

Feb. 22, 1966

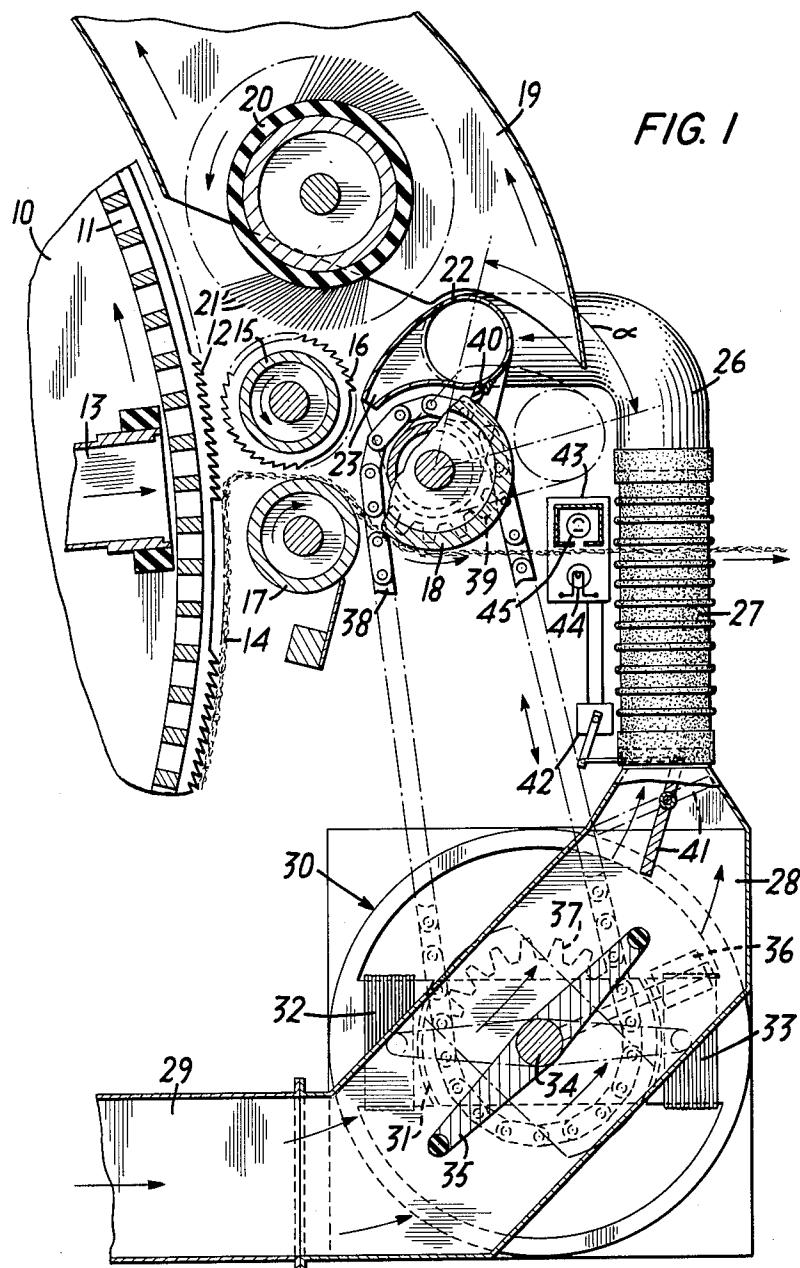
F. REITERER

3,235,911

APPARATUS FOR DETACHING THE WEB OF FIBERS
FROM A CARDING MACHINE

Filed March 13, 1963

