April 25, 1967 O. BASS, JR., ETAL 3,315,320

PNEUMATIC CLEANING MEANS FOR CARDING MACHINES

Filed Aug. 23, 1965 3 Sheets-Sheet 1

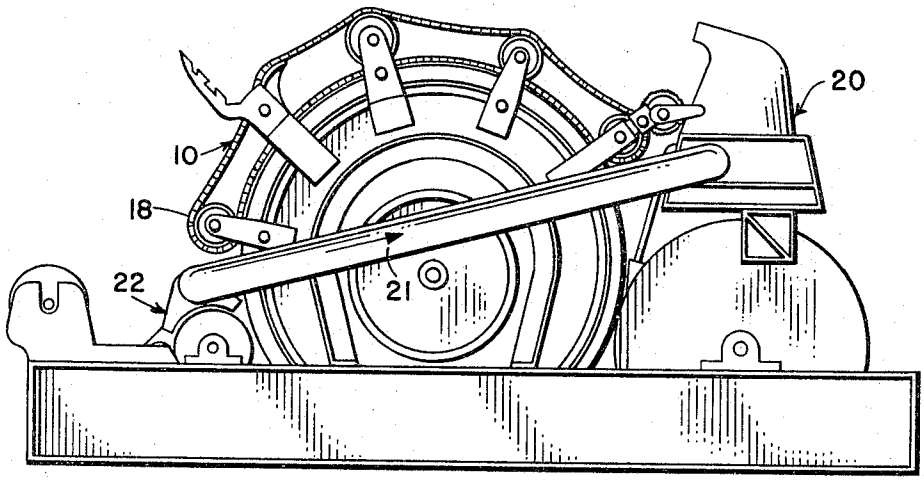


FIG. 1

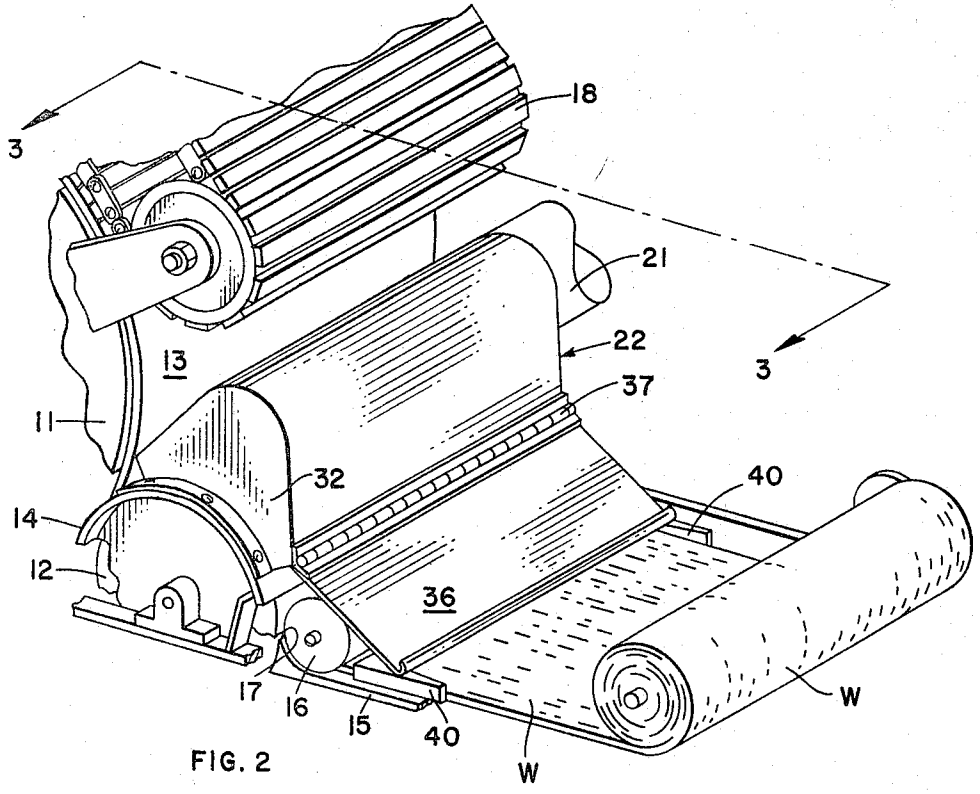


FIG. 2

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Filed Aug. 23, 1965 3 Sheets-Sheet 2

