

Aug. 2, 1949.

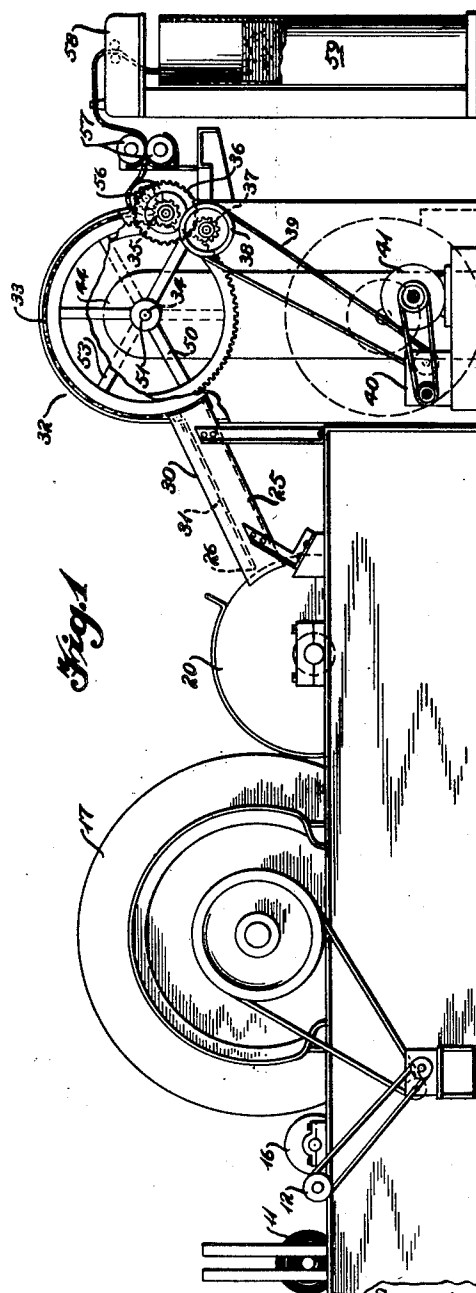
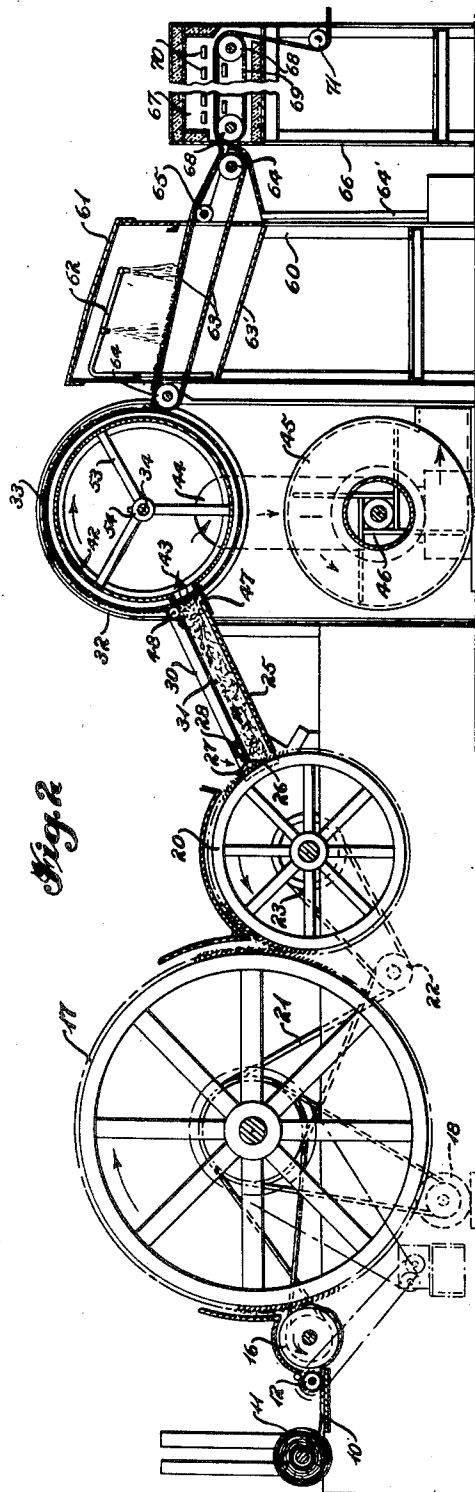
C. C. WILSON ET AL

2,478,148

MACHINE FOR PRODUCING UNWOVEN FABRICS

Original Filed Nov. 18, 1947

4 Sheets-Sheet 1



Inventors
Charles C. Wilson,
Herschel H. Cudd &
Deanzil V. Probasco.
By *Cushman Daryl Cushman*
Attorneys

Aug. 2, 1949.

