

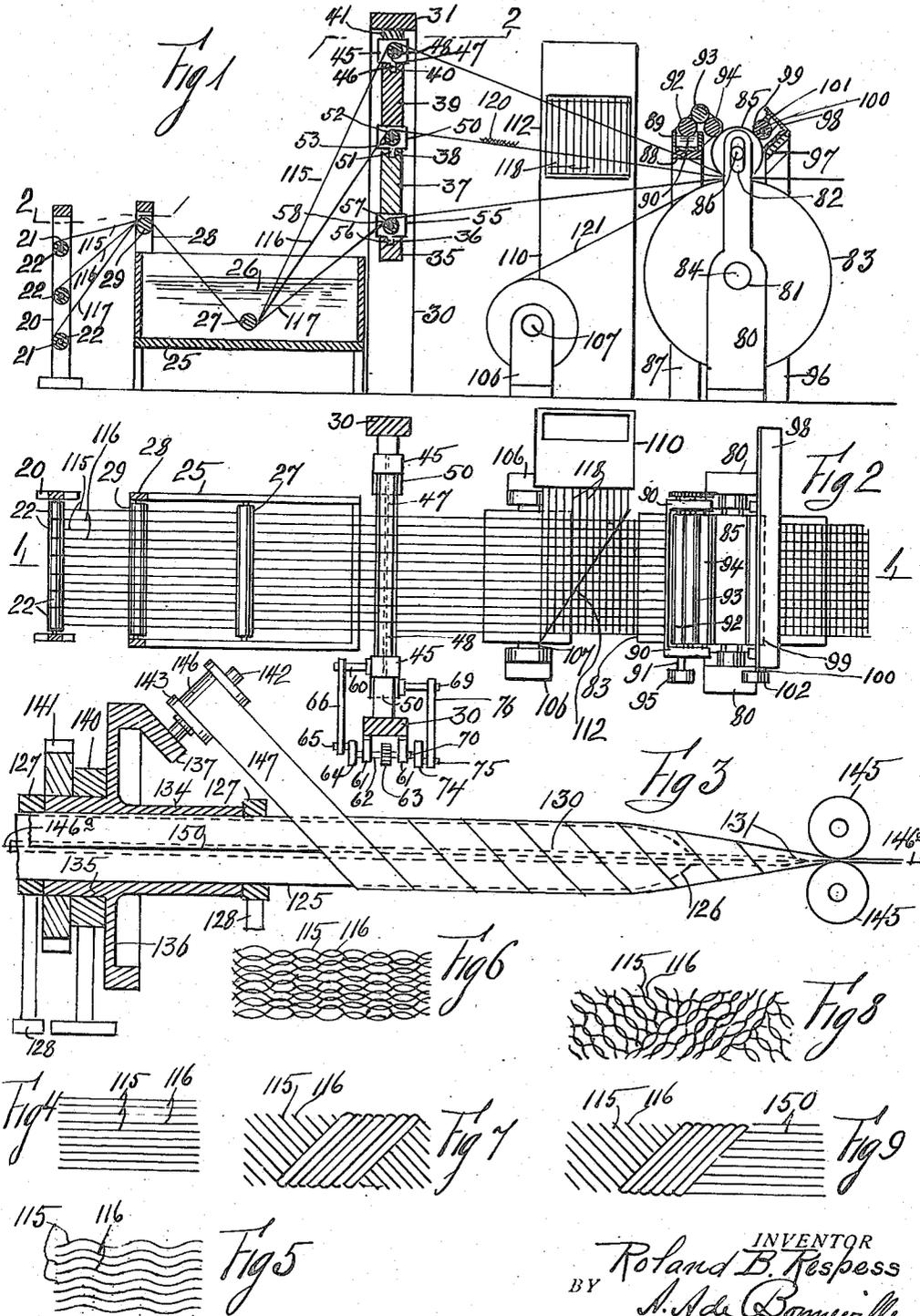
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R. B. RESPESS

UNWOVEN FABRIC AND PROCESS FOR MAKING THE SAME

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INVENTOR
 Roland B. Respass
 BY
 A. Ade Bonville
 ATTORNEY

UNITED STATES PATENT OFFICE.

ROLAND B. RESPESS, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO
RESPRO INC., OF CRANSTON, RHODE ISLAND, A CORPORATION OF RHODE ISLAND.

