Feb. 15, 1944. J. ROCKOFF 2,341,656

DRAFT APRON

Filed Aug. 2, 1940

FIG.1

CALENDER TO FORM SHEET HAVING ALIGNED FIBERS

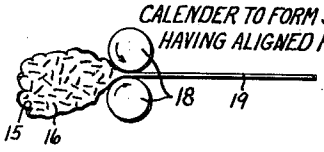


FIG.2

ROLL SHEET ON MANDREL WITH FIBERS CIRCUMFERENTIAL

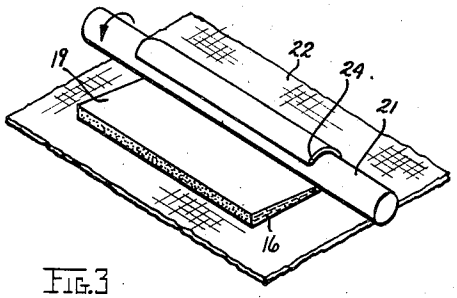


FIG.3

APPLY JACKET LINER

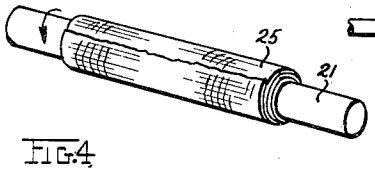


FIG.4

CURE OR VULCANIZE

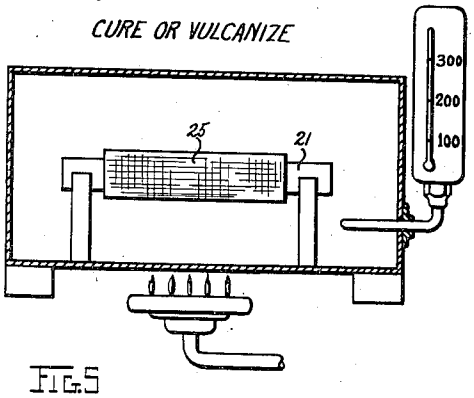


FIG.5

REMOVE JACKET LEAVING IMPRINT OF FABRIC ON SURFACE

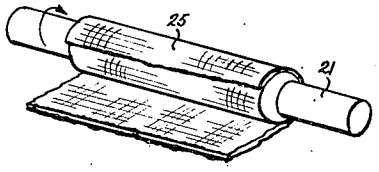


FIG.6

ABRADE OVERLAP TO SMOOTH SURFACE

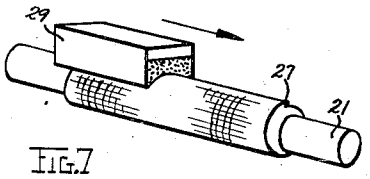


FIG.7

SCUFF TO PROVIDE DESIRED FRICTION SURFACE

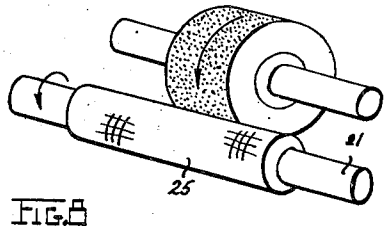


FIG.8

CUT TO LENGTH

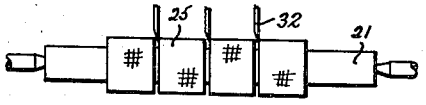


FIG.9

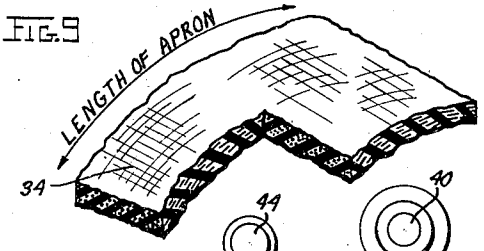


FIG.11

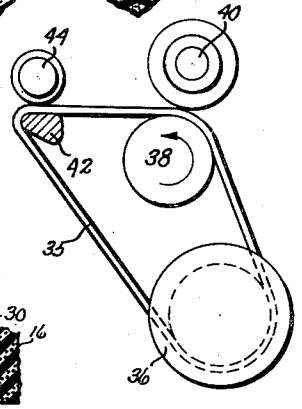
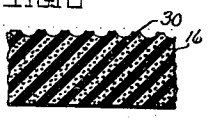


FIG.10



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UNITED STATES PATENT OFFICE

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DRAFT APRON

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Application August 2, 1940, Serial No. 349,517

11 Claims. (Cl. 19—131)

This invention relates to textile drafting machinery, and more particularly to draft aprons and their method of manufacture.

In textile spinning machines comprising fiber drafting mechanism an endless belt or band member is used as a conveyor to carry the fibers along during the drafting stage. Where a three-roll long drafting system is employed a draft or transport apron is utilized to carry the fiber from the middle line drafting rolls to the front line drafting set of rolls. The maximum amount of drafting is done between these two sets of rolls and it is therefore necessary to transport the fibers across the intervening gap between the rolls. The drafting aprons are required to operate under uniform tension and must run straight and true, tracking accurately without any tendency to run to one side or form uneven sides or crooked stretches.