3 Sheets-Sheet 1



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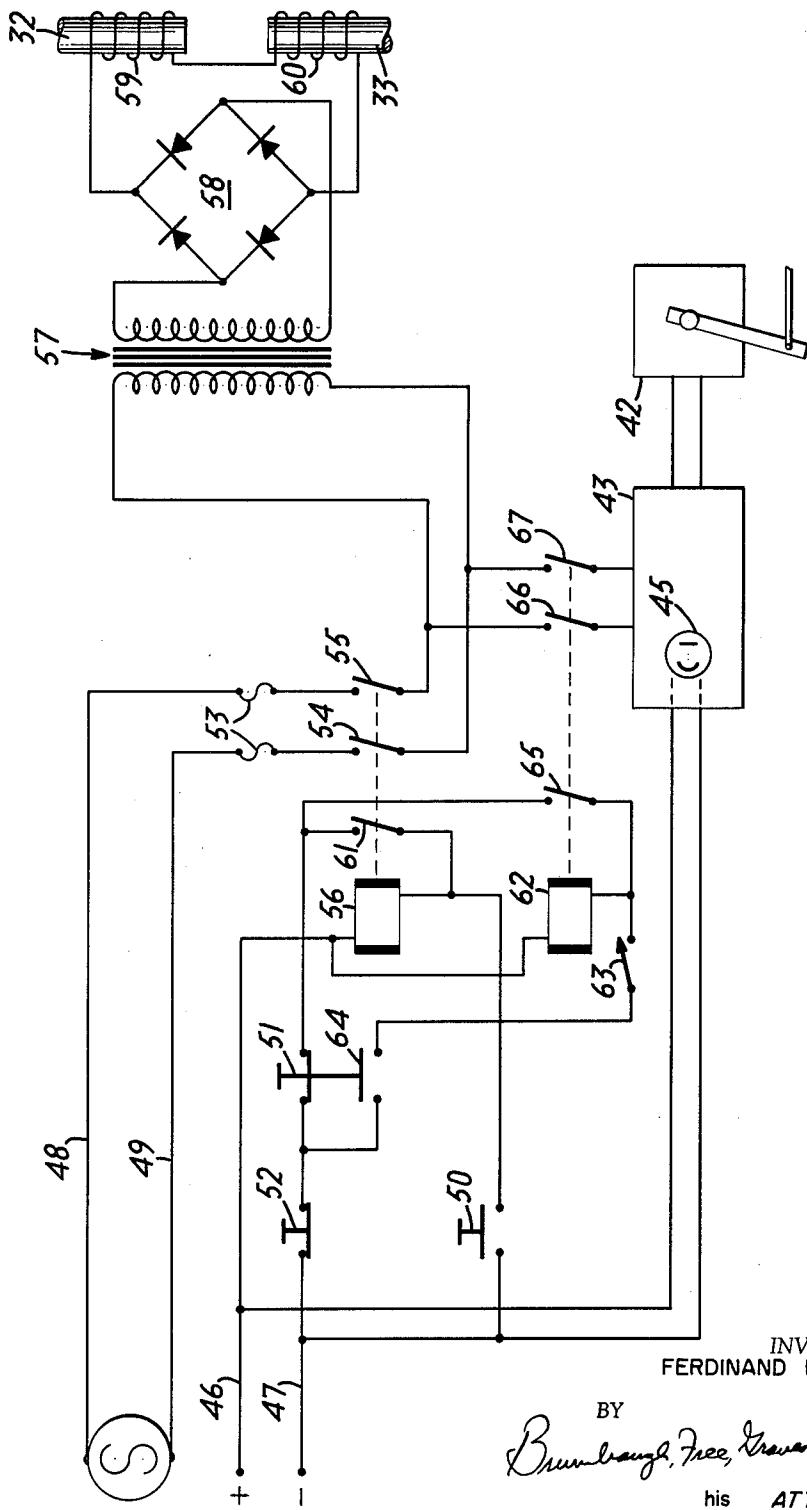
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3 Sheets-Sheet 2



