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METHOD OF CLEANING FIBERS

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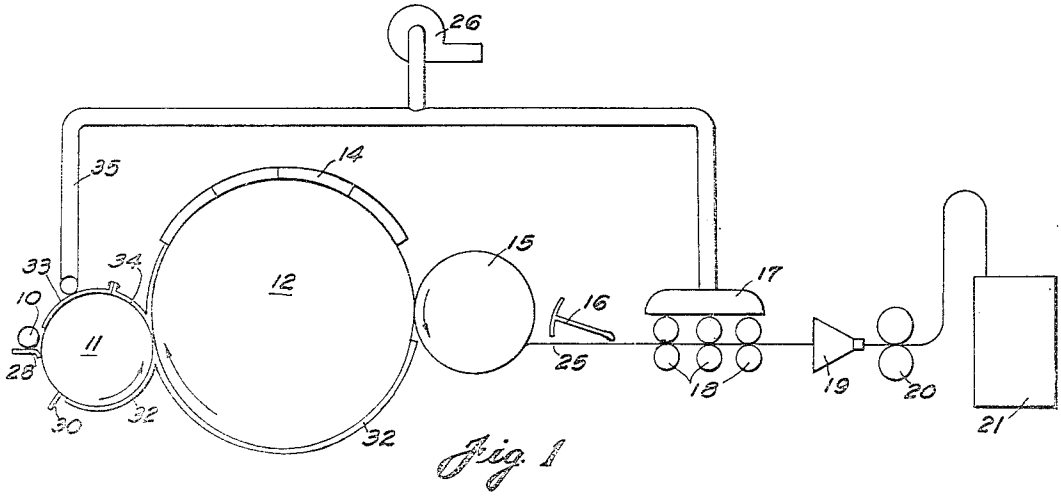


Fig. 1

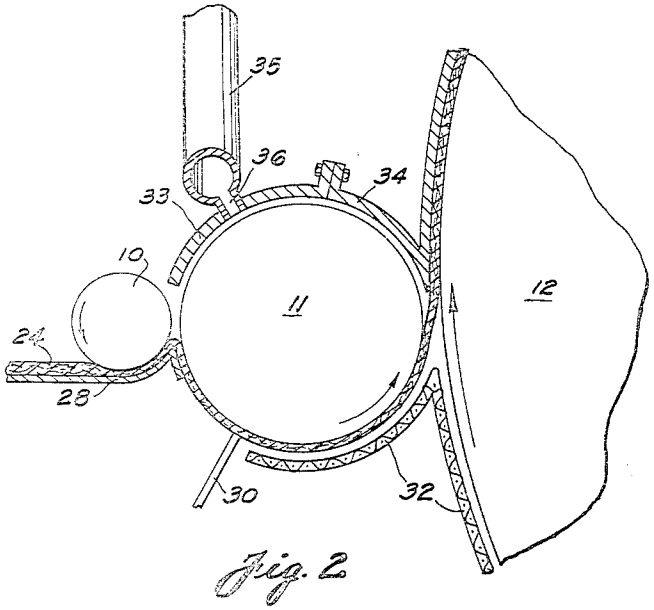


Fig. 2

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METHOD OF CLEANING FIBERS

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Int. Cl. D01g *15/40, 15/00, 15/76*
U.S. Cl. 19—105 3 Claims

ABSTRACT OF THE DISCLOSURE

A method for high-speed processing and cleaning fibers being transferred by a lickerin from a feed roll to a carding cylinder wherein the lickerin is rotated at high speed, in the range of about 900–1700 r.p.m., to centrifugally separate substantial amounts of impurities from the fibers while creating air currents which are then controllably directed to further separate impurities from the fibers as they are transferred from the lickerin to the carding cylinder.

RELATED APPLICATION

This application is a continuation of Ser. No. 611,432, filed Jan. 24, 1967, now abandoned, which in turn is a continuation-in-part of Ser. No. 461,473 filed June 4, 1965, now abandoned.

