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2,870,490

RUB APRON

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Fig. 1

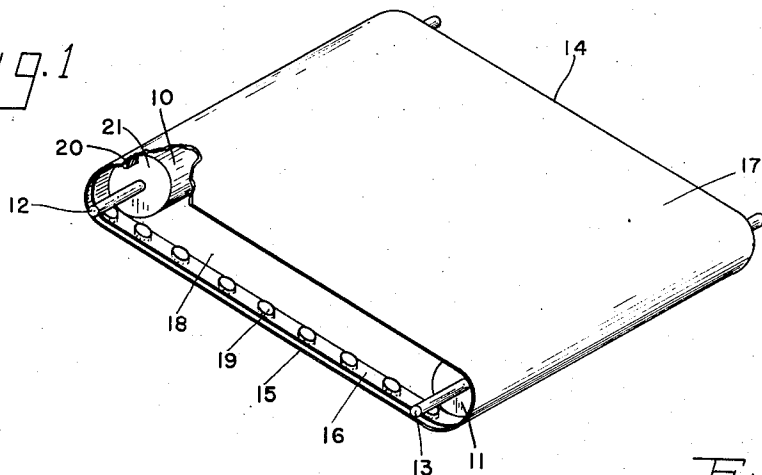


Fig. 2

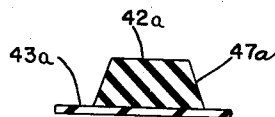
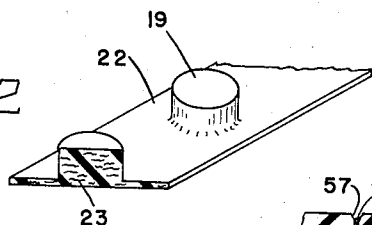


Fig. 6

Fig. 3

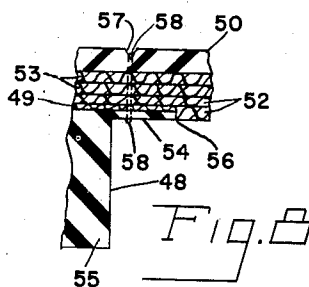
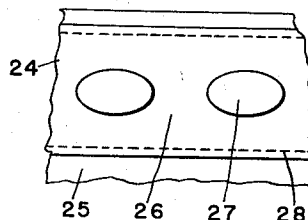


Fig. 4

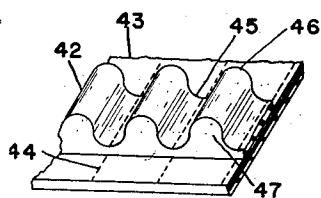


Fig. 5

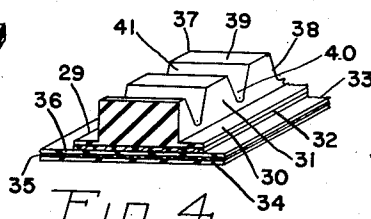
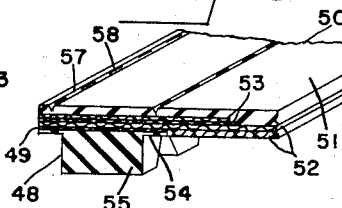


Fig. 7

Fig. 7



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RUB APRON

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13 Claims. (Cl. 19—153)

The present invention relates to flexible sleeves for use in textile working machines and, in particular, to rub aprons employed in the carding or condensing of wool yarn.

