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AND CLEANING OF FIBERS

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2 Sheets-Sheet 1

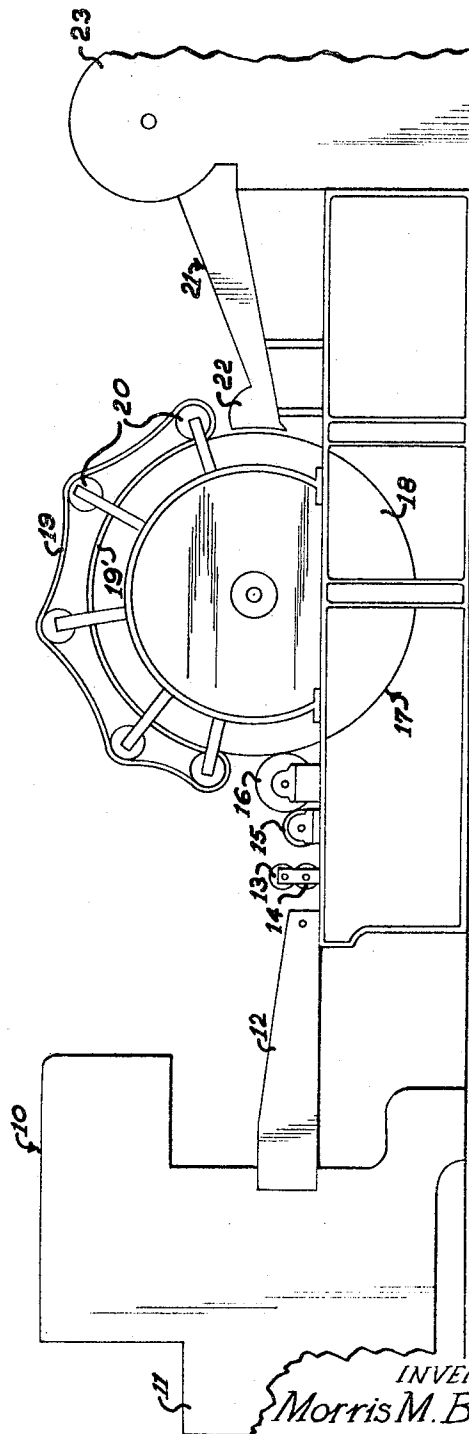


Fig. 1

INVENTOR
Morris M. Bryan, Jr.
BY: *Newton, Hopkins,
Jones & Ormsby*
ATTORNEYS

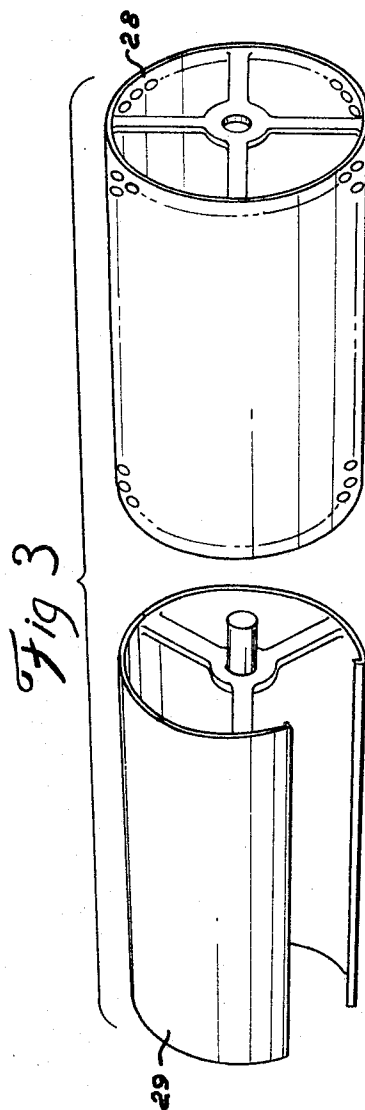
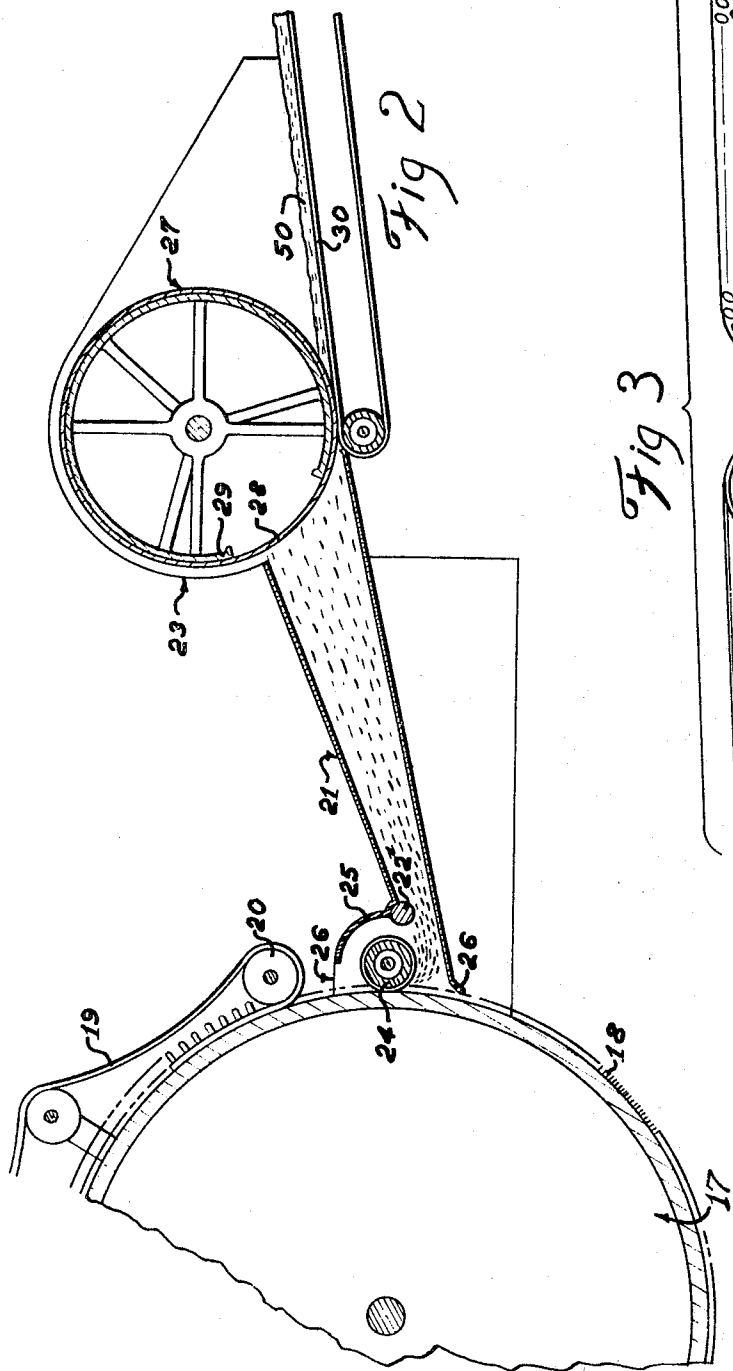
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Morris M. Bryan, Jr., Jefferson, Ga., assignor to The Jefferson Mills, Inc., Jefferson, Ga., a corporation of Georgia

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4 Claims. (Cl. 19—156.1)

This application is a continuation-in-part of co-pending application, Ser. No. 183,890, filed Mar. 30, 1962, now abandoned.

The present invention relates to processing fibers for use in textile manufacturing, and more particularly pertains to a method and apparatus for continuous, high-speed processing and cleaning of such fibers.

Fibers for use in textile manufacturing are frequently obtained in a condition in which they are randomly arranged in masses along with various types of entrained foreign matter, dirt and trash. Before these fibers may be drawn, combed and processed into threads and yarns they must be cleaned, blended and separated so as to remove substantially all of the entrained material.

