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Burger

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[54] **APPARATUS FOR CROSSLAYING WEB MATERIALS**

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Related U.S. Application Data

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[52] **U.S. Cl.** ..... **156/441,** 28/1 CL, 156/166, 156/382, 156/512

[51] **Int. Cl.** **D02g 3/00,** D04h 3/00

[58] **Field of Search** ..... 156/166, 177, 303, 156/382, 441, 510, 512; 161/59, 152; 28/1 CL

[56] **References Cited**

UNITED STATES PATENTS

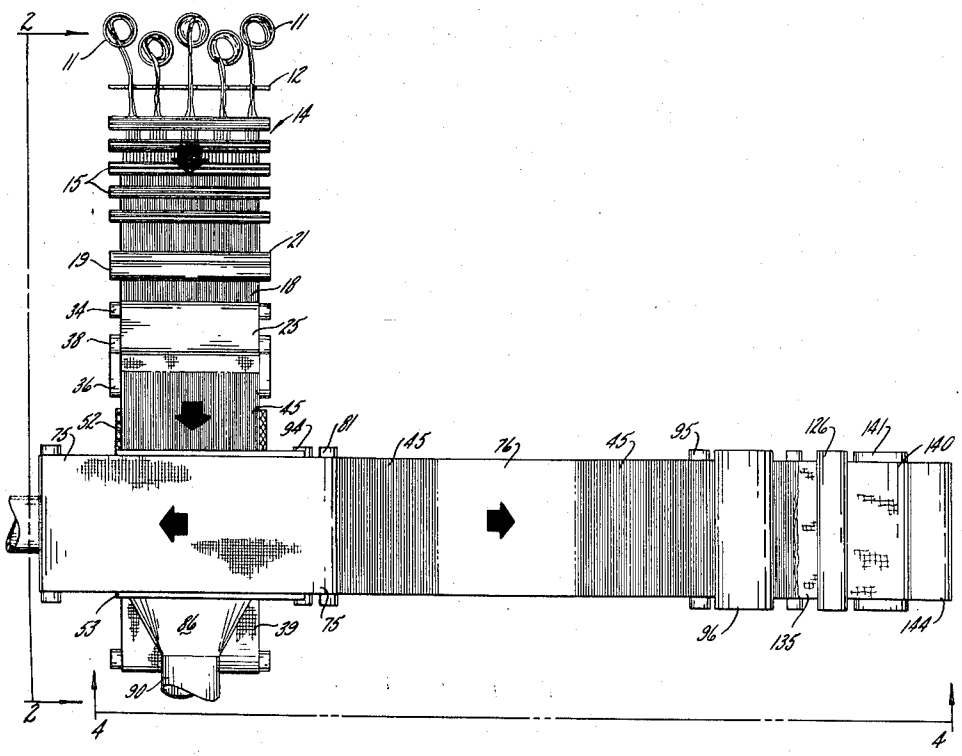
3,658,626	4/1972	Berger et al.	156/441
3,236,711	2/1966	Adler	156/177 X
3,682,734	8/1972	Burger	156/166
3,653,105	4/1972	Klaeni	28/1 CL

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Attorney—Wolfe, Hubbard, Leydig, Voit & Osann, Ltd.

[57] **ABSTRACT**

A method and apparatus for efficiently handling and crosslaying webs of substantially alignd light-weight fibers in the production of non-woven materials incorporating such crosslaid fibers for two-dimensional strength. Webs of substantially aligned fibers are conveyed along a first permeable carrier with their fibers oriented in the direction of travel and are transferred to a second moving permeable carrier crossing in closely spaced parallel relation by directing an air flow through said permeable carriers when each web length reaches the position between the crossing carriers. The air flow causes the light-weight web length to be removed from the first carrier and to be positioned and held against the other moving carrier with the web fibers oriented thereon transversely to the direction of travel. The illustrated apparatus includes two such carrier systems for changing the orientation of web lengths with respect to their direction of travel, and these systems alternately present web lengths to a continuous moving fiber web to form an uninterrupted ply of crosslaid fibers thereon. Two adhesively coated cover sheets are then applied to contain the crosslaid fibers and form a composite non-woven material.

