Nov. 8, 1966 F. KALWAITES 3,283,366

APPARATUS FOR REMOVING A FIBROUS WEB FROM A ROTATABLE SURFACE

Filed Aug. 2, 1965 4 Sheets-Sheet 1

Fig. 1.

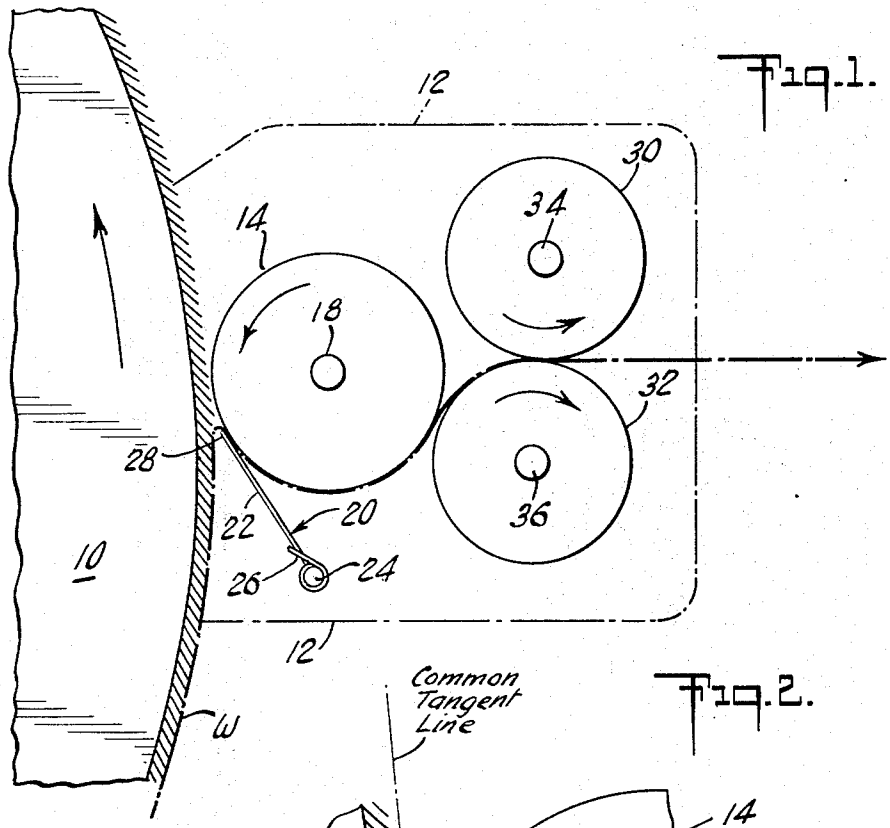
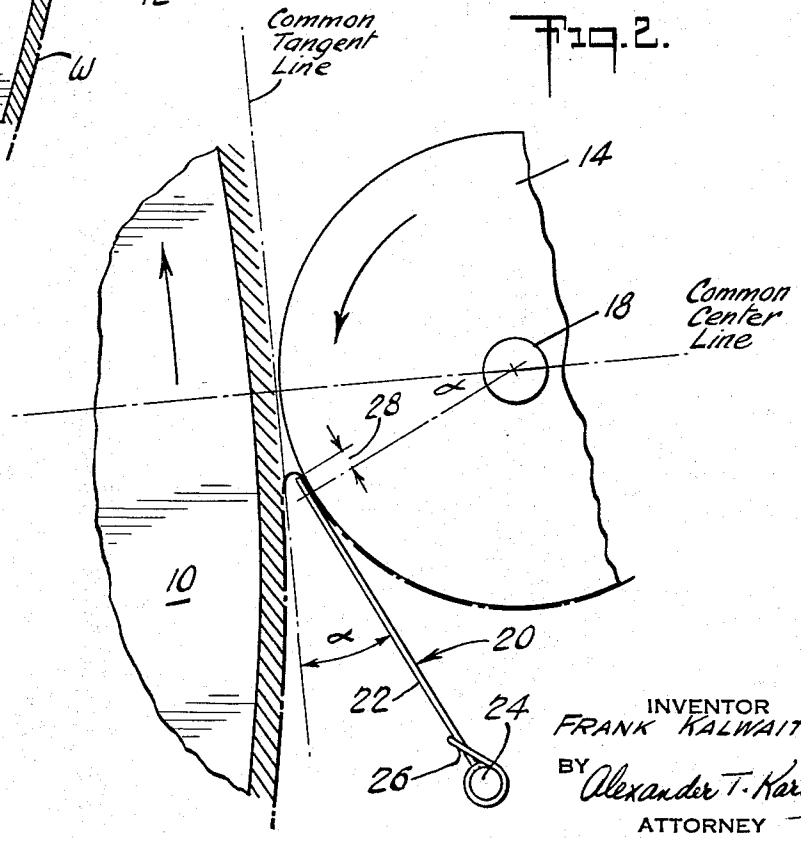


Fig. 2.



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Fig. 3.