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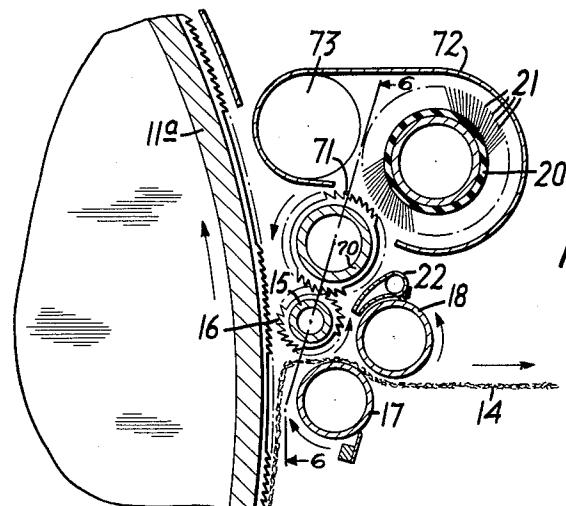


FIG. 5

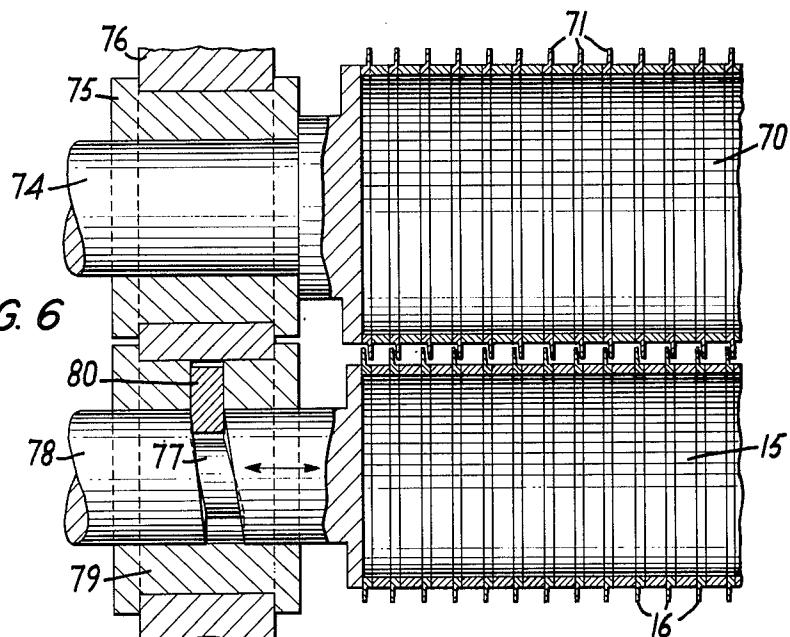


FIG. 6

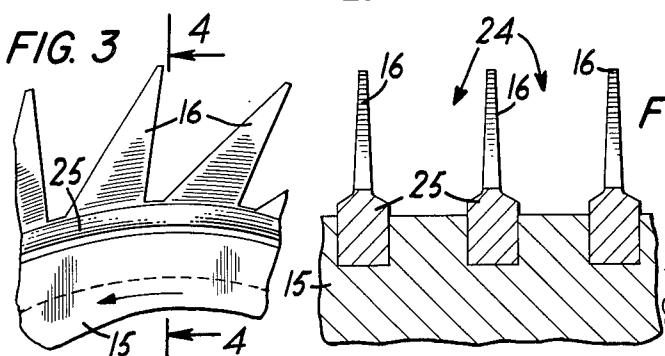


FIG. 4

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APPARATUS FOR DETACHING THE WEB OF FIBERS FROM A CARDING MACHINE

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Claims priority, application France, May 28, 1962, 898,977, 899,041; Aug. 7, 1962, 906,289

11 Claims. (Cl. 19—106)

This application is a continuation-in-part of my copending application Serial No. 141,132, filed September 27, 1961, for "Pneumatic Web Removal in Carding Machines," now Patent No. 3,145,428.

This invention relates to devices for removing a web of fibers from a carding machine and, more particularly, to a new and improved web detaching arrangement for carding machines and the like which is especially adapted to assure complete removal of the fibers from the carding machine at high speed and without damage to the fiber web.