C. C. WILSON ET AL

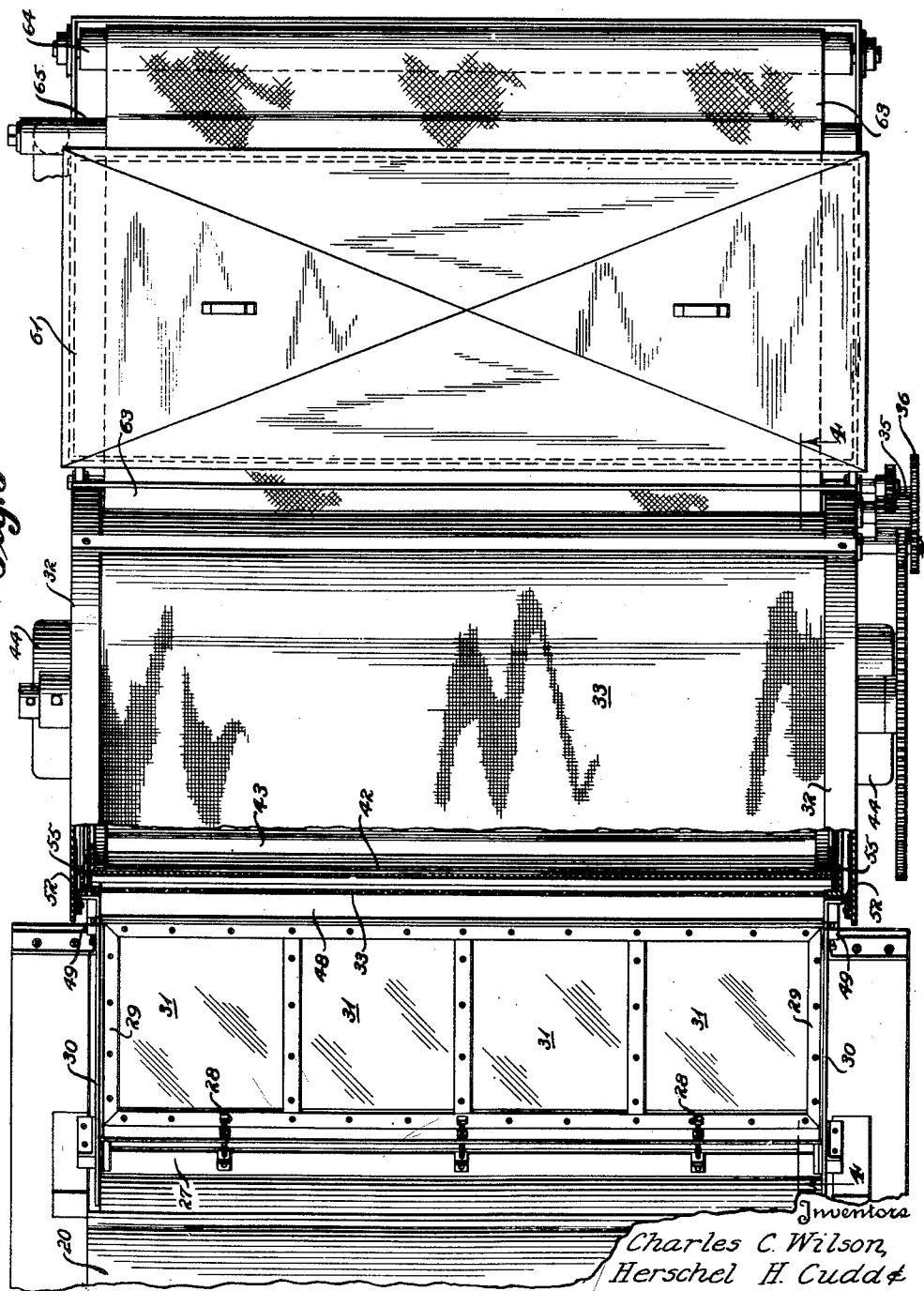
2,478,148

MACHINE FOR PRODUCING UNWOVEN FABRICS

Original Filed Nov. 18, 1947

4 Sheets-Sheet 2

Fig. 3



Inventors
Charles C. Wilson,
Herschel H. Cudd &
Deanzil V. Probasco.

334 Cushman Darby Cushman
Attorneys

Aug. 2, 1949.