BACKGROUND

This invention relates to a method of high-speed processing and cleaning fibers. More particularly, the invention relates to a high-speed method of cleaning fibers as they are passed around a lickerin and transferred to a carding cylinder.

According to conventional carding procedures, masses of fibers are processed at relatively slow speeds in order to obtain good cleaning of the fibers and therefore a good quality carded web. For example, masses of fibers are usually processed through a carding apparatus wherein the lickerin (usually nine inches in diameter) is rotating at speeds up to about 300 r.p.m. and the carding cylinder (usually fifty inches in diameter) is rotating at speeds up to about 185 r.p.m. As a result of these slow speeds the production rate of such carded web is not wholly satisfactory.

Certain previous attempts to increase the production rate of good quality corded web solely by increasing the speed of the carding apparatus have resulted in deterioration of the quality of the web to a point wherein it is unacceptable and must be subjected to additional cleaning operations. Such deterioration of the web quality apparently occurs due to the re-entry of previously separated impurities into the web as it is processed. Moreover, substantial amounts of fibers are thrown outward from the apparatus.

In another previous attempt to increase the production rate of good quality carded web, as disclosed in U.S. Patent No. 3,145,425, the speeds of the carding cylinder and the doffer apparently have been successfully increased to some degree. However, the increases in the speeds of the carding cylinder and doffer have been achieved only with the use of additional equipment which provides a suitable ironing and drafting treatment to control and clean the web as it is received from the doffer.

BRIEF DESCRIPTION OF THE INVENTION

In accordance with the present invention there is provided a method of cleaning fibers wherein masses of fibers may be processed at high-speed through a carding apparatus while producing a good quality carded web. As a result, production rates for such carded web have been

achieved which are substantially greater than heretofore obtained.

Briefly described, the method provides for the cleaning of fibers as they are transferred by a lickerin from a feed roll to a carding cylinder and includes the steps of feeding the fibers to the lickerin, rotating the lickerin at speeds between about 900 and 1700 r.p.m. to centrifugally separate substantial amounts of impurities from the fibers while creating a first air current passing downward between the feed roll and the lickerin and a second air current passing upward between the lickerin and the carding cylinder, transferring the fibers from the lickerin to the carding cylinder while the second air current passes therethrough to further separate impurities from the fibers, directing the second air current away from the carding cylinder after it has passed through the fibers, and at least partially neutralizing the first air current by creating a low pressure region above the area between the feed roll and the lickerin so that the fibers being fed to the lickerin will be securely engaged by the rotating surface of the lickerin and held in place during the transfer.

As will be more apparent from the following detailed discussion, this method of cleaning fibers at the lickerin substantially eliminates any problems with separated impurities re-entering the fibers adjacent the carding cylinder or in other regions of the apparatus. Moreover, the entire carding apparatus may be operated at much higher speeds using the method of this invention while still producing good quality web.

These and other features and advantages of the instant invention will become apparent upon the inspection of the following specification, taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a schematic elevational view of a typical type apparatus in which the method of this invention can be utilized.

FIGURE 2 is a schematic elevational view, partially in cross-section, showing a card cylinder, a lickerin, a feed roll and their associated elements, and including an embodiment of one means which may be used with such apparatus in order to carry out the method of this invention.

DETAILED DESCRIPTION OF THE INVENTION

Referring now more particularly to the drawings, there is shown in FIGURE 1 a carding system in which the present invention may be practiced including a feed roll **10**, a lickerin **11**, a carding cylinder **12**, flats **14**, a doffer **15**, a comb **16**, an air-suction hood **17**, a series of drafting rolls **18**, a trumpet **19**, a pair of calender rolls **20**, and a can **21**.

Generally, in this system, fibers from a bale are fed to the feed roll **10** which immediately passes them on to the lickerin **11**. The lickerin **11** transfers the fibers to the carding cylinder **12** and cooperating flats **14**. After being carded the fibers are doffed in the form of a web **25** by a doffer roll **15**. The web of fibers is then passed through the comb **16** for further parallelization followed by drafting through rolls **18** in the usual manner. The drafting rolls may be of the conventional smooth-surfaced type or of a fluted type as disclosed in copending application Ser. No. 449,118, now U.S. Patent No. 3,307,227. Thereafter, the drafted web is condensed through trumpet **19**, calendered through rolls **20** and deposited into a can **21** for conveyance to a subsequent operation.

