Aug. 9, 1960 D. D. DAY 2,948,022

COTTON CLEANING APPARATUS

Filed Feb. 14, 1958 2 Sheets-Sheet 1

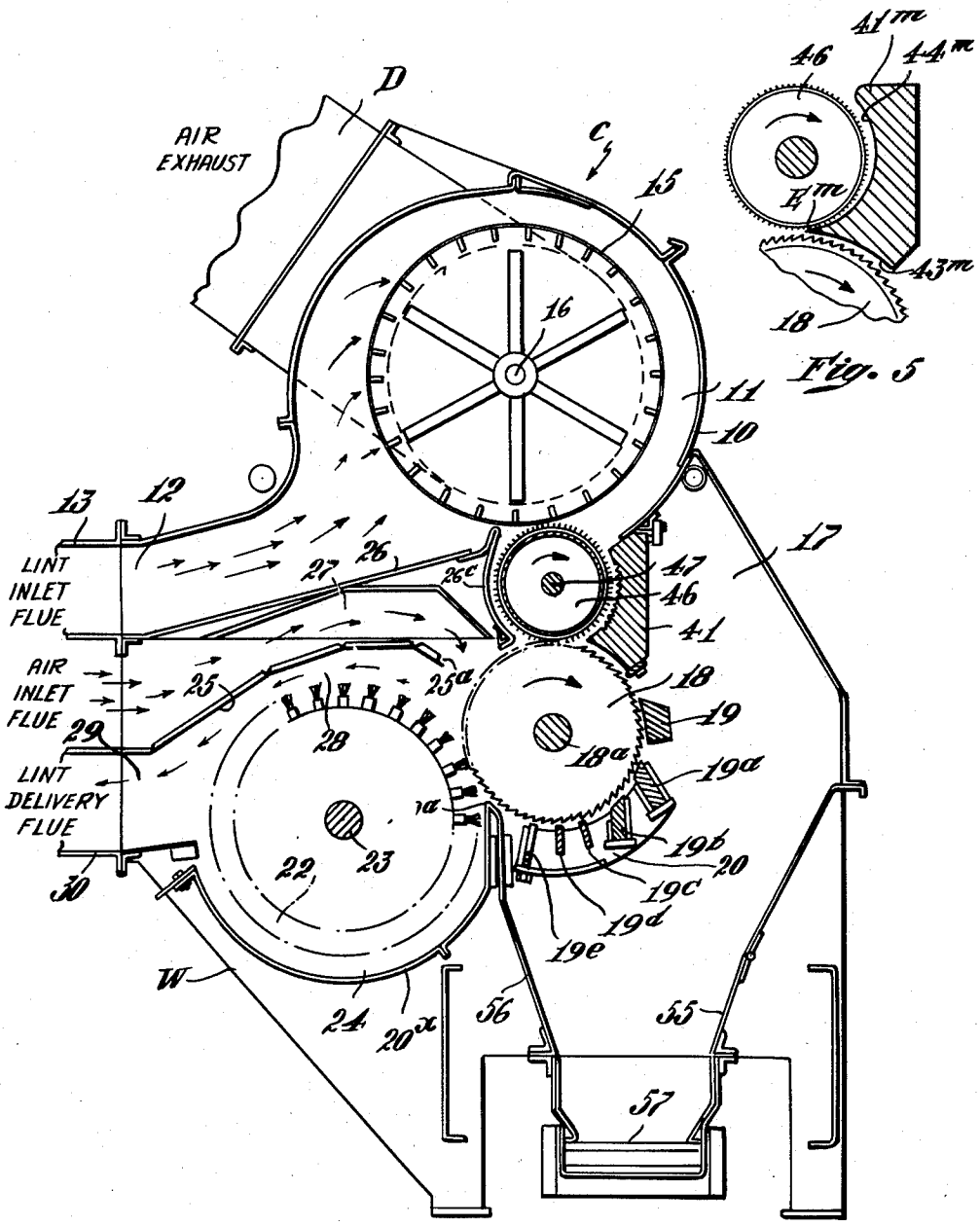


Fig. 1

Fig. 5

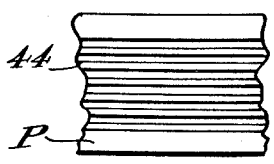


Fig. 4

Inventor
Dewey D. Day
by Roberts Cushman & Comer
Attys

Aug. 9, 1960 D. D. DAY 2,948,022

COTTON CLEANING APPARATUS

Filed Feb. 14, 1958 2 Sheets-Sheet 2

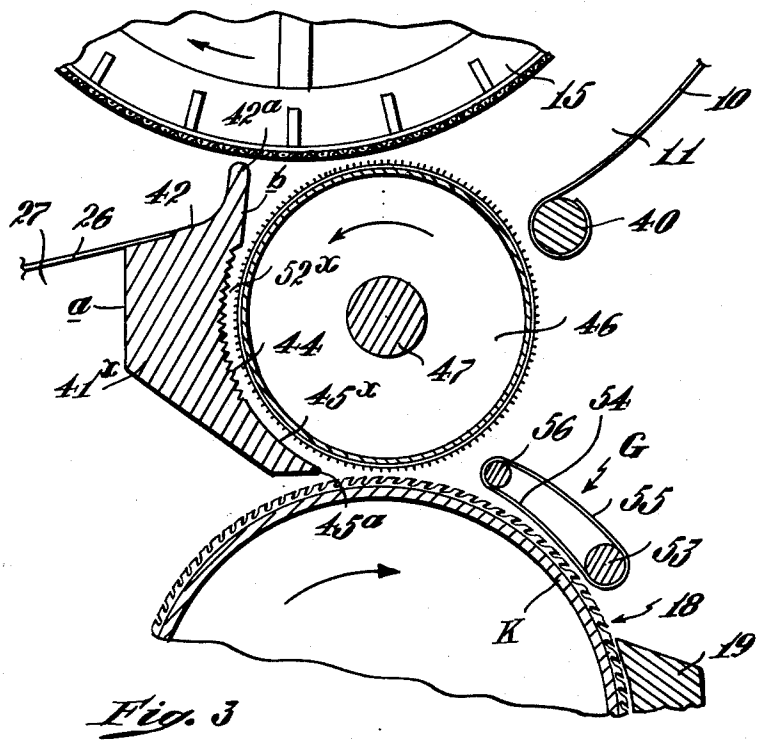


Fig. 3

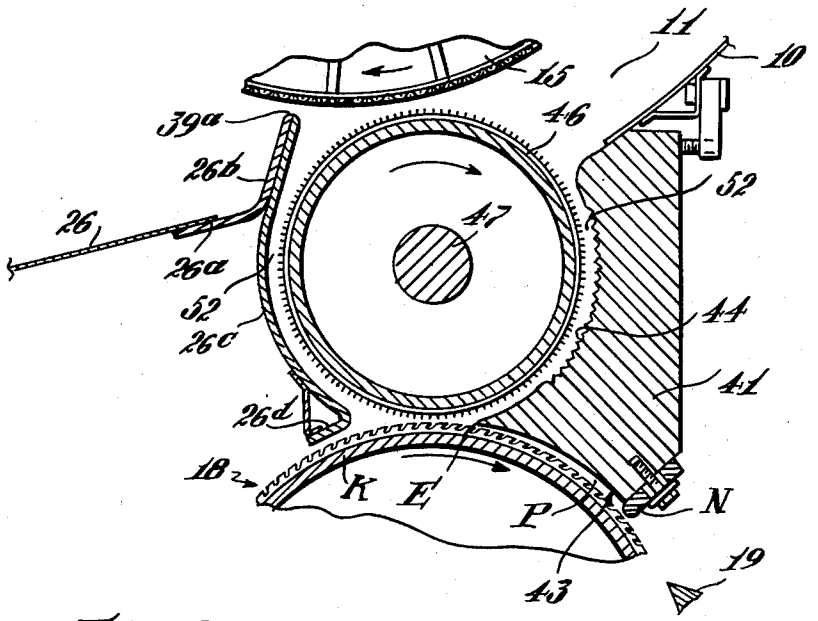


Fig. 2

Inventor
Dewey D. Day
by Roberts Cushman & Grover
Attorneys

United States Patent Office 2,948,022 Patented Aug. 9, 1960

2,948,022

COTTON CLEANING APPARATUS

Dewey D. Day, Dallas, Tex., assignor to The Murray Company of Texas, Inc., Dallas, Tex., a corporation of Delaware

Filed Feb. 14, 1958, Ser. No. 715,412

19 Claims. (Cl. 19—72)

This invention relates to cotton cleaning apparatus useful, for example, in cleaning lint cotton preparatory to its delivery to a baling press. As a particular instance of its utility, it may be employed as a means for removing a portion, at least, of the dirt and trash from cotton which was mechanically picked, and which contains more foreign material than hand-picked cotton, the apparatus being so installed as to receive the airborne lint from an individual gin and to deliver the clean lint to a battery condenser which in turn delivers the lint to a baling press. The press invention is in the nature of an improvement upon the cleaning apparatus disclosed in the copending United States application, Serial No. 481,125, filed by Dewey D. Day on January 11, 1955, now U.S. Patent Number 2,830,328. Like the device of the above application, the cleaner of the present invention is of the kind which is so designed that substantially all of the lint conveying air is separated from the lint before the latter is delivered to the cleaning instrumentalities, and which comprises means for subjecting the lint to a combing or carding action by means including a toothed saw cylinder, a toothed rotary feeding roll, and one or more grid or stripper bars operative to separate dirt and trash from the lint fibers as the latter are whipped past the bar while adhering to the teeth of the rapidly turning saw cylinder.

While in the above application it is suggested that the surface speed of the condenser drum be of the order of 120 feet per minute, it has been found that in the operation of the present apparatus a condenser drum surface speed of approximately 76 feet per minute insures a better distribution of the lint upon the drum surface, and a consequent better and more uniform presentation of the lint to the saw cylinder.

