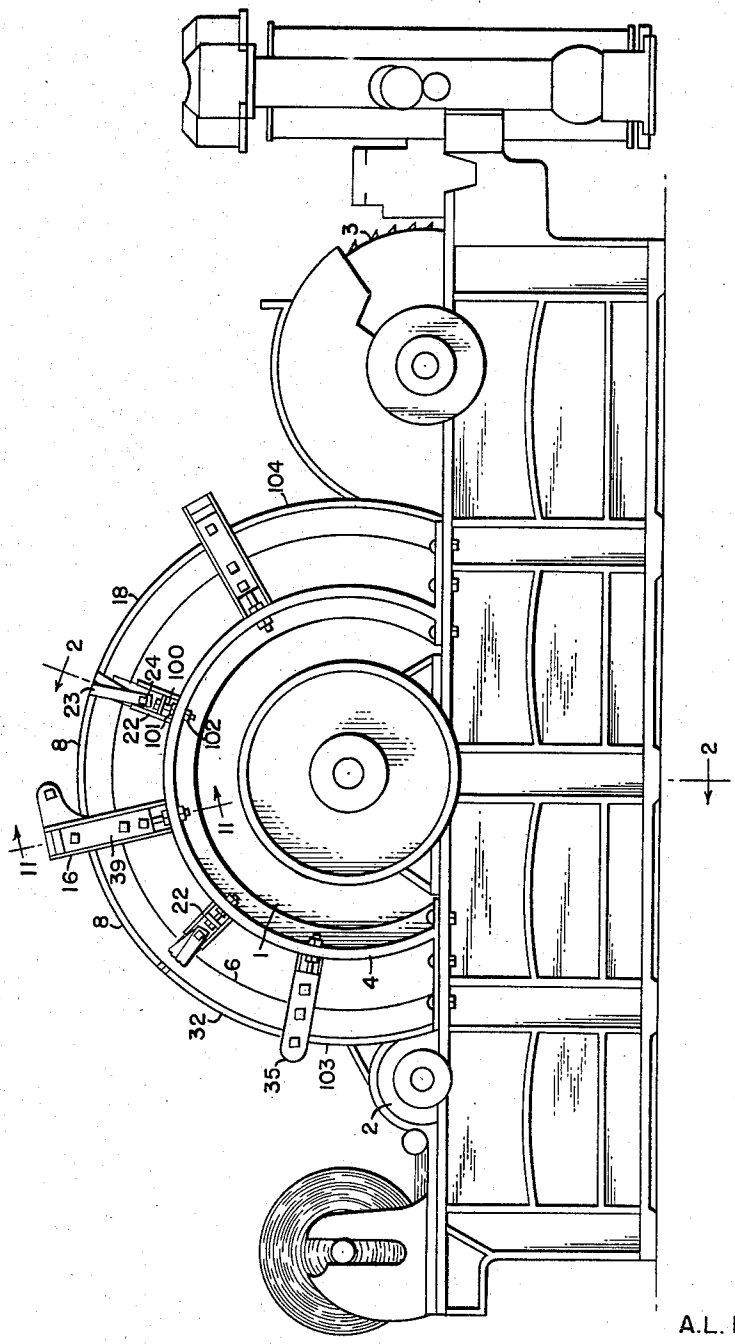
March 31, 1959 A. L. MILLER ET AL 2,879,549

CARDING APPARATUS

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FIG. I.




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CARDING APPARATUS

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FIG. 2.