In order to avoid the disadvantages of conventional web detaching arrangements, such as vibrating combs which tend to disrupt the alignment of the fibers in a web and which limit the speed of operation of the machine, my above-mentioned copending application describes a detaching arrangement utilizing a plurality of detaching rollers arranged to withdraw the fiber web from the doffer of a carding machine. The arrangement described in that application includes a device for directing a blast of air along the surface of the doffer in the direction opposite to the rotation thereof to assist in detaching the web, along with a hollow perforated roller through which air passes and one or more conveying rollers to direct the web away from the doffer. While that arrangement represents a considerable improvement over the vibrating comb type detachers, nonetheless, it leaves room for further refinement.

Accordingly, it is an object of the present invention to provide a new and improved arrangement for removing a web of fibers from a carding machine.

Another object of the invention is to provide a web detaching arrangement capable of detaching a web of fibers at high speed without disrupting the alignment of the fibers in the web.

These and other objects of the invention are attained by providing, in a carding machine having a cylinder covered with a toothed clothing, a first detaching roller rotating in the same direction as the cylinder and having a plurality of teeth which move closely adjacent to the cylinder clothing to remove the web of fibers therefrom, a second detaching roller rotating in the opposite direction and disposed adjacent to the first roller to receive the web therefrom, along with a nozzle for directing air adjacent to the teeth of the first detaching roller in a direction opposite to the direction of motion thereof and toward the surface of the second detaching roller to direct the web of fibers against the surface of the second roller. A third roller may also be provided to hold the web against the surface of the second roller.

Preferably, the teeth on the primary detaching roller are slanted in the direction opposite to their direction of motion to facilitate removal of the web therefrom by the current of air. In addition, to improve the efficiency of the web removal by the air current, the teeth on the first roller are preferably spaced from each other in the lateral direction, thereby allowing the air to disengage fibers which are held at the base of the teeth. Moreover, in one embodiment, these teeth are arranged in adjacent circles about the first roller and a further roller is provided with similarly mounted teeth which

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move in the spaces between the teeth of the first roller so as to clean that roller. If desired, either the first roller or the cleaning roller in this embodiment may also be oscillated in the axial direction to assure complete cleaning of the channels between the teeth.

As a further feature, the velocity of the air current may be regulated in accordance with the density of the fiber web so that higher air velocities, which are more effective in detaching heavy webs, will not be applied to lighter and more fragile webs. Also, if desired, the air supply and the location of the outlet nozzle for the current of air may be controlled so that when operation of the machine is initiated, a strong current of air is supplied but, after the starting period has been completed, the air may be shut off and the air outlet nozzle retracted.

Further objects and advantages of the invention will be apparent from a reading of the following description in conjunction with the accompanying drawings, in which:

FIG. 1 is a view in cross section of a representative embodiment of the invention;

FIG. 2 is an electrical circuit diagram showing a portion of the control system for the machine of FIG. 1;

FIG. 3 is an enlarged fragmentary view illustrating the teeth on the primary detaching roller in the machine of FIG. 1;

FIG. 4 is a view in longitudinal section taken along the line 4—4 of FIG. 3 and looking in the direction of the arrows;

FIG. 5 is a cross-sectional view of a further embodiment of the invention wherein a cleaning roller is provided for the primary detaching roller; and

FIG. 6 is an enlarged view in longitudinal section taken along the line 6—6 of FIG. 5.

In the embodiment of the invention shown in FIGS. 1—4, the detaching arrangement is mounted adjacent to the periphery of a doffer cylinder 10 having a perforated peripheral wall 11 upon which a toothed clothing 12 is mounted, along with an internal air duct 13 arranged to direct air through the wall 11 toward the detaching arrangement to assist in removing a web of fibers 14 from the clothing 12. It will be understood, however, that the detaching arrangement of the present invention can also be used with conventional doffers having an imperforate peripheral wall and no internal air duct, as in the embodiment shown in FIG. 5.