Heretofore, cleaning, blending and separating of these fibers has been accomplished by subjecting the fiber masses to a series of successive operations generally referred to as opening, picking and carding. In the opening operation the masses of fibers are fed to a machine which loosens and partially separates the fibers. During this procedure some dirt and other heavy trash is removed from the fibers by gravity or centrifugal force through screens. However, a large amount of the entrained foreign material remains and further cleaning is essential.

From the opening operation the mixture of fibers is fed to a picker wherein the fibers are again opened and separated. Additional incidental cleaning of the fibers takes place during this processing. Thereafter the randomly oriented fibers are formed into a flat, thick batt called a "picker lap." Frequently, the "picker lap" is wound on a take-up-roller and stored for future use.

The "picker lap" must be further processed and cleaned and therefore is fed to a carding operation. In this operation the "picker lap" is delivered to a carding cylinder by a licker-in. On the carding cylinder the fibers are more completely opened and separated whereby further entrained material is removed. The fibers are also dispersed into a thin, randomly arranged sheet or web whereafter they are transferred to a rotating "doffer cylinder." As the doffer cylinder rotates the web is stripped therefrom by a vibrating doffer comb and subsequently gathered into a "trumpet" for condensing into a sliver. The slivers are then subjected to drawing and combing and thereafter processed into a thread or yarn.

As is apparent from the above discussion the initial processing of the fibers require much apparatus and floor space as well as numerous skilled operators. Furthermore, and possibly most important, the carded web of fibers obtained from a single pass through this operation did not always have an acceptable degree of cleanliness. Consequently, the web of fibers oftentimes had to be processed through several carding operations until an acceptable web was obtained. The net result in these instances was a decreased production rate and consequent economic disadvantage.

The process and apparatus of the present invention provides for continuous operation in which the picker of the prior art is eliminated and wherein the fibers are processed and cleaned to a high degree on a single pass. The continuous operation is accomplished by feeding the masses of fibers to a conventional feeder such as the Bramwell type. From the feeder, the fibers pass to a licker-in for delivery to a card cylinder. The carding cylinder

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performs functions of separating, cleaning and blending the fibers into a web just as in the prior art. A doffer cylinder strips the web of fibers from the carding cylinder whereupon they are pneumatically propelled angularly upward to a foraminous collecting surface. During this propulsion the fibers of the carded web become highly separated whereupon entrained foreign matter drops out and away from the fibers and the collecting surface. The finely divided foreign matter which becomes separated from the fibers but is carried with the airstream due to its light weight passes out through the foraminous collecting surface wherein the fibers are deposited and withdrawn in a highly cleaned state.

The removal of foreign matter from the fibers at high production rates in accordance with the present invention far exceeds the cleaning accomplished by the heretofore employed prior art methods and apparatus. Furthermore, production rates eight to ten times those of the prior art methods and apparatus may be achieved by the present invention.

Therefore, it is one object of my invention to provide a method and apparatus for continuous high-speed processing and cleaning of fibers for use in textile manufacturing.

Another object of my invention is to provide improvements in fiber processing and cleaning which have heretofore been performed by operations known as opening, picking and carding.

A further object of my invention is to provide a method and apparatus for producing fibers having a high degree of cleanliness at high production rates.

These and other objects and advantages of the present invention will appear from the following description with reference to the accompanying drawings wherein:

FIG. 1 is a side elevational view of the method and apparatus of the present invention.

FIG. 2 is a cross-sectional side view of that portion of the method and apparatus shown in FIG. 1 wherein carded fibers are pneumatically propelled to the collecting surface.

FIG. 3 is an exploded view of the rotatable collecting surface and the baffle therefore.

In accordance with the present invention, and as shown in FIG. 1, tangled masses of fibers as received are fed in a known manner to an intake hopper 11 of a conventional feeder 10, i.e. a Bramwell Feeder. The feeder essentially forms the masses of fibers into a batt of tufts which is then transmitted via a feed apron 12 to a pair of opposed driving rolls 13 and 14.

