

Dec. 13, 1966

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3,290,729

CARD CLOTHING

Filed Aug. 4, 1961

2 Sheets-Sheet 1

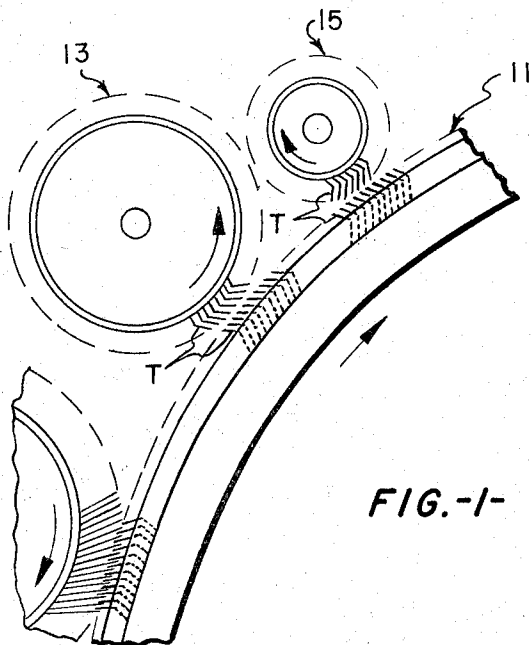


FIG. -1-

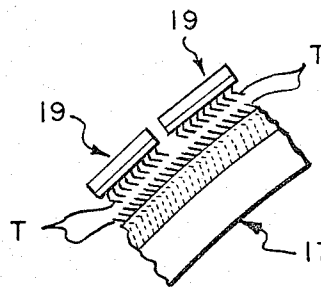


FIG. -2-

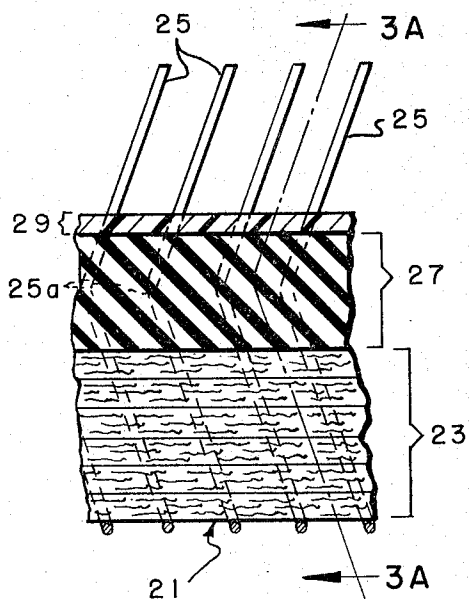


FIG. -3-

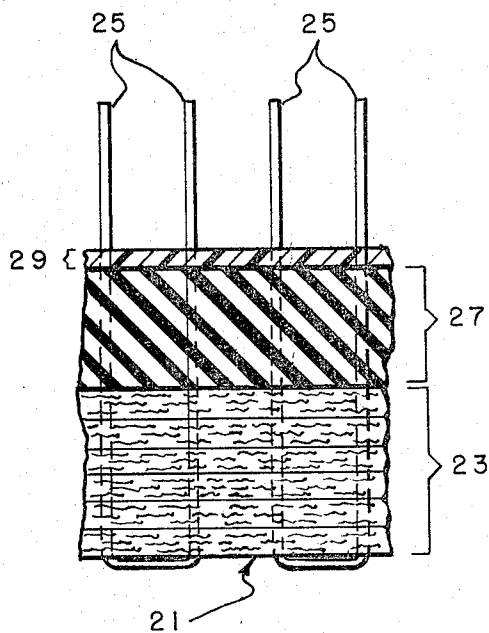


FIG. -3A-

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2 Sheets-Sheet 2

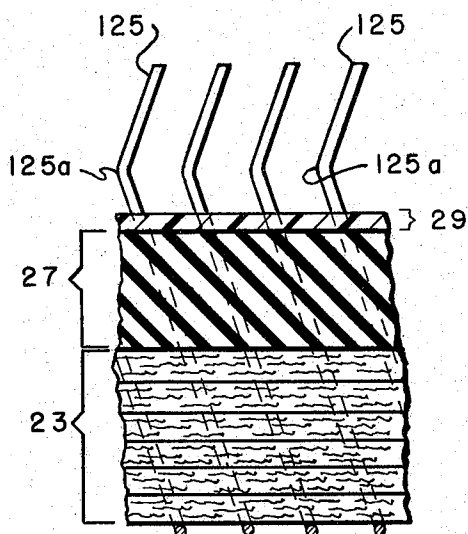


FIG.-4-

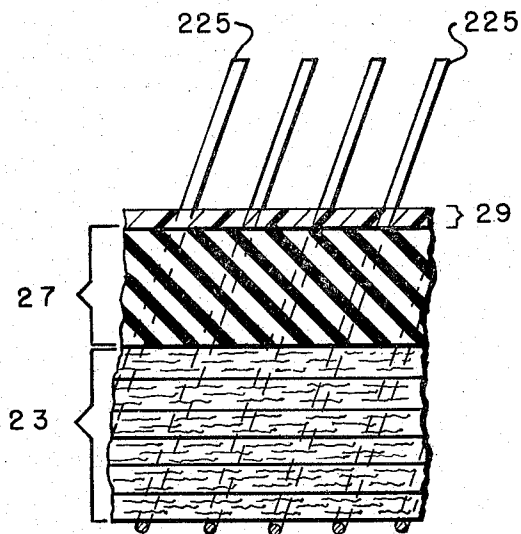


FIG.-5-