The detaching arrangement illustrated in FIG. 1 comprises a primary detaching roller 15 rotating in the same direction as the doffer 11 and having a plurality of teeth 16 mounted on its periphery, the teeth being located close enough to the clothing 12 of the doffer to draw the web of fibers 14 away from the clothing, either by direct contact of the teeth with the web or by motion of the current of air carried by the teeth 16 as the roller 15 rotates. A second, web guiding, roller 17 is mounted adjacent to the roller 15 and rotates in the opposite direction so as to receive the web 14 on its outer surface, which is preferably smooth, and a third, web guiding, roller 18 rotating in the same direction as the first roller 15 and the doffer is located close to the second roller and beyond the roller 15 so as to hold the web of fibers 14 against the surface of the second roller over a substantial portion of its area. Preferably, the separation between the rollers 15, 17 and 18 is great enough so that the web is not compressed as it passes between them and, if desired, the spacing of the roller 18 from the roller 15 may be made adjustable so as to vary the area of contact of the web 14 with the surface of the roller 17.

Disposed above the three detaching and web guiding rollers is a suction hood 19 into which dust and short

fibers released by detachment of the web are drawn and, in order to facilitate dust removal, a dust collecting cylinder 20 of the type described in my copending application for "Dust Removing System for Carding Machines," Serial No. 179,118, filed March 12, 1962, is mounted at the opening of the hood. As described in that application, the cylinder 20 is covered with a plurality of fine needles 21 which catch the dust and carry it into the hood where it is removed by centrifugal force and by the current of air flowing into the hood.

In order to make certain that the web 14 does not adhere to the teeth 16 of the primary detaching roller 15, a blowing nozzle 22 having an air outlet opening 23 extending parallel to the axis of the rollers 15, 17 and 18 is mounted adjacent to the roller 15 so as to direct a current of air tangent to its surface and toward the surface of the second web guiding roller 17. To facilitate passage of the air current between the teeth 16 and thereby improve the effectiveness of the air current in removing the web 14 from the teeth, the teeth are spaced in the lateral direction, as shown in FIG. 4, rather than being closely adjacent as in the usual toothed clothing, thereby providing channels 24 for the air between adjacent rows of teeth. To accomplish this, the teeth 16 may be formed on a strip 25 which is wound spirally around the roller 15 with adjacent turns in spaced relation or separate circular portions of the strip 25 may be mounted in spaced relation on the roller. In either case, the spacing between adjacent rows of teeth should be at least as great as the height of the teeth above the strip and, in a particular case, a spacing of two millimeters between adjacent rows of teeth was found to be satisfactory.

In addition, as shown in FIG. 3, the teeth 16 are preferably sloped in the direction opposite to the direction of motion of the roller 15 to make it easier for the fibers of the web to slip off the teeth under the influence of the current of air from the nozzle 22.

Air is supplied to the nozzle 22 through a conduit 26 provided with a flexible section 27 and connected through a damper housing 28 to an air pressure duct 29. As will be apparent from the description of the control circuit of FIG. 2, which follows, the air supply may be controlled in either of two ways. First, in certain cases, it is desirable to provide a strong current of air upon initiating operation of the carding machine in order to make certain that the detached web of fibers passes between the rollers 17 and 18 but to terminate the flow of air and remove the nozzle from its position between the rollers 15 and 18 after the machine has been started. This mode of operation is accomplished by an electromagnet 30 at one side of the damper housing 28 having a pivotally mounted armature 31 movable between two pole pieces 32 and 33. A shaft 34 attached to this armature carries a damper 35 and an eccentric weight 36 arranged so that the damper 35 is in the open position, shown in solid lines in FIG. 1, when the armature 31 is aligned with the pole pieces 32 and 33 by energization of the electromagnet. When the electromagnet is deenergized, the weight 36 moves the damper and the armature to the positions shown in dashed outline so that the passageway through the damper housing is closed.

In addition, the shaft 34 carries a gear 37 which is linked by a chain 38 to a similar gear 39 mounted at one end of the roller 18 so as to be movable with respect to the roller. Affixed to the gear 39 is a support plate 40 on which one end of the nozzle 22 is mounted, the other end (not visible in the drawings) being similarly supported for pivotal motion about the axis of the roller 18. With the damper 35 in the open position shown in solid lines in FIG. 1 permitting air to pass to the nozzle, the gear 39 is turned so that the nozzle is in the position shown in solid lines in FIG. 1 directing the air tangent to the roller 15. When the damper 35 is turned to the closed position, shutting off the air supply, the chain 38

rotates the gear 39 so as to move the nozzle to the retracted position shown in dashed outline in FIG. 1. As a result of this retraction, the nozzle will not interfere with the flow of air into the hood 19 during normal operation of the machine.