In forming the batt of tufts some incidental cleaning of the fibers takes place. This incidental cleaning results from the manipulation of the fiber masses within the feeder.

The driving rolls 13 and 14 are positioned in such a manner as to compress the batt of tufts as it passes there-through forming a lap resembling a "picker lap." This lap then passes between a feed roll 15 and the licker-in 16 which deposits the fibers of the lap onto a rotating carding cylinder 17.

The carding cylinder 17 is of conventional design and has a metallic wire clothing 18 around its peripheral surface. In close proximity to the upper portion of the peripheral surface of the carding cylinder is an endless series of moving flats 19. This endless series of flats is mounted for continuous movement around rolls 20 in the same direction as the rotation of the carding cylinder but at a different speed. In this manner the lower run 19' of the endless series of flats 19 is moving in the opposite direction with respect to the closely adjacent peripheral surface of the rotating carding cylinder. Rotation in this manner presents a clean flat at the discharge side of the carding cylinder where cleaning is most effective.

The fibers deposited on the carding cylinder are continuously subjected to a brushing action from the oppositely moving flats. This brushing further disentangles the fibers and allows some of the entrained foreign matter to be removed. The fibers emerging from under the flats form a thin web on the surface of the carding cylinder.

Mounted adjacent the discharge side of the carding cylinder is an air duct 21 having an inlet portion 22 in close proximity to the surface of the carding cylinder. The opposite end of the air duct opens into housing 23 within which a collecting surface rotates. Fibers are conveyed from the carding cylinder to the collecting surface in an air stream created within the air duct as further described later.

The air duct 21 is positioned so as to slope upward away from the carding cylinder. This upward slope is important in achieving the desired cleaning of the fibers while they are conveyed through the air duct.

The internal portion of the air duct is illustrated in detail in FIG. 2. As shown therein, the inlet portion 22 of the air duct houses a doffer roll 24. The peripheral surface of the doffer roll may be covered with a metallic wire clothing or granular clothing in accordance with conventional practice. Preferably, the size of the doffer roll is kept as small as possible without introducing objectional vibration. Of course, conventional size doffer rolls may also be used.

Although the doffer rolls of the prior art are customarily driven at a peripheral speed slower than the peripheral speed of the carding cylinder, the doffer roll of the present invention is driven at a surface speed of $1\frac{1}{2}$ to 3 times the surface speed of the carding cylinder. As a result, substantially all of the web of fibers on the carding cylinder are removed at the doffer roll thereby preventing neps from being formed in the fibers. Neps are caused when some of the fibers are carried around on the carding cylinder several times prior to being doffed.

The inlet portion 22 of the air duct has an upwardly extending baffle 25 which houses the upper portion of the doffer roll. This baffle terminates short of the carding cylinder to provide an opening 26 through which air is drawn into the air duct. Air entering this opening may divide to pass between the doffer roll and the carding cylinder and also between the doffer roll and the baffle 25. In the first instance the air aids in removing the fibers from the carding cylinder while in the second instance the air aids in removing the fibers from the doffer roll.

On the lower side of the inlet portion 22 is a lip 26 which spaced from the carding cylinder to also allow air to be drawn into the duct 21. The air entering the duct at this point serves to aid in removing the fibers from both the carding cylinder and the doffer roll.

At the opposite end of the duct 21 from the doffer roll is a foraminous collecting surface through which the air entering the duct at inlet 22 is withdrawn by an exhaust fan (not shown) all of which will be more apparent from the following discussion.

Due to the relatively high rotational speed of the doffer roll and the effects of the exhaust fan a strong air current is set-up within the air duct 21. The fibers which are doffed from the carding cylinder 17 are entrained in particulate fashion in the air current within the duct and carried to the opposite end whereupon they are deposited on the foraminous collecting surface. To aid the fibers in their movement in the air current the duct is provided with a stationary guide bar 22' and smooth side walls to thereby present a generally unobstructed, low resistance path.