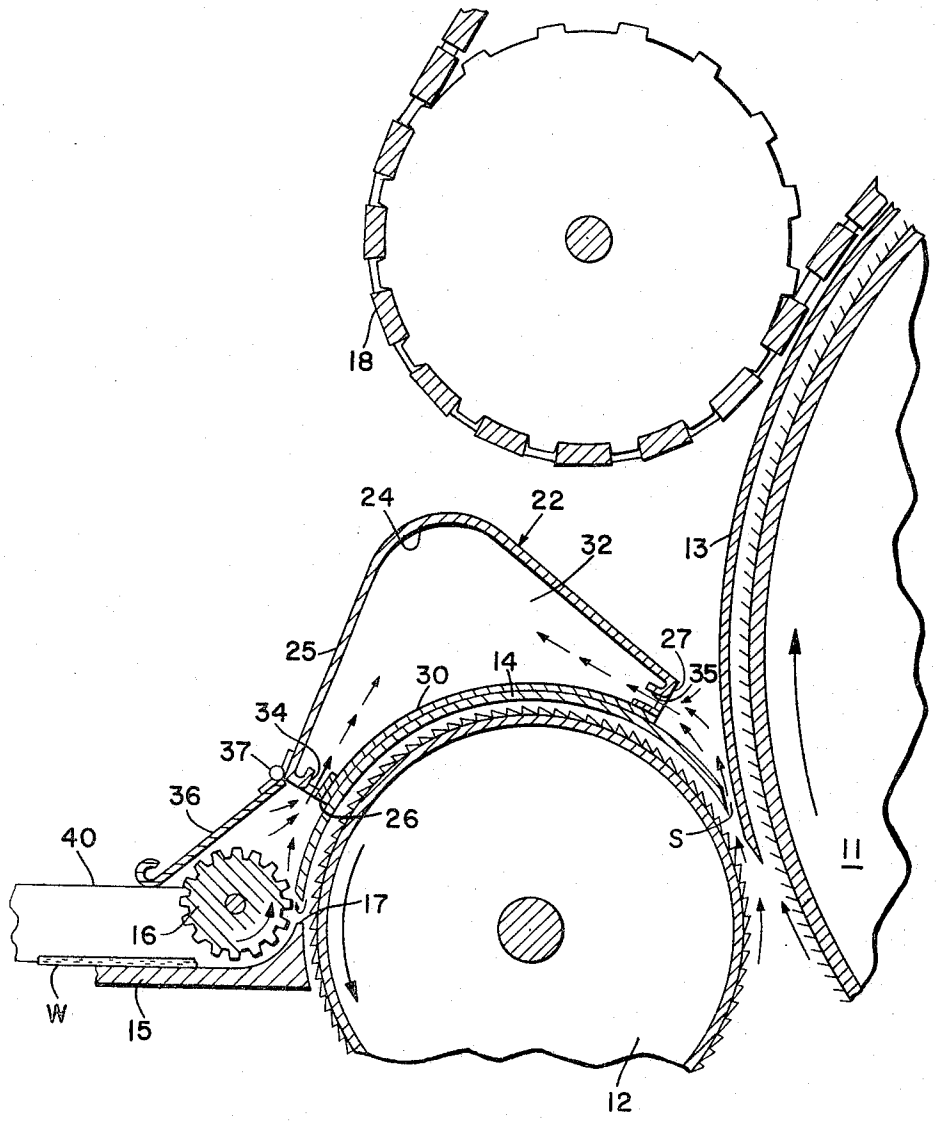


FIG. 3

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PNEUMATIC CLEANING MEANS FOR CARDING MACHINES

Filed Aug. 23, 1965 3 Sheets-Sheet 3

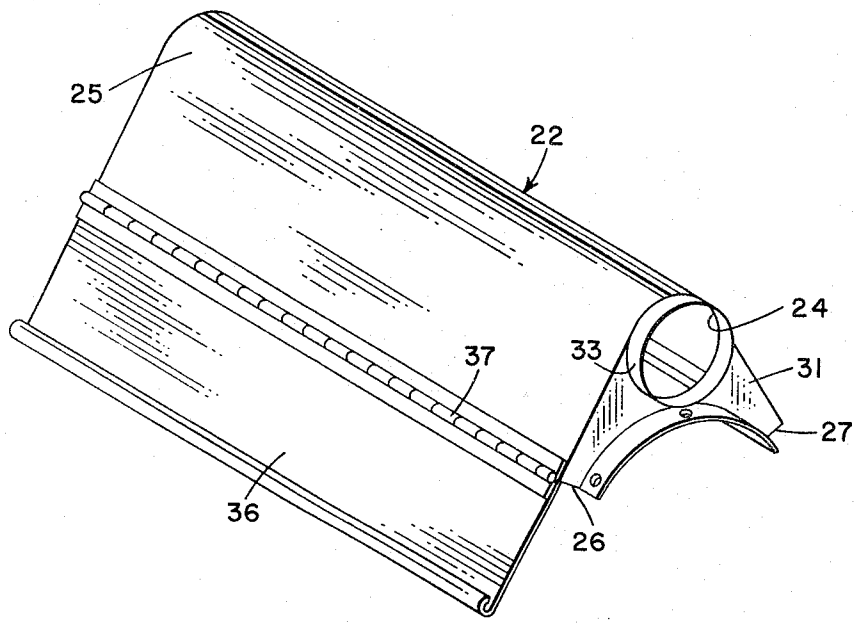


FIG. 4

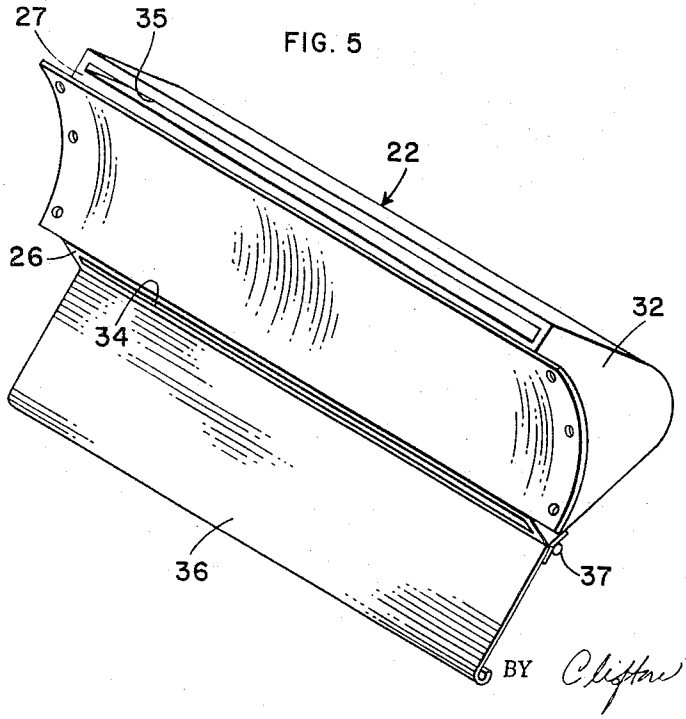


FIG. 5

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PNEUMATIC CLEANING MEANS FOR CARDING MACHINES

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4 Claims. (Cl. 19—107)

This invention relates generally to pneumatic cleaning means for textile machinery, and, more particularly, to a novel suction nozzle adapted for use on a carding machine to reduce blowout and to remove lint, dust and fly from the licker-in end of the machine.

As the textile industry began to press for production at higher and higher speeds, and, in response thereto, as conventional carding machinery was used at higher and higher speeds, the consequential "blowout" or emission of lint, dust, and fly became a great problem in that the air in the carding machinery room became greatly overladen with lint and fly, in that the machinery therein became coated with the lint, dust and fly, in that the room became quite uncomfortable to work in, and particularly in that the lint and fly-laden air and machinery resulted in a slow-down of production and in an inferior grade of sliver. In response to the problem, pneumatic cleaning apparatus was developed.