A suction hood **17** connected to a blower **26** may be provided adjacent the drafting rolls **18** to remove any of the lighter impurities and short undesirable fibers which become loosened during the drafting operation. Any

heavy impurities, of course, may fall directly to the floor beneath the drafting rolls.

A suction duct **35**, also connected to blower **26**, leading to the lickerin side of the carding cylinder, may be provided to create a low pressure region above the lickerin for purposes which will be explained in further detail with regard to FIGURE 2.

Now then, referring to FIGURE 2, it may be seen that the feed roll **10**, lickerin **11** and carding cylinder **12** are rotated in the directions indicated by the respective arrows. The mass of fibers **24** passes over the feed plate **28** and is engaged by the rotating feed roll **10**. As the fibers pass beneath the feed roll **10** they are slightly compressed. This compression enables the feed roll to continuously pull in and advance the mass of fibers **24** to the lickerin **11**. Moreover, since the lickerin is rotated faster than the feed roll, such compression retards the fibers as they are fed to the lickerin whereby the fibers are slightly stretched and parallelized as the teeth (not shown) of the lickerin engage them and transfer them to the carding cylinder **12**.

The lickerin **11**, of conventional construction and size, is rotated at high speed in the range of about 900–1700 rpm. Thus, as the fibers are engaged and held to the surface of the lickerin during such high speed rotation sufficient centrifugal forces are set up so that various impurities and short undesirable fibers become loosened from the mass. These impurities and short fibers then become separated from the mass by either being centrifugally thrown outward away from the lickerin or by being dislodged as the mass passes over the mote knives **30** (only one of which is shown). While these centrifugal forces are sufficient to loosen and separate impurities and short undesirable fibers they are insufficient to cause separation of the majority of the longer fibers in the mass from the lickerin teeth. The mote knives further tend to parallelize these fibers so that no fiber aggregates remain in the mass as it is transferred to the carding cylinder.

From the high speed lickerin the fibers are transferred to the carding cylinder **12** which is rotated in a direction opposite to the rotation of the lickerin and at such a speed that its trangential component of velocity is greater than the tangential component of velocity of the lickerin. Preferably, the carding cylinder, being of conventional construction and size, is rotated at a speed in the range of 335–500 r.p.m. The differential in speeds tends to further thin and parallelize the fibers as they are transferred thus loosening further remaining impurities and short undesirable fibers in the mass of fibers. The manner in which these loosened impurities are removed at this point in the operation is explained later.

Desirably a protective screen **32** is provided which substantially covers the lower juncture of the lickerin and the carding cylinder so that foreign substances are inhibited from entering the mass of fibers as they are transferred from the lickerin to the carding cylinder. The screen also functions to catch any of the longer fibers that may become separated from the mass. As these longer fibers build up on the screen they are picked up by the lickerin or the carding cylinder and are again integrated with the mass.

While it has been found that substantial cleaning of the fibers may be accomplished by rotating the lickerin in the range of 900–1700 r.p.m. it has also been found that relatively strong air currents are created around the lickerin.

Of particular concern is an air current created between the lickerin **11** and the feed roll **10** which, if uncontrolled, would tend to blow the mass of fibers downward at the juncture of the feed plate **28** and the lickerin thereby inhibiting the function of the lickerin teeth in engaging and holding the mass of fibers to the surface of the lickerin. Moreover, such an air current would also tend to cause loosening and separation of the mass of fibers which did become engaged by the lickerin teeth and held to the surface of the lickerin.