The entrained fibers become separated and somewhat parallelized in the air current as they pass through the duct. Separation of the fibers substantially increases from the entry end of the duct to the collection end due to the fact that the duct becomes gradually enlarged

along its length. The result is that the foreign material which is contained in the carded fibers now falls freely to the floor of the air duct. This foreign material slides along the duct floor away from the collecting surface toward the Inlet portion 22 of the air duct due to the inclined positioning of the duct. The space between the lip of the air duct and the carding cylinder may serve as an exit through which the foreign material may escape from the duct.

At the collection end of the duct 21 is a rotating collecting drum 27 contained within the housing 23. The collection drum has a foraminous surface to allow the air current from the duct to pass therethrough while collecting the fibers. The fibers are continuously collected on the surface of the rotating drum and withdrawn in the form of a web 50 onto an endless delivery belt 30 for transfer to subsequent drafting and sliver formation. Other means for withdrawing the web from the collection drum and transferring it to subsequent operations may also be employed.

The collection drum 27 is rotated at a relatively high speed so as to prevent excessive fiber accumulation on any particular area of its surface which could detrimentally interfere with the passage of the air current from the duct 21 to the interior of the drum 27. The precise speed which is employed, consistent with the objectives of the present invention, will vary depending upon the relative size of the apparatus.

As mentioned before, an exhaust fan is connected in a known manner to the interior of the collection drum 27 so as to withdraw air as it passes from the duct 21 through the foraminous surface of the drum. In this manner a continuous air current is created with the duct 21.

It should be understood that any finely divided foreign material which may remain suspended with the fibers in the air stream will pass through the foraminous surface of the collecting drum along with the air stream.

The collecting drum 27 comprises a rotatable cylindrical sleeve 28 of a foraminous material, such as perforated sheet-metal, and a stationary inner baffle member 29, all of which is shown in exploded form in FIG. 3. The baffle member is mounted closely adjacent the interior peripheral surface of the rotatable sleeve 28 and has a longitudinal segment thereof cut-away corresponding with the exit opening of the air duct 21. In this manner the air current in the air duct may pass through the foraminous sleeve 28 while it rotates past the cut-away portion of the baffle member. Since the perforations in the foraminous sleeve are quite small, the fibers being conveyed in the air stream are randomly deposited on the outer surface of the sleeve. An exhaust fan, not shown, is suitably connected to one end of the collecting drum 27 to withdraw the air and any finely divided foreign material from the interior of the collecting drum.

The random deposition of the fibers on the collecting drum continuously forms a web 50 which is immediately stripped from the collecting drum. The thickness of this web will depend upon a rotational speed of the collecting drum and the rate at which the fibers are being conveyed in the air duct.

Thus, having described the present invention it will be apparent that various modifications may be made without departing from the spirit and scope of thereof and, therefore, the present invention is intended to be limited only by the appended claims.

I claim:

1. A method for continuously processing and cleaning masses of fibers at high-speed comprising the steps of carding the fibers into a first web, pneumatically and mechanically directing the carded first web of fibers into an angularly upwardly inclined air stream, substantially separating and partially parallelizing the fibers as they pass through the upwardly inclined air stream while simultaneously permitting heavy particles of trash to separate from the fibers and fall downwardly out of the upwardly inclined

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air stream, directing the thus separated and fallen heavy particles of trash in a direction different from that of the fibers in the upwardly inclined air stream and collecting the fibers into a second web while allowing the air stream and small particles of trash to pass thereon through the second web.

2. A method according to claim 1 comprising the additional step of partially separating and blending the fibers prior to being carded.

3. A method according to claim 1 comprising the additional step of introducing air currents on both sides of the carded first web as it is pneumatically and mechanically directed into the angularly upwardly inclined air stream.

4. A method according to claim 1 comprising the additional step of diverging the angularly upwardly inclined

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air stream as the fibers are being separated and parallelized whereby greater fiber separation is obtained.

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ROBERT R. MACKEY, *Acting Primary Examiner.*

15 I. C. WADDY, *Assistant Examiner.*