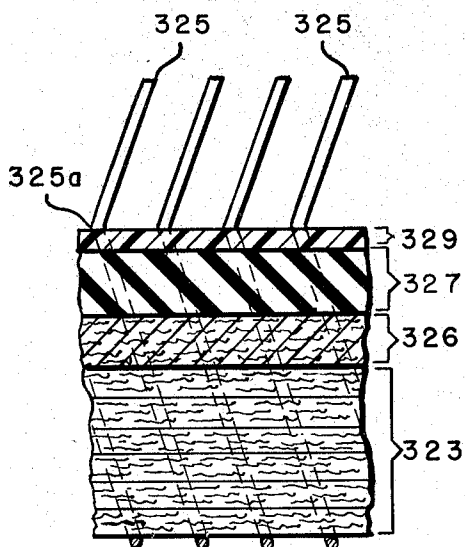


FIG.-6-

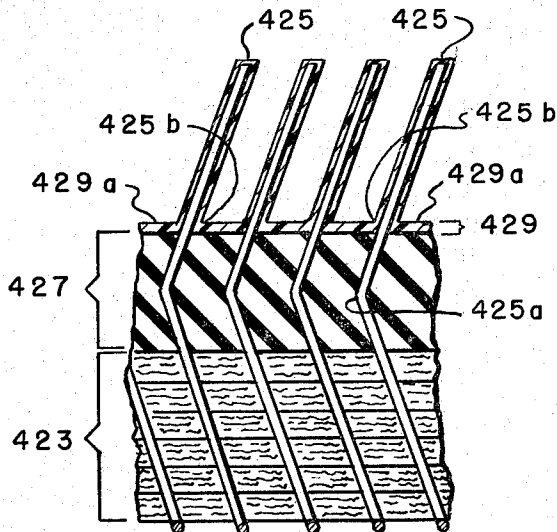


FIG.-7-

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CARD CLOTHING

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6 Claims. (Cl. 19—114)

This invention relates to textile fiber handling means, and more particularly to improved carding machines and card clothing which has materially improved fiber handling characteristics, being particularly less susceptible to accumulation thereon of a layer of fiber waste.