To obtain optimum results in the combing and cleaning of the lint, it is necessary, so far as possible, to minimize the space between the tips of the saw cylinder teeth and that grid bar, at least, which is nearest to the point at which the lint is delivered to the saw cylinder; but, since the saw cylinder is of substantial length between its bearings and rotates at high speed, and because hard lumps of material sometimes enter between the saw cylinder and the grid bar, it has been found impractical heretofore to space the first grid bar less than 0.070 to 0.080 inch from the geometrical cylinder (theoretically defined by the tips of the rotating teeth) because the springing of the saw cylinder or the bending of the grid bar, if a lesser clearance is attempted, results in contact of the teeth with the grid bar, causing serious mechanical injury to the parts and even at times starting a fire in the apparatus. One object of the present invention is to provide an improved saw cylinder, which may be of the customary outside dimensions, and which may be driven at the desired surface speed, but which is so resistant to springing out of true cylindrical form that it is possible to reduce the space between the tips of the saw teeth and the first grid bar to approximately one-half the customary spacing.

In the apparatus disclosed in the above copending application (as actually constructed) a pair of doffer rolls, 5 inches and 6 inches respectively in diameter, is interposed between the condenser drum and a toothed feed roll of approximately 3 inches in outside diameter which receives the lint from the doffer rolls and delivers it to the saw cylinder. It has now been found that by the use of a feed roll of an outside diameter of approximately 7½ inches, improved results are obtained, first because the arc of the feed roll which is active in delivering the lint to the saw cylinder, is flatter and longer than the corresponding arc of a smaller feed roll, and secondly because the larger diameter feed roll can be made stiffer and will thus run more truly than the small roll, so that it becomes possible to set the feed roll with its toothed tips closer to the tips of the saw teeth than heretofore, for instance, at a distance of the order of 0.035 to 0.040 inch with consequent improved combing action.

As a secondary result of the employment of the larger feed roll, it becomes possible to dispense with the two doffer rolls, the feed roll itself acting to doff the lint from the condenser drum. The elimination of the two doffer rolls substantially reduces the cost of the apparatus, for example as much as 4 or 5 percent.

Whenever lint cotton is carried through a conduit or passage by an air current, the presence of any imperfection or roughness in the surface of the duct, even though very minute, provides an anchorage for one or more fibers, and to these first few attached fibers others cling until a long streamer is formed. Because of the action of the moving air current, such a streamer often twists so that eventually it becomes hard and rope-like. When such a mass of fiber becomes heavy enough, it will tear away from the point of anchorage and travel along as a dense mass or wad with the air current. When such a hard mass or wad of fibers is caught by the teeth of the rotating saw cylinder, in a cleaning apparatus of the kind to which the present invention relates, it may become jammed between the saw cylinder and the grid bar, sometimes resulting in a severe smash, requiring a renewal of the saw cylinder or grid bar.