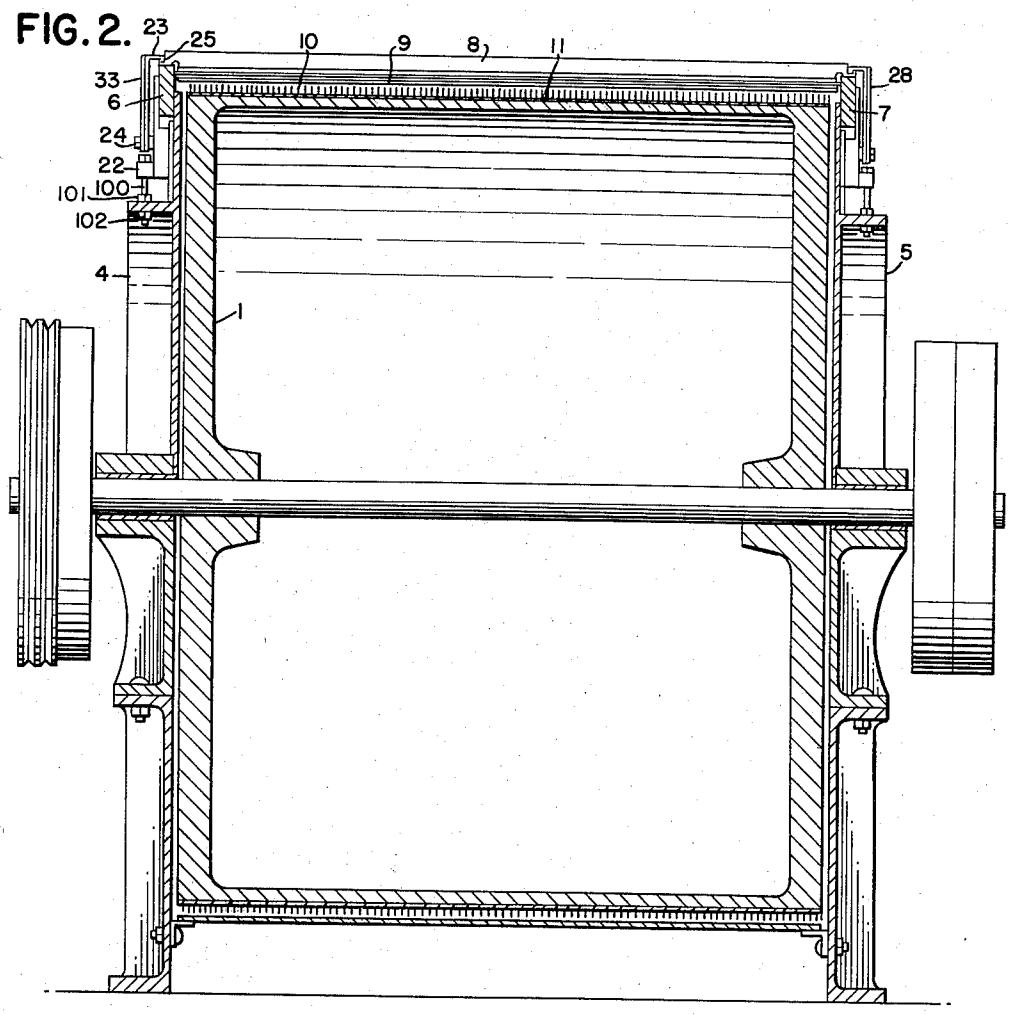
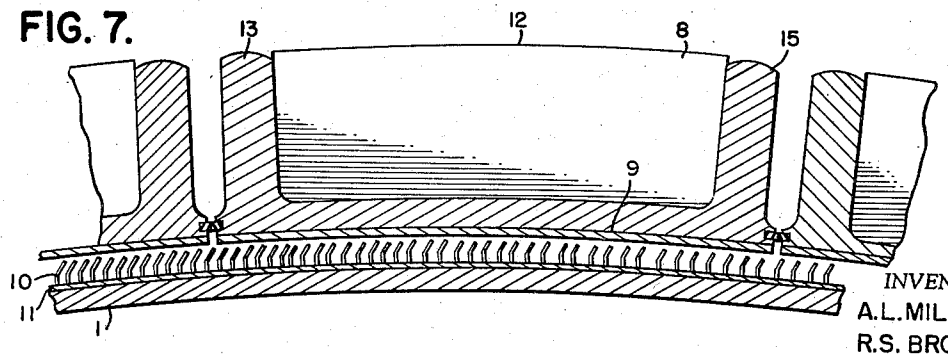



FIG. 7.




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CARDING APPARATUS

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FIG. 3.