In the manufacture of wool yarn, the individual fibers are first formed into loosely matted ribbons or strands known as slivers or rovings which are passed through condensing or rubbing aprons which rub the sliver in a manner which causes the fibers therein to become more closely associated and intertwined. The rub aprons thus employed are flexible sleeves having a working surface, preferably of an oil-resistant synthetic rubber composition, which operate about spaced parallel rollers rotating in the direction of the travel of the sliver through the condensing or carding machinery. At the same time, in order to provide the desired rolling or rubbing action, the flexible sleeves are caused to reciprocate axially of the rollers about which they are moving and transversely of the direction of the travel of the sliver through the apron. Since the aprons are thus forced to reciprocate transversely while they are turning about the rotating and transversely oscillating rollers, it is necessary that some guiding means be provided to prevent the aprons from working off of the rollers. These guiding means are usually in the form of buttons or similarly aligned projections about the inner periphery of the apron adapted to engage either the edge of the rollers or bosses provided thereon.

In the past great difficulty has been encountered, not only in properly arranging the buttons or other guiding means, but also in maintaining them in fixed position on the apron body while the same is in operation. In lieu of the individual buttons or projecting lugs, it has also been previously proposed that a continuous bead or flange be integrally formed about the inner periphery of the apron during the molding or manufacturing thereof. Whereas this expedient avoided the disadvantages involved in the time consumption necessary to position and affix the individual guide buttons to the apron, the presence of the continuous bead or flange formed integrally with the apron seriously impeded its flexibility so that it did not perform satisfactorily in the carding or condensing operation. At the same time, once such an integrally formed bead or flange became worn, the apron could no longer be used even though the working body portion thereof was still in satisfactory condition.

It is accordingly an object of the present invention to provide an improved rub apron for use in the manufacture of textile yarn.

It is a further object of the present invention to provide a tubular rub apron having improved guiding means which may be readily positioned and satisfactorily affixed to the inner periphery of the same.

It is still another object of the present invention to provide a rub apron having easily handled guiding means

which may be readily affixed to the apron, and easily replaced.

Yet a further object of the present invention is to provide such guiding means for a rub apron which will provide improved direction to the linear travel of the same without impairing its flexibility.

It is yet a further object of the present invention to provide a method for the manufacture of the improved rub apron of the type herein disclosed.

To achieve these and other obvious objects and advantages, to be apparent from a reading of the following disclosure, it is proposed that a guiding strip having inwardly projecting lugs be affixed to the inner periphery of the rub apron body about at least one marginal portion thereof. In the preferred adaptation of this invention, the guiding strip will be preformed of a flexible material of such a nature that it may withstand the abrasive wear to which it will be subjected; and the lugs, although they are an integral part of the guiding strip, will be sufficiently independently acting as not to impair the flexibility of the strip or the apron to which it is applied.

The preformed strip thus provided may be easily affixed to the body of the rub apron and readily positioned about the inner periphery thereof so that the guiding lugs or buttons will fall naturally into their desired circumferential alignment. At the same time, such a strip is readily replaceable so that its injury or destruction will not for long impair the operational utility of the tubular apron body to which additional guiding strips may be attached.

Since, in the preferred form of the invention, the guiding strip thereof will be composed of an annular member having a smooth outer surface and being provided about its inner surface with a plurality of circumferentially aligned integrally formed buttons or lugs, the strip will be readily flexible and will not impair the flexibility of the tubular apron body. In order that this flexibility of the rub apron itself will not be further impaired, it has been found that the preformed guiding strips according to this invention may be conveniently and advantageously affixed to the body portion by means of stitches passing either through the guiding strip itself or through flanged or extending portions of a backing web thereon and the apron body or by cementitious means. In a further refinement of the present invention, it has been found that stitching is most effective if the preformed guiding strip as well as the tubular apron body proper are reinforced with fabric laminae at least along the surfaces of the respective members to be made contiguous in the end product. Since the stitching or adhesion about the guiding strip is uniform throughout the entire circumference thereof, there are no concentrations of flexing as has been the case in the past where the individual buttons have been separately fastened to the apron body. It is of course to be understood that any means for affixation of the button strip may be employed within the scope of the present invention, it being at all times desirable, however, to so uniformly distribute this attaching means that the guiding strip and the apron to which it is attached will flex uniformly.