In the apparatus of the above copending application, a guard bar is associated with the feed roll, this guard bar having a concave surface opposed to the teeth of the feed roll, but spaced therefrom. This guard bar prevents loose lint, not firmly embedded in the teeth of the feed roll, from being ejected by centrifugal force before it reaches the teeth of the saw cylinder, thus insuring that all of the lint which enters the space between the feed roll and this guard bar will ultimately be caught by the teeth of the saw cylinder and will not be discharged in uncleaned condition into the stream of air leaving the cleaning apparatus. In accordance with the present invention, there is provided a guard bar having functional characteristics generally like those of the bar just above-described, but which is made sufficiently heavy to withstand force exerted against it by wads of cotton caught between it and the feed roll. In accordance with one embodiment of the invention, the concave surface of this bar is provided with means, for example ribs or teeth, which act to abrade any such hard mass of cotton fiber as it is carried along by the feed roll, so that such mass will be torn up and disintegrated. In order to insure such action so far as possible, this guard bar is of substantial vertical depth so that its concave toothed surface may be of an arcuate length of the order of four inches.

As a further precaution to avoid damage to the apparatus in the event that such a hard mass of material enter between the feed roll and guard bar, or between the saw cylinder and one of the grid bars, the apparatus, in accordance with the present invention, is provided with a friction clutch in the drive connections to prevent

any such hard mass of material from causing breakage of the machine parts. With such an arrangement, and by using a large diameter and rigid saw cylinder, and by making the first grid bar strong and rigid, the possibility of damage to the apparatus from the presence of hard lumps of material is minimized. While in the apparatus of the above application the guard bar, which cooperates with the feed roll is so located that the upgoing teeth of the saw cylinder approach the underside of this guard bar and the feed roll turns oppositely to the saw cylinder, and although in one embodiment of the present invention a similar location of the guard bar is contemplated, there is a preferred construction in accordance with the present invention, in which the guard bar is located at the opposite side of the feed roll, that is to say, it is so located that the down-going teeth of the saw cylinder pass beneath the lower edge of the guard bar, and the feed roll is caused to turn in the same direction as the saw cylinder. In this latter arrangement, the guard bar is so arranged that the passage between its concave surface and the periphery of the feed roll gradually decreases in width radially of the feed roll, while the passage between the lower side of this guard bar and the tips of the down-going teeth of the saw cylinder gradually increases. Preferably, provision is made for varying the exit end of this latter passage, thereby to vary the amount of cleaning which occurs at the first grid bar. Other desirable features and objects of the invention will be pointed out in the following more detailed description and by reference to the accompanying drawings wherein:

Fig. 1 is a vertical section, more or less diagrammatic and omitting parts, in a plane perpendicular to the axis of the carding roll, illustrating one embodiment of the present invention;

Fig. 2 is a fragmentary vertical section, to larger scale than Fig. 1, but in the same vertical plane, showing in greater detail the carding roll and associated guard bar and showing portions of the screen drum and saw cylinder; the latter being shown as provided with Garnett type teeth in lieu of the usual saw teeth.

Fig. 3 is a view similar to Fig. 2, but illustrating a modification;

Fig. 4 is a fragmentary elevation showing the toothed or ribbed face of the guard bar illustrated in Figs. 2 and 3; and

Fig. 5 is a fragmentary view, showing an arrangement generally similar to Fig. 2, but illustrating a guard bar of a modified construction.

Referring to the drawings, the character C (Fig. 1) designates the cleaner as a whole, this cleaner comprising a casing, usually of sheet metal, having an upper section **10** which may, for convenience, be referred to as the condenser section and which defines a chamber **11** having an inlet opening **12** to which there is connected the delivery end of a duct **13** which leads from a gin stand, not shown. Within the chamber **11**, there is arranged a cylindrical condenser or screen drum **15** mounted on a shaft **16** suitably journaled at its ends in bearings, not shown, supported by the casing. The periphery of this screen drum may be of any conventional material, for example, perforated sheet metal or wire cloth suitably supported to provide a cylindrical surface on which the lint, which enters the chamber **11**, may deposit as a thin layer. The opposite ends of the condenser or screen drum **15** are arranged closely adjacent to the opposite end walls of the casing **10** with usual provisions for avoiding air leakage between the ends of the drum and the casing, and the ends of the drum open into suitable chambers from which passages lead to an air duct D which is connected to a suction fan (not shown) of sufficient capacity to withdraw substantially all of the air which, entering through the duct **13**, passes inwardly through the perforate screen drum **15** and out through the open ends of the latter. Suitable manually actuable valves (not here shown) may be provided for controlling the effective size of each of the passages respectively which lead from the open ends of the condenser drum to the air duct D, thereby to control the effective suction in the duct leading from the gin stand, this being desirable when a battery of gin stands is served by the same suction fan. However, this arrangement of valves is no part of the present invention.

Below the chamber **11**, the casing is shaped to provide the cleaning chamber **17** within which is mounted the saw cylinder **18** having a shaft **18a** which is journaled at its opposite ends in suitable bearings, not shown, supported by the casing. This saw cylinder may be substantially like the conventional gin saw cylinder in construction, as indicated in Fig. 1, although it is preferred to employ a saw cylinder comprising a very rigid tubular core K of steel, having a wall thickness of approximately ½" and an outside diameter of approximately 11¾" and which may form a support for Garnett type saw teeth or for annular saw blades with interposed spacers.

Grid bars **19**, **19a**, **19b** etc. are arranged in cooperating relation to the periphery of the saw cylinder, the inner edges of these bars being spaced a short distance from the tips of the saw teeth and operating, as is customary in apparatus of this type, to knock dirt and trash out of the lint as the latter, carried by the teeth of the saw cylinder, is whipped past the bars as the cylinder rotates.