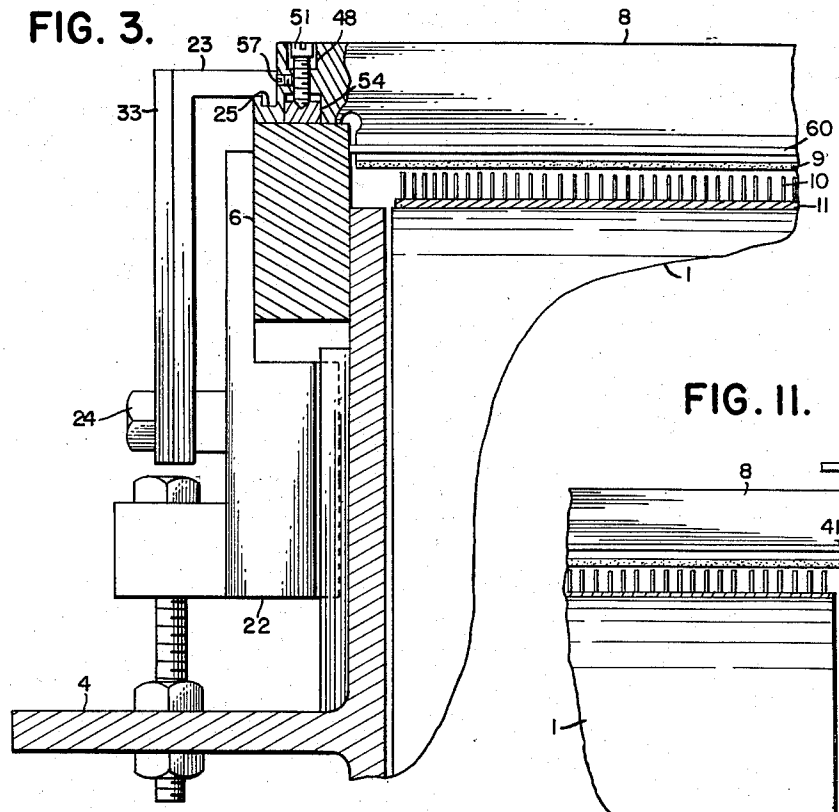



FIG. 11.



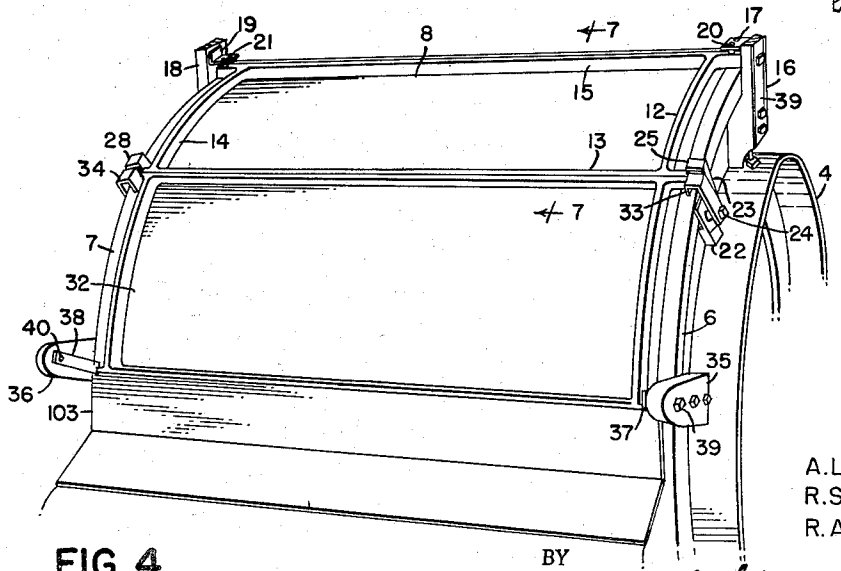




FIG. 4.