UNWOVEN FABRIC AND PROCESS FOR MAKING THE SAME.

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To all whom it may concern:

Be it known that I, ROLAND B. RESPESS, citizen of the United States, and resident of the borough of Manhattan, in the county of New York and State of New York, have invented certain new and useful Improvements in Unwoven Fabric and Processes for Making the Same, of which the following is a specification.

This invention relates to an unwoven fabric and the process for making the same.

One object of the present invention comprises the production and process of making a strong pliable unwoven fabric which may have incorporated therein flexible threads or cords running lengthwise of the fabric in predetermined straight, wavy or other directions. One thread may overlap the next adjacent thread or cord or several adjacent threads or cords to form a matted construction.

A second object comprises the production and process of making a strong pliable unwoven fabric which may have incorporated therein flexible threads or cords, and which may be stretched easily in one or two directions, so that it may readily be formed around the core in making a rubber tire and similar articles in the manner that woven fabric is used.

A third object comprises the production and process of making a strong pliable unwoven fabric, which may have incorporated flexible threads or cords and which is substantially non-stretching in three or more directions.

A fourth object is to construct the improved fabric in an economical manner and by a more rapid method than is employed in weaving or in looping the threads or cords over pins or hooks at the edges of the fabric.

Other objects are evident and will in part hereinafter be pointed out. The invention also consists of the steps to produce the product and the relation of each step with the other step in the process.

Fig. 1 of the accompanying drawing represents a part elevation of one form of the apparatus to carry out the steps of the invention and a part section of Fig. 2 on the line 1, 1; Fig. 2 shows a top plan view and section of Fig. 1 on the broken line 2, 2; Fig. 3 represents a part elevation and part axial section of apparatus for a modifica-

tion of the invention; Fig. 4 shows a portion of the fabric with its threads or cords running in straight lines lengthwise thereof; Fig. 5 represents the fabric with its threads or cords located in wavy directions lengthwise thereof; Fig. 6 represents the fabric with its threads or cords located in wavy directions lengthwise thereof with one thread overlapping two other threads; Fig. 7 shows a diagrammatic part sectional view of the fabric originally in tubular form and then flattened out; Fig. 8 shows a diagrammatic part sectional view of the fabric similar to Fig. 7 with its threads or cords running lengthwise of its length in wavy directions, with one thread overlapping two other threads and Fig. 9 shows a part sectional originally tubular fabric flattened with its threads or cords in straight directions parallel to its length, and a second piece of fabric between the opposite portions of the first piece.

Referring to Figs. 1 and 2, a frame 20 is provided with the journal rods 21 on which are journaled the spools 22. A tank 25 for a binding solution 26 has journaled therein the guide roller 27. A frame 28 extends up from the tank 25 and has journaled therein the guide roller 29. A frame comprises the vertical posts 30 with the top cross-girder 31. The frame has connected therewith the cross-guides 35 with the guide groove 36, the cross-guide 37 with the guide groove 38, the cross-guide 39 with the guide groove 40 and the top cap 41. A pair of slides 45 each having the guide lug 46 are slidably supported on the cross-guide 39. A journal rod 47 connects the slides 45 and a guide roller 48 is journaled on the rod 47. A pair of slides 50 each having the guide lug 51 are slidably supported on the cross-guide 37. A journal rod 52 connects the slides 50 and a guide roller 53 is journaled on the rod 52. A pair of slides 55 similar to 45 each with a guide lug 56 are slidably supported on the cross-guide 35. A journal rod 57 connects the slides 55 and a guide roller 58 is journaled on the rod 57. From one of the slides 45 extends a pin 60 and to one of the posts 30 are secured a pair of journal brackets 61, that support a driving shaft 62. The latter has fastened thereto a driving gear 63. A disc 64 on the shaft 62 has extending therefrom the crank pin 65. A

connecting rod 66 connects the crank pin 65 and the pin 60. From one of the slides 50 extends a pin 69 similar to 60 and to the same post 30 are secured a second pair of journal brackets similar to 61. A driving shaft 70 similar to 62 is supported in the latter pair of journal brackets. The driving shaft 70 has fastened thereto a driving gear not shown similar to 63. A disc 74 on the shaft 70 has extending therefrom a crank pin 75. A connecting rod 76 connects the crank pin 75 and the pin 69. One of the slides 55 has connected therewith similar appurtenances as just described for the slides 45 and 50.