In the manufacture of a rub apron according to this invention, the tubular body portion is built up in the well-known manner preferably by first winding successive plies of rubberized fabric about a mandrel and then winding thereover a considerable thickness of a rubber-like material, preferably an oil-resistant synthetic rubber composition such as one based upon the butadiene-acrylonitrile copolymers. The tubular apron body thus constructed is subjected to proper conditions of pressure and temperature to effect vulcanization and integration thereof. The guiding strip provided by this invention may be

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separately formed in any of the well-known rubber working methods such as compression molding or the like. This particular means of forming the guiding strip is desirable to produce a strip having aligned buttons or lugs of cylindrical or elliptical cross-section. On the other hand, where it is desired to provide a toothed strip having inwardly projecting lugs in the nature of flat toothed cogs or successive corrugations, the guiding strip may be formed in the shape of an annulus, possibly having inwardly convergent side surfaces but preferably having such side surfaces forming right angles with the bottom or innermost surface of the annulus; and the lugs may then be provided by transversely serrating or notching the innermost portion of the annulus thus formed. Where such a toothed guiding strip is employed, the same may be conveniently stitched to the apron body constructed as described above by means of stitches passing either circumferentially of the strip along the edges thereof or transversely of the same through the teeth or the troughs thereof. Where, according to one refinement of the present invention, the guiding strip is provided with a backing web which extends laterally beyond the guiding lugs or buttons so as to provide a flange at the outer surface of the strip, the stitching may, of course, be conveniently placed to extend circumferentially of the strip through the flange or extending web portion.

For a more detailed description of the principles and features of this invention, reference may be had to the following description and the appended drawings to which the same refers wherein there are shown and described certain preferred embodiments of such principles and features.

In the drawings:

Figure 1 is a view in perspective showing a rub apron according to this invention partly broken away to show the rollers about which the same turns.

Figure 2 is a perspective view in partial cross-section showing one form of guiding strip according to the present invention.

Figure 3 is a plan view of a rub apron having a modified guiding strip attached thereto according to the present invention.

Figure 4 is a perspective view in partial cross-section showing still another modification of a rub apron and guiding strip according to the present invention.

Figure 5 is a similar perspective in partial cross-section of yet another form of guiding strip according to the present invention, showing an alternative means for affixing said strip to the apron body.

Figure 6 is a cross-section of a modification of the strip of Figure 5.

Figure 7 is a refinement of the present invention showing a guiding strip similar to that of Figure 4 affixed to a slightly modified apron construction.

Figure 8 is an enlarged detail showing the manner of affixation of the guiding strip to the apron of Figure 7.

In Figure 1 are shown parallel rollers 10 and 11 having shafts 12 and 13 respectively which may be rotatably mounted in a mechanism such as a wool carding machine wherein an apron according to the present invention may be advantageously employed. About these spaced parallel rollers is shown the endless tubular rub apron designated generally at 14. This rub apron consists of an apron body 15 about the inner periphery and along at least one marginal portion of which is affixed a guiding strip 16 according to this invention. The apron body itself may be constructed according to any of the well-known methods of construction but it is preferred that the same consist of a working surface 17 composed of an elastomeric composition having the desired amount of resiliency and elasticity to enable a proper working of the wool yarn. The interior surface 18 of this apron body is in most instances reinforced with a fabric backing, and this fabric backing is particularly desirable in the use of the

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present invention as will be more fully explained below.

As explained above, it is to be understood that the rub apron shown in Figure 1 will operate in cooperation with a second rub apron positioned above or below the one shown and operating about similarly spaced parallel rollers in such fashion that the broadside surface of the apron 14 as it turns about the rollers may be brought into contiguous relationship with a similar surface of the second rub apron in such a manner that the contiguous portions of the apron will be traveling in the same direction. Also as previously explained, it is to be understood that the rollers such as 10 and 11, while they are rotating to allow for the passing thereover of the apron body, must also reciprocate axially so that the rub apron itself will move in the direction axially of the rollers. It is this axial movement of the apron, coupled with a reverse axial movement of the second apron having a working surface with which it is contiguous, which provides the necessary rolling and rubbing action to properly condense the wool yarn.