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CARDING APPARATUS

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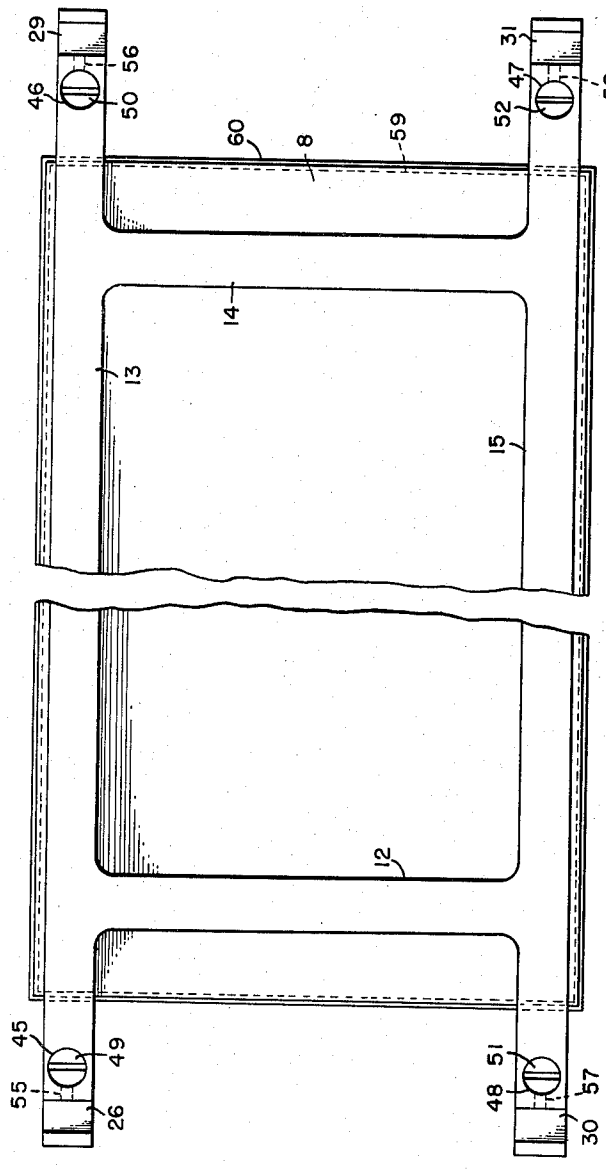



FIG. 5.

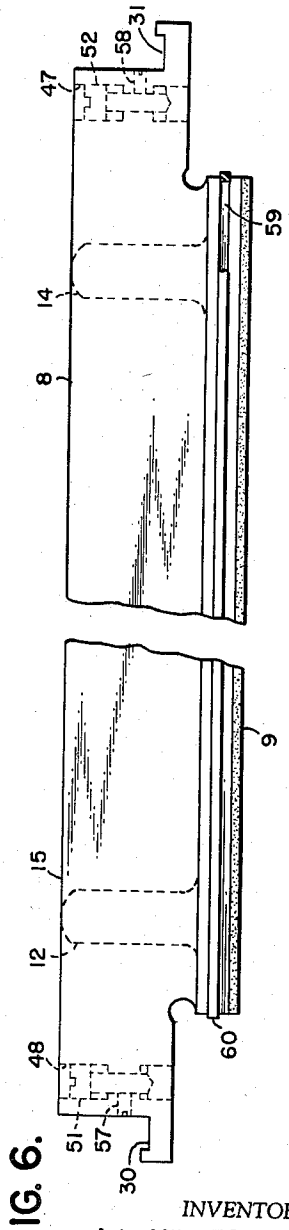



FIG. 6.

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CARDING APPARATUS

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FIG. 8.

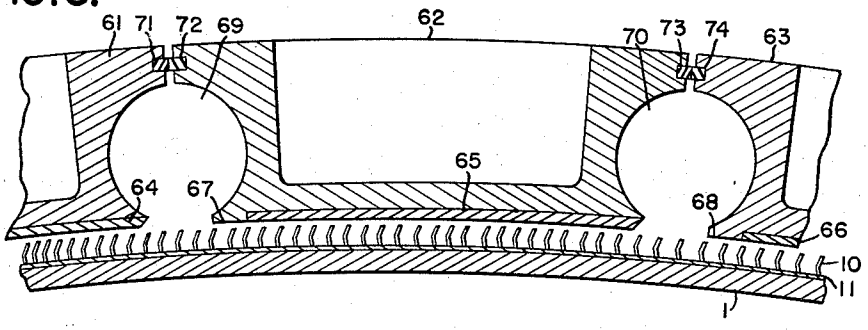



FIG. 9.