In other instances, it is desirable to maintain the flow of air from the nozzle 22 past the roller 15 at reduced velocity during normal operation of the machine, the velocity being dependent upon the density or thickness of the fiber web. To this end, another damper 41 is mounted in the housing 28 and the position of this damper is regulated by a conventional control device 42, in accordance with a control signal received from a web density detecting unit 43. The typical density detecting unit shown in FIG. 1, by way of example, consists of a light source 44 and a photoelectric cell 45 disposed on opposite sides of the web 14 and arranged to provide an electric control signal to the device 42, directing it to move the damper 41 toward the closed position in response to decreasing web density or thickness and toward the open position in response to increasing web density.

A typical electrical control circuit for the air control system is shown in FIG. 2 wherein a low voltage direct current source is connected to two conductors 46 and 47 and a source of alternating current at line voltage is connected to two conductors 48 and 49. In order to initiate the operation of the machine, a push button switch 50 is provided in the usual manner and two further push button switches 51 and 52, which are normally closed, 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125 130 135 140 145 150 155 160 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315 320 325 330 335 340 345 350 355 360 365 370 375 380 385 390 395 400 405 410 415 420 425 430 435 440 445 450 455 460 465 470 475 480 485 490 495 500 505 510 515 520 525 530 535 540 545 550 555 560 565 570 575 580 585 590 595 600 605 610 615 620 625 630 635 640 645 650 655 660 665 670 675 680 685 690 695 700 705 710 715 720 725 730 735 740 745 750 755 760 765 770 775 780 785 790 795 800 805 810 815 820 825 830 835 840 845 850 855 860 865 870 875 880 885 890 895 900 905 910 915 920 925 930 935 940 945 950 955 960 965 970 975 980 985 990 995 1000 1005 1010 1015 1020 1025 1030 1035 1040 1045 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4050 4055 4060 4065 4070 4075 4080 4085 4090 4095 4100 4105 4110 4115 4120 4125 4130 4135 4140 4145 4150 4155 4160 4165 4170 4175 4180 4185 4190 4195 4200 4205 4210 4215 4220 4225 4230 4235 4240 4245 4250 4255 4260 4265 4270 4275 4280 4285 4290 4295 4300 4305 4310 4315 4320 4325 4330 4335 4340 4345 4350 4355 4360 4365 4370 4375 4380 4385 4390 4395 4400 4405 4410 4415 4420 4425 4430 4435 4440 4445 4450 4455 4460 4465 4470 4475 4480 4485 4490 4495 4500 4505 4510 4515 4520 4525 4530 4535 4540 4545 4550 4555 4560 4565 4570 4575 4580 4585 4590 4595 4600 4605 4610 4615 4620 4625 4630 4635 4640 4645 4650 4655 4660 4665 4670 4675 4680 4685 4690 4695 4700 4705 4710 4715 4720 4725 4730 4735 4740 4745 4750 4755 4760 4765 4770 4775 4780 4785 4790 4795 4800 4805 4810 4815 4820 4825 4830 4835 4840 4845 4850 4855 4860 4865 4870 4875 4880 4885 4890 4895 4900 4905 4910 4915 4920 4925 4930 4935 4940 4945 4950 4955 4960 4965 4970 4975 4980 4985 4990 4995 5000 5005 5010 5015 5020 5025 5030 5035 5040 5045 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10040 10045 10050 10055 10060 10065 10070 10075 10080 10085 10090 10095 10100 10105 10110 10115

of the electromagnet so that the weight 36 rotates the shaft 34 to close the damper 35 and pivot the nozzle 22 the retracted position shown in dotted lines.