Early attempts at at providing pneumatic cleaning apparatus included the positioning of a massive suction hood over the entire carding machine or, in the alternative, the enclosure of large sections of the machine and evacuation of these large enclosed sections by suctions of large intensity. These attempts proved unsatisfactory in that productions of suctions of great intensity were required in order that the apparatus be effective in reducing the atmospheric content of lint and fly. Additionally, installation of this apparatus was an expensive and time-consuming process. The apparatus as installed impeded the necessary access to various sections of the operating machine and proved to be ineffective to reduce the blowout associated with carding machinery operated at the high rates of speed now used.

Subsequent designs for pneumatic cleaning apparatus have included the provision of various types of suction nozzles positioned on the machine at various points wherein the production of substantial concentrations of blowout could be alleviated. It is in combination with this type of cleaning apparatus that the novel suction means of the invention is particularly useful. One pneumatic cleaning system with which the nozzle according to the invention is particularly useful is that disclosed in a co-pending application by Ivan Horvat, a co-inventor of this invention, which co-pending application was filed in the United States Patent Office July 27, 1964, under Ser. No. 385,354 and entitled "Pneumatic Cleaning Unit for Textile Machines." One form of the nozzle according to the invention is disclosed in that application.

One area of the machine wherein occurs an intense "blowout" of lint, dust and fly is in the vicinity of the feed roll and the licker-in roll. This "blowout" is occasioned by the high velocity surface air currents generated by the rapid rotation of the licker-in and the main cylinder which are compressed by the licker-in bonnet and screen, and by the tendency of fibres to become loosened or separated from the web at and adjacent the licker-in,

as when the web is bent over the peak or crown of the feed plate and fed onto the rapidly rotating licker-in roll. Other fibres and foreign matter are loosened from the web by the compressed surface air currents as the web moves beneath the licker-in and contribute to the concentration of fibres dispersed in the atmosphere as a sizable quantity of the said surface air currents pass from under the licker-in bonnet into the atmosphere adjacent the feed roll and the conventional back knife plate of the main cylinder.

One attempt to combat the dispersion of lint, dust and fly at the licker-in end of the machine is disclosed in United States Letters Patent No. 1,612,581 to Holden, which teaches the use of separate dust rolls over the opening between the licker-in bonnet and the back knife plate and over the feed roll to collect the lint, dust and fly dispersed at these two points. Dust rolls have proved to be increasingly inefficient in collecting lint and fly as the carding machine is operated at higher and higher speeds.

Other attempts to reduce blowout include the approach disclosed in United States Letters Patent Nos. 2,983,966 to Brown et al. and 3,034,179 to Hall wherein the licker-in bonnet was replaced with a special cover designed to cause the natural air currents generated by the rotating licker-in roll and main cylinder to carry dispersed fibres and trash back into the web prior to its introduction under the feed roll. While the use of these covers do tend to partially reduce the concentration of lint, etc. in the blowout, the covers are objectionable for certain desired qualities of carding in that the short fibres and trash should be removed from the lap prior to working by the flats rather than purposely laid back onto the lap. Otherwise, the short fibres tend to produce neps which impede the desired parallelization of fibres during the carding operation and adversely affect subsequent dyeing operations.

One means and method of applying suction to the licker-in is shown in United States Letters Patent No. 3,150,415 to Reiterer which teaches the use of a suction hood provided with a perforated plate mounted closely adjacent the licker-in surface and connected to a source of suction. Such a device replaces the licker-in bonnet and applies suction directly to the entire upper periphery of the licker-in roll with the consequent danger of stripping usable long fibres from the licker-in roll which would otherwise be retained by the compressed surface air currents for subsequent delivery to the main cylinder. It has been found that the excessive waste engendered by Reiterer's perforated plate can be eliminated while attaining the desired cleaning and control of the air currents created through rapid rotation of the licker-in roll by confining the application of suction to the web transfer points at either side of the licker-in roll.

It is therefore an object of this invention to provide a novel suction nozzle adapted to be connected to any suitable suction source and arranged in overlying relation to the licker-in cover to collect lint and fly at both sides of the licker-in, i.e., at the feed roll, and at the opening between the licker-in cover and the back knife plate. Arranged in this manner, the nozzle effectively draws off or diverts from the atmosphere great quantities of the machine generated and lint-laden compressed air currents by directing them into the suction system as they escape from beneath the licker-in bonnet. This is an important

feature of the invention. The suction inlets of the present nozzle are not directed toward the licker-in roll and are separated therefrom by the licker-in cover, thereby avoiding the danger of excessive waste by stripping off desirably long fibres.