As the rollers and the apron carried thereby reciprocate axially it is apparent that the apron will tend to be stretched and stressed to a certain extent causing it to track off of the rollers to the detriment of the rubbing operation. To prevent this, guiding means are necessary and such guiding means are provided according to the present invention in the form of the marginal circumferential guiding strip 16. In one preferred embodiment, this strip may be positioned so that the side surfaces of the guiding lugs or buttons 19 will come into contact with the end of the rollers as the buttons pass around the same. This phenomenon is best illustrated in the broken-away portion of Figure 1 wherein the lug 20 is shown to be in a sliding contact with the edge 21 of the roller 10. Thus, as the roller 10 moves axially toward the button 20, it will contact the same and positively urge the apron in a similar axial direction. Depending upon the size of apron to be employed and the amount of axial reciprocation necessary, a guiding strip such as 16 may be provided about both marginal portions of the inner periphery of the apron 14; however, for smaller operations or where the buttons pass through a grooved boss in the roller surface, only one marginal strip may be necessary.

The guiding strip employed in the rub apron assembly of Figure 1 is shown in greater detail in Figure 2 wherein it may be observed that the individual buttons 19 having a cylindrical cross-section project from the flat backing web 22. It will also be observed from the illustration of Figure 2 that the individual buttons 19 are integrally formed with the backing strip 22 such that the former will not be easily separated from the latter. Notwithstanding this integral construction, the guiding lugs 19 in no way impair the flexibility of the overall strip and consequently of the apron itself in view of the fact that these lugs are so spaced upon the strip or backing web 22 that the buttons are independently acting insofar as flexibility of the strip and the apron to which it is attached are concerned.

A guiding strip such as that shown in Figure 2 may be satisfactorily formed from a great variety of the flexible, organic plastic elastomeric substances included among which are natural rubber, the various synthetic rubber-like compositions, the various poly-vinyl plastic materials and the like. It has been found, however, that a preferred material for use in the construction of the buttons or guiding strips provided by the present invention should be relatively hard and have good resistance to the oils of the yarn being treated and the machinery to which the strip will be exposed as well as good abrasion resistance to retard the wear that will result from the sliding contact of the guiding lugs with the edges of the roll or the bosses provided therein.

A compound found suitable for this application and

having the desired properties required therein has been found to consist of the following ingredients:

	Parts by weight
Butadiene-acrylonitrile copolymer -----	100
Sulfur -----	3.75
Zinc oxide -----	5
Antioxidant (phenyl-beta-naphthyl-amine) -----	2
Accelerator (benzothiazyl disulfide) -----	1.25
Stearic acid -----	1.5
Tricresyl phosphate -----	5.0

To improve the abrasive resistance and the hardness of the compound employed in the manufacture of the guiding strip, minute particles of textile or similar fibrous material may be intimately dispersed in the rubber composition. Such discrete fibers are shown at 23 in Figure 2. Although these fibers are shown to be of such size as to be visible to the naked eye, it is preferred that the same be considerably smaller than shown, the enlargement in Figure 2 being merely for the purpose of illustration. A preferred amount of fibers for incorporation in the above compound would be 20 parts by weight. The quantity of the fibers and/or the other compounding ingredients should be such that the Shore A durometer hardness of the resulting composition should be between 75 and 98. While this range of hardness is critical insofar as the projecting lugs or buttons are concerned, the backing web portion of the guiding strip may or may not be composed of the same composition. Where the hardness of the button composition exceeds 90 on the Shore A durometer, it is desirable that the web should be formed from a softer, more flexible stock. This difference in composition notwithstanding, the guiding strip should always be an integrated unit, and this integration may be achieved by causing the different plastic materials to coalesce during the molding operation. In general the fiber content should range from about 5 to 25 parts per 100 parts of rubber and the individual fibers should range in length from about $\frac{1}{32}$ " to about $\frac{1}{4}$ ".