A pair of journal frames 80 have formed therewith the journal bearings 81 and the elongated journal bearings 82. A drum 83 is supported on the axle 84 which is journaled in the bearings 81. A pressure roller 85 is fastened to the axle 86 which latter is guided in the elongated journal bearings 82. A pair of uprights 87 support a cross-girder 88 for a receptacle 89 containing a cleaning fluid 90. The receptacle has journaled in its walls 90 a shaft 91 on which is fastened a roller 92. A second roller 93 and a third roller 94 are also journaled in extended portions of the walls 90. The roller 93 contacts with the rollers 92 and 94. A pulley 95 is fastened to the shaft 91. Uprights 96 support an inclined top cross-girder 97. The latter supports an angle shaped scraper 98 one leg of which contacts with the pressure roller 85. A cleaning roller 99 is fastened to shaft 100 which latter is journaled in journal brackets 101 that extend from a leg of the scraper 98. A pulley 102 is fastened to the shaft 100.

A pair of journal brackets 106 have journaled therein a shaft 107. A carding machine 110 is shown with the discharge apron 112.

To produce the fabric threads or cords 115, 116, 117 of suitable fibers such as cotton and the like on the spools 22 are unwound from the latter and guided over the guide roller 29. From the latter the threads or cords lead into the tank 25 under the guide roller 27. The threads while moving through the tank are immersed in the binding solution 26, which may be a compound of rubber. This step may be carried out in a vacuum. The threads or cords 115, 116 and 117 are then respectively guided over the guide rollers 48, 53 and 58. The latter may be maintained stationary or they may receive movements in directions of their longitudinal axes. They are moved by imparting rotations to the gear 63 coaxing with roller 48 and the similar gears coaxing with the rollers 53 and 58. The threads or cords 115, 116 and 117 are next led between the drum 83 and pressure roller 85. When the frames of the guide rollers 48, 53 and 58

are maintained stationary the threads or cords 115, 116 and 117 are deposited on the drum 83 in straight line running lengthwise of the fabric as shown in Fig. 4. When the said frames are simultaneously moved in the same direction, the threads or cords are deposited on the drum in wavy parallel line as indicated in Fig. 5. When the said guide rollers are simultaneously moved in opposite directions they may be made to intersect each other when deposited on the drum 83 as shown in Fig. 6, where one thread intersects two others. Various modifications of the intersections of the threads may be produced by varying the lengths of the strokes given to the cross-movements of the guide rollers 48, 53 and 58.

Before the threads or cords reach the drum 83 a binding sheet of fibers 118 may be deposited on one or more layers of the parallel threads or cords 115, 116 and 117. This may be accomplished by depositing the fibers of the sheet 118 by means of the carding machine 110. Fibers 120 may also be blown in and among the threads or cords 115, 116 and 117. A foundation sheet 121 of rubber, a cotton mat of interlocked fibers or a prepared sheet of unwoven fibers on the shaft 107 may meet the other threads or cords on the drum 83. The pressure roller 85 causes the threads or cords to adhere to each other or to the binding sheet 118 of fibers between them, or to the foundation sheet 121 according to the method of construction of the fabric. The pressure roller 85 is kept clean by the roller 99 and the scraper 98. The rollers 92, 93 and 94 carry the cleaning fluid 90 from the receptacle 89 to the pressure roller 85 to clean the latter.

The pressure roller 85 is also intended to serve the additional purpose of securing an efficient saturation of the threads or cords with the binding solution.

After the fabric passes from the drum 83 and pressure roller 85, it is conducted by conveyors not shown to a drying chamber where the solvent on the fabric is evaporated. The fabric is then again passed through pressure rollers and rolled up. When a foundation sheet of untreated matted fiber is used the fabric may be again saturated throughout with the binding agent, dried and subjected to pressure.