If continuous application of a controlled air current is desired, the switch 63 is closed before operation is initiated or before the button 51 is depressed. This switch has no effect on the starting of the machine since the switch 64 is normally opened but, when the switch 51 is depressed, this closes the switch 64 energizing the relay 62 and, at the same time, maintaining the relay 56 energized through the switch 64 and the contacts 65 and 61 and, when the button 51 is released, the holding circuit is maintained through that switch. Closing of the contacts 66 and 67 supplies power to the control unit 42 through the detecting device 43 so that the position of the damper is controlled in accordance with the illumination of the photocell 45, increasing the air current for dense or thick webs and decreasing it for light webs. Upon depression of the stop button 52, both relays are released, closing the damper 35 and retracting the nozzle 22 in the manner described above.

A modification of the detaching arrangement of the present invention is shown in FIGS. 5 and 6. In this embodiment, the detaching and web guiding rollers 15, 17 and 18 are the same as described above with reference to FIG. 1 and the doffer is substantially the same except that the outer wall 11a thereof is imperforate. Moreover, the air nozzle 22 of this embodiment need not be retractable because it does not interfere with the flow of air, the collecting hood being arranged in a different manner from that of FIG. 1. In this arrangement, the teeth 16 on the roller 15 are mounted in a series of axially spaced circles around the periphery of the roller, as indicated in FIG. 6, and another roller 70 having similarly arranged rings of teeth 71 is mounted closely adjacent to the roller 15 so that the teeth 71 pass between the rings of teeth 16 and very close to the surface of the roller 15. The roller 71 is rotated in the same direction as the roller 15 but the teeth 71 thereon are slanted forwardly in the direction of rotation so as to be most effective in cleaning the channels between the circles of teeth 16 on the roller 15, and the rotary speed of the cleaning roller 70 is preferably about 10 to 20 percent greater than that of the detaching roller 15.

A suction hood 72, connected to a suction duct 73 and having a dust collecting cylinder 20 of the type described in connection with the FIG. 1 embodiment, is mounted so that the opening of the hood and the periphery of the dust collecting cylinder closely are adjacent to the cleaning roller 70 on the opposite side thereof from the roller 15. Consequently, the dust and short fibers cleaned from the roller 15 by the roller 70 are drawn from the surface of that roller into the hood.

Furthermore, in order to clean the channels between the rings of teeth 16 more completely, one of the rollers 15 and 70 may be oscillated with respect to the other. In the embodiment shown in FIG. 6, this is accomplished by mounting the shaft 74 for the roller 70 in fixed axial position in a bearing 75 provided in a support plate 76 and forming a groove 77 around the shaft 78 for the roller 15 at an angle to a plane perpendicular to that shaft. To oscillate the shaft 78, the bearing 79 for this shaft, which is fixed in the plate 76, carries a pin 80 which projects into the groove 77. Consequently, during each rotation of the shaft, the roller 15 will be displaced slightly in the axial direction and then restored to its original position, permitting the teeth 71 to sweep the entire width of the channels between the teeth 16. With this arrangement, the lateral spacing between the rings of teeth on both rollers may be increased somewhat and, in one case, a five millimeter spacing was found to be satisfactory.

Although the invention has been described herein with reference to specific embodiments, many modifications and variations therein will readily occur to those skilled

in the art. Accordingly, all such variations and modifications are included within the intended scope of the invention as described by the following claims.

I claim:

1. Apparatus for detaching a web of fibers from the clothing of a cylinder in a fiber processing machine comprising a primary detaching roller rotating in the same direction as the cylinder and having a plurality of teeth on its outer surface movable adjacent to the clothing to detach a web of fibers therefrom, a second web guiding roller rotating in the opposite direction and having a surface adjacent to the primary roller so as to receive the web of fibers from the primary roller, nozzle means arranged to direct a current of air tangent to the surface of the primary detaching roller in a direction opposite to the direction of rotation thereof and toward the surface of the second web guiding roller, and means for detecting the density of the web of fibers and air current control means responsive to the detecting means for controlling the strength of the current of air from the nozzle means in accordance with the web density.