6 Claims, 5 Drawing Figures



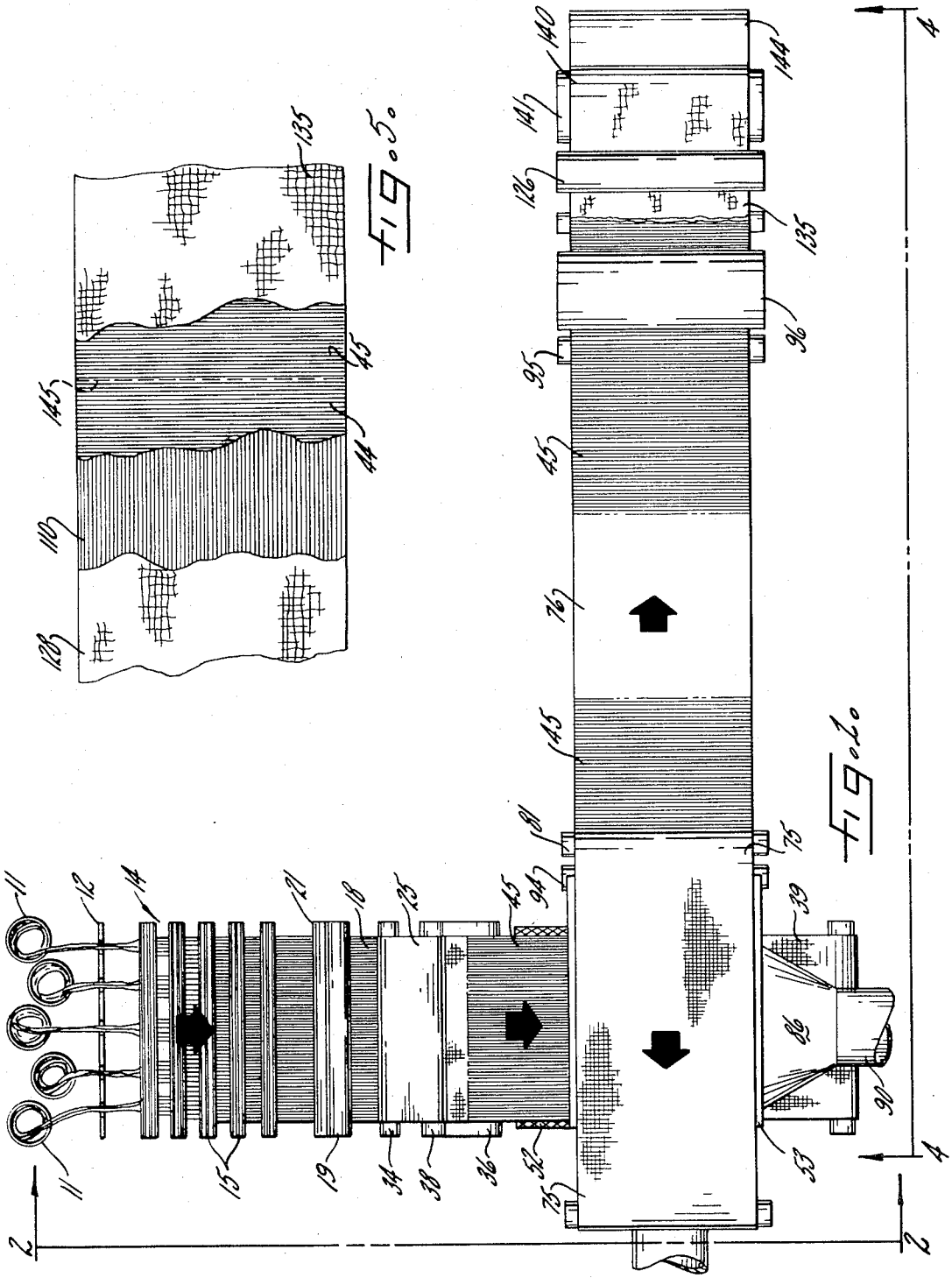

FIG. 5.
FIG. 1.
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Fig. 2

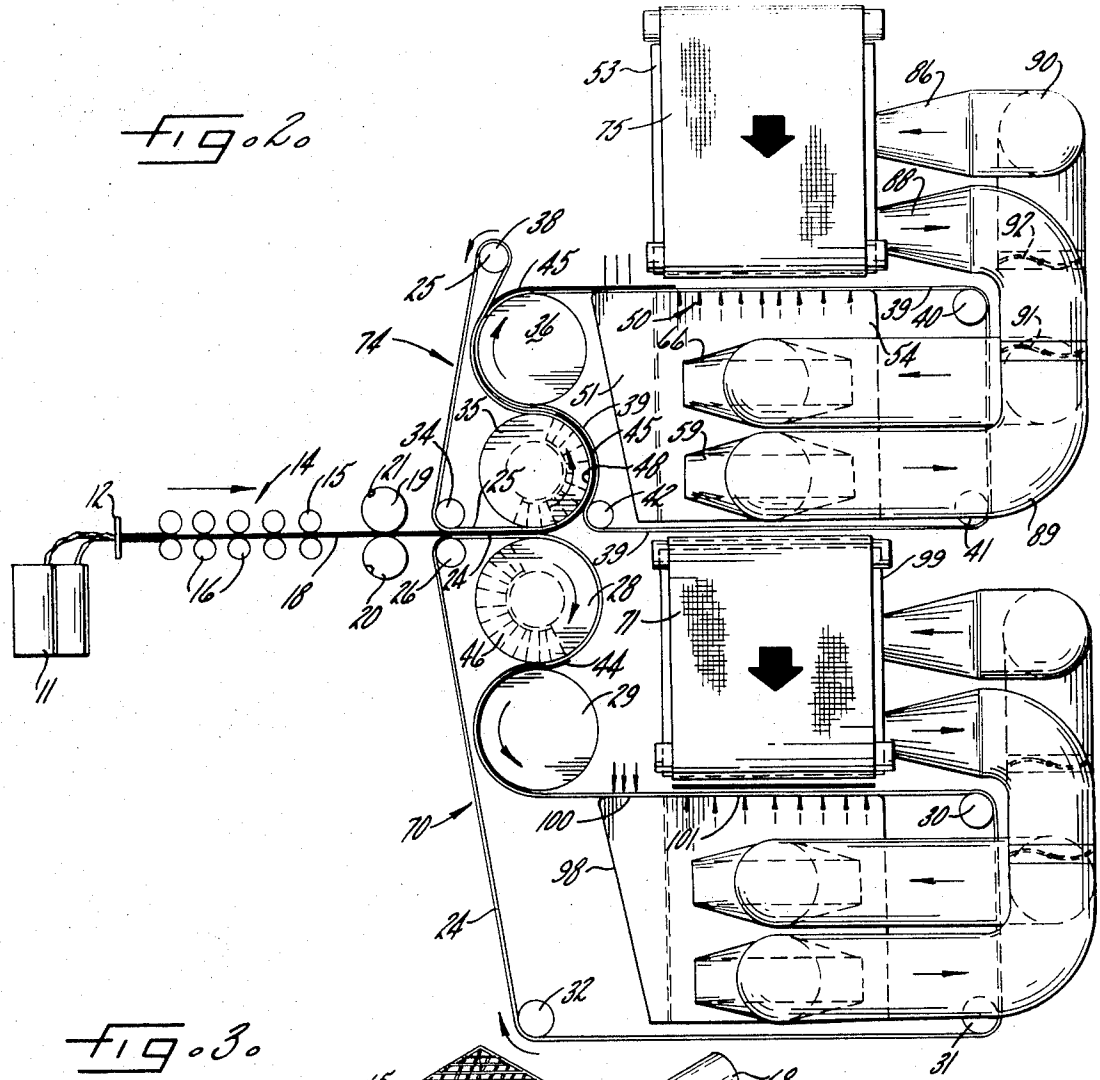
