opposite directions, said rolls positioned one above the other with their peripheries substantially touching whereby their respective air streams merge to form a united air stream proceeding away from the rolls in a generally horizontal direction, means for feeding fibers onto said brush roll at a point ahead of said merger of the air streams, the speed of said rolls and the force of the peripheral air streams generated by the rolls due to their speed being sufficient to discharge the fibers from said one roll into the united air stream whereby they are independently air-borne by the united air stream away from the rolls in said generally horizontal direction, means for diverting said united air stream downwardly at a point spaced laterally of said rolls, an endless horizontal reticulate conveyor disposed below the level of said rolls, said

conveyor constructed and arranged to travel across the path of the downwardly diverted air stream to receive the fibers carried thereby and transport them out of the path of said air stream, and means for introducing a binder into said united air stream at a point above the conveyor, whereby the binder co-mingles with the fibers as they travel downwardly toward the conveyor.

18. In the method of making fibrous mat wherein the fibers pass through a garnett or carding machine and emerge on a rotating doffer roll, the improvement which comprises sweeping the fibers from the doffer roll with a rotary brush roll, rotating said brush roll at a speed sufficient to fling the fibers from the brush roll into the peripheral air stream of said roll, generating a second air stream and directing same into a portion of said peripheral air stream to divert the latter and form therewith a merged air stream carrying the fibers away from the brush roll and along a particular path, collecting the fibers into a mat after they have traveled in said merged air stream a distance exceeding the diameter of said doffer roll, and removing the mat from said air stream.

19. In the method of making fibrous mat wherein the fibers pass through a garnett or carding machine and emerge on a rotating doffer roll, the improvement which comprises sweeping the fibers from the doffer roll with a rotary brush roll, rotating said brush roll at a speed sufficient to fling the fibers from the brush roll into the peripheral air stream of said roll, generating a second air stream and directing same into a portion of said peripheral air stream to divert the latter and form therewith a merged air stream carrying the fibers away from the brush roll and along a particular path, introducing a binder into the merged air stream to co-mingle with the air-borne fibers traveling along said path, collecting the co-mingled fibers and binder after the fibers have traveled along said path a distance exceeding the diameter of the doffer roll, and removing the collected fibers and binder from said air stream.

20. In the method of making fibrous mat wherein the fibers pass through a garnett or carding machine and emerge on a rotating doffer roll, the improvement which comprises sweeping the fibers from the doffer roll with a rotary brush roll, rotating said brush roll at a speed sufficient to fling the fibers from the brush roll into the peripheral air stream of said roll, generating a second air stream and directing same into a portion of said peripheral air stream to divert the latter and form therewith a merged air stream carrying the fibers away from the brush roll and along a particular path, causing said fibers to travel along said path in said air stream for a distance exceeding the diameter of the doffer roll, and then directing the air stream through a foraminous barrier to cause the fibers to pile up in haphazard jackstraw fashion against said barrier.

21. In the method of making fibrous mat wherein the fibers pass through a garnett or carding machine and emerge on a rotating doffer roll, the improvement which comprises sweeping the fibers from the doffer roll with a rotary brush roll, rotating said brush roll at a speed sufficient to fling the fibers from the brush roll into the peripheral air stream of said roll, generating a second air stream and directing same into a portion of said peripheral air stream to divert the latter and form therewith a merged

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air stream carrying the fibers away from the brush roll and along a particular path, causing said fibers to travel along said path in said air stream for a distance exceeding the diameter of the doffer roll, then directing the air stream through a foraminous barrier to cause the fibers to pile up in haphazard jackstraw fashion against said barrier, and introducing a binder into said air stream to co-mingle with the air-borne fibers at a point ahead of said barrier.

22. Apparatus of the character described comprising a source of fibers, a first roll adjacent said source having a plurality of peripheral bristles adapted to engage said fibers, a wind roll adjacent and substantially parallel to said first roll, means for rotating said rolls in opposite directions whereby the rolls generate peripheral air streams tending to proceed around the rolls in opposite directions, the speed of the first roll being sufficient to fling the fibers into the air stream of that roll, said rolls positioned sufficiently close together that a portion of their respective air streams, instead of passing between the rolls, merge to form a united air stream proceeding away from said first roll and carrying the fibers away from said first roll along a particular path.

23. Apparatus of the character described comprising a source of fibers, a first roll adjacent said source having a plurality of peripheral bristles adapted to engage said fibers, a wind roll adjacent and substantially parallel to said first roll, means for rotating said rolls in opposite directions whereby the rolls generate peripheral air streams tending to proceed around the rolls in opposite directions, the speed of the first roll being sufficient to fling the fibers into the air stream of that roll, said rolls positioned sufficiently close together that a portion of their respective air streams instead of passing between the rolls merge to form a united air stream proceeding away from a plane passing through the axes of the two rolls and carrying said fibers away from said first roll.

24. Apparatus as in claim 23 wherein said parallel rolls are disposed one above the other so that a plane passing through the axes of the two rolls is substantially vertical.

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25. Apparatus of the character described comprising a source of fibers, a first roll adjacent said source having a plurality of peripheral bristles adapted to engage said fibers, a wind roll adjacent and substantially parallel to said first roll, means for rotating said rolls in opposite directions whereby the rolls generate peripheral air streams tending to proceed around the rolls in opposite directions, the speed of the first roll being sufficient to sweep the fibers from said source and fling them into the air stream of that roll, said rolls positioned sufficiently close together that a portion of their respective air streams, instead of passing between the rolls, merge to form a united air stream proceeding away from said first roll whereby the fibers are carried into said united air stream and are individually air-borne thereby away from said rolls, a reticulate conveyor positioned across the united air stream at an appreciable distance beyond the point at which fibers enter that air stream thereby to block the advance of the air-borne fibers and thus cause same to pile up in haphazard jackstraw fashion against the conveyor, and means for driving the conveyor in a direction transverse to the path of the united air stream to carry the fibers piled up thereagainst out of the range of the united air stream.

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