2. Apparatus according to claim 1 wherein the detecting means comprises light source means and photoelectric means disposed on opposite sides of the web of fibers.

3. Apparatus for detaching a web of fibers from the clothing of a cylinder in a fiber processing machine comprising a primary detaching roller rotating in the same direction as the cylinder and having a plurality of teeth on its outer surface movable adjacent to the clothing to detach a web of fibers therefrom, a second web guiding roller rotating in the opposite direction and having a surface adjacent to the primary roller so as to receive the web of fibers from the primary roller, nozzle means arranged to direct a current of air tangent to the surface of the primary detaching roller in a direction opposite to the direction of rotation thereof and toward the surface of the second web guiding roller, and means for retracting the nozzle means away from the primary detaching roller, means for shutting off the current of air through the nozzle means, and connecting means providing simultaneous operation of the retracting means and the means for shutting off the air current.

4. Apparatus for detaching a web of fibers from the clothing of a cylinder in a fiber processing machine comprising a primary detaching roller rotating in the same direction as the cylinder and having a plurality of teeth on its outer surface movable adjacent to the clothing to detach a web of fibers therefrom, a second web guiding roller rotating in the opposite direction and having a surface adjacent to the primary roller so as to receive the web of fibers from the primary roller, nozzle means arranged to direct a current of air tangent to the surface of the primary detaching roller in a direction opposite to the direction of rotation thereof and toward the surface of the second web guiding roller, and control means for controlling the supply of air to the nozzle means responsive to starting of the fiber processing machine to supply maximum air current to the nozzle means and to termination of the starting operation to reduce the air current to the nozzle means.

5. Apparatus according to claim 4 wherein the control means includes means for regulating the current of air according to the density of the web after termination of the starting operation.

6. Apparatus according to claim 4 wherein the control means includes means for shutting off the current of air and retracting the nozzle means after termination of the starting operation.

7. Apparatus for detaching a web of fibers from the clothing of a cylinder in a fiber processing machine comprising a primary detaching roller rotating in the same direction as the cylinder and having a plurality of teeth on its outer surface movable adjacent to the clothing to

detach a web of fibers therefrom, a second detaching roller rotating in the opposite direction and having a surface adjacent to the primary roller so as to receive the web of fibers from the primary roller, and means for directing the web of fibers away from the teeth of the primary roller and toward the surface of the second roller, wherein the teeth on the primary detaching roller are disposed in rows which are spaced in the axial direction of the roller so as to provide channels between adjacent rows of teeth, and wherein the spacing between adjacent rows of teeth is at least as great as the height of the teeth.

8. Apparatus for detaching a web of fibers from the clothing of a cylinder in a fiber processing machine comprising a primary detaching roller rotating in the same direction as the cylinder and having a plurality of teeth on its outer surface movable adjacent to the clothing to detach a web of fibers therefrom, a second detaching roller rotating in the opposite direction and having a surface adjacent to the primary roller so as to receive the web of fibers from the primary roller, and means for directing the web of fibers away from the teeth of the primary roller and toward the surface of the second roller, wherein the teeth on the primary detaching roller are disposed in rows which are spaced in the axial direction of the roller so as to provide channels between adjacent rows of teeth, and wherein the rows of teeth are circularly disposed about the primary roller and including a cleaning roller rotating adjacent to the primary roller

and having similarly spaced circular rows of teeth arranged to pass adjacent to the surface of the primary roller between the rows of teeth thereon.

5 9. Apparatus according to claim 8 including means for providing relative oscillation between the primary detaching roller and the cleaning roller in the axial direction with a displacement less than the spacing between the rows of teeth.

10 10. Apparatus according to claim 8 including dust collecting hood means having an opening disposed adjacent to the cleaning roller to collect dust therefrom.

11. Apparatus according to claim 8 wherein the cleaning roller rotates in the same direction as the primary detaching roller and the teeth on the cleaning roller are 15 slanted forwardly in the direction of rotation thereof.

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