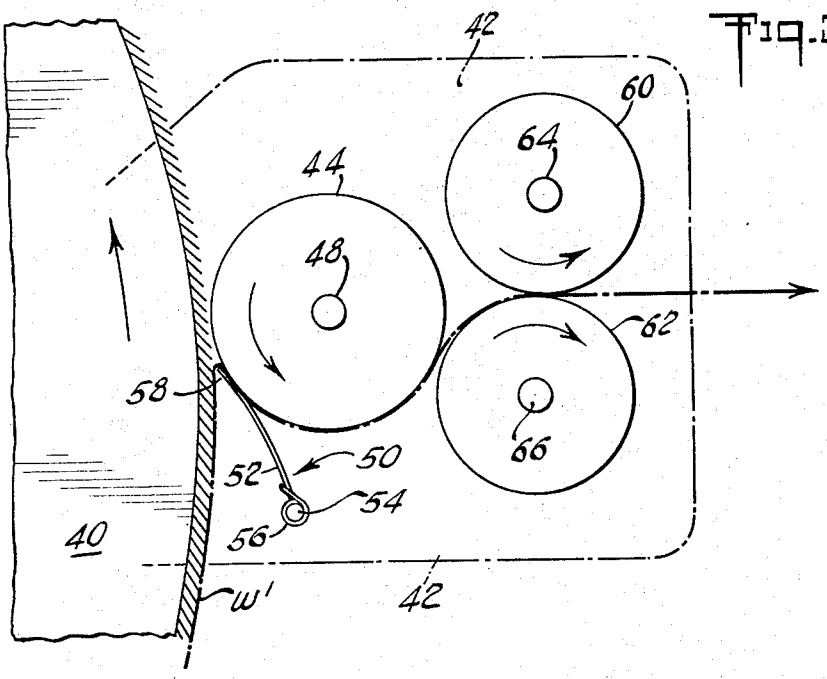
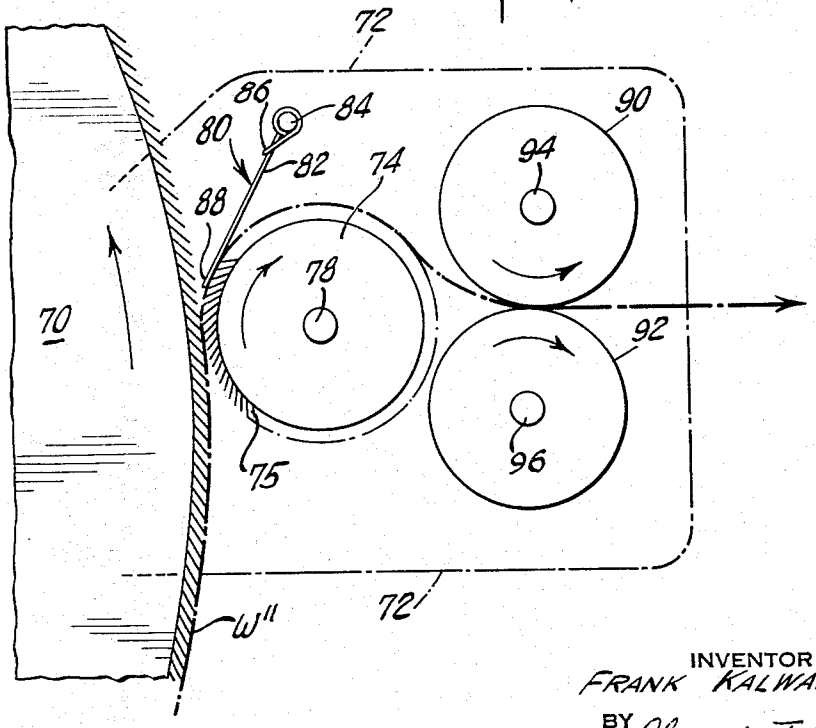


Fig. 4.



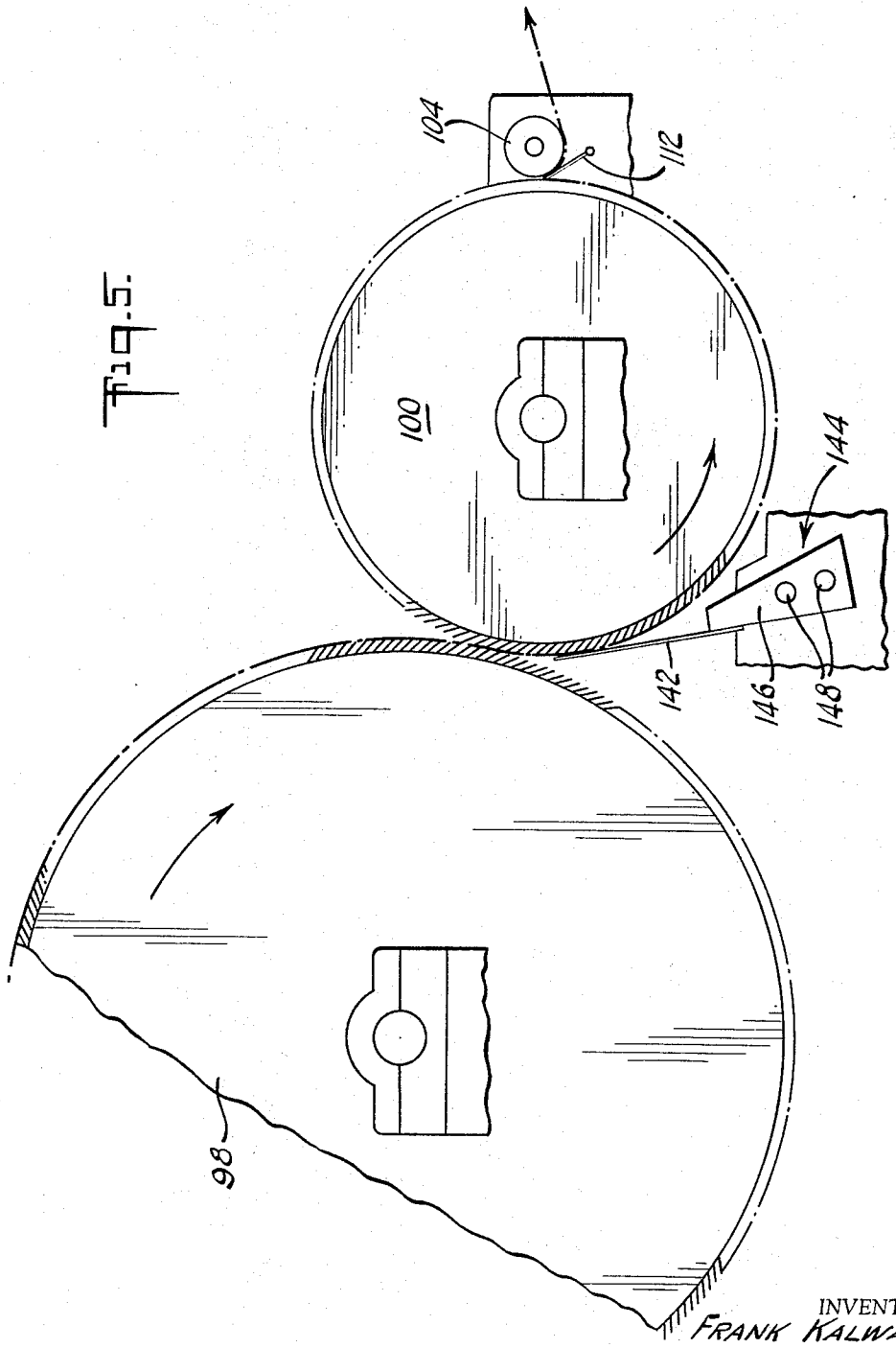
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APPARATUS FOR REMOVING A FIBROUS WEB FROM A ROTATABLE SURFACE