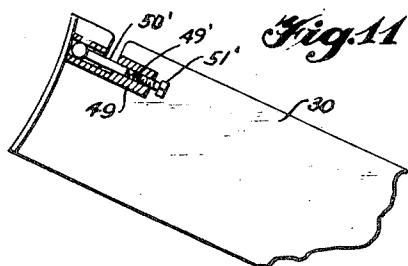
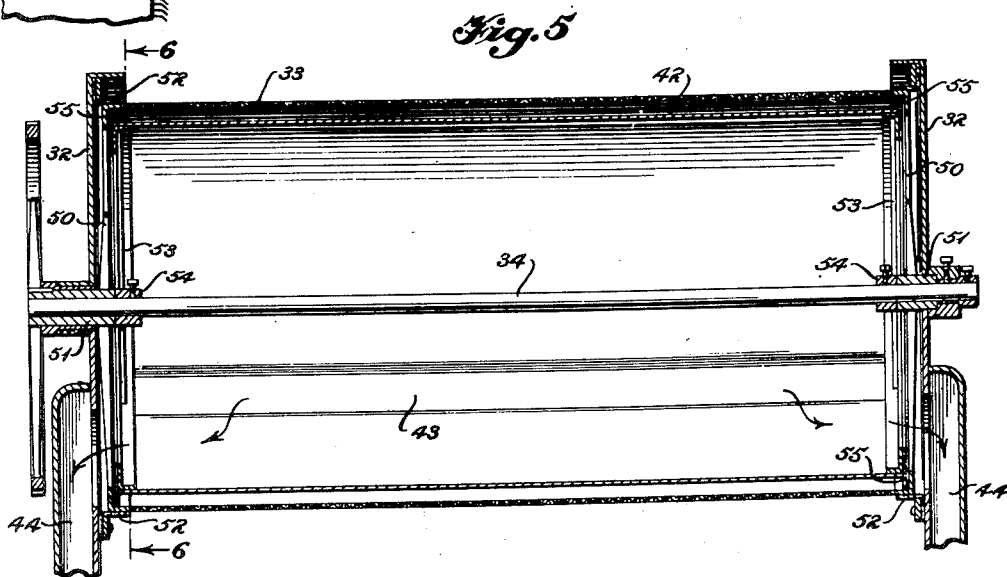
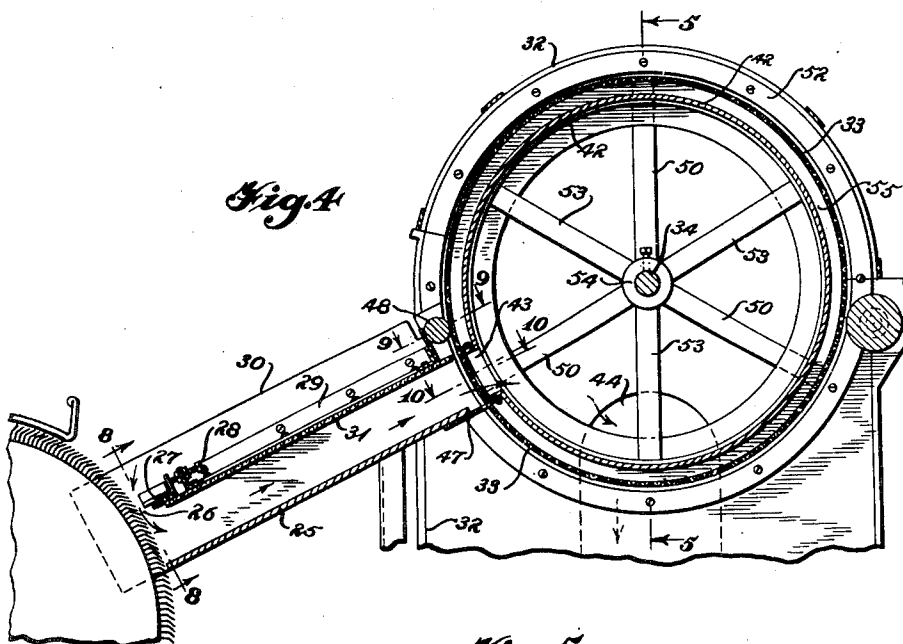
C. C. WILSON ET AL

2,478,148

MACHINE FOR PRODUCING UNWOVEN FABRICS

Original Filed Nov. 18, 1947

4 Sheets-Sheet 3



Inventors
Charles C. Wilson,
Herschel H. Cudd &
Deanzil V. Probasco.
By *Cushman, Daryl & Cushman*
Attorneys

Aug. 2, 1949.