The first three of these bars Fig. 1, indicated at **19**, **19a**, **19b**, respectively, are thicker than is customary and have inner arcuate faces approximately concentric with the saw cylinder, and upper substantially flat faces which intersect said arcuate faces to form acute edges, parallel to the axis of the saw cylinder and directed upwardly toward the down-coming saw teeth. As here illustrated, the flat upper face of each of the bars **19**, **19a**, and **19b** is inclined at approximately 40° to a radial plane through the acute edge of said bar. In a preferred arrangement, the acute inner edge of the first or upper grid bar **19** is above a horizontal plane through the axis of the saw cylinder and in a radial plane which makes an angle of 25° with the horizontal; the edge of the second grid bar **19a** is in a radial plane which makes an angle of 18° below the horizontal; and, the edge of the third grid bar **19b** is in a radial plane which makes an angle of 43° below the horizontal. The lower bars **19c**, **19d** and **19e** are shown as substantially rectangular in transverse section and disposed in approximately radial relation to the saw cylinder. The several bars are mounted at their opposite ends in adjustable brackets **20** carried by the end walls of the casing, but normally these bars are stationary. Since as above described, the saw cylinder is unusually rigid and runs true, it is desirable to make the first or upper grid bar, at least, very rigid. Thus, it may, as illustrated, be of the order of 1¾" in maximum thickness and of a maximum depth of the order of 3", and, being so rigid, its edge may be spaced from the path of the saw teeth not more than from 0.035" to 0.040".

At the rear of the saw cylinder, there is arranged a rotating doffer brush **22** mounted on a shaft **23**. The brush turns oppositely to the saw cylinder and has a peripheral surface velocity exceeding that of the saw cylinder, for example a surface velocity of 7,000 feet per minute. Running at this velocity, the brush acts as a fan, generating an air current sufficient to carry the lint, after removal from the teeth of the saw cylinder, through the conduit **30** to a battery condenser. The brush is so arranged that its bristles reach substantially to the roots of the teeth of the saw cylinder. This brush is housed in a chamber **24** defined at its top by an upper wall **25** which is spaced from the lower wall **26** of the passage **12** to provide a channel **27** through which atmospheric air may enter freely and flow toward the periphery of the saw cylinder. The wall **25** terminates at **25a** a short

distance, for example 1⅛ inches from the periphery of the saw cylinder, and is spaced from the periphery of the brush 22 to provide a delivery passage 28 leading to the outlet 29 from which the conduit 30 leads to the battery condenser. The lower wall 20x of the brush chamber 24 is approximately concentric with the brush, being united at its forward end at 20a to the rear wall 56 of the chamber 17 and at its opposite edge to the outer wall W of the casing. Between the edges 25a and 20a, the saw cylinder is exposed to the brush so that the lint carried by the teeth of the saw cylinder may be doffed by the brush, the lint being swept away from the saw cylinder by the air current generated by the brush and delivered to the outlet 29 as above described.

Immediately below the screen drum 15, a feed roll or combing or carding cylinder 46 is arranged. This combing cylinder or roll is desirably of the order of 7½ inches in external diameter. Its peripheral surface may be formed of a layer of card clothing of conventional type but, preferably, as herein illustrated, the pins or teeth of this card clothing project radially outward instead of being inclined as is the more customary arrangement. The toothed covering material is attached to the peripheral surface of a rigid, cylindrical core, desirably formed from steel tubing and having a wall thickness of approximately ½ inch carefully turned to provide an accurate cylindrical surface. This cylindrical core is provided at its opposite ends with trunnions, one of which is indicated at 47, which turn in bearings, not shown, carried by the casing. Using a carding roll of the diameter suggested, it is desirably driven at a speed of 100 r.p.m. One of the trunnions is of sufficient length to receive a driving element, for instance a sprocket or gear.

As shown in the drawings, the axis of the combing cylinder 46 is offset to the right of the vertical plane through the axis of the screen drum 15. In actual practice, the vertical planes through the axes of the roll 46 and screen drum 15 are approximately two and one-half inches apart. With this arrangement, the distance between the peripheries of the screen drum and the carding cylinder, at their point of near tangency, is approximately one quarter of an inch. With this spacing, the carding cylinder acts as a doffer to take lint directly from the surface of the screen drum, thus eliminating the doffer roll or rolls commonly employed in apparatus of this general type.

As illustrated in Figs. 1 and 2, a rigid bar 41 is just to the right of the combing roll 46. The bar 41 extends the full length of the combing roll 46 and is fixedly attached at its opposite ends to the casing.

The lower margin of the casing 10 is fixedly connected to the upper part of the bar 41, the latter having an upwardly concave lower surface 43 (Fig. 2) whose radius of curvature may, for example be six and three-eighths inches, whereas the radius of curvature of saw cylinder 18 is approximately six inches. The surface 43 is eccentric to the saw cylinder so that the passage P between the surface 43 and the path of the tips of the saw teeth increases from its entrance end, where its width is one-sixteenth of an inch, towards its delivery end, where it is approximately one-quarter of an inch in width.

The rear or inner surface of the bar 41 (as viewed in Fig. 2) is concave and of a radius of curvature of approximately three and thirty-one-thirty-seconds of an inch, as compared with a radius of curvature of the combing roll of three and three-quarters of an inch, but the center of curvature of the concave surface of bar 41 is located approximately five-sixty-fourths of an inch above the axis of the roll 46 so that the lint-guiding passage 52 between the bar 41 and the tips of the saw teeth tapers downwardly in width, being approximately seven-thirty-seconds of an inch in width at its upper or entrance end, and approximately one-eighth of an inch in width at its lower or delivery end. The lower surface 43 of the bar 41 intersects the rear or inner concave surface of the bar at a smoothly rounded edge E, the circumferential width of the concave surface 43 being such that it extends from the point E downwardly to a point approximately 45° from the vertical plane to the axis of the saw shaft. In order to reduce the size of or to disintegrate lumps or wads of lint which may enter the wider, upper end of the passage 52, the surface of the concavity in the bar 41 may be provided with longitudinally extending ribs 44 (Fig. 4) or with rigid teeth of any desired configuration so that, in cooperation with the pins of the carding cylinder 46, this rough surfaced concavity acts like a grater to scrub and abrade any lumps or wads and thus reduce them to a size such that they may pass through the smaller end of the lint-guiding passage and between the combing cylinder and saw without causing damage to the machine parts.