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Fig. 5.



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APPARATUS FOR REMOVING A FIBROUS WEB FROM A ROTATABLE SURFACE

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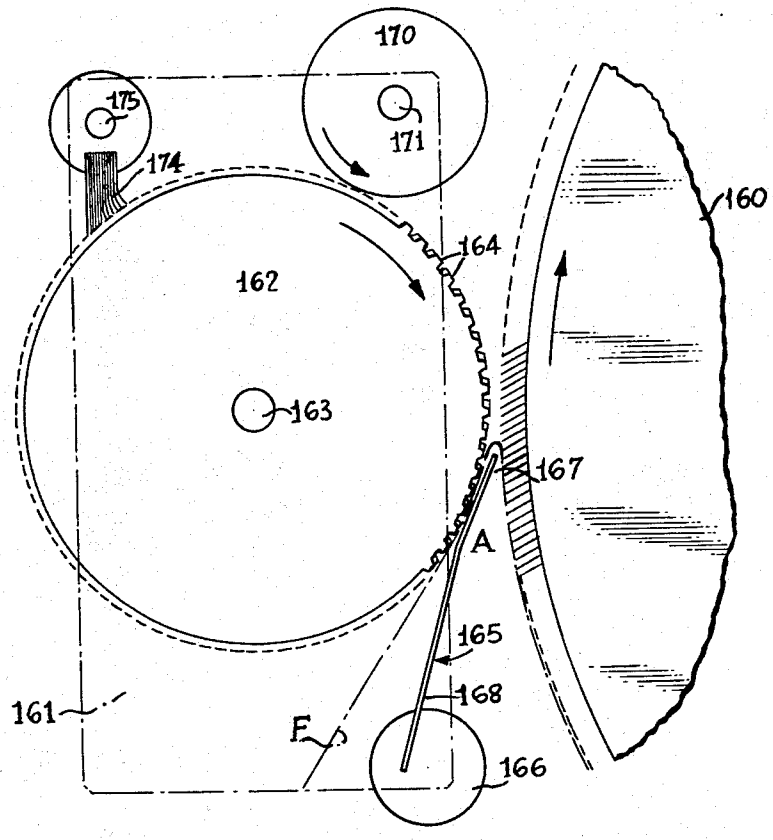


FIG. 6.

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3,283,366

APPARATUS FOR REMOVING A FIBROUS WEB FROM A ROTATABLE SURFACE

Frank Kalwaites, Somerville, N.J., assignor to Johnson & Johnson, a corporation of New Jersey

Filed Aug. 2, 1965, Ser. No. 478,027
6 Claims. (Cl. 19—106)

This patent application is a continuation-in-part of my co-pending patent application Serial Number 324,602, filed November 13, 1963, now abandoned, which in turn was a continuation-in-part of my patent application Serial Number 279,949, filed May 13, 1963, now abandoned.

The present invention relates to apparatus and methods for removing fibrous webs from rotating surfaces and more particularly is concerned with apparatus and methods for removing fibrous webs from the rotating doffing cylinder of a textile carding machine.

In the processing of textile-length fibers whereby they are converted from naturally-occurring or synthetically-prepared, intermatted fibrous masses into relatively uniform fibrous textile materials, such as slivers, rovings and webs which have a generally predominant fiber orientation in the long direction thereof, the individual fibers are initially separated and formed into a fibrous web by means of a textile carding machine. This fibrous web, in which the individual fibers are relatively aligned generally in the long direction of the web, is doffed or removed from the rotating doffing cylinder of the card usually by a rapidly reciprocating doffing comb for further processing or handling, as desired or required. This rapidly reciprocating doffing comb, having a periodic to-and-fro movement, is physically limited in its maximum speed and in the number of reciprocations it can make and in most cases is the limiting factor on the speed of the rotating doffing cylinder which, having a rotational movement, normally could have a greater surface linear speed, if it were not so limited by the doffing comb. Thus, the doffing comb limits the speed of the textile carding machine and is considered the limiting factor on its capacity or "throughput."