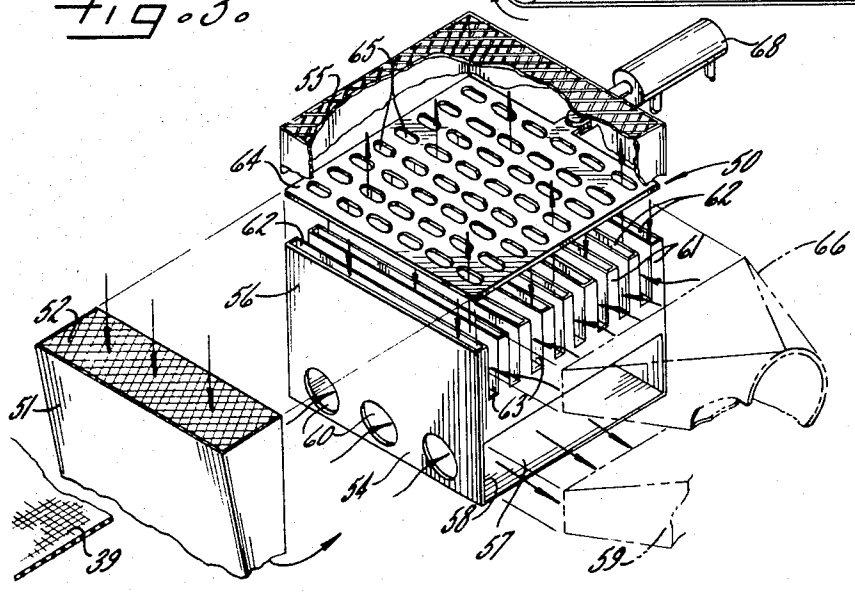

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Fig. 3


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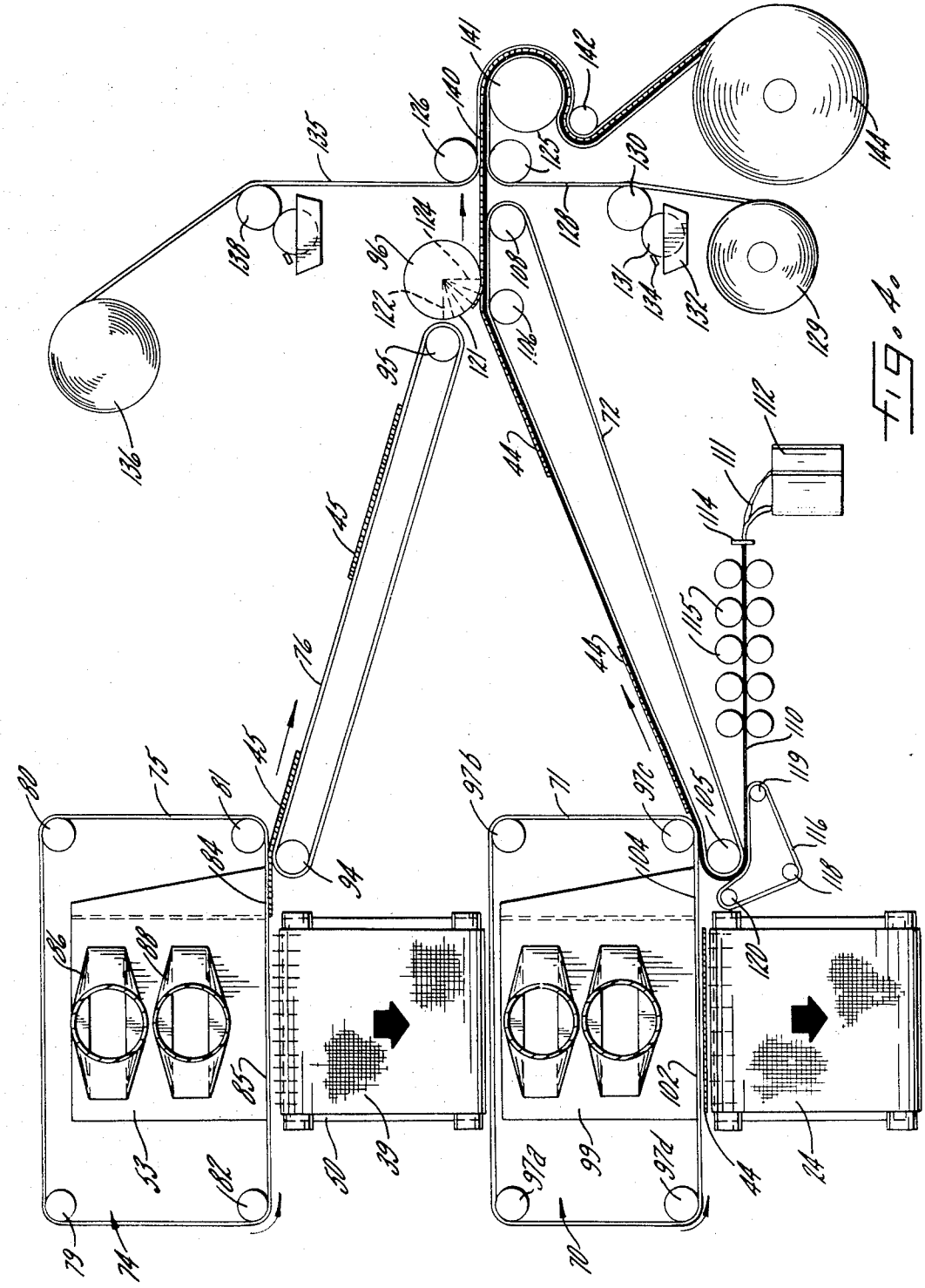