A textile carding machine including the main cylinder, and the flats or worker and stripper rolls as the case may be, are designed and built for the basic purpose of placing the card clothing in a position to function most efficiently in handling the textile fibers. Otherwise stated, the cylinder rolls, worker rolls, stripper rolls, and flats are merely a movable solid foundation for the card clothing or wire which serves to perform the various functions of carding, stripping and transfer of the fibers in order to provide a desirably uniform sliver or roving. In this formation of a uniform sliver or roving, it has been the practice, particularly in the woolen industry, to permit the normal tendency of the working surface on the card cylinders and rolls to accumulate a layer of fibers of a desired thickness so as to provide a resilient mat surface for the fibers being worked and processed into roving or sliver by the teeth of the cylinders and other tooth-carrying fiber-working elements. This has not been satisfactory for several reasons, among which are the high cost of the woolen fibers which form the waste layer of fibers at the base of the teeth of the clothing, the unevenness of the roving or sliver which is being produced during the build up, whether evenly or unevenly, of these fibers to desired thickness on the card clothing; and the continuing build up of such fibers on the card clothing after the desired thickness is obtained, resulting in continuing change of weight of the roving or sliver and eventual requirement for stripping of the card clothing to remove all of the fibers, whereupon the entire operation is repeated. The waste fibers which are periodically removed or stripped from the card clothing have a small, but materially reduced, value in the case of cotton fibers; however, in the case of woolen fibers the wool waste thus removed from the card clothing sells for only one or two percent of the original cost of the wool, and it will be apparent that card strips, particularly in the woolen processing industry, are a major economic problem. In both the woolen and the cotton industries there is also the economic problem of down time of the machines while the waste fiber accumulation is stripped off, and the cost of the labor required in stripping the card of these fibers. Various attempts have been made to solve this problem, particularly on the woolen carding machines, by provision of fillet card clothing in which the wire teeth are embedded in a resilient fillet base of a desired thickness and resiliency so as to simulate the optimum built-up thickness condition of the woolen fibers on the clothing, and while various compositions, such as felt, rubber, and various plastics, all in various laminate constructions, have been employed to provide this resilient build up, none of these has been successful in eliminating or even very materially reducing the requirement for stripping of the cards, since there has still been a continuing build up of fibers on all previous card clothing.

It is accordingly a major feature of the present invention to provide improved card clothing, and consequent improved carding machines as well as improved card

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cylinders, worker and stripper rolls, flats, etc., which provide the desired degree of resilience for the fibers and fiber working teeth at the working surface of the clothing and on which clothing and cards there is a substantial reduction in the tendency to build up a layer of waste fibers on the clothing, thereby materially reducing, if not entirely eliminating, the requirement for periodic shut-down and stripping of a built-up mass of waste fibers on the clothing.

Another feature is the reduction in tendency to accumulate and build up a layer of grease and dirt on the clothing surface.

Still other features and attendant advantages will become apparent to those skilled in the art from a reading of the following detailed description of several physical embodiments constructed according to the invention, taken in conjunction with the accompanying drawings wherein:

FIGURE 1 is a schematic line drawing of a portion of a woolen card embodying the present invention.

FIGURE 2 is a schematic line drawing of a portion of a cotton card embodying the invention.

FIGURE 3 illustrates in schematic longitudinal cross section one physical embodiment of fillet clothing particularly adapted for woolen cards according to the invention.

FIGURE 3A is a schematic cross section taken along the line 3A—3A of FIGURE 3.

FIGURES 4—7 are schematic longitudinal cross sections of four modified embodiments according to the invention.