Additionally, it has been determined that the reciprocating action of the teeth of the doffing comb, as they rapidly pass to-and-fro through the fibrous web, strike, rub and brush against the individual fibers, change the predominant fiber orientation thereof, and perform their doffing function in a generally inefficient manner.

It is therefore a principal purpose of the present invention to provide apparatus and methods capable of: (1) doffing or removing fibrous materials from a rotating surface such as the doffing cylinder of a textile carding machine without limiting its speed, capacity or "throughput"; and (2) performing such doffing or fiber-removing function in an efficient manner without materially changing the predominant fiber orientation of the fibrous web.

It has been discovered that such a principal purpose may be accomplished by providing a first rotatable surface which is capable of carrying a fibrous web, positioning a second rotatable surface also capable of carrying a fibrous web immediately adjacent to but spaced from said first-mentioned rotatable surface whereby a V-shaped throat having arcuate surfaces leading to a narrow opening is formed between the two rotatable surfaces, and then positioning a stationary but adjustable flexible nip blade in tangential pressing contact with the second rotatable surface and extending away from that second rotatable surface on both sides of the point of tangency therewith, with one relatively short free end of the nip blade extending up into the narrow V-shaped throat formed by the two rotatable surfaces. As a result, the fibrous web which is carried by the first rotatable surface can be removed

therefrom to be carried around the free end of the nip blade into contact with the second rotatable surface to be pressed against such second rotatable surface by the nip blade substantially only at the point of tangency and then to be carried forwardly by the second rotatable surface and delivered for further processing and handling, as desired or required.

Now, inasmuch as only rotating surfaces are involved in such an arrangement and since there is no limiting reciprocating to-and-fro periodic movement, much higher speeds are obtainable whereby increased capacity or "throughput" is realized. Also, there is no rapid reciprocation of comb teeth to-and-fro through the fibrous web whereby increased doffing efficiency is realized and the predominant fiber orientation is not materially changed.

The fibrous web or layer which is processed to form the products of this invention may contain natural or synthetic, vegetable, animal or mineral fibers such as cotton, silk, wool, vicuna, mohair, alpaca, flax, ramie, jute, etc.; synthetic or man-made fibers such as the cellulosic fibers, notably cuprammonium, viscose or regenerated cellulose fibers; cross-linked cellulosic fibers such as "Corval" and "Topel"; cellulose ester fibers such as cellulose acetate ("Celanese") and cellulose tri-acetate ("Arnel"); the saponified cellulose ester fibers such as "Fortisan" and "Fortisan–36"; the polyamide fibers such as nylon 420, nylon 6 (polycaprolactam), nylon 66 (hexamethylene diamine-adipic acid), nylon 610 (hexamethylene diamine-sebacic acid), nylon 11 (11-amino undecanoic acid-"Rilsan"); protein fibers such as "Vicara"; halogenated hydrocarbon fibers such as "Teflon" (polytetrafluoroethylene); hydrocarbon fibers such as polyethylene, polypropylene, polybutadiene and polyisobutylene; polyester fibers such as "Kodel" and "Dacron"; vinyl fibers such as "Vinyon" and saran; dinitrile fibers such as "Darvan"; nitrile fibers such as "Zefran"; acrylic fibers such as "Dynel," "Verel," "Orlon," "Acrilan," "Creslan," etc.; mineral fibers such as glass, metal; etc.

The average lengths of the fibers in the starting fibrous web are of textile length and may vary from about ⅜ inch or ½ inch up to about 2½ inches or more in length, depending upon the particular properties and characteristics required or desired in the resulting fibrous web.

If desired, the fibrous layer may have added thereto, by a subsequent processing step, from about 1 or 2 percent by weight up to about 100 percent by weight but preferably less than about 50 percent by weight, of fibers other than those of textile length. These other fibers may be of short papermaking length, which extend from about ⅜ inch in length down to about 1/16 of an inch or less in length, which shorter fibers normally are not used in conventional methods of producing fibrous webs.

Illustrative of these short papermaking fibers are the natural cellulosic fibers such as woodpulp and wood fibers, cotton linters, cotton hull shaving fibers, mineral fibers such as asbestos, glass, rock wool, etc., or any of the hereinbefore-mentioned natural or synthetic fibers in lengths less than about ⅜ inch and down to about 1/16 of an inch or less.

The denier of the individual synthetic fibers referred to above is preferably in the range of the approximate thickness of the natural fibers mentioned and consequently deniers in the range of from about 1 to about 5 are preferred. Where greater opacity or greater covering power is desired, special fiber deniers of down to about ¾ or even about ½ may be employed. Where desired, deniers of up to about 5.5, 6, 8, 10, 15, or higher, may be used. The minimum and maximum denier are naturally dictated by the desires or requirements for producing a particular fibrous web, by the machines and methods for producing the same, and so forth.

The weight of the fibrous web or layer of starting material on the doffing cylinder may be varied within relatively wide limits above a predetermined minimum value, depending upon the requirements of the intermediate or the final products. A single, thin web of fibers, such as produced by a card and as presented by the doffing cylinder, may have a weight of from about 30 to about 250 or more grains per square yard and may be used in the application of the principles of the present invention. Within the more commercial aspects of the present invention, however, web weights on the doffing cylinder of from about 50 grains per square yard to about 175 grains per square yard are contemplated.