FIG. 4.

APPARATUS FOR CROSSLAYING WEB MATERIALS

This is a divisional application of application Ser. No. 848,657 filed Aug. 8, 1969, now U.S. Pat. No. 3,616,037.

DESCRIPTION OF THE INVENTION

The present invention relates generally to non-woven materials having crosslaid fibers and more particularly concerns an improved method and apparatus for making such non-woven materials.

In the manufacture of non-woven materials it is often desirable to apply fibers in transverse directions to give two-dimensional strength to a composite material. In the past it has been difficult to handle such fibers or webs of such fibers due to their light weight and fragile character.

It is a primary object of the present invention to provide an improved and efficient method and apparatus for handling and crosslaying light-weight fibers in the production of a composite non-woven material.

Another object is to provide an efficient and reliable means for transferring a web of substantially aligned fibers from one moving carrier on which the fibers are oriented in the direction of travel to another moving carrier with the web fibers positioned on that carrier transversely to the direction of travel, while not disarranging or damaging the individual web fibers.

Other objects and advantages of the invention will become more apparent upon reading the following detailed description and upon reference to the accompanying drawings, wherein:

FIG. 1 is a schematic top plan view of apparatus embodying the present invention;

FIG. 2 is a schematic side elevation of the apparatus of the present invention taken in the plane of line 2—2 in FIG. 1;

FIG. 3 is a schematic perspective view of one of the air pressure units employed in the apparatus shown in FIG. 1, with the parts separated for illustrative purposes;

FIG. 4 is a schematic elevation view taken in the plane of line 4—4 in FIG. 1;

FIG. 5 is a plan view of a finished material manufactured by the illustrated apparatus with sections of the individual layers broken away to show the multicomponent construction.

While the invention is susceptible of various modifications and alternative constructions, certain illustrative embodiments thereof have been shown in the drawings and will be described below in detail. It should be understood, however, that there is no intention to limit the invention to the specific forms disclosed, but, on the contrary, the intention is to cover all modificatons, alternative constructions and equivalents falling within the spirit and scope of the invention.

Turning now to the drawings, the invention is exemplified in an apparatus for forming a non-woven composite material having highly oriented crosslaid fibers therein. In the illustrative apparatus, multiple slivers of textile fibers are drawn from their respective supply cans **11** over a guide comb **12** and in juxtaposed relation into a draw frame **14** which comprises a series of pairs of rolls **15** and **16**. The rolls of each pair are driven by appropriate gearing well known in the art at a peripheral rate of speed faster than the rate of rotation of the preceding roll pair. As the juxtaposed slivers

pass through the draw frame **14**, the individual fibers are drafted and spread out to form a flat striated web of substantially aligned fibers as indicated at **18**. The fiber web **18** has a principal strength component, or direction of strength, in the direction of the fiber alignment, while it is substantially deficient in cross direction strength. While the illustrated method and apparatus will be described in connection with such highly drafted fiber webs, it will be understood that other light-weight fragile webs could similarly be employed.

The web **18** while still under tension may next be separated into discrete lengths or segments **44, 45**. In the illustrated arrangement, the web is drawn between a knife roll **19** and anvil roll **20**. A knife blade **21** positioned on the periphery of the knife roll **19** severs the web **18** into equal lengths **44, 45** upon each revolution of the roll. It is apparent that the length of the web is determined by the circumference of the knife roll. In this case, the web **18** is cut into lengths equal to the width of the web, although one skilled in the art will understand that other rectangular proportions could be used.