C. C. WILSON ET AL

2,478,148

MACHINE FOR PRODUCING UNWOVEN FABRICS

Original Filed Nov. 18, 1947

4 Sheets-Sheet 4

Fig. 6

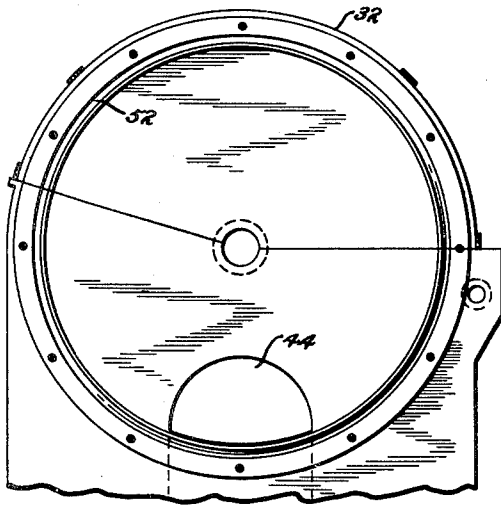


Fig. 7

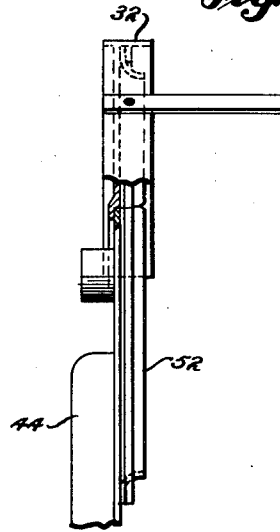


Fig. 8

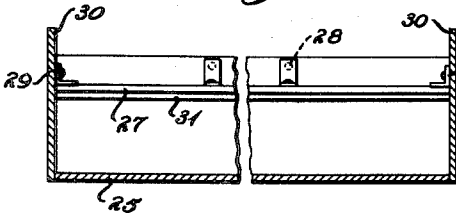


Fig. 9

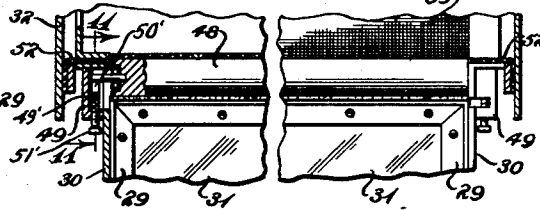
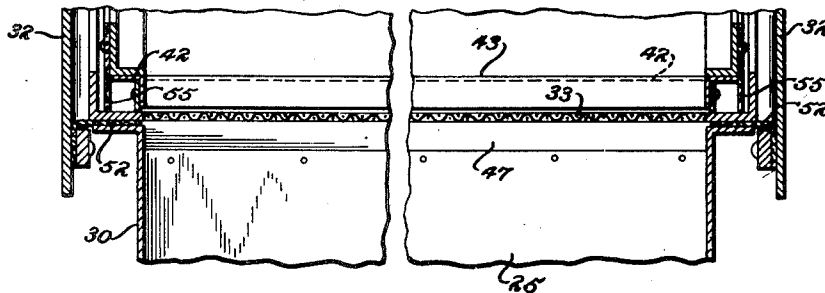


Fig. 10



Inventors
Charles C. Wilson,
Herschel H. Cudd &
Deanzil V. Probasco.

By *Richard D. Probasco*
Attorneys

UNITED STATES PATENT OFFICE

2,478,148

MACHINE FOR PRODUCING UNWOVEN FABRICS

Charles C. Wilson, Lanett, Ala., and Herschel H. Cudd and Denzil V. Probasco, West Point, Ga., assignors to West Point Manufacturing Company, West Point, Ga., a corporation of Alabama

Original application November 18, 1947, Serial No. 786,662. Divided and this application March 3, 1949, Serial No. 80,502

3 Claims. (Cl. 19—156)

1

This invention relates to a machine for producing unwoven fabrics. This is a division of application Serial No. 786,662, filed November 18, 1947, covering the method and article of applicants' invention.

Unwoven fabrics are broadly old, but equipment heretofore used has not produced fabric of satisfactory make-up insofar as uniformity of fabric texture and strength in all directions are concerned.

Fabrics of this type are formed by depositing fibers drawn from any suitable source, such as a hopper, a card, or a doffer, in random fashion on a suitable foraminous receiving member in closely interlaced relation, the object being to secure textural uniformity and strength in all directions. Satisfactory results cannot, however, be obtained without particular attention to the removal of the fibers from the source and their distribution on the receiving member, and, it is preferable in many cases, to subject the web thus formed to a bonding treatment to stabilize the fibers and produce a web of proper density, uniformity, and stability, insofar as fiber relations are concerned.