A further step in the process relates to the adaptation of the prepared sheets, in the construction of sheets in which the threads or cords in the fabric may run at an angle to the length of the sheet, with one layer of the threads or cords superimposed on one or more similar layers of threads or cords at angles to the next adjacent layer of threads or cords. By this disposition of the layers the completed fabric in some cases may be easily stretched in one or two directions and in other cases is

substantially non-stretching in all directions. This step of the process may be obtained by the apparatus indicated in Fig. 3. The latter apparatus comprises a stationary cylindrical barrel 125 with the tapered end 126. Supporting brackets each with the ring 127 and leg 128 support the barrel. A conduit 130 for a binding agent extends through the barrel with its outlet end at 131. A sleeve with the portions 134 and 135 surrounds the barrel 125. A disc 136 with the projecting lug 137 extends from the portions 134 and 135. A journal bracket 140 supports the portion 135 and a spur gear 141 is secured to said portion. A journal pin 142 has journaled thereon the spool 143. A pair of pressure rollers 145 are journaled adjacent to the tapered end 126 of the barrel 125. To carry out the step of the process with the apparatus just described, a roll 146 of the prepared fabric 147 is carried on the spool 143, and by imparting rotation to the spur gear 141 the said spool is revolved around the barrel 125, and thereby the fabric is wound around said barrel at an angle of 45 degrees to the axis of the barrel with the edge of one winding overlapping the edge of the next adjacent winding. The pressure rollers 145 are turned, and the fabric being located between them pulls it from the barrel 125 and presses the tubular formed fabric into a flat double sheet. If desired a slight amount of the binding solution may be forced through the conduit 130 and may be thus deposited on the inner wall of the tubular fabric, so that when said fabric is pressed into a double sheet, the members thereof adhere firmly together and the solution also serves the purpose of preventing the formation of air bubbles between the members of the double sheet. Independent cords 146^a may be run on the outside of the barrel under the tubular formed product when the latter is being formed. A further step may be added to make the fabric non-stretching in any direction by locating a prepared foundation sheet 150 having its threads or cords running lengthwise thereof upon the barrel 125 and around the upper half of its circumferential surface. This sheet 150 will ultimately be located between the members of the double sheet as it projects from the pressure rollers 145. The foundation sheet 150 may be composed of rubber to more firmly bind the two thread layers to each other and to constitute a coating for the double sheet when it is flattened and pressed. When the foundation sheet 150 is to be of rubber, it is prepared by pressing the rubber between the rolls of a heavy calender press to produce a thin sheet which may be rolled up between cloth to prevent layers thereof sticking together. For some purposes it is desirable to have a foundation sheet 150 of matted fibers. In lieu of

rubber, a foundation sheet of matted fibers, prepared in any usual or known manner may be employed.

In Fig. 7 the tubular sheet of prepared fabric 147 is shown with the straight threads or cords 115 and 116. In Fig. 8 the tubular sheet of fabric is shown with the fibers 115 and 116 intersecting each other and in Fig. 9 the tubular sheet of fabric is shown with the parallel threads or cords 115 and 116 and the sheet 150.

Having described my invention, what I desire to secure by Letters Patent and claim is:

1. The herein described process of making an unwoven fabric consisting of coating threads or cords with a binding agent, conducting the threads or cords through movable guides in parallel lines to a gathering place, laying a binding sheet of fibers on a set or sets of threads or cords, conducting the coated threads or cords so that they run parallel to each other lengthwise of the sheet to be formed in a wavy or predetermined design, coating another set or sets of parallel threads or cords with a binding agent, conducting the second set or sets or parallel threads or cords through a movable guide to a gathering place, depositing the second set or sets of threads or cords so that the threads or cords run parallel to each other lengthwise of the sheet in a wavy or predetermined design to overlap the first set or sets of threads or cords, compressing the product and drying same.

2. The herein described process of making an unwoven fabric consisting in coating threads or cords with a binding agent, conducting the threads or cords through movable guides in parallel lines to a gathering place, laying a binding sheet of fibers on a set or sets of threads or cords, depositing the threads or cords on a foundation sheet of rubber so that the threads or cords run parallel to each other lengthwise of the sheet in a wavy or predetermined design, coating other sets of parallel threads or cords with a binding agent, conducting the second set or sets of parallel threads or cords through movable guides to a gathering place, depositing the second set or sets of threads or cords so that the threads or cords run parallel to each other lengthwise of the sheet in a wavy or predetermined design to overlap the first set or sets of threads or cords located on the foundation sheet and with the binding sheet or sheets of fibers between to form a predetermined design, compressing the product and drying same.