At the opposite side of the combing cylinder 46 from the bar 41, the forward margin of the casing member 26 is attached, for example by welding to a flange 26a of a sheet metal guard device having an upwardly directed portion 26b which terminates in a rounded edge 39a spaced approximately one-quarter of an inch from the peripheral surface of the screen drum 15. This guard device also comprises a portion 26c which extends downwardly in substantially concentric relation to the combing roll 46 and spaced from the surface of the latter to provide a clearance of approximately one-quarter of an inch and terminates in a flange member 26d which is spaced from the tips of the saw teeth a distance of approximately one-quarter of an inch. The clearance between the edge 39a and the surface of drum 15 permits any lint, which may not be removed from the drum 15 by the roll 46, to continue along on the surface of the drum, thus avoiding the formation of wads of lint in the angle between the flange 26a and the drum.

The lower part of the casing of the cleaner (Fig. 1) is of hopper shape comprising the downwardly diverging walls 55 and 56 which lead to a channel having a floor formed by the upper run 57 of an endless belt which receives the dirt and trash which falls from the bars 19, 19a etc. and carries it out through an opening (not shown) in the end wall of the casing. This same belt, if desired, may extend along an entire battery of cleaners so as to receive refuse from each in turn. For good results, and as an example of desirable relative sizes of certain of the parts, the diameter of the saw cylinder may be eleven and three-fourths inches, the diameter of the combing cylinder 46 may be seven and one-half inches; the peripheral surface speed of the saw cylinder 18 may be of the order of 2,000 feet per minute; the surface feed of the doffer brush cylinder 22 may be of the order of 7,200 feet per minute; the surface feed of the combing cylinder 46 may be of the order of 240 feet per minute; and, the condenser drum 15 may have a surface speed of approximately 76 feet per minute.

It will be noted (Fig. 2) that the terminal end of the lint-guiding passage 52 is near the vertical plane through the axes of the combing roll 46 and saw cylinder 18, for instance, a distance of approximately one inch and, as above described the passage P extends from edge E about the periphery of the saw cylinder to a point approximately 45° from the vertical plane through the axis of the saw cylinder. With this arrangement, the lint which moves downwardly through the lint-guiding passage 52 is kept in contact with the toothed surface of the carding cylinder through a long arc, for example 110° more or less; and, since the width of the passage gradually decreases the lint is subjected throughout the entire length of the passage to a combing operation for a sufficiently long time to insure optimum smoothing and paralleling of the fibers.

Desirably, there is provided at the lower part of the bar 41 an adjustable plate N (Fig. 2) having a rounded edge directed towards the saw teeth. This plate may be

adjusted up or down. By changing the position of this member N, the effective width of the passage P, at its terminal end, may be varied, for example from one-sixteenth of an inch to one-quarter of an inch. By thus adjusting this member N, the amount of throw-off at the first grid bar **19** may be varied. If less cotton loss is desired at the expense of cleaning, the edge of member N is set close to the saw cylinder; but, if maximum cleaning is desired at the expense of a slightly greater amount of throw-off, then the width of the passage P, at its terminal portion, may be increased to the maximum one-quarter of an inch.

The drive connections for the screen drum **15** and carding roll **46** desirably comprise a slip-clutch, which may be of any conventional or desired type. For instance, a clutch such as is sold by Morse Chain Company of Houston, Texas, under the name "Torque Limiter" may be interposed between the power source and the sheave which drives the several rotating parts of the cleaner. By the use of such a slip-clutch between the driving and driven parts, the jamming of wads of lint between the rotating members and adjacent parts, for example between the carding roll and guide bar will not result in breakage of parts.

While the arrangement hereinabove described is useful, a modified construction is illustrated in Fig. 3. The modified apparatus, thus shown, is in general like that above described, comprising a casing which defines a chamber **11** in which the screen drum **15** is located; the carding cylinder **46**; the saw cylinder **18**; and, a doffer brush (not shown in Fig. 3) like the brush **22** illustrated in Fig. 1. The casing comprises a part **26** which forms the lower wall of a flue through which the lint-carrying air current enters the chamber in which the condenser drum **15** is housed.

In this modification, the carding cylinder **46** turns in opposition to the saw cylinder and a rigid bar **41x** (generally corresponding in structure and function to the bar **41** above described) is arranged to the left of the carding roll, as viewed in Fig. 3, that is to say, at the opposite side of the carding roll as contrasted with the position of the bar **41** of Figs. 1 and 2. This bar has an upper surface **42** (Fig. 3) desirably provided with a shallow rabbet in which the forward margin of the casing wall **26** is secured. At its forward part, the upper surface of the bar is shaped to provide an upwardly directed rib **42a** having a smoothly rounded upward edge which is spaced approximately one-quarter of an inch from the periphery of the screen drum **15**. The right-hand face of the bar **41x** has a longitudinally extending shallow concavity, of a radius of curvature of approximately seven and twenty-one-thirty-seconds inches, that is to say, its radius of curvature exceeds that of the combing or carding roll by approximately seven-thirty-seconds of an inch. Preferably, the center of curvature of this concavity in the guard bar is eccentric with respect to the axis of the roll **46** so that the lint-guiding channel **52x**, between the bar and the surface of the roll, tapers downwardly from a relatively wide upper end toward its lower end, the latter end being closely adjacent to the periphery of the saw cylinder. Desirably, the lower end of this channel **52x** is of a fixed width of approximately one-eighth of an inch.

To provide for such a downwardly tapering channel, the center of the curvature of the concavity of the bar may be located five-sixty-fourths of an inch above the axis of the roll **46**. To provide the requisite rigidity, the bar **41**, which may be an aluminum extrusion, may be of a right-to-left thickness, between the surfaces *a* and *b*, of approximately two and three-fourths inches, and of a maximum depth of approximately seven and three-eighth inches.

As shown in Fig. 3, the lower portion **45x** of the curved forward surface of the bar **41** is devoid of ribs or teeth and is substantially concentric with the carding or combing roll **46** while the surface of the concavity is provided with teeth **44** like the teeth **44** of the bar **41**. The bar tapers downwardly at its lower part and terminates in a rounded edge **45a** located in the dihedral angle between the peripheral surfaces of the cylinders **46** and **18**.

The casing wall **10** is substantially concentric with the screen drum **15** but, at its lower part is secured, preferably by wrapping its margin about a bar **40** which extends from one side of the machine to the other. This bar, with the terminal portion of the casing wall, is here illustrated as being spaced approximately ¼ inch from the peripheral surface of the combing cylinder **46**.