It is another object of this invention to provide a novel licker-in suction nozzle, the use of which eliminates the need for dust rolls at the licker-in end of the machine.

It is a further object of this invention to provide a novel licker-in suction nozzle and associated suction system which can be easily and inexpensively fabricated and quickly installed as an accessory on a conventional carding machine.

It is a still further object of this invention to provide a novel means and method of discriminately collecting undesirably short fibres and trash from the web prior to its introduction by the main cylinder to the working area of the flats.

Having stated some of the objects of the invention, other objects and a fuller understanding of the invention may be had by referring to the claims and to the following description taken in conjunction with the drawings in which

FIGURE 1 is a side elevation of a carding machine having mounted thereon a self-contained suction system which includes the novel suction nozzle of the invention;

FIGURE 2 is a perspective view of the novel suction nozzle as positioned over the licker-in bonnet of a conventional carding machine;

FIGURE 3 is an enlarged fragmentary sectional view taken substantially along the line 3—3 in FIGURE 2 and showing the suction nozzle in operative position on the licker-in bonnet;

FIGURE 4 is a perspective view looking at the top and one end of the nozzle removed from the machine; and

FIGURE 5 is a view similar to FIGURE 4, but looking at the bottom and the other end of the nozzle.

As most clearly appears from FIGURES 1 and 2, the invention is particularly adapted to be used in conjunction with a carding machine **10** which includes a main carding cylinder **11** and a licker-in roll **12**. A portion of the periphery of the main cylinder adjacent the licker-in roll is covered by a back knife plate **13** and the upper periphery of the licker-in roll is covered by a licker-in bonnet or cover **14** which for the purpose of the invention is spaced slightly from the plate **13** to define an opening or space S extending across the machine. A lap W of textile material to be processed on the carding machine is fed to the licker-in roll **12** across a feed plate **15** by a feed roll **16**.

The forward end of the feed plate **15** adjacent the licker-in roll **12** includes an upstanding end portion or crown **17** which extends between the peripheries of the licker-in roll **12** and the feed roll **16** and across which the lap W is fed immediately prior to its delivery to the licker-in roll **12**. The licker-in roll **12** and the main cylinder rotate at a considerably faster rate of speed than the feed roll **16** with the result that a large quantity of short fibres are released from the lap W as it is passed sharply about the projection or crown **17** on the forward end of the feed plate **15** as the lap W passes on to the licker-in roll **12**. The lap W is subjected to a cleansing action during which foreign matter including dirt, dust and fly is removed from the web during its passage about the lower periphery of the licker-in roll **12** and prior to its delivery to the rapidly rotating main cylinder **11** and its associated flats **18**.

The area beneath the carding machine **10** is generally closed in an effort to prevent the short fibres, dirt, dust, fly, lint and other foreign matter released from the web during its processing from being released into the atmosphere about the card and much of the lint, fly, etc. thus generated is in fact trapped in the enclosed area beneath the carding machine. Despite this precaution, however, considerable quantities of the lint, fly, etc. are normally expelled into the atmosphere about the carding machine

through the openings at either side of the licker-in bonnet **14**, i.e. between the licker-in roll **12** and the feed roll **16** on one side and between the licker-in bonnet **14** and the back knife plate **13** on the other side. The structure thus far described is conventional and it is the control and collection of the fibres and foreign matter released by the conventional carding machinery at these two points with which the present invention is concerned.

According to the invention, a source of suction and a collection box **20** are conveniently located relative to the carding machine **10** from which a suction tube **21** extends to a suction nozzle **22** mounted on the licker-in bonnet **14**.