In Figure 3 there is shown an alternative form of guiding strip 24 affixed to a tubular rubber apron body 25 similar to that described above in connection with Figure 1. This button strip like that of Figure 2 may be integrally formed from a flexible, organic plastic composition by molding or other suitable means. This modification also embodies the basic component of a backing strip 26 from one surface of which project a plurality of guiding buttons 27. The other surface of this backing strip is affixed to the inner periphery of the tubular apron body. As shown in Figure 3, this affixation may be conveniently effected by means of stitches 28 along the edges of the backing strip near each edge thereof.

In the guiding strip of Figure 3, the lugs 27 projecting at right angles from the flexible web 26 are elliptical in cross-section. Where the nature of the carding machinery is such that the rubber apron is subjected to considerable lateral stress, it may be desirable to arrange the elliptical buttons so that the major axis of the ellipse lies transversely of the strip. Where only normal lateral stress is to be encountered, however, it is preferred that the major elliptical axes extend longitudinally of the strip as shown in Figure 3 so as to present a greater broadside surface to the apron-guiding contact surfaces of the roller and the guiding lugs so that smoother tracking of the apron around the rollers results.

Still another modification of the guiding strip of the present invention is shown in Figure 4 wherein the strip is designated generally at 29 and is shown to consist of a web or backing portion 30 integrally associated with projecting portion 31. It will be further noted that the web portion 30 is reinforced with a backing layer of fabric 32 along its outermost surface and that this outermost surface is affixed to a tubular rubber apron body 33 which itself comprises a body portion 34 of rubber-like material and a fabric backing or reinforcement 35 which

may or may not be separated from the guiding strip by an additional rubber layer 36 which may be in the form of a skim coating previously applied to the fabric. While the guiding strip may be affixed to the apron body by any conventional means, it is preferred that a uniform means of affixation be employed and in lieu of the stitches previously described, the guiding strip of Figure 4 is affixed to the apron body 33 by means of an adhesive between the contiguous surfaces of the strip and the apron. The adhesive employed may be a vulcanizable rubber cement, a solvent released bonding agent, or any other flexible material having the requisite cohesive and adhesive properties. This provision of affixing means which act uniformly throughout the length of the guiding strip as it is joined to the apron body is considered to be an important part of the present invention in that, for reasons which are not completely understood, the guiding strip thus uniformly adhered to the apron body results in a rubber apron capable of considerably improved performance over the previously known aprons which employed intermittent guides and fastening devices such as rivets and the like. It has been found further that where stitches or suitable flexible adhesives are employed, the guiding strip is capable of performing more as a unit with the apron body without impairing the flexibility of the apron and guiding strip assembly.

The projecting portion 31 of the strip in this modification is shown to consist of a plurality of flat teeth 37, the sides 38 and the top 39 of which are planar and are so disposed that the latter intersects the former at right angles, said teeth being longitudinally spaced by V-shaped grooves or serrations 40. These teeth may be formed during the molding operation in the preforming of the guiding strip or they may be formed by serrating a continuous guiding bead or annulus projecting from the backing web and integrally associated therewith.

While the teeth thus provided may be spaced in a variety of positions, it has been found that improved tracking of the apron body may be achieved by so spacing the teeth that, as the apron and the guiding strip flex in passing about the rollers, the serrations or troughs between the teeth will substantially close. When the interdental spaces are thus closed, the inclined surfaces 41 of the respective teeth approach contact with similar surfaces of adjacent teeth so that a nearly continuous guiding annulus is formed. The continuous guiding member constantly urges the apron to move in response to the axial reciprocation of the rollers about which the apron is operating and the stresses imparted to the apron by this reciprocation are uniformly absorbed such that undesirable intermittent stress concentrations are avoided. At the same time, the continuous guiding annulus is provided without any loss to the desired flexibility of the strip or apron in that the teeth 37 are independently acting at all times and do not, therefore, impair the flexibility of the web portion from which they project.