A horizontal shaft **53** has its axis in a radial plane of the saw cylinder about 16° above the radial plane through the acute edge of the upper grid bar **19**. This shaft **53** supports a lint guard G, here shown as comprising a hollow sheet metal shell having a concave inner wall **54** and an outer wall **55**, with a stiffening rod **56** at its upper edge where the inner and outer walls merge. The upper edge of this guard is normally disposed approximately ½ inch from the up-going portion of the peripheral surface of the combing cylinder **46**, while the inner surface of the wall **54** at its lowest point is spaced from the tips of the saw teeth approximately ⅛ inch. Normally, the inner wall **54** of this guard diverges upwardly and away from the saw cylinder. To give access to the saw cylinder at this point, the guard G is preferably so mounted on the shaft **53** that it may be turned outwardly and away from the saw cylinder. The guard G is operative to prevent lint which is not firmly caught by the saw teeth from escaping before it reaches the grid bar **19**. Any lint which is not adequately embedded in the saw teeth and which flies off from the teeth at this point is recaptured by the guard G and returned to the saw cylinder at the lower edge of the guard. If the guard device G were not used, a considerable amount of lint might be thrown off from the saw cylinder at the point where the feed roll or combing cylinder **46** delivers the lint to the saw cylinder. If the shaft **53** which supports the guard were to be located substantially closer to the top grid bar **19**, then, as above described, the moting action of the top grid bar would be substantially reduced. Thus, the particular location of the guard G, as above described, is important in order to minimize the loss of useful lint; while, at the same time, to obtain the maximum moting effect.

In the arrangement illustrated in Fig. 5, all of the parts, except for the guard bar, are like those of Fig. 2 and are designated by the same reference characters. The guard bar **41m** of Fig. 5 is devoid of the ribs or teeth **44** shown in Fig. 2, its main concave surface **44m** being smooth. Moreover, the edge **Em**, at which the concave inner surface **44m** intersects the lower concave surface **43m** is located closer to the vertical plane of the axes of the combing roll and saw cylinder than in the arrangement of Fig. 3, for instance a distance of the order of one-half inch. This type of guard bar does not exert any abrading action upon the lint, and may be preferred under some conditions, particularly when little trouble is experienced from the formation of lumps.

While certain embodiments of the invention have herein been disclosed by way of example, and while dimensions have been cited as suggestive of relationships which have been found in practice to insure desirable results, it is to be understood that the specific mechanism and such suggested dimensions are made by way of illustration, and that all modifications within the scope of the appended claims are considered to be within the purview of the invention.

I claim:

1. In a cotton lint cleaner wherein the cleaning instrumentalities include a rotatable saw cylinder and spaced grid bars arranged about an arc of the peripheral surface of the saw cylinder, and having a rotating screen drum

whose axis is parallel to that of the saw cylinder, and on whose peripheral surface the lint to be cleaned is pneumatically deposited as a thin layer; in combination, a toothed carding cylinder turning about an axis parallel to the axes of the screen drum and saw cylinder with its toothed periphery closely adjacent, at circumferentially spaced points, to a tangent to the screen drum and to a tangent to the saw cylinder respectively, said toothed cylinder being driven at such a linear velocity and in such a direction as to doff lint directly from the screen drum and to deliver it directly to the teeth of the saw cylinder, said toothed cylinder constituting the sole mechanical means for transferring lint from the screen drum to the saw cylinder.

2. A drum lint cleaner, according to claim 1, wherein the toothed carding cylinder is of the order of 7.5 inches in outside diameter and the saw cylinder has a rigid tubular steel core of a wall thickness of the order of 0.5 inch and an external diameter of the order of 11.75 inches.

3. In a cotton lint cleaner wherein the cleaning instrumentalities include a rotatable saw cylinder and spaced grid bars arranged about an arc of the peripheral surface of the saw cylinder, and having a rotating screen drum whose axis is parallel to that of the saw cylinder, and on whose peripheral surface the lint to be cleaned is pneumatically deposited as a thin layer; in combination, a toothed carding cylinder turning about an axis parallel to the axes of the screen drum and saw cylinder with its toothed periphery closely adjacent, at circumferentially spaced points, to a tangent to the screen drum and to a tangent to the saw cylinder respectively, said toothed cylinder being driven at such a linear velocity and in such a direction as to doff lint directly from the screen drum and to deliver it directly to the teeth of the saw cylinder, and having guard means spaced from but extending about the carding cylinder through an arc of approximately 90°, said guard means being operative to prevent centrifugal expulsion of lint from the periphery of the carding cylinder.

4. In a cotton lint cleaner wherein the cleaning instrumentalities include a rotatable saw cylinder and spaced grid bars arranged about an arc of the peripheral surface of the saw cylinder, and having a rotating screen drum whose axis is parallel to that of the saw cylinder, and on whose peripheral surface the lint to be cleaned is pneumatically deposited as a thin layer; in combination, a toothed carding cylinder turning about an axis parallel to the axes of the screen drum and saw cylinder with its toothed periphery closely adjacent, at circumferentially spaced points, to a tangent to the screen drum and to a tangent to the saw cylinder respectively, said toothed cylinder being driven at such a linear velocity and in such a direction as to doff lint directly from the screen drum and to deliver it directly to the teeth of the saw cylinder, said toothed cylinder constituting the sole mechanical means for transferring lint from the screen drum to the saw cylinder, and a rigid elongate bar extending parallel to the axis of the toothed carding cylinder, and which has a concave arcuate surface opposed to the periphery of the carding cylinder, but spaced from the latter to provide a lint passage between them, said passage tapering in width with its narrower end closely adjacent to the path of the tips of the teeth of the saw cylinder.

5. In a cotton lint cleaner wherein the cleaning instrumentalities include a rotatable saw cylinder and spaced grid bars arranged about an arc of the peripheral surface of the saw cylinder, and having a rotating screen drum whose axis is parallel to that of the saw cylinder, and on whose peripheral surface the lint to be cleaned is pneumatically deposited as a thin layer; in combination; a toothed carding cylinder turning about an axis parallel to the axes of the screen drum and saw cylinder with its toothed periphery closely adjacent, at circumferentially spaced points, to a tangent to the screen drum and to a tangent to the saw cylinder respectively, said toothed cylinder being driven at such a linear velocity and in such a direction as to doff lint directly from the screen drum and to deliver it directly to the teeth of the saw cylinder, said toothed cylinder constituting the sole mechanical means for transferring lint from the screen drum to the saw cylinder, and wherein the carding cylinder and saw cylinder turn in opposite directions, and the rigid bar is arranged at that side of the carding cylinder toward which the up-going teeth of the saw cylinder are moving.