In unwoven webs of the prior art, the fibers have been in some instances so laid as to parallel them either warpwise or fillingwise, resulting in a fabric of unequal strength in different directions as distinguished from the fabric of the present invention, in which the fibers are disposed in uniformly random fashion, free from knots or tangles, so that textural uniformity in all directions results.

It has been proposed with earlier equipment to subject fibers to air currents in disposing them on a receiving surface, but such equipment lacks the technical efficiency of the present machine, which involves the removal of the fibers in continuous flow directly from the supply by positive and direct air currents regulated within suitable ranges, insofar as intensity of flow is concerned, critical flow intensities being determined by the particular conditions met.

In practicing the invention herein disclosed, it has been found that the speed of the fiber supplying instrumentalities must be considerably increased over the normal speeds in equipment of this kind as heretofore developed, the reason for this increased speed being that the fibers will be more completely and uniformly separated and

2

the knots and tangles straightened out, so that delivery from the fiber-carrying instrumentalities to the fiber-receiving and web-forming instrumentalities results in a web of more uniform density and strength than under the slow speed equipment heretofore used.

Following fiber removal from the doffer, which is here shown as the source of the raw material, by air currents, such fibers, in suspended condition and in free relation to one another, are carried at high speed through a fiber transfer duct which leads to a movable fiber receiving member, here shown as a screen cylinder, upon which the fibers are laid in random fashion and in closely matted relation. The thickness of the web, using the equipment hereinafter described, may be readily varied by regulating the speed of the movable fiber-receiving members so as to permit greater or less amounts of fiber to be deposited in a given period of time. Further, the width of the webs formed on the receiving surface may be varied so as to form a web of a width equal to the full length of the fiber receiving member, or fibers may be deposited on the receiving member in less than the full length of that member so as to form narrow webs or slivers. As stated, the present disclosure shows the removal of fibers directly from a doffer by air currents, the doffer being supplied in the usual manner from a card, but it will be understood that the removal of the fibers may be made directly from the card cylinder or other suitable source without the interposition of a doffer if desired.

In the description which follows, the machine producing the web is set forth in detail and the equipment is illustrated in the drawings forming part of this disclosure. It is to be understood that this disclosure is illustrative and not restrictive as obvious variations from this disclosure within the scope of the invention may be made.

In the drawings:

Figure 1 is a view in side elevation showing the feed-in roller, the card, the doffer, the duct for removing the fiber from the doffer, and the fiber-receiving and web-forming screen.

Figure 2 is a sectional view of the equipment shown in Figure 1 with the web bonding instrumentalities and the web-drying equipment added.

Figure 3 is a view in plan showing the doffer, the duct, the fiber-receiving screen, the spraying

3

chamber, and the web-receiving roller, the driving gears for operating the parts being shown.

Figure 4 is an enlarged detail view, substantially on the line 4—4 of Figure 3, showing a portion of the doffer, the air duct which removes the fibers from the doffer, and the screen cylinder to which the fibers are delivered and on which the web is formed.

Figure 5 is a longitudinal sectional view of the web-forming screen on substantially the line 5—5 of Figure 4.

Figure 6 is a cross-sectional view on substantially the line 6—6 of Figure 5.

Figure 7 is a detail view showing the end of the screen housing.

Figure 8 is a detail view substantially on the line 8—8 of Figure 4.

Figure 9 is a sectional view substantially on the line 9—9 of Figure 4.

Figure 10 is a view substantially on the line 10—10 of Figure 4.

Figure 11 is a detail view substantially on the line 11—11 of Figure 9.

Referring to the drawings by numbers, the same numbers designating the same parts in the several views, and considering first the disclosures in Figures 1 and 2, the frame 10, of any suitable or usual construction, carries the lap 11, the feed roller 12, the taker-in 16, and the card cylinder 17, as in the usual carding engine construction. These parts are all driven from any suitable source of power, a motor 18 being here shown from which power is supplied to drive the various instrumentalities through suitable belting and gears. This being the usual construction of carding engines, further detailed description of it is not necessary.