The invention will be more fully understood from the description which follows taken in conjunction with the accompanying drawings in which there are illustrated preferred designs of machines and modes of operation embodying the invention. It is to be understood, however, that the invention is not to be considered limited to the constructions disclosed except as determined by the scope of the appended claims. In the drawings:

FIGURE 1 is a simplified, fragmentary, schematic view in elevation showing one embodiment of the general principles of operation of the present invention;

FIGURE 2 is an enlarged view of a portion of FIGURE 1, drawn to a much larger scale showing in greater detail certain elements of the present invention;

FIGURE 3 is a simplified, fragmentary, schematic view in elevation showing another embodiment of the general principles of operation of the present invention;

FIGURE 4 is a simplified, fragmentary, schematic view in elevation showing still another embodiment of the general principles of operation of the present invention; and

FIGURE 5 is a simplified, fragmentary, schematic view in elevation showing a further embodiment of the general principles of operation of the present invention; and

FIGURE 6 is a simplified, fragmentary, schematic view in elevation showing a further embodiment of the general principles of operation of the present invention.

In the embodiment of the invention illustrated in FIGURE 1 of the drawing, a conventional textile card is used and comprises a conventional rotatable main card cylinder (not shown) which is used to provide for the normal carding of the fibers fed thereto leading generally to a thin sheet of individualized fibers very sparsely spread over the main card cylinder surface in an amount weighing merely a few grains per square yard. These substantially individualized fibers are then presented to and transferred to a slower moving doffing cylinder **10** rotating on a shaft mounted in bearings secured to the card frame **12**.

The doffing cylinder **10** is conventional and may be covered with conventional fillets which are continuous strips of narrow card clothing, 1½ or 2 inches wide, and long enough to helically wrap around and entirely cover the cylindrical surface of the doffing cylinder. The conventional bent wires penetrate the heavy fabric foundation of the fillet card clothing and protrude therefrom in the usual way whereby doffing and stripping functions are possible. If desired, however, the doffing cylinder may be covered with conventional metallic card clothing which consists of a steel band with teeth punched or otherwise formed in one side and usually a thick rib on the other side. This steel band is wound helically around the surface of the cylinder, on edge, so that each coil fits closely against the preceding coil, thus producing a cylindrical surface entirely covered with fine saw-tooth points whereby doffing and stripping functions are possible.

Immediately adjacent the doffing cylinder **10**, and approximately at the position where the fibrous web W formed thereon is conventionally removed by the usual reciprocating doffing comb, there is located a cylindrical, rotatable doffing roll **14** rotating on a shaft **18** also mounted in the card frame **12**. This doffing roll **14** has about the same length as the doffing cylinder **10** but has a much smaller diameter which is in the range of from about 1¼ inches to about 10 inches, or even larger, but preferably is in the range of from about 3 inches to about 6 inches. Under normal circumstances, it rotates with the same surface linear speed as that of the doffing cylinder **10**.

The doffing roll **14** is so positioned with respect to the doffing cylinder **10** and is so spaced therefrom that a V-shaped throat is formed between two rotatable surfaces leading to a relatively narrow opening. This opening or clearance is sufficient to permit rotation of the doffing cylinder **10** without rubbing against the doffing roll **14**. The clearance between the doffing cylinder **10** and the doffing roll **14** will depend upon many factors such as the type of fibers being processed, the weight of the web being handled, the relative speeds involved, etc. In most cases, this clearance is of the order of from about 1/64 inch up to about 5/32 inch, with a preferred range of from about 1/32 inch up to about 1/16 inch.

The doffing roll **14** is relatively smooth-faced, as compared to the doffing cylinder **10** which is covered with fillet or metallic card clothing. The doffing roll **14** is given a very slightly roughened or textured surface, preferably by means of flutes, fine knurling, engraving, etching, or sandblasting. In many instances, a textured surface having very small cavities, such as prevails in the case of natural or synthetic rubber, leather or like-leather surfaces is suitable. In other instances flutes running along the axis of the rolls are preferred, for example from about 10 to 16 flutes per circumferential inch with the flutes having a depth of from about 0.02 to 0.05 inch have been found suitable. It is desired that the flutes be positioned on a slight spiral to the longitudinal axis of the roll to provide for smooth riding of the nip blade **20** and prevent chattering of the blade. The fluted rolls have been found very desirable when doffing cotton fibers as the seed and trash material normally found with cotton will ride in the flutes and still allow good contact between the roll surface and the nip blade. Doffing rolls which have smooth or slick surfaces are not generally suited for the application of the basic principles of the present invention.

A relatively flat flexible nip blade **20** is adjustably positioned on a pivot **24** and is capable of being placed in pressing tangential contact with the doffing roll **14**. Any suitable pressure-applying means, such as a helical spring **26**, may be employed to cause the nip blade **20** to exert the desired pressure on the doffing roll **14**. If desired, the flexible nip blade **20** may merely be placed in pressing contact with the doffing roll **14** and locked in that position. As shown in FIGURE 1, both sides of the nip blade **20** extend tangentially away from the surface of the doffing roll **14**, with the relatively short free end **28** extending forwardly up into the V-shaped throat formed by the doffing cylinder **10** and doffing roll **14**. The point of tangency of the nip blade **20** and the doffing roll **14** is so located that the free end **28** of the nip blade **20** is of relatively short length, and is only about ⅛ of an inch up to about ⅜ of an inch in length. As a result of this extension of the free end **28**, a relatively short entrance opening is formed between the short free end **28** and the surface of the doffing roll **14**. The purpose of this small opening will be discussed hereinafter.