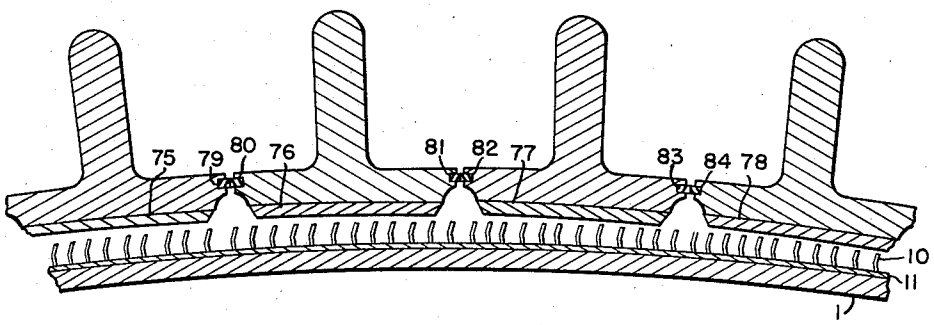
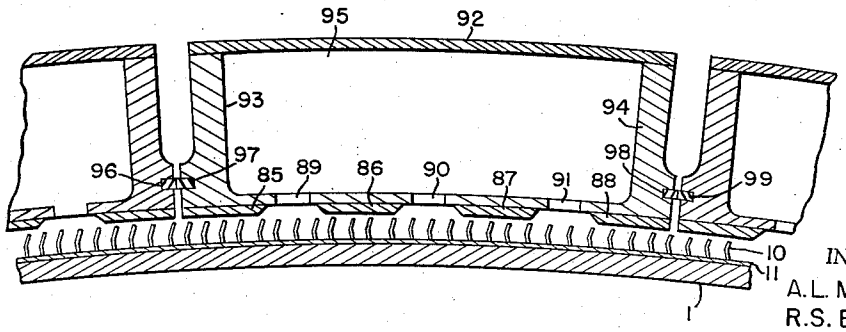



FIG. 10.




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United States Patent Office 2,879,549 Patented Mar. 31, 1959



2,879,549

# CARDING APPARATUS

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Application January 3, 1957, Serial No. 632,400

7 Claims. (Cl. 19—104)

(Granted under Title 35, U. S. Code (1952), sec. 266)

A non-exclusive, irrevocable, royalty-free license in the invention herein described, throughout the world for all purposes of the United States Government with the power to grant sublicenses for such purposes, is hereby granted to the Government of the United States of America.

This invention relates to improvements in carding machines.

Conventional carding machines in use at the present time consist essentially of a lickerin to pluck small tufts of fiber from a bat of fibers, a carding cylinder onto which the fibers are deposited by the lickerin, a plurality of flat bars, the revolving flats, which surround about one third of the peripheral surface of the carding cylinder, and a doffer which removes the fibers from the cylinder. The revolving flats have a needle-clothing surface, similar to that of the carding cylinder, which is relatively motionless, moving only a few inches per minute for the purpose of being cleaned. The surface speed of the carding cylinder itself is about 2200 feet per minute as it carries the fibers past the revolving flats.

During the carding process the needles of the revolving flats collect fibers from the carding cylinder and become loaded and relatively ineffective for about 60% of the working cycle. The unopened fibers collected by the flats amount to about from 2% to 5% of the total fibrous material fed to the machine. These fibers, known as "flat strips," are disposed of as waste. In addition, loading of the flats forces the fibers on the cylinder down into the cylinder clothing, causing impacting and increasing the amount of material wasted by about another 1%. However, one of the more serious disadvantages of conventional carding machines which results directly from the loading of the flats and the cylinder is the tendency to produce a non-uniform product and one having a considerable number of neps.

It is an object of this invention to provide a carding apparatus which completely eliminates the waste due to flat strips and substantially reduces the cylinder strips.