The fabric backing 32 of the web 30 is preferably impregnated and/or coated with a composition similar to or compatible with the material from which the remainder of the guiding strip is formed so that integration of the fabric and the remainder of the strip will be accomplished during the molding operation. This fabric backing provides a desirable anchoring reinforcement for the stitches, rivets, or other fastening means which may pass through the strip and the apron body to fasten the two together.

A modification of the toothed guiding strip just described in connection with Figure 4 is shown in Figure 5 wherein the strip is shown to consist of an annular portion 42 which has no backing web similar to that present in the previously described strip, but is attached to the apron body 43 by stitches 44 passing through the projecting portion itself. These stitches 44, like those previously described, may, if desired, extend longitudinally of the strip about each edge thereof; however, such a toothed

annulus as 42 lends itself to the transverse stitching shown in Figure 5 wherein the stitches 44 pass through the troughs or grooves 45 separating the teeth or cogs 46. All of these transverse stitches may be uniformly spaced as shown in Figure 5; however, it is possible that the stitching be concentrated on the apron body at each side of the annular member 42 so as to provide an anchor for one large stitch or loop connecting anchors on opposite sides of a given groove and lying against the grooved surface of the guiding strip. This variation might be considered as nothing more than the transverse stitching shown in Figure 5 with the exception that one loop or stitch rather than several span the entire width of the strip. When this form of stitching is employed, a heavy cord or twine may be used without impairing the flexibility of the apron.

It should also be noted in Figure 5 that the teeth 46 are rounded. The sides 47 of the teeth may be parallel as shown in Figure 5 or they may converge as do the sides 47a of the annulus 42a affixed to the apron body 43a of Figure 6. The rounded teeth and convergent side surfaces thereof alone or in combination serve to cushion the apron from the stresses resulting from reciprocation of the rollers and the tracking of the apron as it is guided in response thereto. As has been pointed out, however, where immediate response of the apron to the reciprocation of the roller is desired the flat toothed strip having its side portion forming right angles with the apron body and the axis of its rotation are preferred.

In Figures 7 and 8 is shown a further refinement of the present invention particularly as it pertains to the combination of a rub apron and the guiding strip taught herein. While the guiding strip 48 is shown to have a fabric reinforcing strip 49 and a general configuration similar to that shown in Figure 4, it is to be understood that any guiding strip may be employed as shown in this modification illustrated in Figures 7 and 8. This strip is shown to be affixed to a particularly adapted apron body 50 which has an outer working or yarn contacting surface 51 of a resilient synthetic rubber composition backed by one or more plies of rubberized fabric 52 about the inner periphery of the tubular body. In addition to this fabric backing which extends across the entire width of the tubular body portion, there may be provided additional fabric reinforcing strips 53 along the edges of the apron at the point where the guiding strip or other fastening means are to be attached. The function of these marginal fabric strips 53 is to provide additional anchorage for whatever fastening means are employed to affix the guiding means to the apron body. Where, according to this invention, the guiding strip 48 is to be stitched to the apron body, the various fabric strips present about the edge of the apron body and the fabric reinforcement of the guiding member are important to provide the necessary anchorage. Where, however, an adhesive is employed to connect the guiding strip to the apron body, such anchoring means are, of course, not necessary except insofar as they provide some reinforcement to the apron body against the wearing effects of the lateral forces that are imparted to the same as the rollers about which it is rotating reciprocate axially or transversely.