Therefore, in order to overcome any possible detrimental effects of such an air current there is provided a region of low pressure above the area between the feed roll and the lickerin to at least partially neutralize any downwardly directed air current which may be created by the high-speed lickerin. It is pointed out that the degree of low pressure required is governed by the particular speed at which the lickerin is operated and may be easily adjusted to fit the situation as will be understood by those skilled in the art. Neutralization, of course, is necessary only to the extent that the above-mentioned possible adverse effects are prevented. Complete neutralization of this air current is also acceptable as is creation of an air current flowing upward between the feed roll and the lickerin.

A suitable arrangement for providing a neutralizing low pressure region above the area between the feed roll and the lickerin is shown in FIGURE 2. A curved cover segment **33** is mounted in slightly spacetd apart relationship from the lickerin surface adjacent the area between the feed roll and the lickerin. A vacuum is then created in the space betweetn the cover segment and the lickerin by a suction line **35** communicating with the cover segment through an elongated slot **36**. The suction line **35** may also be connected to the blower **26**. Thus, any air current being swept into the space between the cover segment **33** and the lickerin will be at least partially exhausted through the suction line **35**. Moreover, the lickerin is inhibited or prevented from creating any air current in a downward direction immediately adjacent the feed roll due to the effects of the low pressure region.

Another air current of concern is created between the lickerin and the carding cylinder and moves in an upward direction. Therefore, as the mass of fibers are transferred from the lickerin to the carding cylinder and are thinned and parallelized, as previously discussed, the air current passes through the fibers and carries with it the loosened impurities.

In order to prevent these impurities from re-entering the fiber mass it is essential to direct the air current away from the carding cylinder. This is accomplished by a cover segment **34** which conforms to the curvature of the corresponding portions of the lickerin and the carding cylinder and is mounted in spaced-apart relationship over the area between the lickerin and the carding cylinder. Preferably, the cover segment **34** is secured in a conventional manner to one end of the cover segment **33** to form a continuous passage over the upper surface of the lickerin. In addition, that portion of the conver segment **34** lying adjacent the carding cylinder is positioned in such a manner that the mass of fibers being transferred will substantially fill the area between the cover segment and the carding cylinder. As a result, the air current passing through the mass of fibers and carrying the impurities will be directed through the continuous passage formed by the cover segment **34** over the lickerin and exhausted through the suction duct **35**.

It will thus be understood that the method according to the invention makes it possible to not only provide the cleaning of a mass of fibers being processed through a carding apparatus but also provides greater efficiencies in operation and increased production of carded web. Moreover, from the above description it will be obvious to those skilled in the art that certain variations may be undertaken without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. In a method of cleaning fibers; the steps of feeding fibers from a feed roll to the circumferential surface of a lickerin rotating at a rotational speed which provides a velocity to said circumferential surface sufficient to cause a substantial amount of any impurities that are intermingled with said fibers and that have a greater mass

than said fibers to be thrown from said circumferential surface by centrifugal force because of said greater mass, said velocity being substantially equal to the velocity of the circumferential surface of a lickerin having a diameter of nine inches and a rotational speed within a range between 900 and 1700 revolutions per minute; and subsequently feeding said fibers from said circumferential surface of said lickerin to the cylindrical surface of a carding cylinder rotating at a rotational speed which provides a velocity to said cylindrical surface which is substantially equal to the velocity of the cylindrical surface of a carding cylinder having a diameter of fifty inches and a rotational speed within a range of 335 to 500 revolutions per minute; said method being further characterized by the motion of said circumferential surface of said lickerin creating a substantial flow of air toward fibers passing between said feed roll and said lickerin and by substantially neutralizing said flow of air before it reaches said fibers passing between said feed roll and said licketrin by drawing air from above said lickerin.

2. The method of claim 1 including the step of feeding said fibers from said cylindrical surface of said carding cylinder through a series of drafting rolls and of drawing air and debris upwardly from said fibers as said fibers pass between said drafting rolls.

3. The method of claim 2 including the step of passing air upwardly through said fibers and away from said carding cylinder while feeding said fibers from the said circumferential surface of said lickerin to said cylindrical surface of said carding cylinder.

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DORSEY NEWTON, Primary Examiner

U.S. Cl. X.R.

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