6. In a cotton lint cleaner wherein the cleaning instrumentalities include a rotatable saw cylinder and spaced grid bars arranged about an arc of the peripheral surface of the saw cylinder, and having a rotating screen drum whose axis is parallel to that of the saw cylinder, and on whose peripheral surface the lint to be cleaned is pneumatically deposited as a thin layer; in combination, a toothed carding cylinder turning about an axis parallel to the axes of the screen drum and saw cylinder with its toothed periphery closely adjacent, at circumferentially spaced points, to a tangent to the screen drum and to a tangent to the saw cylinder, respectively, said toothed cylinder being driven at such a linear velocity and in such a direction as to doff lint directly from the screen drum and to deliver it directly to the teeth of the saw cylinder, said toothed cylinder constituting the sole mechanical means for transferring lint from the screen drum to the saw cylinder, a rigid elongate bar extending parallel to the axis of the toothed carding cylinder, and which has a concave arcuate surface opposed to the periphery of the carding cylinder, but spaced from the latter to provide a lint passage between them, said passage tapering in width with its narrower end closely adjacent to the path of the tips of the teeth of the saw cylinder, wherein the concave arcuate surface of the rigid bar is roughened to provide abrading elements operative to disintegrate lumps of cotton lint interposed between the bar and the carding cylinder.

7. In a cotton lint cleaner wherein the cleaning instrumentalities include a rotatable saw cylinder and spaced grid bars arranged about an arc of the peripheral surface of the saw cylinder, and having a rotating screen drum whose axis is parallel to that of the saw cylinder, and on whose peripheral surface the lint to be cleaned is pneumatically deposited as a thin layer; in combination, a toothed carding cylinder turning about an axis parallel to the axes of the screen drum and saw cylinder with its toothed periphery closely adjacent, at circumferentially spaced points, to a tangent to the screen drum and to a tangent to the saw cylinder respectively, said toothed cylinder being driven at such a linear velocity and in such a direction as to doff lint directly from the screen drum and to deliver it directly to the teeth of the saw cylinder, said toothed cylinder constituting the sole mechanical means for transferring lint from the screen drum to the saw cylinder, a rigid elongate bar extending parallel to the axis of the toothed carding cylinder, and which has a concave arcuate surface opposed to the periphery of the carding cylinder, but spaced from the latter to provide a lint passage between them, said passage tapering in width with its narrower end closely adjacent to the path of the tips of the teeth of the saw cylinder, and wherein the arcuate surface of the rigid bar is provided with a plurality of parallel rigid ribs operative to abrade lumps of lint carried along by the teeth of the carding cylinder.

8. In a cotton lint cleaner of the kind to which lint is conveyed from a gin by an air current and which comprises a casing having therein a rotary condenser drum on whose surface the lint is deposited as a thin layer while the major portion of the conveying air is being separated from the lint, and cleaning instrumentalities including a rotating saw cylinder whose axis is parallel to that of the condenser drum, spaced parallel grid bars arranged about an arc of the peripheral surface of the

saw cylinder, and means for doffing cleaned lint from the teeth of the saw cylinder, in combination, a carding cylinder turning about an axis parallel to the axis of the saw cylinder, said carding cylinder having a peripheral surface to which lint tends to adhere, the carding cylinder being so located, relatively to the condenser drum and saw cylinder, as to doff lint directly from the condenser drum and to deliver it directly to the teeth of the saw cylinder, and means extending about an arc of the carding cylinder, but spaced from the peripheral surface of the latter, to define, with said carding cylinder, a lint-guiding passage whose terminus is closely adjacent to the path of travel of the tips of the teeth of the saw cylinder, and wherein the means which cooperates with the carding cylinder to define the lint-guiding passage is located above that part of the saw cylinder at which the teeth of the saw cylinder are moving upwardly.

9. In a cotton lint cleaner of the kind to which lint is conveyed from a gin by an air current and which comprises a casing having therein a rotary condenser drum on whose surface the lint is deposited as a thin layer while the major portion of the conveying air is being separated from the lint, and cleaning instrumentalities including a rotating saw cylinder whose axis is parallel to that of the condenser drum, spaced parallel grid bars arranged about an arc of the peripheral surface of the saw cylinder, and means for doffing cleaned lint from the teeth of the saw cylinder, in combination, a carding cylinder turning about an axis parallel to the axis of the saw cylinder, said carding cylinder having a peripheral surface to which lint tends to adhere, the carding cylinder being so located, relatively to the condenser drum and saw cylinder, as to doff lint directly from the condenser drum and to deliver it directly to the teeth of the saw cylinder, and means extending about an arc of the carding cylinder, but spaced from the peripheral surface of the latter, to define, with said carding cylinder, a lint-guiding passage whose terminus is closely adjacent to the path of travel of the tips of the teeth of the saw cylinder, wherein the means which cooperates with the carding cylinder to define the lint-guiding passage is a rigid bar having a concave, arcuate rear surface spaced from the periphery of the carding cylinder and forming one wall of said passage, said bar being located above that part of the saw cylinder at which the teeth of the saw cylinder are moving downwardly, the bar having a concave, arcuate bottom surface eccentric to the saw cylinder and defining a delivery passage whose width increases from its upper end, where it is adjacent to the periphery of the carding cylinder toward its lower end where said bottom surface terminates at an edge which is approximately 45° from a vertical plane through the axis of the saw cylinder.

10. A cotton cleaner, according to claim 9, wherein the passage between the rigid bar and the saw cylinder is of a width of approximately 1/16 of an inch at that end which is the closer to the carding cylinder.

11. A cotton cleaner, according to claim 9, wherein the two concave surfaces of the rigid bar merge in a rounded edge spaced a distance of the order of one-half inch from a vertical plane through the axis of the saw cylinder in the direction in which the saw teeth are moving, and the carding cylinder turns in the same direction as the saw cylinder.

12. A cotton cleaner, according to claim 9, wherein means is provided for adjusting the width of the delivery end of the passage between the concave bottom surface of the rigid bar and the periphery of the saw cylinder.