As the web is being severed by the knife roll **19**, the forward end of the length of web has been drawn between two moving carriers **24, 25** made of permeable material, such as fourdrinier wires. One carrier **24** is trained around a guide roll **26** adjacent the anvil roll **20**, a screen roll **28**, a drum **29** in juxtaposed relation to the screen roll **28**, and guide rolls **30, 31, 32**. The second carrier **25** is trained about a guide roll **34** adjacent the knife roll **19**, a screen roll **35** immediately adjacent the screen roll **28**, a drum **36** in juxtaposed relation to the screen roll **35**, and a guide roll **38**. Still another permeable carrier **39** runs immediately adjacent the carrier **25** while being trained about the drum **36** and screen roll **35**, and then continues around the guide rolls **40, 41** and **42**. As can be seen, cut lengths of web are drawn between the carriers **24, 25** and are conveyed toward the screen rolls **28, 35**.

In keeping with the invention, the screen rolls **28, 35** are adapted to direct alternate web lengths **44** along a lower carrier system **70** comprising carriers **24, 71**, and **72** and alternate lengths **45** along an upper carrier system **74**, comprising carriers **25, 39, 75** and **76**. To this end, each screen roll **28, 35** has a screen portion **46, 48**, respectively, making up half the circumference, the other half of each roll being made of nonpermeable material, and suction is applied internally of each roll in any well known manner. The screen rolls **28, 35** each may have a circumference equal to twice the length of the web segments **44, 45** so that the circumferential suction portions **46, 48** equal the length of the web segment. By appropriately driving the screen rolls so that they rotate 180° out of phase with each other, the suction portions **46, 48** will draw alternate cut web lengths **44, 45**, respectively, against the screen roll and direct them along their associated carriers **24, 25**. Rotation of the screen rolls **28, 35** may be timed so that the suction portion of one roll reaches the nip position between the rolls at the same time the leading edge of a web reaches that position.

It should be appreciated that while in the illustrated embodiment a knife roll **19** has been shown for severing the web **18** into determined lengths **44, 45**, separation of the web into discrete lengths may be affected by other means. For example, since the web generally is quite fragile, severing of the web may be achieved di-

rectly by the suction screen rolls **28, 35.** In that case, the draw frame **14** would feed the web **18** directly between the carriers **24, 25** and the suction portions **46, 48** of the screen rolls **28, 35** would engage alternate sections of the web with the web being pulled apart each time the suction portion of one roll passes by the nip between the rolls and the suction portion from the other roll began to act on the web. Since the web fibers are relatively short, the web would be separated with a substantially clean and even break. The web segments similarly would have lengths corresponding to the circumferential distance of the screen roll suction portion and would be directed to alternate carriers.

After engagement of alternate web lengths **44, 45** by the suction screen rolls **28, 35,** the web lengths continue to travel along the respective carriers **24, 25.** The web lengths **45** engaged by the suction portion **48** of the upper screen roll **35** are conveyed upward around the screen roll **35** and drum **36** while being interposed between the carriers **25** and **39.** When the web length **45** reaches the top of the drum **36,** it is then conveyed away from the drum **36** by the carriers **25** and **39.** The alternate web lengths **44** engaged by the lower suction screen roll **28** travel downward about the screen roll **28** and drum **29** and are then conveyed away from the drum **29** by the carrier **24.** In each case, the aligned fibers of the web lengths are oriented in their direction of travel.

In keeping with the invention, the web lengths each are transferred from the permeable carrier on which they are being conveyed to another moving permeable carrier crossing closely parallel to the first carrier with the webs being positioned on said other carrier with their fibers oriented transversely to the direction of travel of that carrier. To effect a reliable and efficient transfer of the webs without disorienting or damaging the web fibers, each web length is carried to a position directly below and in close relation to the other moving carrier and air flow is directed through the permeable carriers causing the web to be removed from the first carrier and be positioned and held against the other moving carrier. Referring to the upper carrier system **74** of the illustrated embodiment, as best shown in FIGS. **2** and **4,** the carrier **75** which also is made of a permeable material such as fourdrinier wire, is disposed about guide rolls **79, 80, 81,** and **82** so that it crosses the carrier **39** in close parallel relation therewith. Thus, the carrier **39** can convey each web length **45** to a position directly under the other moving carrier **75,** at which time an upward surge or air may be passed through the carriers **39, 75** to effect the transfer.

To provide a controlled flow of air through the permeable carriers **39, 75** in timed sequence with each web length **45** reaching the position directly between the carriers, air units **50** and **53** are positioned on opposite sides of the carriers **39, 75,** respectively; each air unit having air emission grate surfaces immediately adjacent its respective carrier. In the illustrated embodiment the lower air unit **50,** shown in detail in FIG. **3,** comprises an extension portion **51** having an upper grate **52** and a main body portion **54** having a grate surface **55** of approximately the same size as the web lengths **45.** The air unit **50** is adapted to create a constant suction pressure at the extension grate **52** to hold a web length **45** firmly against the carrier as it approaches the closely spaced crossing carrier **75,** while providing a regulated alternating updraft and downdraft at the main grate **52** to effect the transfer. The unit **50** includes a base **56** having a lower chamber **57** with a main opening **58** on one side communicating with a duct **59** and apertures **60** in another side communicating with the interior of the extension portion **51.** A suction pressure source connected to the duct **59,** as will be explained below, creates a constant suction or downdraft at the extension grate **52.**