Referring to FIGURES 4 and 5, the nozzle **22** includes a hollow body portion or suction chamber **24** defined by an upstanding generally arcuate cover or top **25**. A pair of elongated relatively narrow side walls **26** and **27** depend from opposite longitudinal edges of the top **25** and extend between the top wall **35** and a bottom wall **30**, preferably shaped in cross section to conform to the curvature of the licker-in bonnet **14** on which it is adapted to be supported, as most clearly shown in FIGURE 3. So positioned, the side walls **26** and **27** extend in respective planes which converge adjacent the axis of the licker-in roll. The ends of the nozzle are closed by end walls **31** and **32**. A nipple or sleeve **33** extends outwardly from the end wall **31** for providing communicative connection between the interior of the suction chamber **24** and the conduit **21**. The side walls **26** and **27** have respective longitudinally extending slots **34** and **35**, each extending substantially the entire length of its respective side wall between the end walls **31** and **32**.

The nozzle **22** is so dimensioned that when positioned on the licker-in bonnet as shown in FIGURE 3 the suction inlet **34** is positioned or located immediately above the feed roll **16** while the suction inlet **35** is positioned above and directed toward the juncture of the licker-in bonnet **14** with the back knife plate **13**. The area immediately above the feed roll is selectively closable by a plate or flap **36** which is articulated to the nozzle adjacent the juncture of the top wall with the side wall **26**, as at **37**. The free end of the extension plate **36** is supported by conventional web guides **40** adjacent the longitudinal side edges of the feed plate. Arranged in this manner, the extension plate **36** overlies the suction inlet **34** as well as the feed roll thereby partially enclosing the area about the feed roll and increasing the efficiency of the suction action at this point.

The licker-in roll rotates at a rapid rate of speed in the direction of the arrow in the drawings thereby creating surface currents of air which are compressed between the licker-in roll **12** and the licker-in bonnet **14**, these compressed air currents being released in part at the edge of the bonnet **14** adjacent the feed roll **16** and in part through the space S between the bonnet **14** and the back knife plate **13**. The currents of air are lint-laden and have heretofore escaped into the atmosphere with considerable velocity. The small remainder of the surface air currents generated through the rapid rotation of the licker-in roll flow into the enclosed area beneath the carding machine. The suction inlet **35** also serves to draw off surface air currents generated by the rapidly rotating main cylinder **11** which pass through the space S, thereby helping to relieve the superatmospheric air pressure within the enclosed area beneath the carding machine.

As most clearly seen in FIGURE 3, the flap **36** is supported in closely spaced relation above the feed roll **16** so that it defines an open-ended enclosure above the feed roll with which the suction inlet **34** communicates. Air is drawn into the open ends of the enclosure and across the upper periphery of the feed roll **16** to cleanse it of lint and short fibres remaining on the fluted roll **16** after it has delivered the lap W to the licker-in roll **12**, it being noted that the feed roll **16** rotates in a counterclockwise direction in FIGURE 3, or toward the flap **36**

from the peak **17** of the feed plate **15**. The need for a dust roll to clean the feed roll is thus eliminated.

The short fibres and lint releastd from the lap W as it passes over the peak **17** and onto the licker-in roll **12** are similarly drawn into the enclosure beneath the flap **36** and carried into the suction inlet **34** by the licker-in surface air currents and by air drawn into the open ends of the enclosure and across the top of the feed roll.

The suction inlet **35** is spaced closely adjacent the back knife plate **13** and the space S between the plate **13** and the licker-in cover **14**. So positioned, the inlet **35** is arranged to draw off surface air currents from the licker-in and the main cylinder which escape through the space S, carrying with them short fibres and lint released from the web as it is transferred from the licker-in to the main cylinder. It will, of course, be understood that the elongated strip of wood or metal which has heretofore been used to close the space S in an effort to prevent blowout at that point is removed for the purpose of the invention to open the space S for controlled release of the air currents and lint.

The back knife plate **13** and the proximate downwardly converging surface of the top wall **25** define an open ended trough beneath the bight of the flats **18**, into which accumulations of lint drop from the flats and the spaces created therebetween as they move around the bight above the licker-in. Accumulations of lint which thus fall toward the bottom of said trough-like area are effectively drawn into the suction inlet **35**.

The suction inlets **34** and **35** each preferably taper outwardly from their ends adjacent the coupling **33** toward the end wall **32** of the nozzle **22** to provide substantially uniform suction throughout the length of the nozzle.