Another object is to provide a carding apparatus which produces a more uniform card sliver having fewer neps.

In general, the objects of this invention are achieved by replacing the revolving flats with a plurality of stationary adjacent bars or plates, in the form of a cover spaced from the cylinder, which are secured to the flexible bend and which present a continuous granular or abrasive surface to the carding cylinder. The bars cover the entire width and a portion of the circumference of the cylinder and are contoured to match the surface of the carding cylinder. The clearance between the bars and



the cylinder is determined by the requirements of the particular kind of fiber being carded.

The invention is described in detail below, reference being made to the accompanying drawings in which:

Figure 1 shows a side elevation of a conventional carding machine in which the revolving flats and their auxiliary operating mechanism are replaced by the stationary carding bars of the present invention;

Figure 2 is a sectional view taken on line 2—2 of Figure 1 showing a general internal relationship between the carding bars and the old elements of the carding machine;

Figure 3 is an enlarged section of a portion of Figure 2 and shows the details of the means for securing and adjusting the carding bars;

Figure 4 is a portion of a perspective view of the apparatus showing the method of mounting a preferred form of the bars and their relationship to each other;

Figure 5 is a plan view of a preferred form of carding bar;

Figure 6 is a side elevation of the same bar;

Figure 7 is a section taken on line 7—7 of Figure 4 showing the contoured surface and the relationship of the carding bar to the carding cylinder;

Figures 8, 9, and 10 show variations of the preferred form of carding bar. These will be described in detail below; and

Figure 11 is a sectional view of the conventional structure taken on line 11—11 of Figure 1 and shows the means for adjusting the position of the flexible bends, as will be described in detail below.

As seen from Figure 1, the apparatus resembles the conventional carding machine in that it has the usual carding cylinder 1, lickerin 2, doffing cylinder 3, arches 4 and 5, and flexible bends 6 and 7. However, according to this invention, the revolving flats and their accompanying mechanism have been eliminated and replaced by a stationary cover comprising a plurality of similar carding bars 8.

The carding bars are of metal and are provided with a concave granular surface 9 contoured to match the curved surface of the needles 10 of the card clothing 11 on cylinder 1. Reenforcing ribs 12, 13, 14 and 15 may be provided for strength and to keep the bars dimensionally stable.

The granular surface may vary in roughness, from coarse to fine, depending on the fibers being carded, and may be obtained either by machining or sandblasting the metal, or by cementing a granular or abrasive cloth or paper to the metal.

The carding bars are adjustably secured to the flexible bends by means of a series of clamps on the brackets provided on the conventional machine for securing and adjusting the flexible bends. Thus, bracket 16 which is one of the brackets for securing the flexible bend, is provided with an additional bracket 17 to form a clamp. Corresponding brackets 18 and 19, respectively, are provided on the other side. Screws 20 and 21 in the brackets bear on rib 15 and force the carding bar against flexible bends 6 and 7. The other side of the carding bar may be clamped by the means shown in Figures 1–4. These means consist of the bracket 22, which is part of the

conventional machine and is radially adjustable by means of bolt 100 and nuts 101 and 102, and a hooked member 23 which is rotatably mounted on bracket 22 by means of screw 24. A lip 25 on member 23 engages a groove 26 on the extension of rib 13 of the carding bar, and a corresponding lip 27 on a member 28 similar to member 23 engages groove 29 on the other end of rib 13 of carding bar 8. As can be seen from Figure 5, each carding bar is provided with four similar grooves at the ends of the extension of each of the longitudinal ribs which function as bearing surfaces for the clamps. These are shown at 26, 29, 30, and 31 in the figure. In order to secure an adjacent carding bar, such as, carding bar 32, a second clamp 33, similar to 23, is also rotatably mounted on bolt 24, and a corresponding clamp 34 is mounted on the same bolt (not shown) as clamp 28.