To provide an alternating pressure at the main grate **55,** the base **56** is formed with a series of parallel vertical baffles **61,** the top portion of each baffle being open to form apertures **62** which permit communication with the lower chamber **57.** Air passageways **63** are defined between the baffles **61.** To control the direction of the air flow through the grate **55,** a shutter plate **64** having a series of aligned apertures **65** is slidably positioned on the top surface of the baffles **61** with the main grate **55** positioned over the shutter **64.** A duct **66** attached to the side of the base **56,** above the duct **59,** connects the passageways **63** between the baffles **61** to a positive pressure source, which also will be explained below. By slidably shifting the shutter **64** to a downdraft or suction position, the shutter apertures **65** are in alignment with the baffle apertures **62** while the passageways **63** between the baffles are closed by the shutter. In that position, suction in the duct **59** draws through the lower chamber **57,** baffle apertures **62,** shutter apertures **65** and the grate **55.** When the shutter **64** is shifted to an updraft or positive pressure position, the shutter apertures **65** are in alignment with the air passageways **63** and the baffle apertures **62** are closed by the shutter. A draft therefore is created through the duct **66,** passageways **63,** shutter apertures **65** and out through the grate **55.** An actuating mechanism **68,** controlled by well known means, may slidably move the shutter **64** between the downdraft and updraft positions at determined intervals.

The other air unit **53,** being of the same basic construction as the unit **50,** need not be described in detail. The unit **53** similarly has an extension grate **84** subjected to a constant inward or suction pressure and a main grate **85** subjected to alternating outward and inward air flows. Ducts **86, 88** extend from a suction chamber and baffle region, respectively, similar to those described above.

As shown in FIG. **2,** a conduit **89** connects the duct **59** extending from the lower chamber **57** of the air unit **50** to the duct **88** at the baffle region of the other unit **53.** Another conduit **90** connects the duct **66** at the baffle region of the unit **50** with the duct **86** at the suction chamber of the other unit **53.** To create appropriate pressures in the ducts, a power fan **91, 92** is enclosed within each conduit **89, 90,** respectively. It can be seen that by directing the air flow from fan **92** within the conduit **90** toward the duct **66** extending from the baffle region of the air unit **50** a positive pressure build-up will be created in the air passageways **63** between the baffles **61** and a negative or suction pressure will be created in the suction chamber of the air unit **53.** By directing the fan **91** contained in the conduit **89** in the opposite direction a positive pressure is created in the baffle passageways of the unit **53** and a suction pressure in the chamber **57** of the unit **50,** as shown by the direction arrows.

It will be appreciated that the illustrated air units **50, 53** may be operated simultaneously by an appropriate actuating means so that when the shutter for the unit

50 is in an updraft position the shutter for the other unit is in a suction position so that a steady upward flow of air is directed through main air unit grates 55, 85, and thus through the area where the permeable carrier 75 crosses the carrier 39. Likewise, when the shutter for the unit 50 is in its suction position, the shutter for the unit 53 is in its outdraft position causing a steady downward flow of air through the permeable carriers 39, 75.

In operation, as a web length 45 passes over the extension grate 52 of the unit 50, the constant suction pressure existing at the grate 52 acts through the permeable carrier 39 causing the web to be held closely to the carrier as it approaches the position where the carrier 75 crosses in close parallel relation to the first carrier. When the leading edge of the web length 45 reaches the main air grate 55, the air unit shutters are simultaneously actuated so that a steady downdraft is created through the permeable carriers 39, 75, causing the web length 45 to remain in close contact with the carrier 39 as it is conveyed between the carriers. As the web segment 45 reaches a position completely over the main grate 55, and thus directly under the transversely moving carrier 75, the shutters for the air units 50, 53 are simultaneously shifted to change the air flow from a downdraft to an updraft, causing the web length 45 to be lifted from the carrier 39 and be forced against the moving carrier 75 with the web fibers thus oriented transversely to the direction of travel of the carrier 75. It has been found that the rapid reversal of air flow achieved by the cooperating air units 50, 53 achieves an efficient and uniform transfer of the web length 45 from the first moving carrier to the other without disarrangement or damage to the web fibers. The updraft from the main air grates 55, 85 continues to hold the web length 45 firmly against the carrier 75 as the web length is conveyed by the carrier away from the grate 85. The constant suction pressure existing at the extension grate 84 of the upper air unit 53 further holds the web length 45 against the carrier 75 until the leading edge of the length reaches a nip between the carrier 75 and an auxiliary carrier 76 through which it is drawn. When the trailing edge of the web length 45 has been conveyed past the upper main grate 85, the leading edge of another web length reaches the main air grate 55 of the lower air unit 50, and at that time, the actuating mechanism will again shift the shutters to reverse the direction air flow to cause a downdraft through the carriers 39, 75 as the next web length passes over the lower main air grate 55 to repeat the cycle.

It will be appreciated that the spacing between the web lengths 45 carried by the carrier 39 results from alternately directing the web lengths 44, 45 along the two carrier systems 70, 74. While in the illustrated embodiment, the web segments are substantially square so that the carriers 39, 75 would have equal speeds, it will be understood by one skilled in the art that other rectangular sizes of web segments could be employed by making appropriate adjustments in the carrier speeds.