3. The herein described process of making an unwoven fabric consisting in coating threads or cords with a binding agent, conducting the threads or cords through guides in parallel lines to a gathering place,

laying a binding sheet of fibers on the set or sets of threads or cords, depositing the coated threads or cords so that the threads or cords run parallel to each other in
 5 straight lines lengthwise of the sheet, coating another set or sets of parallel threads or cords with a binding agent, conducting the second sets or sets of parallel threads or cords through guides in parallel lines
 10 to a gathering place, depositing the second set or sets of threads or cords on the first set or sets of threads or cords and the fiber binding sheet or sheets so that the threads or cords of the second set or sets run parallel
 15 to each other and to the threads or cords of the first set or sets lengthwise of the sheet, compressing the product, winding the sheet around a tube so that one edge of the sheet conforms to and slightly overlaps the
 20 other edge of the sheet, pressing the two edges together to form a cover for the tube, drawing the cover from the tube to form a flat sheet, compressing the product and drying same.

25 4. The herein described process of making an unwoven fabric consisting in coating threads or cords with a binding agent, conducting the threads or cords through
 30 guides in parallel lines to a gathering place, laying a binding sheet of fibers on a set or sets of threads or cords, depositing the coated threads or cords and the fiber binding sheet or sheets on a foundation sheet of rubber or
 35 matted fibers so that the threads or cords run parallel to each other in straight lines lengthwise of the sheet, coating another set or sets of parallel threads or cords with a binding agent, conducting the second set or sets of parallel threads or cords in parallel
 40 lines to a gathering place, depositing the second set or sets of threads or cords on the first set or sets of threads or cords and the fiber binding sheet or sheets and the foundation sheet, so that the threads or cords of
 45 the second set or sets run parallel to each other and to the threads or cords of the first layer lengthwise of the sheet, compressing the product, winding the sheet around a tube so that one edge of the sheet
 50 conforms to and slightly overlaps the other edge of the sheet to form a cover for the tube, drawing the cover from the tube to form a flat sheet, compressing the product and drying same.

55 5. The herein described process of making an unwoven fabric consisting in coating threads or cords with a binding agent, conducting the threads or cords through guides
 60 in parallel lines to a gathering place, laying a binding sheet of fibers on the set or sets of threads or cords, depositing the coated threads or cords so that they run parallel to each other in straight lines lengthwise
 65 of the sheet, coating other sets of parallel threads or cords with a binding agent, con-

ducting the second set or sets of parallel threads or cords through guides in parallel lines to a gathering place, depositing the second set or sets of threads or cords on the first set or sets of threads or cords so that
 70 the threads or cords of the second set or sets run parallel to each other and to the threads or cords of the first set or sets lengthwise of the sheet, compressing the product, taking a sheet of the prepared
 75 fabric of a width equal to one-half the circumference of a barrel and placing same on the barrel to conform to one-half its circumference surface and running lengthwise of the same, winding a second sheet of the
 80 prepared fabric around the barrel and over the first sheet at an angle of 45 degrees to the lengthwise direction of the barrel so that one edge of the second sheet conforms to and slightly overlaps the other edge of the sheet
 85 to form a tubular cover for the barrel, drawing the cover from the barrel to form a flat sheet, compressing the product and drying same.

6. The herein described process of making an unwoven fabric consisting in coating threads or cords with a binding agent, conducting the threads or cords through guides
 90 in parallel lines to a gathering place, laying a binding sheet of fibers on the set or sets of threads or cords, depositing the coated threads or cords on a foundation sheet of rubber or matted fiber so that the threads or cords run parallel to each other
 95 in straight lines lengthwise of the sheet, coating other sets of parallel threads or cords with a binding agent, conducting the second set or sets of parallel threads or cords through guides in parallel lines to a gathering place, depositing the second set or sets
 100 of threads or cords on the first set or sets of threads or cords and the fiber binding sheet or sheets and the foundation sheet, so that the threads or cords of the second set or sets run parallel to each other and
 105 to the threads or cords of the first set or sets lengthwise of the sheet, compressing the product, taking one sheet of the prepared fabric of a width equal to one-half the circumference of a barrel and placing same on
 110 the barrel to conform to one-half of its circumferential surface and running lengthwise of the barrel, winding a second sheet of the prepared fabric around the barrel and over the first sheet at an angle of 45
 115 degrees to the length of the barrel so that one edge of the second sheet conforms to and slightly overlaps the other edge of the sheet to form a tubular cover for the barrel, drawing the cover from the barrel to form
 120 a flat sheet, compressing the product and drying same.