The other end or the base portion **22** of the nip blade **20** also extends tangentially away from the surface of the doffing roll **14** and provides an exit opening of rapidly increasing size. The purpose of this exit opening of rapidly increasing size will also be discussed hereinafter.

Consideration of FIGURE 1 will reveal that the fibrous web W is carried forwardly on the surface of the doffing cylinder **10** and is directed around the extending free end **28** of the nip blade **20** into the small opening or entrance formed by the free end **28** and the doffing roll **14**. The fibrous web W is then pressed by the nip blade **20** against the doffing roll **14** for a very short length located substantially at the point of tangency. Then, due to the exit opening of rapidly increasing size, the pressure

on the fibrous web W is quickly released whereby it does not build up to accumulate or drag on the doffing roll **14** but is rapidly carried forwardly by any advancing means, such as a pair of rotatably driven nip rolls **30** and **32** mounted on shafts **34** and **36** rotatably mounted in bearings in the card frame. The fibrous web W is then advanced for further process or handling, as desired or required.

FIGURE 2 is an enlarged view of the area of the doffing roll **14** immediately adjacent to its point of tangency with nip blade **20**. This figure illustrates the action on the fibrous web W by the nip blade **20** and the doffing roll **14**. The relatively short area of pressing contact is to be noted particularly whereby the possibility of frictional drag on the fibrous web is drastically reduced, thus decreasing the possibility of jamming and fiber accumulation on the doffing roll **14**. If the area of pressing contact becomes too large or too long, fiber accumulation and machine stoppages will occur.

Also illustrated in FIGURE 2 is (1) the common tangent line which passes tangentially between the doffing cylinder **10** and the doffing roll **14** and (2) the common center line passing through the centers of the doffing cylinder **10** and the doffing roll **14**. These lines are, of course, at right angles to each other. The nip blade **20** is so inclined that its angular relationship with respect to the common tangent line is in the range of from 10° to about 35°, with the preferred range extending from about 15° to about 30°. This angle is represented by the angle α in FIGURE 2, and, due to the geometric relationship involved, is also the angle between the common center line and a radius of the doffing roll **14** which goes to the point of tangency of the doffing roll **14** and the nip blade **20**.

In FIGURE 3 there is illustrated another embodiment of the present invention wherein corresponding parts are given reference numerals **30** higher than their counterparts in FIGURE 1. The basic difference in the two embodiments is the use of a curved or arcuate nip blade **50** in this embodiment, as compared to the relatively planar or flat nip blade used in the embodiment of FIGURE 1. The use of such a curved nip blade **50** which is convexly shaped with respect to the rotating surface of the doffing roll **44** permits a wider entrance opening with a shorter free end **58** as well as an exit opening with an even more rapid increase in size for the same length of the base portion **52** of the nip blade **50**. Naturally, the length of the area of tangency is also decreased which is highly desirable.

In the embodiment of the invention illustrated in FIGURES 1 and 3, relatively smooth-faced doffing rolls **14** and **44** have been illustrated but it is not essential that the doffing rolls be relatively smooth-faced. As shown in FIGURE 4 wherein corresponding parts are given reference numerals **60** higher than their counterparts in FIGURE 1, a doffing cylinder **70** cooperates with a rotatable doffing roll **74** which is mounted on a shaft **78** secured in bearings in the card frame **72**. As illustrated in FIGURE 4, the doffing roll **74** is provided with a peripheral surface having wire teeth **75** extending thereon. Such wire teeth may be either conventional fillets or metallic card clothing, as desired. Plush or pile fabric surfaces may also be used.

The doffing roll **74** is illustrated adjacent to and spaced from the doffing roll **70** in very much the same relationship which exists between doffing roll **14** and doffing cylinder **10**. FIGURE 4 also illustrates another variation of the embodiment disclosed in FIGURES 1 and 3 in that the direction of rotation of the doffing roll **74** is opposite to the direction of rotation of the doffing roll **70**. Additionally, it is also to be noted that the flexible nip blade **80**, which is mounted on pivot **84** and is provided with a helical spring **86**, a free end **88** and a base portion **82**, is located on the opposite side of the point of closest adjacency of the doffing roll **74** and the doffing cylinder **70**. As such, there is also provided an oppositely directed V-shaped throat having arcuate sides leading to a narrow opening or clearance, as previously described.

The operation of the apparatus illustrated in FIGURE 4 is generally similar in principle to the forms of apparatus illustrated in FIGURES 1 and 3. Specifically, the fibrous web W'' is carried forwardly on the surface of the doffing cylinder **70**, passes through the narrow opening or clearance, and is then directed under the short free end **88** of the nip blade **80**. The fibrous web W'' is then pressed against the doffing roll **74** by the flexible nip blade **80** substantially only at the point of tangency and is then carried forwardly on the surface of the doffing roll **74** to be drawn forwardly by a pair of rotatable nip rolls **90** and **92** mounted on shaft **94** and **96** secured in bearings in the card frame **72**. The web W'' is then forwarded for further processing or handling, as desired or required.

It is not essential that the two rotatable surfaces used in the application of the principles of the present invention be a doffing cylinder and a doffing roll. In FIGURE 5, there is illustrated a further embodiment of the present invention wherein a conventional main cylinder **98** and a conventional doffing cylinder **100** are employed, along with a doffing roll **104** and its associated nip blade **112**.