Since the web lengths 45 are positioned on the crossing carrier 75 with their fiber alignment oriented transversely to the direction of travel of that carrier, they are conveyed onto the auxiliary carrier 76 with a similar fiber orientation. The auxiliary carrier 76, being trained about guide rolls 94 and 95 conveys the web lengths 45 at spaced intervals to a position for engagement by a screen roll 96, which completes the travel of the web length 45 through the upper carrier system 74.

The web lengths 44 directed along the lower carrier system 70 incur a somewhat similar course of travel, being conveyed along the carrier 24 with their web fibers aligned in the direction of travel and then being transferred to another moving carrier 71 with the fibers oriented transversely to the direction of travel of that carrier. Again referring to FIGS. 2 and 4, each alternative web length 44 is conveyed by the carrier 24 to a position where the carrier 71, which crosses in close parallel relation therewith. The carrier 71 is trained about guide rolls 97*a*, 97*b*, 97*c* and 97*d*.

To effect the transfer of the web length 44 from the carrier 24 to the transversely moving carrier 71, air units 98, 99 are disposed on opposite sides of the carriers 24, 71 in a manner identical to that described above. As the web length 44 is conveyed over an extension grate 100 of the unit 98, a constant suction pressure existing at the grate 100 acts through the permeable carrier 24 to draw the web length 44 closely to the carrier. The web length 44 remains firmly on the carrier 24 as it is conveyed to a position directly under the transversely moving carrier 71 by a downward flow of air through main air grates 101, 102 of the units 98, 99, respectively. When the web length is in proper position between the carriers 24, 71, a simultaneous reversal of air direction through the main air grates 101, 102 causes the web length to be lifted from the carrier 24 and be held firmly against the moving carrier 71, which has a direction of travel transverse to the web fiber alignment. A constant suction pressure existing at an extension grate 104 of the unit 99 retains the web length 44 against the carrier until it reaches on auxiliary carrier 72 and is drawn through a nip between the carriers 71, 72. The auxiliary carrier 72, which is trained about guide rollers 105, 106 and 108, receives the web lengths 44 at spaced intervals for travel in a direction transverse to their fiber alignment.

In keeping with the invention, the web lengths 44, 45 are crosslaid on another moving medium to form a two-ply, non-woven material. In the illustrated embodiment, the web lengths 44, 45 are placed alternately on a moving continuous fiber web 110 having fibers aligned in the direction of the web travel. The web 110 is formed by drawing multiple slivers of textile fibers 111 from their respective supply cans 112, over a guide comb 114, and into a drawn frame 115 which forms the flat striated web 110 of aligned fibers similar to the web described above. From the draw frame 115, the web 110 is drawn between a nip formed by the auxiliary carrier 72 and a carrier 116, which is trained around guide rolls 118, 119, 120 with the auxiliary carrier guide roll 105 acting as a direction roll and creating the nip. The continuous web 110 is then drawn around the auxiliary carrier guide roll 105 and is moved along with the auxiliary carrier 72. The carrier 71 deposits the web lengths 44 at spaced intervals on the continuous web 110 with the fibers of the lengths 44 being oriented transversely to the fibers of the continuous web 110. The continuous web 110 and the crosslaid web lengths 44 are then conveyed toward the screen roll 96 where the web lengths 45 are positioned in the spaces between the lengths 44 to complete a substantially uniform ply of crosslaid fibers over the continuous web 110.

To facilitate proper positioning of the web lengths 45 on the continuous web 110, the screen roll 96 is provided with a constant suction pressure acting over the

configuration distance **121** between the auxiliary carriers **76** and **72** so that each web length **45** is held against the rotating screen roll as it is carried over the distance **121** and is guided onto the continuous web **110** moving with the carrier **72.** In the illustrated apparatus, the suction pressure is limited to the circumferential distance **121** by appropriate stationery radial vanes **122, 124** which define a suction chamber encompassing the distance **121.** It can be seen that each web carried by the screen roll **96** from the carrier **76** to the carrier **72** is released from a suction pressure as it passes the stationery vane **124.**

It will be understood by those skilled in the art that by providing the distance of travel through the upper carrier system equal to the distance of travel through the lower carrier system, or otherwise by appropriately controlling the carrier speeds, the web lengths **44** and **45** may be made to alternately reach the nip of the screen roll **96** and carrier **72** so that the web lengths **45** are placed in and fill the spaces between the web lengths **44** already positioned on the continuous web **110.** It will be appreciated that due to the very thin nature of the fiber webs **44** and **45,** however, any small amount of overlapping that may exist between web lengths **44, 45** will have no noticeable effect in a finished product.