7. The herein described process of making an unwoven fabric consisting in coating threads or cords with a binding agent, con-
 125
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ducting the threads or cords through movable guides in parallel lines to a gathering place, depositing the coated threads or cords so that the threads or cords run parallel to each other lengthwise of the sheet in a wavy or predetermined design, coating other sets of parallel threads or cords with a binding agent, conducting the second set or sets of parallel threads or cords through a movable guide to a gathering place, depositing the second set or sets of threads or cords so that the threads or cords run parallel to each other lengthwise of the sheet in a wavy or predetermined design to overlap the first set or sets of threads or cords to form a predetermined matted design, winding the sheet around a tube so that one edge of the sheet conforms to and slightly overlaps the other edge of the sheet to form a cover for the tube, drawing the cover from the tube to form a flat sheet, compressing the product and drying same.

8. The herein described process of making an unwoven fabric consisting in coating threads or cords with a binding agent, conducting the threads or cords through movable guides in parallel lines to a gathering place, depositing the coated threads or cords, so that the threads or cords run parallel to each other lengthwise of the sheet in a wavy or predetermined design, coating other sets of parallel threads or cords with a binding agent, conducting the second set or sets of parallel threads or cords through movable guides to a gathering place, depositing the second set or sets of threads or cords so that the threads or cords run parallel to each other lengthwise of the sheet in a wavy or predetermined design to overlap the first set or sets of threads or cords to form a predetermined matted design, taking one sheet of the prepared fabric of a width equal to one-half the circumferential surface of a barrel and placing same on the barrel to conform to one-half its circumferential surface and running lengthwise of the barrel, winding a second sheet of the prepared fabric around the barrel and over the first sheet at an angle of 45 degrees to the length of the barrel, so that one edge of the second sheet conforms to and slightly overlaps the other edge of the sheet to form a tubular cover for the barrel, drawing the cover from the barrel to form a flat sheet, compressing the product and drying same.

9. The herein described process of making an unwoven fabric consisting in coating threads or cords with a binding agent, conducting the threads or cords through movable guides in parallel lines to a gathering place, depositing the coated threads or cords on a foundation sheet of rubber or matted fibers so that the threads or cords run parallel to each other lengthwise of the sheet in a wavy or predetermined design, coating other sets

of parallel threads or cords with a binding agent, conducting the second set or sets of parallel threads or cords through movable guides to a gathering place, depositing the second set or sets of threads or cords so that the threads or cords run parallel to each other lengthwise of the sheet in a wavy or predetermined design to overlap the first set or sets of threads or cords to form a predetermined matted design, compressing the product, winding the sheet around a barrel so that one edge of the sheet conforms to and slightly overlaps the other edge of the sheet to form a cover for the barrel, drawing the cover from the barrel to form a flat sheet, compressing the product and drying same.

10. The herein described process of making an unwoven fabric consisting in coating threads or cords with a binding agent, conducting the threads or cords through movable guides in parallel lines to a gathering place, depositing the coated threads or cords on a foundation sheet of rubber or matted fibers so that the threads or cords run parallel to each other lengthwise of the sheet in a wavy or predetermined design, coating other sets of parallel threads or cords with a binding agent, conducting the second set or sets of parallel threads or cords through movable guides to a gathering place, depositing the second set or sets of threads or cords, so that the threads or cords run parallel to each other lengthwise of the sheet in a wavy or predetermined design to overlap the first set or sets of threads or cords to form a predetermined matted design, compressing the product, taking one sheet of the prepared fabric of a width equal to one-half the circumference of a barrel and placing same on the barrel to conform to one-half its circumferential surface and running lengthwise of the tube, winding a second sheet of the prepared fabric around the barrel and over the first sheet at an angle of 45 degrees to the length of the barrel so that the edge of the second sheet conforms to and slightly overlaps the edge of the sheet, to form a cover for the barrel, drawing the cover from the barrel to form a flat sheet, compressing the product and drying same.

11. The herein described process of making an unwoven fabric consisting in coating threads or cords with a binding agent, conducting the threads or cords through movable guides in parallel lines to a gathering place, laying a binding sheet of fibers on the set or sets of threads or cords, depositing the coated threads or cords so that the threads or cords run parallel to each other lengthwise of the sheet to be formed in a wavy or predetermined design, coating other sets of parallel threads or cords with a binding agent, conducting the second set

or sets of parallel threads or cords through movable guides to a gathering place, depositing the second set or sets of threads or cords so that the threads or cords run parallel to each other lengthwise of the sheet in a wavy or predetermined design to overlap the first set or sets of threads or cords with the binding sheet or sheets of fibers between to form a predetermined design, compressing the product, winding the sheet around a cylindrical barrel so that one edge of the sheet conforms to and slightly overlaps the other edge of the sheet to form a cover for the barrel, drawing the cover from the barrel to form a flat sheet, compressing the product and drying same.