13. In a cotton cleaner of the kind which comprises a rotary saw cylinder, a plurality of spaced, parallel grid bars arranged about an arc of the peripheral surface of the saw cylinder, a condenser drum on whose peripheral surface lint is deposited as a thin layer while the major portion of a lint-carrying air current is being separated from the lint, in combination, a toothed carding cylinder and condenser drum, said toothed carding cylinder being of such a diameter and having its axis so located that spaced points in the periphery of the carding cylinder are so close to tangents to the condenser drum and saw cylinder, respectively, that the carding cylinder acts to doff lint directly from the condenser drum and to deliver it directly to the teeth of the saw cylinder, means operative to keep the lint, removed from the condenser drum, within the field of action of the said carding cylinder along an arc of the latter cylinder exceeding 90°, and for keeping the lint within the field of action of the saw cylinder through an arc of its periphery of approximately 45°.

14. A cotton lint cleaner, according to claim 13, wherein the means for keeping the lint within the fields of action of the carding cylinder and saw cylinder comprises a rigid bar having a concave surface which is opposed to but spaced from the peripheral surface of the carding cylinder, and a second concave surface which is opposed to but spaced from the periphery of the saw cylinder, said concave surfaces meeting at an edge which is located within the dihedral angle defined by the peripheries of the carding cylinder and saw cylinder, said edge being spaced, in the direction of movement of the saw teeth, from a vertical plane through the axis of the saw cylinder.

15. In a cotton cleaner of the kind which comprises a rotary saw cylinder, a plurality of spaced parallel grid bars arranged about an arc of the peripheral surface of the saw cylinder, a condenser drum on whose peripheral surface lint is deposited as a thin layer while the major portion of the lint-carrying air current is being separated from the lint, in combination, a toothed carding cylinder arranged to turn about an axis which is parallel to the axes of the condenser cylinder and the saw cylinder, said toothed carding cylinder being of such dimensions and turning about an axis so located that spaced points in the periphery of the carding cylinder are so close to tangents to the condenser drum and saw cylinder, respectively, that the carding cylinder acts to doff lint directly from the condenser drum and deliver it directly to the saw cylinder, a rigid guard bar having a surface which is opposed to but spaced from the periphery of the carding cylinder, said guard bar being located above the first of the grid bars which is engageable by lint carried by the down-going teeth of the saw cylinder, said guard bar being so shaped as to provide a passage extending about the carding cylinder through an arc of approximately 110°, and which, at its upper end, is of a width of approximately 7/32 of an inch and which, at its lower end, is normally of a width of approximately 1/8 of an inch, the guard bar also being shaped to provide a passage extending about the saw cylinder through an arc of approximately 45°, and which, at its upper end, is approximately 1/16 of an inch in width, and, at its lower end is approximately 1/4 of an inch in normal width, the lower end of said latter passage being spaced approximately 20° of arc from the first of said grid bars.

16. In a cotton cleaner of the kind which comprises a rotary saw cylinder, a plurality of spaced parallel grid bars arranged about an arc of the peripheral surface of the saw cylinder, a condenser drum on whose peripheral surface lint is deposited as a thin layer while the major portion of the lint-carrying air current is being separated from the lint, in combination, a toothed carding cylinder arranged to turn about an axis which is parallel to the axes of the condenser drum and the saw cylinder, said carding cylinder being of such dimensions and turning about an axis so located that spaced points in the periphery of the carding cylinder are so close to tangents to the condenser drum and saw cylinder, respectively, that the carding cylinder acts to doff lint directly from the condenser drum and deliver it directly to the saw cylinder, and means cooperable with the saw cylinder to keep the lint in close proximity to the periphery of the saw cylinder through an arc of approximately 45° meas-

ured in the direction of motion of the saw teeth from a point at which the lint is first delivered to the saw cylinder by the carding cylinder.

17. In a cotton cleaner of the kind which comprises a rotary saw cylinder, a plurality of spaced parallel grid bars arranged about an arc of the peripheral surface of the saw cylinder, a condenser drum on whose peripheral surface lint is deposited as a thin layer while the major portion of the lint-carrying air current is being separated from the lint, in combination, a toothed carding cylinder arranged to turn about an axis which is parallel to the axes of the condenser drum and the saw cylinder, said carding cylinder being of such dimensions and turning about an axis so located that spaced points in the periphery of the carding cylinder are so close to tangents to the condenser drum and saw cylinder, respectively, that the carding cylinder acts to doff lint directly from the condenser drum and to deliver it directly to the saw cylinder, a guard which cooperates with the saw cylinder to define a passage extending from a point adjacent that at which the lint is first deposited on the saw cylinder by the carding cylinder, said passage being of a length of approximately 45° about the periphery of the saw cylinder, the lint being carried by the saw teeth through said passage, the passage being of greater width (measured radially of the saw cylinder) at its delivery end than at its receiving end.

18. A cotton cleaner, according to claim 17, wherein the passage between the guard and saw cylinder is of a width approximately 1/16 of an inch at its receiving end and of a normal width of approximately 1/4 of an inch at its delivery end, and adjustable means for varying the effective width of the passage at its delivery end.

19. In cotton lint-cleaning apparatus of the kind which

comprises a foraminous condenser which acts to separate the major portion of the air from a lint-carrying air current and on which the separated lint is deposited as a thin layer, and cleaning instrumentalities including a saw cylinder, a plurality of spaced parallel grid bars arranged about an arc of the periphery of the saw cylinder and means for doffing cleaned lint from the teeth of the saw cylinder, in combination, a toothed cylinder having a surface to which lint tends to cling and which turns about an axis parallel to that of the saw cylinder, said toothed cylinder being so constructed and arranged as to doff lint directly from the condenser and to deliver it directly to the teeth of the saw cylinder, and means cooperating with the toothed cylinder to disintegrate lumps of lint which contact the surface of the toothed cylinder, wherein the means for disintegrating lumps of lint comprises a rigid bar having a concave surface opposed to but spaced from the periphery of the toothed cylinder and which cooperates with the roll to define a lint-guiding passage, said passage being of decreasing width radially of the toothed cylinder from its receiving end to its delivery end, said concave surface being provided with protuberances operated to abrade lumps of lint as they are moved through the passage by the toothed cylinder.

References Cited in the file of this patent

UNITED STATES PATENTS

1,173,978	Johnston	Feb. 29, 1916
1,239,432	O'Connell	Sept. 4, 1917
2,711,381	Novotny et al.	June 21, 1955
2,747,235	Wallace	May 29, 1956
2,755,512	Moss	July 24, 1956