In the illustrated embodiment, the continuous web **110** and crosslaid web lengths **44, 45** are next drawn from the carrier **72** through a pair of rollers **125, 126** and incorporated between cover sheets of elongated material to form a composite non-woven material. As shown in FIG. **4,** a sheet of elongated material **128,** such as a creped wadding sheet which has been stretched and ironed to facial tissue softness, is drawn around the lower roller **125** from a supply roll **129.** An offset printing roll **130** is located between the roller **125** and supply roll **129** and a metered amount of adhesive is applied to the roll **130** from an application roll **131** rotatably disposed in an adhesive drip pan **132.** Excessive adhesive is wiped from the application roll with a suitable doctor blade **134.** The application roll **131** preferably is an intaglio print roll having a substantially open spaced pattern, such as a diamond pattern. The total area occupied by the adhesive preferably should not exceed more than 25 percent of the total area of the final product. The adhesively printed sheet **128** is drawn around the guide roll **125** with the fibers of the crosslaid webs **110, 44, 45** impinging against the adhesive surface of the sheet and becoming partially embedded therein. An elongated creped wadding sheet **135** from a supply roll **136** similarly is printed with an adhesive by a printing roll **138** and is drawn around the upper guide roll **126** and applied to the opposite side of the crosslaid fiber webs to form a composite laminated sheet **140.**

The composite sheet **140** thus formed is drawn from the rollers **125, 126** and around a heating drum **141** where curing of the adhesive is substantially completed to a non-tacky condition while the web fibers are in firm contact therewith. To provide a maximum curing time for the composite sheet **140,** the sheet is drawn around a position roll **142** which increases the distance of travel around the curing drum **141.** While an adhesive was not applied between the crosslaid webs in the illustrated case, it will be appreciated that the web fibers will be embedded sufficiently within the adhesive of the cover sheets as to form a firmly bonded composite material. After being cured, the composite sheet is drawn and wound around a take-up roll **144.** Referring to FIG. **5,** the finished composite material includes the outer cover sheet **128,** fibers of the web **110** oriented longitudinally, crosslaid fibers of the webs **44, 45** shown laying on either side of a phantom line **145** although being understood that there may be some overlap as previously pointed out, and the outer cover sheet **135.**

In view of the foregoing, it can be seen that the apparatus and method of the present invention provides an efficient and reliable means of handling and crosslaying light-weight web fibers in the production of a composite non-woven material. It will be apparent to those skilled in the art that many variations from the examples given may be employed without departing from the spirit of this invention. For example, slivers introduced into the draw frames **14** and **115** may include thermoplastic fibers which, when heated, bond together. Also other types of oriented webs, especially webs which are deficient in cross-direction strength, such as creped tissue, carded webs, spread tow, plastic films or split film networks, highly oriented in the direction of travel, may be substituted for the highly drafted web if desired.

I claim as my invention:

1. Apparatus for fabricating a nonwoven material having highly oriented crosslaid materials therein, means for separating into discrete lengths a fragile web of material having a principal strength component oriented substantially in the longitudinal direction of the material, a first moving carrier made of permeable material, means for placing lengths of said web on said first carrier at spaced intervals with said web strength components oriented in the direction of travel, another moving carrier cross parallel to first carrier made of permeable material, said first carrier being operable to convey each said web length to the position where said carriers cross, means for transferring said lengths from said first carrier to said other carrier when each said web length reaches said position, said other moving carrier receiving and conveying said transferred web lengths with their strength components oriented transversely to the direction of travel, means for placing other lengths of said web on a second moving carrier at spaced intervals with said web strength components oriented in the direction of travel, another moving carrier cross parallel to said second carrier made of permeable material, said second carrier being operable to convey each said other web length to the position where said carriers cross, means for transferring said other web lengths from said second carrier to said other crossing carrier when each web length reaches said position, each transferring means including an air pressure unit which creates an air flow through said crossing permeable carriers when each web length reaches the position where said carriers cross, said air flow causing each web length to be removed from the carrier on which it is conveyed and be held against the other crossing carrier, said second other carrier receiving and conveying said transferred web lengths with their strength components oriented transversely to the direction of travel of said other carrier, and a continuous moving medium receiving said lengths of web from said other carriers wwith the web strength components oriented transversely to the direction of travel of said medium.

2. The apparatus of claim 1 in which said placing means includes a pair of juxtaposed screen rolls, said first carrier being movable about one of said screen rolls and said second carrier being movable about the other screen roll, said screen rolls forming a nip between said first and second carriers through which said web lengths pass, said screen rolls each having a suction pressure acting over a portion of their circumferences and said suction portions engage alternate lengths of said web and direct them along the respective carrier associated with that screen roll, and said moving medium receives said web lengths from said other carriers in alternate succession to form an uninterrupted ply of crosslaid webs on said medium.

3. The apparatus of claim 1 in which said separating means is a pair of juxtaposed screen rolls which form a nip through which said web is drawn, said screen rolls each having a suction pressure acting over half of their circumferences and being rotatable out of phase with each other so that said screen roll suction portions alternately engage said web and separate it into lengths corresponding to the circumferential length of the screen roll suction portion, and said first and second carriers each being operable about one of said screen rolls to receive said alternate web lengths.

4. The apparatus of claim 1 in which said separating means includes a rotatable knife roll and a juxtaposed rotatable anvil roll which form a nip, said web being drawn through said nip and being severed by said knife roll into equal lengths corresponding to the circumference of said knife roll.

5. The apparatus of claim 1 in which said web comprises substantially aligned multiple slivers of staple length fibers, said fibers being oriented in the longitudinal direction of the web and forming the principal strength component of said web, and said moving medium is a continuous web of fibers substantially aligned in the direction of travel, said continuous web successively receiving alternate web lengths from said other carriers to form an uninterrupted ply of crosslaid fibers over said continuous web.

6. The apparatus of claim 5 including a continuous moving sheet of cover material, means for applying an adhesive to said cover material and means for combining said adhesively coated cover sheet and said continuous web with crosslaid web lengths.

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