Adjacent the card cylinder 17 is a doffer 20, this doffer being driven from the card cylinder by means of the cross belt 21, the pulley 22, and the doffer belt 23, so as to revolve the doffer in the direction of the arrow opposite from the direction of rotation of the card cylinder 17. In the ordinary carding engine, the doffer rotates at a speed which is normally from 3 to 18 R. P. M., thus producing an attenuation or draft from 90 to 140 on the stock, with draft being defined as the peripheral speed of the doffer divided by the peripheral speed of the feed-in roll. In the present equipment, however, it has been found that the speed of the doffer must be higher relative to the speed of the feed-in roll and the card cylinder, and drafts from 500 to 1500 are necessary, a mean of 980 having been found to be a satisfactory draft, although it will be understood that the draft may be varied to some extent from the preferable mean. As a result of this range of high drafts, the card cylinder deposits the fibers on the doffer in a completely separated condition with each fiber being separate from the others and not gathered together in groups, bunches, or clumps of many fibers as are ordinarily present in equipment of this character when low speed doffing instrumentalities are used, so the fibers are laid on the doffer in an evenly distributed, well separated manner.

On the side of the doffer opposite its contact point with the card is provided a fiber transfer air duct 25, preferably of uniform dimension throughout its length, the doffer end of the duct 25 being placed in close relation to the teeth of the doffer and preferably the duct 25 will be slightly above the horizontal center of the doffer roll, as shown in Figure 2. It is desirable that the duct 25, which constitutes a confined unin-

4

interrupted path, be of equal area in cross-section throughout its length in order that there may be a uniform, even and continuous flow of air and fiber through the duct and turbulence caused by cross currents or swirls which might affect proper transmission of the fibers through the duct if it was of varying cross-section, are avoided. The duct 25 may be provided, preferably on its upper side, with an air inlet 26, which inlet may be regulated by means of a gate 27 adjusted in any suitable manner as by the adjusting screw 28, so as to vary the size of the inlet 26 as may be desired. The duct 25 may be constructed in any suitable manner and is supported by means of a frame 29 secured to supporting side plates 30 mounted at one end on the doffer frame and at the other end on the screen housing, presently to be described. The duct supporting frame 29 may be provided with transparent panels 31, preferably at its upper side in order that the flow of fiber through the duct may be observed and, if necessary, regulated by adjustment of the air inlet.

The delivery end of the duct 25 passes through a housing 32 having upper and lower sections in which is mounted a foraminous receiving surface, here shown as a revolving cylindrical screen 33 to which the duct delivers, the screen 33 being mounted to revolve on a fixed shaft 34. Screen 33 is driven by a pinion gear 35 carried on the shaft of gear 36, and said gear 35 engages gear teeth on the screen cylinder, as shown in Figure 1. Gear 36 is driven by the gear 37 on pulley 38 belted by belt 39 to a gear assembly 40 driven from the motor 41. The gear assembly 40 is made up of a gear box having provision for interchanging the gears to vary speeds in the usual manner of changeable speed gear boxes. Interiorly of the screen 33 is fixed shield 42 supported by shaft 34 having an air-receiving opening 43 in line with and of the same cross-sectional area as the delivery end of the duct 25, as shown in Figure 4, and through which opening 43 the blast of air passes after it has deposited the fibers on the screen 33. The fixed shield 42 prevents any disturbance of the web laid upon the screen, the air being drawn out of the shield through exhaust connections 44 which open at their upper ends into the shield and the lower ends of which engage a fan casing 45 having a fan 46, conventionally shown, which fan is driven from any suitable source of power and creates a strong suction through the escape passage 44; the duct 25, and the air inlet 26. The air current created by the fan strips the fibers directly from the doffer 20, the usual doffer comb being dispensed with, and carries them in suspended and separated condition through the duct and deposits them on the screen 33. The speed of rotation of the screen may be varied through the change gear box or assembly 40 so as to give different screen speeds. By varying the speed of the screen, the thickness of the web formed by the fibers deposited on the screen may be widely varied. If a thin web is desired, the screen cylinder will be revolved at relatively high speed so that a thin layer of fibers is deposited on it. If a thicker web is desired, the speed of the screen may be slowed down and a thicker web results.

The delivery end of the duct 25 will be sealed off from the screen in any suitable manner as for example, by the flexible seals 47, as shown in Figure 4, or by means of the sealing off roller 48, which sealing off roller is mounted for free revolution by reason of its contact with the screen sur-

5

face, this roller being preferably mounted in an adjustable spring mounting 49, as shown in Figures 9 and 11, made up of a spring 49', a follower 50', and adjusting screw 51', so that its tension against the screen surface may be varied.

The screen 33, which is mounted to revolve on the fixed shaft 34, is carried by the spokes 50 mounted on the hub 51 and driven by the gear 36. It is essential that the screen be sealed off from the housing against the entry of air and this is accomplished, as shown in Figure 5, by providing sealing strips 52 carried by the housing 32, these strips effectually preventing the entrance of air to the interior of the screen.