Referring now in detail to the figures of the drawings, FIGURE 1 illustrates a portion of a woolen card having fillet card clothing thereon according to the invention. As in conventional practice, the woolen card includes a cylinder or swift 11 of relatively large diameter, and a plurality of worker rolls 13 and stripper rolls 15 disposed about a portion of the periphery of the cylinder or swift 11. Each of the swifts or cylinders, worker rolls, stripper rolls and fancy rolls (not shown), as well as doffer rolls (not shown) has a clothing of teeth T on its peripheral surface in order to perform various actions on the fibers during the carding operation. The cylinder or swift 11 serves generally to carry the main body of fibers past the plurality of worker rolls 13, and relative movement between the adjacent points of the teeth of the worker rolls and the swift or main cylinder serves to separate the fibers and comb them, both on the surface of the swift or main cylinder and on the surface of the worker rolls. The stripper rolls 15 are conventionally located rearwardly of and closely adjacent their respective worker rolls 13, as well as the surface of the cylinder or swift 11. These stripper rolls 15 rotate in the same direction as the worker rolls 13 and at a faster rate, and this faster rate combined with the direction of inclination of the teeth on the stripper surface results in stripping of the fibers from the surface of the worker roll, whereupon these fibers are subsequently redeposited on the swift or main cylinder 11 by interaction between the teeth of the stripper roll 15 and of the swift 11 which is traveling at a much higher rate of speed. Thereafter, the fibers may again be worked, redistributed, opened and mixed by the reworking action at the interfaces at each of the swift, worker roll and stripper roll. This action is continued at the various worker and stripper roll positions about a substantial portion of the periphery of the swift or main cylinder, to give the desired degree of opening, redistribution or planting, and combing of the fibers. At a subsequent position along the path of travel of the main cylinder or swift 11 there is provided a fancy roll (not shown) which serves to raise the fibers, and particularly the trailing ends of

the fibers, above the upper surface of the teeth on the main cylinder or swift. This raising or fluffing of the fibers on the cylinder serves to orient the fibers for ease of removal from the cylinder or swift 11 by a subsequent doffer roll (not shown), and such raising or fluffing is accomplished by providing the fancy roll with comparatively long and highly flexible fine teeth which pass beneath the outer point surface of the teeth on the cylinder 11 and reach to substantially the bottom of the fiber mass which is being worked on the cylinder, but preferably do not engage the land surface between the teeth.

As a result of this working of the fibers between the cylinder or swift and the various rolls disposed thereabout there is a general tendency to build up a layer of dirt and grease, together with a formation of short and other fibers which tend to become embedded at the base of the teeth on each of the various rolls, although there is comparatively little tendency for this to occur on the fancy roll. According to the present invention, each of these rolls, including the swift or main cylinder, worker rolls, stripper rolls, doffer rolls, etc., or other elements having card clothing thereon which tends to accumulate or build up a waste layer of fibers, dirt and grease, is covered with an improved card clothing which provides a desirably resilient or elastic tooth supporting base and an outer surface which almost completely resists the sticking of anything such as fibers, dirt or grease thereto.

In FIGURE 2 there is shown a portion of a cotton card having a toothed surfaced main cylinder roll 17 with associated toothed surface carding flats 19. Either or both of the cylinder roll 17 and flats 19 may be clothed as shown with card clothing according to the present invention and as illustrated, for instance, in the following described FIGURES 3-7.

In FIGURES 3 and 3A there is shown in schematic cross section a preferred embodiment of flexible fillet clothing 21 which may suitably be employed to cover the cylinders or swifts as well as the worker rolls and stripper rolls. This improved clothing includes a flexible multiply fabric foundation, base layer or substrate 23 which serves to provide a strong backing and secure base for mounting and holding a plurality of spaced apart teeth 25 formed of wire or the like. An intermediate layer or substrate 27 of comparatively elastic material, such as natural or synthetic rubber, including neoprene, etc., or other rubber-like material having the general physical properties of rubber, is suitably bonded to the multiply fabric base or foundation substrate 23 as by vulcanizing, or through the medium of a suitable adhesive such as a rubber cement or the like. An outer relatively thin coating or covering 29 of a solid fluorocarbon polymer or copolymer compound, which may suitably be a fluoroethylene polymer or copolymer compound such as poly (fluoroethylene) containing three or four fluorine atoms per ethylene group (examples, poly(tetrafluoroethylene), available commercially as Teflon, poly(chlorotrifluoroethylene), available commercially as Kel-F, or copolymers of fluorinated ethylene and propylene, available commercially as Teflon FEP) is suitably bonded, as with an adhesive, to the rubber substrate. This bonding of the fluoroethylene layer 29 to the rubber layer 27 may be effected according to conventional practice in the fluoroethylene art as by etching of one surface of a film of fluoroethylene and the rubber layer 27 and bonding the etched surfaces with a suitable adhesive such as a liquid neoprene, a commercially available example of which is Thiocin. The wire teeth 25, which are preferably bridged together in pairs as shown in FIGURE 3A, may then be inserted as by stapling the teeth, with or without pre-piercing of the laminate, through the backing fabric 23 and the other rubber 27 and fluoroethylene strata 29 of the combined laminate. In the embodiment of FIGURE 3, these teeth are set at an angle at their lower end and at another angle at their upper end, with a knee 25a formed within the soft elastic rubber substrate 27.