However, as will be apparent, any suitable means for clamping the carding bars to the flexible bends may be used. For example, in securing carding bar 32, in addition to clamps 33 and 34 which secure the carding bar at the corners adjacent to carding bar 8, the two remaining corners are held down by means of already-existing brackets 35 and 36 to which have been added rods 37 and 38, respectively. These are rotatably mounted in the brackets by means of bolts 39 and 40. Since brackets 35 and 36 are radially adjustable, rods 37 and 38 are held against the corners of the carding bar while the brackets are drawn toward the center of the arch.

As in the conventional carding machine, the flexible bends are positionally adjustable. This is made possible, as shown in Figure 11, by providing a slidable bracket 39 in bracket 16 which carries a pin 40. The pin is inserted into a hole 41 in the flexible bend. Since bracket 39 is radially adjustable by means of bolt 42 and nuts 43 and 44, the flexible bend 6 may be set at any desired position. From Figure 1, it will be seen that adjustments may also be made at brackets 35, 22, 24, and at a fifth point, not shown, at the right hand end of the flexible bend. It will be understood that, as in the conventional apparatus, similar adjustment means are provided on the other side of the machine for flexible bend 7.

The clearance between the carding bars of the present invention and the card clothing may be adjusted by means of the structure shown in Figures 3, 5, and 6. Countersunk holes 45, 46, 47, and 48 are provided, one at each corner, in the extensions of ribs 13 and 15, and these are threaded to accommodate screws 49, 50, 51, and 52. A bearing plug 54 fits loosely in an enlarged portion at the bottom of hole 48, for example. One such plug is provided in each of holes 45, 46, 47, and 48. The plugs rest on the machined upper surface of the flexible bends; and the distance between the carding bar and the card clothing may be varied in either direction by turning adjusting screws 49, 50, 51, and 52. Once the proper adjustment has been made the bars may be fixed in position by tightening set screws 55, 56, 57, and 58 to keep adjusting screws 49, 50, 51, and 52 from working themselves out of position. Thus by a combination of adjustments made possible by the adjusting screws and by the previously described adjustments in the position of the flexible bends, it is possible to obtain any desired setting for the carding bars for the most efficient carding of any given type of fiber.

The size and number of carding bars are so selected as to cover substantially the same portion of circumference of the main cylinder as was covered by the revolving flats, and to fit snugly against cover plates 103 and 104 in order to completely enclose the cylinder.

An advantageous feature of the present invention which was not possible with the old revolving flats is the ability to make the apparatus substantially air-tight and thus materially reduce the amount of atmospheric dust which is always present as a result of the carding operation. This is accomplished by cutting a groove 59 along the edges of the carding bar and inserting a sealing gasket 60 which extends a short distance beyond all four of the sides of the bar. This sealing gasket may be made of rubber or any other suitable flexible material. The gaskets at each end of the bar bear on the flexible bends, as seen in Figures 2 and 3, while those along the sides contact gaskets on adjacent bars. In this manner the interior of the apparatus is sealed substantially air-tight.



Several variations in the preferred structure of the carding bars are possible.

One such variation, shown in Figure 8, provides, in a series of adjacent bars 61, 62, and 63, a series of intermittent granular surfaces 64, 65, and 66 separated by smooth surfaces 67 and 68 and air spaces 69 and 70. Sealing gaskets in the ends (not shown) bear against the flexible bends, as in the preferred form of Figures 5 and 6, while adjacent bars are made air-tight by seals 71, 72, 73, and 74. The air-spaces, or recesses, disturb the flow of air and cause the fibers to make repeated contact with the carding bars.

In another variation, as shown in Figure 9, the carding bars may be made in relatively narrow widths with their granular surfaces 75, 76, 77, and 78 set at an angle to the cylinder which converges in the direction of rotation. Because of the narrow width of these bars, their surfaces need not be contoured to match the surface of the card clothing. As in the previously described forms, the bars are provided with sealing gaskets in their ends (not shown) and along their adjacent edges. These are represented in Figure 9 by elements 79, 80, 81, 82, 83, and 84. In this variation, the converging angle increases the contact between the fibers and the carding bars.