A further feature of the present invention shown in Figures 7 and 8 involves the proper recessing of the inner periphery of the apron body so that, where a webbed backing strip is employed, the web portion may be inserted into the apron body such that its innermost surface 54 will be flush with the inner surface of the apron body, and the web will not act as a premature guiding means stopping or controlling the movement of the apron prior to the contact of the lugs 55 with the roller edges or roller bosses. In Figure 7 the recessed portion of the apron is shown to begin at 56 such that the inner surface 54 of the web portion 51 of the guiding strip 48 and the inner surface of the apron body 50 form one smooth and continuous surface to the point at which the projecting

lugs 55 are formed. The lugs 55 are shown in Figure 7 to be rectangular; that is, having planar side and bottom surfaces. These lugs may be rectangular in cross section so that the planes of side and bottom surfaces intersect at right angles; or the side surfaces or planes may be convergent in a similar fashion to the design of Figure 6 in which sides 47a are shown to converge. In either case, the lugs may be designated as transversely extending teeth although the teeth are circumferentially aligned. If desired, the lugs may take the form of rounded transversely extended teeth as shown in Figure 5. Still other forms of lugs may be substituted for those shown in Figures 7 and 8, such as the cylindrical lug of Figure 2 or the elliptical cross section lug of Figure 3. In the latter case, the lug may have its major axis extending longitudinally or transversely of the guiding strip, although the Figure 3 showing is of the former type.

Still another feature of the present invention set forth in Figures 7 and 8 and shown in greater detail in Figure 8 involves the provision of grooves or troughs 57 upon the working surfaces of the apron body in which the stitching 58 passing through the strip and the apron body may be countersunk. It is the discovery involved in the use of these grooves for recessing the stitches so that they do not extend beyond the working surface of the apron to impair the rubbing qualities thereof which has allowed for the use of stitches as set forth in the above description. While it is not so important that the stitches as they are exposed to the inner surface of the apron and guiding strip assembly be recessed below the surface thereof, similar recesses may be provided in the webbed portion of the guiding strip so that the smooth and continuous surface formed by the inner periphery of the apron body and the inner surface of the web backing will not be disrupted by these stitches.

While the foregoing description has, in compliance with statute, set forth specific embodiments and principles of this invention, such description is not intended to limit the scope of the same as it is particularly defined and set forth in the subjoined claims.

We claim:

1. An improved rub apron for operation about spaced parallel rollers on a carding machine comprising a flexible tubular body portion of elastomeric composition and a separate, preformed guiding strip attached to the inner periphery of said body, said guiding strip comprising a backing web positioned in a recessed portion of the inner surface of said body such that the inner surface of the web will lie in a common plane with the inner surface of said body portion, said web having a plurality of circumferentially aligned lugs formed integrally therewith and projecting inwardly therefrom.
2. A rub apron according to claim 1 wherein said strip is composed of a flexible, organic plastic elastomeric composition.
3. A rub apron according to claim 2 wherein at least said lugs are composed of a relatively hard rubber-like material.
4. A rub apron according to claim 3 wherein said rubber-like material is reinforced by discrete textile fibers intimately dispersed therein.
5. A rub apron according to claim 1 wherein said lugs are cylindrically shaped.
6. A rub apron according to claim 1 wherein said lugs are elliptical in cross section.
7. A rub apron according to claim 6 wherein the major elliptical axes lie longitudinally of the guiding strip.
8. A rub apron according to claim 1 wherein said lugs are transversely extending teeth.
9. A rub apron according to claim 8 wherein said teeth have planar side and bottom surfaces, the latter intersecting the former at right angles.
10. A rub apron according to claim 8 wherein the side surfaces of said teeth are convergent.

11. A rub apron according to claim 8 wherein said teeth are rounded.

12. An improved rub apron comprising a flexible tubular body having grooves in the outer surface thereof and an annular guiding strip sewn to the inner periphery of said body along at least one marginal portion thereof by stitches passing through said grooves, said strip having integrally formed circumferentially aligned lugs projecting inwardly therefrom.

13. A rub apron according to claim 12 including fabric reinforcing strips between the contiguous surfaces of said body and strip.

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