As noted above, the multi-ply substrate base or foundation of woven fabric 23 serves as a strong backing for anchoring of the wire teeth, the intermediate layer or substrate of soft rubber material serving to simulate the soft buildup layer of fibers which is conventionally permitted to build up, particularly on a woolen card, in order to provide for proper operation thereof, whereas the outer layer of fluorocarbon serves the purpose and function of substantially reducing or eliminating the tendency of fibers, dirt or grease to stick to and build up a further undesirable waste layer at the base of the teeth on this outer surface of the clothing. Thus, there is provided a unique card clothing 21 which provides its own resilient artificial build up layer 27 simulating the normal waste build up formed by expensive fibers which should be processed and not wasted, yet which substantially reduces the tendency of the fibers, grease, and dirt, to stick thereto and build up a further layer above the desired thickness formed by the outer surface of the polyfluorocarbon layer. This artificially buildup resilient surfaced card clothing resists or substantially eliminates any building up or further enlargement of its thickness, with resulting very material benefits of substantial reduction in card waste in the form of card strips, and the formation of more uniform card sliver or roving by the carding machine.

As a result of bonding of the outer layer of fluoroethylene material to the rubber or other similarly elastic material layer the polyfluorocarbon layer is caused to more closely press against the base of the teeth under the compressive recovery action of the rubber layer to which it is bonded, whereas the polyfluorocarbon material itself has a substantial tendency to tear and very little recovery tendency urging it to hold against the base of the teeth. This materially enhances the self-cleaning tendency of the clothing surface, as any large tears or other openings in the surface of the fluoroethylene would obviously result either in entrapment of fibers or reduced tendency to resist pick up of fibers. This bonding of the fluoroethylene layer to the elastic self-recoverable layer of soft rubber or the like which is compressively self-pressed against the teeth also aids in reducing the inherent tendency of the polyfluorocarbon material to split under the influence of lateral flexing or shearing which might otherwise result in complete shattering and disembodiment of the polyfluorocarbon layer.

While the clothing is often most advantageously formed with a knee disposed within the elastic layer of the clothing for the purpose of clothing a cylinder or swift, worker rolls or stripper rolls, it is of course within the scope of my invention to provide the knee at other levels of the fabric, or to eliminate the knee, as shown in the further additional FIGURES 4-6.

In FIGURE 4, the construction is substantially similar to that of FIGURES 3 and 3A, with the exception that the knees 125a of the teeth 125 are exposed above the outer surface of the layer of polyfluorocarbon. This provides for more flexing of the wire teeth 125 above the layer of polyfluorocarbon 29 and with resulting lesser flexing forces being exerted on the polyfluorocarbon layer as a result of bending of the wire teeth.

In FIGURE 5, there is disclosed a similar clothing laminate with the teeth 225 being straight and inclined in one direction, without the formation of a knee therein.

In FIGURE 6 the teeth are formed with a knee disposed at the outer surface of the polyfluorocarbon layer, and the soft simulated build up is formed by a layer of felt and a layer of neoprene or other suitable rubber, or other rubber-like composition having the general physical properties of rubber. The felt layer 326 may be bonded to the neoprene 327 on one side and to the fabric foundation on the other side as with any suitable adhesive, such as rubber cement, or a plasticized resin, and if desired the felt substrate layer 326 may be impregnated with resin

or other suitable impregnant to provide a more coherent mass.