The shield 42 is supported by the spokes 53 carried by the hub 54 which is pinned to the shaft 34 so as to hold the shield 42 in fixed position. The shield 42 is sealed off at its ends from the screen 33 by the sealing strips 55 so as to confine the suction through the shield and permit its escape only through the connections 44.

In the form of the invention shown in Figure 1, the machine is set to form a narrow fabric or sliver, which sliver is doffed from the revolving screen 33 by means of a doffing roll 56, as shown in Figure 1, driven from pinion 35, from which doffing roll it passes to the drawing-off rolls 57 driven from any suitable source, and then passes to a sliver-receiving head 58, from which it is deposited in a sliver can 59.

In Figure 2, the machine is shown with means for bonding the web with any suitable bonding solution. Any convenient or desired bonding equipment can be used. As here shown, it comprises a supporting stand 60 having at its upper end a housing 61 in which are disposed spray heads connected to a pipe 62, which pipe may be supplied from any suitable source with the bonding solution. The web will be removed from the screen cylinder 33 and brought to the bonding area by a belt 63 mounted on rollers 64 driven from any suitable source of power, so that, as the belt is driven, the web will be carried forward to drying instrumentalities hereinafter described. The belt may be formed of any suitable flexible and porous material such as cloth, woven wire, and the like. Any suitable means such, for example, as suction tube 65 may be provided to draw the bonding solution through and thoroughly impregnate the web. Any excess solution from the belt 63 will be caught by a drainage shelf 63' having a discharge tube 64' through which excess solution or overflow from the belt 63 will be delivered to any suitable receptacle.

The web passes from the belt 63 to drying and curing means as shown in Figure 2. This drying and curing equipment may be made up in different ways, but is here shown as an electrical dryer. It comprises a stand 66 having a heated box 67 in which is mounted for rotation rollers 68 having a carrier belt 69 to which the web is delivered from the belt 63. Heating and drying elements 70, conventionally shown as electrical heating elements to which current is supplied from any suitable source, are disposed above and below the belt 69 so that the web is subjected to complete drying and curing and then passes over a roller 71 and is delivered in bonded and dried condition.

The equipment herein shown and described produces a non-woven fabric characterized by uniform density and texture and of equal strength in all directions, free from imperfections caused by knots and tangles, and of superior appearance may be produced.

6

Such variations from the specific construction here shown and described as involve only mechanical skill and are comprehended by the appended claims are to be regarded as within the range of the invention.

We claim:

1. A machine of the class described comprising carding means to provide a continuous source of fiber supply, a fiber transfer duct having a straight, confined, uninterrupted passage of uniform cross-sectional area therethrough and a fiber-receiving end in close contact with said fiber carding means provided with an air inlet near its contact end to permit entrainment of air; means for adjusting said air inlet a foraminous fiber-receiving member at the delivery end of said duct; means for creating an air current through said foraminous member, duct, and air inlet to remove fibers from said carding means, transfer them by said duct in a continuous flow and deposit them at a predetermined point on said foraminous member to form a web; and means for removing the web from said foraminous member.

2. A machine of the class described comprising rotatable carding means to provide a continuous fiber supply; a fiber transfer duct having a straight, confined, uninterrupted passage of uniform cross-sectional area therethrough and a fiber-receiving end in close contact with said fiber carding means provided with an air inlet near its contact end to permit entrainment of air; means for adjusting said air inlet a rotatable foraminous fiber-receiving member at the delivery end of said duct; means for creating an air current through said foraminous member, duct, and air inlet to remove fibers from said carding means, transfer them by said duct in a continuous flow and deposit them at a predetermined point on said foraminous member to form a web, and means for preventing the air current from disturbing the web deposited on said foraminous member.

3. A machine of the class described comprising rotatable carding means to provide a continuous source of fiber supply; a fiber transfer duct in close contact with said carding means having a straight, confined, uninterrupted passage therethrough of uniform cross-sectional area provided with an air inlet near its contact end to permit the entrainment of air to remove fibers from said carding means; means for adjusting said air inlet a rotatable screen cylinder on which said duct deposits fiber in a continuous flow at a predetermined point to form a web; means for creating an air current through said duct and screen, and a fixed cylindrical shield in said screen cylinder having an air inlet of the same cross-sectional area as the delivery end of said duct opposite the predetermined fiber deposit point of said screen cylinder to prevent the air current from disturbing the web deposited on said screen cylinder.