12. The herein described process of making an unwoven fabric consisting of coating threads or cords with a binding agent, conducting the threads or cords through movable guides in parallel lines to a gathering place, laying a binding sheet of fibers on the set or sets of threads or cords, depositing the coated threads or cords so that the threads or cords run parallel to each other lengthwise of the sheet in a wavy or predetermined design, coating other sets of parallel threads or cords with a binding agent, conducting the second set or sets of parallel threads or cords through movable guides to a gathering place, depositing the second set or sets of threads or cords so that the threads or cords run parallel to each other lengthwise of the sheet in a wavy or predetermined design to overlap the first set or sets of threads or cords with the binding sheet or sheets of fibers between to form a predetermined design, compressing the product, taking one sheet of the prepared fabric of a width equal to one-half the circumferential surface of a cylindrical barrel and placing same on the barrel to conform to one-half its circumferential surface and running lengthwise of the barrel, winding a second sheet of the prepared fabric around the barrel and over the first sheet at an angle of 45 degrees to the length of the barrel, so that one edge of the second sheet conforms to and slightly overlaps the other edge of the sheet, to form a cover for the barrel, drawing the cover from the barrel to form a flat sheet, compressing the product and drying same.

13. The herein described process of making an unwoven fabric consisting in coating threads or cords with a binding agent, conducting the threads or cords through movable guides in parallel lines to a gathering place, laying a binding sheet of fibers on the set or sets of threads or cords, depositing the threads or cords on a foundation sheet of rubber or matted fibers so that the threads or cords run parallel to each other lengthwise of the sheet in a wavy or predetermined

design, coating other sets of parallel threads or cords with a binding agent, conducting the second set or sets of parallel threads or cords through movable guides to a gathering place, depositing the second set or sets of threads or cords so that the threads or cords run parallel to each other lengthwise of the sheet in a wavy or predetermined design to overlap the first set or sets of threads or cords located on the foundation sheet and with the binding sheet or sheets of fibers between to form a predetermined design, compressing the product, taking one sheet of the prepared fabric of a width equal to one-half the circumferential surface of a cylindrical barrel and placing same on the barrel to conform to one-half its circumferential surface and running lengthwise of the barrel, winding a second sheet of the prepared fabric around the barrel and over the first sheet at an angle of 45 degrees to the length of the barrel so that one edge of the second sheet conforms to and slightly overlaps the other edge of the sheet to form a cover for the barrel, drawing the cover from the barrel to form a flat sheet, compressing the product and drying same.

14. An unwoven fabric comprising sets of parallel threads or cords coated with a binding agent, the sets of threads or cords overlapping to form a predetermined matted construction, a foundation sheet of matted fibers, the product folded around another sheet of unwoven fabric comprising sets of parallel threads or cords coated with a binding agent, the sets of threads or cords overlapping to form a predetermined matted construction, to produce a sheet having three layers of matted threads or cords, in the center layer of which the threads or cords run lengthwise of the sheet, and the outside layers having the threads or cords running at angles to the length of the sheet and crossing each other.

15. An unwoven fabric comprising sets of parallel threads or cords coated with a binding agent of rubber, the sets of threads or cords overlapping to form a predetermined matted construction, a foundation sheet of rubber, the product folded around another sheet of unwoven fabric comprising sets of parallel threads or cords coated with a binding agent of rubber, the sets of threads or cords overlapping to form a predetermined matted construction, to produce a sheet having three layers of matted threads or cords, in the center layer of which the threads or cords run lengthwise of the sheet and the outside layers having the threads or cords running at angles to the length of the sheet and crossing each other and a vulcanizing agent for the product.

16. An unwoven fabric comprising sets of parallel threads or cords coated with a bind-

ing agent, a thin binding sheet or sheets of fibers between the sets of threads or cords, and the sets of threads or cords overlapping to form a predetermined matted construction.

17. An unwoven fabric comprising sets of parallel threads or cords coated with a binding agent of rubber, a thin binding sheet or sheets of fibers between the sets of threads or cords, the sets of threads or cords overlapping to form a predetermined matted construction, a sheet of rubber attached to the product, and a vulcanizing agent for the product.