The operation of the apparatus illustrated in FIGURE 5 is basically similar in principle to that of the other forms of apparatus illustrated in FIGURES 1, 3 and 4. Specifically, a fibrous web W''' is carried forwardly on the peripheral surface of the main cylinder **98** and is carded by the card flats (not shown). The fibrous web passes downwardly between the nip or throat formed by the surfaces of the main cylinder **98** and the doffing cylinder **100** and is then directed under the short free end of a flexible nip blade **102** positioned in light-pressing, tangential contact with the peripheral surface of the doffing cylinder **100** in very much the same fashion as the nip blade **22** in FIGURES 1 and 2 is positioned with respect to doffing roll **14** and doffing cylinder **10** therein.

The fibrous web is then lightly pressed against the doffing cylinder **100** by the flexible nip blade **142** substantially only at the point of tangency and is then carried forwardly on the peripheral surface of the doffing cylinder **100** and removed therefrom subsequently by doffing roll **104** and associated nip blade **112**, or by any other desired doffing means, such as a doffing comb, for example. The fibrous web may then be forwarded for further processing or handling, as desired or required.

An adjustable nip blade assembly **144** is employed to properly position the nip blade **142** and comprises a rotatable and adjustable base **146** provided with an adjustable screw mounting **148**. The nip blade **142** is secured to the base **146** by any desired securing means.

In FIGURE 6 there is illustrated another embodiment of the present invention. A conventional doffing cylinder **160** covered with conventional clothing either fillet or metallic is provided and rotates in the direction of the arrow shown. Mounted on a frame **161** immediately adjacent the doffing cylinder is the doffing roll **162**. The doffing roll is mounted for rotation on the shaft **163** mounted in the frame and rotates in the direction of the arrow shown. The doffing roll has flutes **164** on its outer surface. There are approximately 16 flutes per circumferential inch of the roll and the flutes have a depth of about 0.035 inch. The flutes run in the longitudinal direction of the roll on a slight spiral of about $1\frac{5}{16}$ inches.

A flexible nip blade **165** is adjustably positioned on pivot **166** mounted from the frame **161** and is capable of being placed in pressing tangential contact with the doffing roll. The nip blade is bent slightly at A to insure a line contact on the doffing roll and removes the blade from interfering with the fibrous web as it leaves the doffing roll. Both sides of the nip blade **165** extend tangentially away from the surface of the doffing roll **162** with the free end **167** extending forwardly up into the V-shaped throat formed by the doffing cylinder and doff-

ing roll. The other end or base portion **168** extends tangentially away to the bend A. The base portion with the bend provides an exit opening of rapidly increasing size.

The fibrous web F is carried forwardly on the surface of the doffing cylinder and is directed around the extending free end of the nip blade. The web is pressed by the nip blade against the doffing roll for a very short length located substantially at the point of tangency. Then due to the rapidly increasing exit opening, the pressure on the web is released and the web drops from the fluted roll to be carried forwardly by any suitable advancing means.

Mounted adjacent the doffing roll in light surface contact is a cleaner roll **170**. The cleaner roll is mounted for rotation on shaft **171** mounted in the frame. The cleaner roll rotates in the direction of the arrow shown. The cleaner roll is preferably felt-covered and is used to remove any fibers which may become wrapped about the doffing roll.

Mounted behind the cleaner roll in light contact with the doffing roll is the brush **174**. The brush is mounted on a stationary shaft **175** mounted in the frame. The brush is used to keep the doffing roll clean, that is, free of loose fibers.

The invention will be further illustrated in greater detail by the following specific examples. It should be understood, however, that although these examples may describe in particular detail some of the more specific features of the invention, they are given primarily for purposes of illustration and the invention in its broader aspects is not to be construed as limited thereto.

Example I

The starting fibrous material, as positioned on the doffing cylinder of a textile card, is a 45" wide card web of viscose rayon staple fibers, weighing about 75 grains per square yard and containing fibers having a substantially uniform average length of about 1 9/16" and a denier of about 1½. The peripheral surface linear velocity of the doffing cylinder is about 20 yards per minute. The doffing cylinder is covered with metallic card clothing having 11 points per inch with 26 wraps per inch of cylinder.

The fibrous web is transferred to and guided around the free end of a flexible nip blade, such as illustrated in FIGURE 1, and then passes between the nip blade and the doffing roll which also has a peripheral surface linear speed of about 20 yards per minute. A helical spring positioned on the nip blade pivot exerts a slight pressure against the nip blade whereby the fibrous web is pressed against the surface of the doffing roll only at the point of tangency.

The doffing roll is steel and is relatively smooth-faced, as compared to the doffing cylinder which, as noted above, is covered with metallic card clothing. The doffing roll has a slightly roughened or textured surface created by sand-blasting. The finish is referred to as a "satin finish."

Immediately after such pressing action by the nip blade which takes place substantially only at the point of tangency, the fibrous web exits into a rapidly diverging opening and is relatively free to be drawn forwardly by a pair of rotatable nip rolls.

Examination of the fibrous web after it has passed through the rotatable nip rolls indicates that the predominant fibrous orientation has not been materially changed.

Examples II and III

The procedures set forth in Example I are carried out substantially as set forth therein with the exception that the speeds of the doffing cylinder and the doffing roll are both increased to (a) 30 yards per minutes and (b) 40 yards per minute. The fiber transfer takes place with continued high efficiency and without disturbing the predominant fibrous orientation of the web to any substantial degree.

Example IV

The procedures set forth in Example I are carried out substantially as set forth therein with the exception that cotton fibers having an average staple length of about 1 3/16 are used. The results are comparable to those set forth in Example I.