The third variation shown in Figure 10 is also for the purpose of improving contact between the fibers and the carding bars where the nature of the fibers requires it. As shown, the granular surface is not continuous, but is broken into a number of intermittent surfaces 85, 86, 87, and 88, separated by perforations 89, 90, and 91. A cover plate 92 bridges ribs 93 and 94 as well as the ribs on the ends of the bar (not shown), forming a sealed dead air space 95 above the perforations which serves to disturb the air flow and thus enhance contact between the fibers and the granular surfaces. In this modification too, the bars are provided with end gaskets (not shown) as well as gaskets 96, 97, 98, and 99 to seal off the spaces between adjacent bars.

The advantages of the carding bars in place of the revolving flats are numerous. When properly selected for the type of material being carded, the granular surface will not accumulate fibers, or load up. It therefore presents 100% of its working surface at all times to open and align the fibers which are being carried on the cylinder. The carding action of this large working area is so complete that there are no unopened tufts of fibers to be removed such as are deposited in the flats of a conventional carding machine. The "flat strips" are therefore completely eliminated with a resulting saving of from 2 to 5% of the fibrous material. Furthermore, the fibers being conveyed on the main cylinder of the carding machine are not forced down into the wires as happens with the conventional revolving flats. As a result, the amount of "cylinder strips" is reduced by up to 50%, which represents a valuable additional saving of fibrous material.

In addition to the above-mentioned saving in material, the fact that the carding bars present a large working surface at all times and do not load results in a card sliver which has fewer neps.

This invention also results in reduction of a health hazard. The carding room in textile mills has always been considered an area in which the atmosphere is undesirable because of lint and dust in the air. However, because bars of the present invention are made air tight over the card cylinder, the dust and lint which normally escape through the flats is eliminated.

The following table presents test data obtained for purposes of comparison between a conventional carding

machine having revolving flats and one in which the flats have been replaced by the carding bars of this invention:

*Low middling grade, 1 1/32" cotton*

| Machines Being Compared | Neps per Grain | | | Card Waste After 2.5 Hours' Production | | | |
|---|---|---|---|---|---|---|---|
| | Minutes of Operation | | | Flat Strips, Percent | C and D [1] Strips, Percent | Motes and Fly, Percent | Total, Percent |
| | 22 | 72 | 132 | | | | |
| Conventional Card with Revolving Flats | 15.2 | 22.2 | 20.9 | 3.89 | 1.95 | 1.71 | 7.55 |
| Card equipped with Granular Carding Bars | 6.27 | 9.48 | 10.9 | 0.0 | .89 | 2.58 | 3.47 |

[1] Cylinder and doffer.

We claim:

1. Carding apparatus comprising a main cylinder, card clothing on the cylinder, and a stationary cover spaced from the cylinder covering all of width and a portion of the circumference of said cylinder, the cover being provided with a non-loading, rigid, abrasive granular surface facing the card clothing.

2. Carding apparatus comprising a main cylinder, card clothing on the cylinder, structure supporting the cylinder, stationary cover means spaced from and covering all of the width and a portion of the circumference of said cylinder, the cover means being provided with a non-loading, rigid, abrasive granular surface facing the card clothing, means for securing the stationary cover means on the supporting structure, and means for adjusting the spacing between the stationary cover means and the cylinder.

3. Carding apparatus comprising a main cylinder, card clothing on the cylinder, structure supporting the cylinder, stationary cover means spaced from the card clothing to provide clearance for passage of fibers, said cover means covering all of the width and a portion of the circumference of the cylinder and card clothing and being provided with a non-loading, rigid, abrasive granular surface facing the card clothing, means for securing the stationary



cover means on the supporting structure, means for adjusting the clearance between the cover means and the card clothing, and sealing means on the cover to provide an air tight seal whereby a substantially sealed chamber enclosing the cylinder is formed.

4. The apparatus of claim 3 wherein the cover means is contoured to match the cylindrical surface of the card clothing.

5. The apparatus of claim 3 wherein the cover means is constructed in sections, each section being individually mounted and adjustable on the supporting structure.

6. The apparatus of claim 3 in which a substantially continuous non-loading, rigid, abrasive granular surface is presented to the card clothing.

7. The apparatus of claim 3 in which the granular surface is discontinuous and in which the discontinuous granular areas are separated by air spaces.

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