In FIGURE 7, there is shown a further modification in which the teeth are formed similarly to the embodiment of FIGURE 3 with the knee 425a thereof embedded in the soft neoprene or other rubber or rubber-like substratum 427. In this embodiment, however, the fluorocarbon layer 429 has been applied by a spray coating technique in which a suitable air drying dispersion of fluorocarbon material, of the general type described in connection with FIGURE 3, in a suitable adhering carrier has been sprayed onto the teeth and the surface of the neoprene stratum 427 after bonding of the neoprene stratum to the multi-layer fabric foundation 423 and insertion of the teeth 425 through this intermediate form laminate 423, 427. Particularly, due to the usually cellulosic character of the fabric foundation layer 423 and the presence of the rubber or neoprene in the layer 427 it is most desirable that the fluorocarbon coating 429 be capable of air drying without any necessity for curing at elevated temperatures. To this end, I have found that a suitable air-drying coating may be applied by spraying a pigmented air-drying resin-bonding liquid containing a binder, and particularly a lacquer carrier and binder, and containing as pigment a suitable dispersion, preferably colloidal, of solid fluorocarbon polymer or copolymer particles.

The fluorocarbon polymer or copolymer may be a solid fluoroethylene polymer or copolymer selected from such polyfluoroethylene compounds as those having three or more fluorine atoms per carbon atom, for example, poly(tetrafluoroethylene), poly(chlorotrifluoroethylene) or fluorinated copolymers of ethylene and propylene, as discussed previously.

As a present commercially available example of a suitable spray coating compound of this nature, I have found that Emralon manufactured and sold by Atcheson Colloids Company, Inc., Port Huron, Michigan, may be applied with a conventional spray gun in film coating thicknesses of approximately one to five thousandths of an inch with excellent results. In some instances in order to obtain better adhesion, it may be desirable to apply a phosphate coating to the tooth surfaces, or to etch such surfaces lightly with acids such as 1 to 3% phosphoric acid for 5 to 30 minutes beforehand. Upon drying of the resulting toothed laminate clothing the outer layer of sprayed-on fluoroethylene material is found to adhere well both to the teeth and the neoprene or other rubber or the like substrate, thus providing a substantially continuous coating or covering both on the land surface 429a between the teeth and particularly in the zone 425b at the base of the teeth at the points of intersection of the teeth 425 with the land surface 429a. Additionally, the teeth 425 themselves have a coating of polyfluorocarbon resin-bonded thereto, and while there is an increased tendency for this tooth coating to wear off, particularly adjacent the points of the teeth, this tooth coating is found to be advantageous, particularly insofar as it provides a highly advantageous close adherence of the polyfluorocarbon layer in the zone 425b at the base of the free portion of the teeth.

While the invention has been described and illustrated with respect to several physical embodiments, it will be apparent that various modifications and improvements may be made without departing from the scope and spirit of

the invention. Accordingly, it is to be understood that the invention is not to be limited by the specific details of the embodiments illustrated herein, but only by the scope of the appended claims.

That which is claimed is:

1. A fiber handling laminate particularly adapted for use on textile carding machines and the like, comprising a foundation layer, an intermediate resilient layer of soft elastic and flexible material, an outer covering of a material comprising a polyfluorocarbon compound having an outer exposed face, and a plurality of spaced fiber handling teeth being anchored in said foundation layer and extending through said layers and outwardly from said outer exposed face, said outer covering being in adhering relation to both said intermediate layer and said teeth.

2. The structure of claim 1 wherein said outer layer is in adhering relation to both said teeth and said intermediate layer at the point where said teeth extend from said intermediate layer.

3. The structure of claim 2 wherein said outer layer is bonded to both said teeth and said intermediate layer and extends about a substantial portion of the length of said teeth.

4. A fiber handling laminate comprising a base substrate of woven textile yarn, an intermediate substrate of soft elastic flexible material, an outer stratum of a material comprising a polyfluorocarbon compound and having a plurality of fiber handling teeth anchored in said base substrate and extending through all of said substrates and outwardly from said outer stratum, said outer stratum having a land face area and said teeth extending outwardly therebeyond said land face area, said outer stratum being bonded both to said teeth and said intermediate substrate.

5. The structure of claim 4 wherein said outer stratum extends along a substantial portion of the length of said teeth.

6. The structure of claim 5 wherein said outer stratum encompasses substantially the entire length of said teeth.

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