18. An unwoven fabric comprising sets of parallel threads or cords coated with a binding agent, a thin binding sheet or sheets of fibers between the sets of threads or cords, the sets of threads or cords overlapping to form a predetermined matted construction, the product folded to produce a sheet having the matted threads or cords on one side of the sheet running at an angle to the length of the sheet and the threads or cords on the opposite side of the sheet running at an angle to the length of the sheet and crossing the other set of threads or cords.

19. An unwoven fabric comprising sets of parallel threads or cords coated with a binding agent, a thin binding sheet or sheets of fibers between the sets of threads or cords, the sets of threads or cords overlapping to form a predetermined matted construction, the product folded around another sheet of the product to produce a sheet having three layers of matted threads or cords, in the center layer of which the threads or cords run lengthwise of the sheet and the outside layers having the threads or cords running at angles to the length of the sheet and crossing each other.

20. An unwoven fabric comprising sets of parallel threads or cords coated with a binding agent, a thin binding sheet or sheets of fibers between the sets of threads or cords, the sets of threads or cords overlapping to form a predetermined matted construction, a foundation sheet of matted fibers, the product folded to produce a sheet having the matted threads or cords on one side of the sheet running at an angle to the length of the sheet and the threads or cords of the opposite side of the sheet running at an angle to the length of the sheet and crossing the other set of threads or cords.

21. An unwoven fabric comprising sets of parallel sets of threads or cords coated with a binding agent, a thin binding sheet or sheets of fabric between the sets of threads or cords, the sets of threads or cords overlapping to form a predetermined matted construction, a foundation sheet of matted fibers, the product folded around another sheet of unwoven fabric comprising sets of

parallel threads or cords coated with a binding agent, the sets of threads or cords overlapping to form a predetermined matted construction, to produce a sheet having three layers of matted threads or cords in the center layer of which the threads or cords run lengthwise of the sheet, and the outside layers having the threads or cords running at angles to the length of the sheet and crossing each other.

22. An unwoven fabric comprising sets of parallel threads or cords coated with a binding agent of rubber, a thin binding sheet or sheets of fibers between the sets of threads or cords, the sets of threads or cords overlapping to form a predetermined matted construction, a foundation sheet of rubber, the product folded to produce a sheet having the matted threads or cords on one side of the sheet running at an angle to the length of the sheet and the threads or cords of the opposite side of the sheet running at an angle to the length of the sheet and crossing the other set of threads or cords, and a vulcanizing agent for the product.

23. An unwoven fabric comprising sets of parallel threads or cords coated with a binding agent of rubber, a thin binding sheet or sheets of fibers between the sets of threads or cords, the sets of threads or cords overlapping to form a predetermined matted construction, a foundation sheet of rubber, the product folded around another sheet of unwoven fabric comprising sets of parallel threads or cords overlapping to form a predetermined matted construction, to produce a sheet having three layers of matted threads or cords, in the center layer of which the threads or cords run lengthwise of the sheet and the outside layers having the threads or cords running at angles to the length of the sheet and crossing each other and a vulcanizing agent for the product.

24. An unwoven fabric comprising sets of parallel threads or cords coated with a binding agent of rubber, a thin binding sheet or sheets of fiber between the sets of parallel threads or cords, a foundation sheet of rubber, the product folded to produce a sheet having the parallel threads or cords on one side of the sheet running at an angle to the length of the sheet and the threads or cords of the opposite side of the sheet running at an angle to the length of the sheet and crossing the other set of parallel threads or cords, and a vulcanizing agent for the product.

25. An unwoven fabric comprising sets of parallel threads or cords coated with a binding agent of rubber, a thin binding sheet or sheets of fibers between the sets of parallel threads or cords, a foundation sheet of rubber, the product folded around another sheet of unwoven fabric comprising sets of parallel threads or cords, a thin binding sheet or

5 sheets of fibers between the set or sets of parallel threads or cords to produce a sheet having three layers of parallel threads or cords, in the center layer of which the parallel threads or cords, run lengthwise of the sheet, and the outside layers having the parallel threads or cords running at angles to the length of the sheet and crossing each other, and a vulcanizing agent for the product.

Signed at the borough of Manhattan, in the county of New York and State of New York, this 6th day of March, A. D. 1919.

ROLAND B. RESPESS.