One important advantage of the invention as described is that the lint and short fibres which have heretofore been either released to the atmosphere or carried beneath the licker-in and through the screen with the relatively heavy motes, dirt and foreign matter are now collected separately through the nozzle **22** and delivered to a collection box substantially free of dirt, etc. It will be apparent that the invention which separates the relatively light short fibres and lint from other undesirable relatively heavy matter released from the web at the licker-in screen makes possible a higher quality by-product of the carding operation than other cleaning systems previously known.

There is thus provided an improved suction nozzle for the licker-in end of a carding machine which effectively and discriminately removes short fibres and lint after they have been released from the web by conventional carding techniques.

In the drawings and specification there have been set forth preferred embodiments of the invention and, although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being defined in the claims.

We claim:

1. A suction nozzle for use with the licker-in of a carding machine having a main cylinder, a licker-in roll and a licker-in bonnet and a feed roll, said nozzle comprising:

(a) a top wall;

(b) a bottom wall spaced from the top wall and shaped to conform to the configuration of the licker-in bonnet;

(c) a pair of spaced side walls extending between the top and bottom walls and lying in respective planes which converge adjacent the axis of the licker-in roll;

(i) each of said side walls having a suction orifice providing communication between the atmosphere and the interior of the nozzle;

(ii) one of said side walls with the orifice therein positioned so as to draw in air from the area where the licker-in roll and the main cylinder diverge,

(iii) the other of said side walls with the orifice therein positioned so as to draw in air from beneath the licker-in bonnet adjacent the feed roll;

(d) a pair of spaced end walls joined to the top, bottom and side walls; and

(e) a nipple extending through one wall of said pair of spaced end walls and adapted to provide communication between the interior of the nozzle and a source of suction.

2. A structure according to claim **1** which includes a flap extending from adjacent the jucture of the top wall with one of said side walls above its respective suction orifice and adapted to overlie the feed roll in closely spaced relation whereby suction currents may be induced across the upper periphery of the feed roll to remove lint and short fibres.

3. A suction nozzle for carding machines having a main cylinder, associated flats and a licker-in roll, an imperforate licker-in bonnet covering the licker-in roll and an imperforate back knife plate spaced from the bonnet and covering a portion of the periphery of the main cylinder adjacent the licker-in, a feed plate on the other side of the licker-in and a feed roll for feeding a web of textile material to the licker-in, said suction nozzle comprising:

(a) a suction chamber defined by;

(i) a bottom wall shaped to conform to the curvature of the licker-in bonnet and extending between the ends of the bonnet and the longitudinal edges of the bottom wall being spaced inwardly from the longitudinal edges of the bonnet;

(ii) a pair of downwardly converging spaced side walls rising from the longitudinal edges of the bottom wall and each of said side walls having a longitudinally extending suction orifice, one of said side walls with the orifice therein positioned so as to draw in air from the area where the back knife plate and the licker-in bonnet converge, and the other side wall with the orifice therein positioned so as to draw in lint-laden air from beneath the licker-in bonnet adjacent the feed roll;

(iii) a vaulted top wall rising from said side walls and spaced above the bottom wall;

(iv) a pair of spaced end walls extending between the top and bottom and side walls and one of said end walls having a nipple extending therethrough adapted to provide communication between the suction chamber and a suction source;

(b) an air-diverting baffle flap articulated to one side wall adjacent its juncture with the top wall and above its suction orifice and extending over said suction orifice in closely spaced superposed relation to the feed roll; and

(c) said nozzle being fastened on said licker-in bonnet beneath said flats with the suction orifices arranged to draw in air from adjacent the opposite longitudinal edges of the bonnet.

4. A suction nozzle for use with the licker-in end of a carding machine having a licker-in roll, a feed roll, a licker-in cover, and a back knife plate, said suction nozzle comprising a top wall spaced above the licker-in roll and having a first longitudinal edge adjacent the juncture of said back knife plate with said licker-in cover, said top wall having a second longitudinal edge spaced above the feed roll, a side wall depending from each longitudinal edge of said top wall and extending toward the licker-in roll, each of said side walls having a suction orifice providing communication between the

atmosphere and the interior of the nozzle, means otherwise closing the interior of the nozzle from communication with the atmosphere, and means connecting the interior of the nozzle to a source of suction.

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