4. A machine of the class described comprising carding means to provide a continuous source of fiber supply; a fiber transfer duct in close contact with said carding means having a straight, confined, uninterrupted passage therethrough of uniform cross-sectional area provided with an air inlet near its contact end to permit the entrainment of air to remove fibers from said carding means; means for adjusting said air inlet a rotatable screen cylinder on which said duct deposits fibers in a continuous flow at a predetermined point to form a web; sealing means

between the delivery end of said transfer duct and said screen; a fixed cylindrical shield in said screen cylinder having an air inlet of the same cross-sectional area as the delivery end of said duct opposite the predetermined fiber deposit point to prevent the air current from disturbing the web deposited on said screen cylinder; sealing means between the air inlet of the shield and said screen cylinder, and means to create an air current through said duct, screen cylinder and shield.

5. A machine of the class described comprising carding means to provide a continuous fiber supply; a fiber transfer duct in close contact with said carding means having a straight, confined, uninterrupted passage therethrough of uniform cross-sectional area provided with an air inlet near its contact end to permit the entrainment of air to remove fibers from said carding means; means for adjusting said air inlet a rotatable screen cylinder on which said duct deposits fibers in continuous flow at a predetermined point to form a web; a spring-pressed sealing roller between the delivery end of said duct and said screen cylinders; a fixed cylindrical shield in said screen cylinder having an air inlet of the same cross-sectional area as the delivery end of said duct opposite the predetermined fiber deposit point to prevent the air current from disturbing the web deposited on said screen cylinder; sealing means between the air inlet of the shield and said screen cylinder, and means to create an air current through said duct, screen cylinder and shield.

6. A machine of the class described comprising carding means to provide a continuous fiber supply; a fiber transfer duct in close contact with said carding means having a straight, confined, uninterrupted passage therethrough of uniform cross-sectional area provided with an air inlet near its contact end to permit the entrainment of air to remove fibers from said carding means; means for adjusting said air inlet a rotatable screen cylinder on which said duct deposits fibers in continuous flow at a predetermined point to form a web; a spring-pressed sealing roller between the delivery end of said duct and said screen cylinder; means for adjusting said roller for sealing pressure; a fixed cylindrical shield in said screen cylinder having an air inlet of the same cross-sectional area as the delivery end of said duct opposite the predetermined fiber deposit point to prevent the air current from disturbing the web deposited on said screen cylinder; sealing means between the air inlet of the shield and said screen cylinder, and means to create an air current through said duct, screen cylinder and shield.

7. A machine of the class described comprising carding means to provide a continuous fiber

supply; a fiber transfer duct having a straight, confined, uninterrupted passage of uniform cross-sectional area therethrough; a fiber-receiving end on said duct in close contact with said carding means having extended side walls embracing the sides of the carding means to prevent excessive inflow of air at the receiving end and an air inlet near the contact end of said duct to permit entrainment of air; means for adjusting said air inlet a foraminous fiber-receiving member at the delivery end of said duct, means for creating an air current through said foraminous member, duct, and air inlet to remove fibers from said supply and transfer them by said duct to deposit them at a predetermined point on said foraminous member to form a web; and means for removing the web from said foraminous member.

8. A machine of the class described comprising carding means to provide a continuous source of fiber supply; a fiber transfer duct having a straight, confined, uninterrupted passage of uniform cross-sectional area therethrough and a fiber-receiving end in close contact with said carding means provided with an air inlet near its contact end to permit entrainment of air; means for adjusting said air inlet a movable foraminous fiber-receiving member at the delivery end of said duct; means for varying the speed of said fiber-receiving member; means for creating an air current through said foraminous member, duct, and air inlet to remove fibers from said supply, transfer them by said duct in continuous flow and deposit them at a predetermined point on said foraminous member to form a web, and means for removing the web from said foraminous member.

CHARLES C. WILSON.
HERSCHEL H. CUDD.
DENZIL V. PROBASCO.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
141,270	Harrington	July 29, 1873
730,158	Rembert	June 2, 1903
1,710,977	Herbener	Apr. 30, 1929
1,935,170	Woody et al.	Nov. 14, 1933
2,023,273	Leguillon	Dec. 3, 1935
2,146,698	Rogers	Feb. 7, 1939
2,222,633	Sheesley	Nov. 26, 1940
2,396,178	Kane	Mar. 5, 1946
2,451,915	Buresh	Oct. 19, 1948

FOREIGN PATENTS

Number	Country	Date
220,149	Great Britain	Aug. 14, 1924