Examples V, VI and VII

The procedures set forth in Example I are carried out substantially as set forth therein with the exception that the surface of the doffing roll is slightly roughened or textured by means of (a) fine knurling, (b) fine engraved lines, and (c) relatively fine etching. The results are comparable to those set forth in Example I.

Although the present invention has been described with particular reference to a doffing cylinder and a doffing roll which rotate with susbtantially the same peripheral surface linear speed, it is to be appreciated that the peripheral surface linear speed of the doffing roll need not necessarily be the same as that of the doffing cylinder. For example, if the peripheral surface linear speed of the doffing roll is increased, so that it is greater than that of the doffing cylinder, drafting of the fibers results whereby their parallelization and alignment is improved in the long direction. In order to obtain such drafting of the fibers, the ratio of the peripheral surface linear speed of the doffing roll to the peripheral surface linear speed of the doffing cylinder should be greater than 1:1 and may be up to about 10:1, with preferred ranges being from about 1¼:1 up to about 2½:1.

Example VIII

The procedures set forth in Example I are carried out substantially as set forth therein with the exception that the ratio of the peripheral linear speed of the nip rolls to the peripheral linear speed of the doffing roll is 1½:1. The results are comparable to those set forth in Example I except that drafting of the fibers results in improved parallelization and alignment thereof.

Example IX

The procedures of Example I are carried out substantially as set forth therein except that a nip blade assembly as illustrated in FIGURE 5 is used to transfer the fibrous web from the main cylinder to the doffing cylinder prior to its removal therefrom by the doffing roll. The problems of a vanishing web are eliminated and the operation is successful.

Example X

The procedures of Example I are carried out substantially as set forth therein except that the peripheral surface linear velocity of the doffing roll is decreased to (a) 15; (b) 10; and (c) 7 yards per minute. The device is operative and the results are comparable except that a heavier, more compacted and less oriented web is obtained.

In the drawings, no driving means such as motors, pulleys, belts, gears, sprockets, and the like have been illustrated for the doffing cylinder, the doffing roll, or the pair of nip rolls. It must be understood that this has been done because such driving means are conventional and well known in the art. Additionally, their omission from the drawings makes the individual figures thereof less complicated and easier to read and to understand.

Although several specific examples of the inventive concept have been described, the same should not be construed as limited thereby nor to the specific features mentioned therein but to include various other equivalent features as set forth in the claims appended hereto. It is understood that any suitable changes, modifications and variations may be made without departing from the spirit and scope of the invention.

What is claimed is:

1. Apparatus for removing a fibrous web from a rotatable surface carrying the same which comprises:

a rotatable surface capable of carrying a fibrous web;

a rotatable roll capable of carrying a fibrous web and located immediately adjacent said first-mentioned rotatable surface whereby a V-shaped throat is formed between the rotatable surface and the rotatable roll; and

a stationary flexible nip blade in tangential contact with said rotatable roll and immediately extending away from said rotatable roll on both sides of the point of tangency therewith, one free end of said nip blade extending into the throat formed by the rotatable surface and the rotatable roll, whereby the fibrous web carried by the first rotatable surface is removed therefrom, carried around the free end of said nip blade into contact with the rotatable roll to be pressed thereagainst by the nip blade at the point of tangency and carried forwardly by the rotatable roll.

2. Apparatus defined in claim 1 wherein the stationary nip blade is arcuate and convex with respect to the rotatable roll.

3. Apparatus defined in claim 1 wherein the rotatable roll has an engraved finish.

4. Apparatus defined in claim 1 wherein the rotatable roll is fluted.

5. Apparatus for removing a fibrous web from a rotatable surface carrying the same which comprises:

a rotatable surface capable of carrying a fibrous web;

a rotatable roll having flutes disposed longitudinally along the surface of the roll and on a slight spiral capable of carrying a fibrous web and said rotatable roll located immediately adjacent said first-mentioned rotatable surface whereby a V-shaped throat is formed between the rotatable surface and the rotatable roll; and

a stationary flexible nip blade in tangential contact with said rotatable roll and immediately extending away from said rotatable roll on both sides of the point of tangency therewith, one free end of said nip blade extending into the throat formed by the rotatable surface and the rotatable roll, whereby the fibrous web carried by the rotatable surface is removed therefrom, carried around the free end of said nip blade into contact with the rotatable roll to be pressed thereagainst by the nip blade at the point of tangency and carried forwardly by the rotatable roll.

6. Apparatus for removing a fibrous web from a rotatable surface carrying the same which comprises:

a rotatable surface capable of carrying a fibrous web;

a rotatable roll having from about 10 to 16 flutes per circumferential inch disposed longitudinally along the surface of the roll and at a slight spiral to the longitudinal axis of said roll capable of carrying a fibrous web and said rotatable roll located immediately adjacent said first-mentioned rotatable surface whereby a V-shaped throat is formed between the rotatable surface and the rotatable roll; and

a stationary flexible nip blade in tangential contact with said rotatable roll and immediately extending away from said rotatable roll on both sides of the point of tangency therewith, one free end of said nip blade extending into the throat formed by the rotatable surface and the rotatable roll, whereby the fibrous web carried by the rotatable surface is removed therefrom, carried around the free end of said nip blade into contact with the rotatable roll to be pressed thereagainst by the nip blade at the point of tangency and carried forwardly by the rotatable roll.

References Cited by the Examiner

UNITED STATES PATENTS

1,862,542	6/1932	Laurency	19—106

FOREIGN PATENTS

Ad. 44,595	12/1934	France.
3,444	of 1862	Great Britain.

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