Heretofore, draft aprons have been made of leather and similar material but it has been difficult to provide an apron having uniform gauge thickness throughout its length so that difficulty has been encountered in maintaining a true running fiber transport apron. When the drafting apron, during operation of the fiber-drafting unit, does not run straight and true forming an angle to one side, the traverse of the apron pulls the cotton or fiber being drafted off to one side causing ineffective drafting and resulting in breakdowns. The fiber pulled through the narrow opening between the rolls is subjected to higher resistance and causes an extra pulling down or drafting of the fiber which results in overdrafting and frequent breakage of the fiber necessitating discarding of the draft aprons.

It is an object of this invention to produce draft aprons which are substantially of uniform gauge thickness and can be duplicated throughout a large number of aprons and to provide a fiber transport apron which will operate under uniform tension, run straight and true, and possess a long life in service.

Another object of this invention is to provide a long draft apron made of vulcanized synthetic rubber composition or synthetic resin composition combined with fibers and which is substantially inextensible and which will have the proper degree of friction for accurately controlling the fibers during the drafting operation so as to produce a yarn which is even and regular in unit lengths.

Another object of this invention is to provide an improved draft apron which is made of a combined synthetic rubber and fiber composition or a synthetic resin and fiber composition and is of substantially uniform gauge thickness throughout, possessing the proper coefficient of friction at its surface which will carry the fibers along through the drafting unit in a uniformly straight line, and which apron will operate in unison with the rest of the machine so that slippage resulting in off balance operation is not encountered.

Another object is to devise a draft apron composed of vulcanized synthetic resin or vulcanized synthetic rubber combined with fibers to form a long staple inextensible material extending lengthwise of the circumference or periphery of the apron to produce a longitudinally inextensible apron having a working surface of sufficient coefficient of friction to prevent slippage during operation.

Another object is to provide a method of making draft aprons comprising a vulcanized synthetic rubber composition or vulcanized resin composition including fibers wherein the desired thickness of the apron is built up by wrapping a thin sheet of substantially inextensible composition material on a mandrel or arbor until the desired thickness of the apron is secured and thereafter curing the material to provide a belt or apron having the proper surface texture to provide a fairly high coefficient of friction.

Another object is to devise a method of making draft aprons or belt-like conveyors which are substantially static free, oil proof, abrasive resistant, and will not be subject to cold flow in service, or become deformed or tacky when subjected to the temperature and atmospheric conditions maintained during the drafting operation.

Another object is to devise an improved draft apron made of synthetic rubber compositions or synthetic resin compositions containing fibrous material, shaped and treated to produce a substantially longitudinally inextensible apron which has favorable ageing properties and remains odorless when subjected to the temperature and atmospheric conditions during operation of the spinning machine.

These and other objects and advantages will become apparent from the accompanying description taken in connection with the drawing.

For the purpose of illustrating my invention, the draft apron and method of making is shown as embodied in a three-roll drafting system. This system is commonly referred to as the "Saco-Lowell" draft system. My invention, however, is not limited to this particular type of drafting system and is adapted for use in two-apron drafting systems, such as commonly employed in "Whitin" type drafting machines or other types of fiber drafting units where draft aprons are employed.

In the drawing, there is diagrammatically illustrated the different steps performed in making the improved draft aprons of my invention.

As a typical example, a long draft apron is shown as used in a three-roll drafting system.

Figure 1 illustrates diagrammatically the initial step of calendering a synthetic rubber and fiber composition so as to produce a plastic unvulcanized sheet of the desired thickness and wherein the fibers are arranged parallel to each other throughout the length of the sheet.

Figure 2 is a perspective view illustrating the second step of winding the above mentioned plastic unvulcanized calendered sheet of Figure 1 on a mandrel so that the fibers in the sheet are parallel to the circumference of the mandrel to provide an apron body of the desired gauge thickness.

Figure 3 diagrammatically illustrates the third step comprising wrapping the cloth or fabric jacket liner around the built-up apron body wound on the mandrel preparatory to vulcanizing the laminated sheet layers wound on the mandrel.

Figure 4 illustrates a vulcanizing chamber in elevation and partly in section in which the wrapped draft apron material wound on the mandrel is placed for heat curing to an integral resilient body.

Figure 5 shows in perspective the step of removing the wrapper to leave an imprint or bead on the outer surface of the vulcanized apron body.

Figures 6 and 7 illustrate diagrammatically and in perspective the steps of removing the overlap portion to provide a vulcanized apron body having a uniform outer diameter and scuffing off the surface by grinding or in any other manner, for example, by pickling, for producing a uniformly level rough surface having the desired coefficient of friction.

Figure 8 illustrates the step of cutting aprons of the desired width from the built-up vulcanized and ground body.

Figure 9 is an enlarged fragmentary detail view of a portion of the finished apron illustrating the relative position of the fibers of the apron material with respect to the longitudinal axis of the apron.

Figure 10 is an enlarged fragmentary sectional view showing the surface and interior structure of the finished apron product.

Figure 11 is a diagrammatic view in elevation illustrating the use of the apron in a three-roll drafting machine assembly.

Referring to the drawing in detail, particularly Figures 1 to 9, there is illustrated the different steps to be performed in making the draft aprons of this invention. These steps comprise the following:

STEP I

A stock mass 15 having fibers 16 intermixed therewith is passed through calendering rolls 18 so as to form a plastic unvulcanized sheet 19 of substantially uniform thickness wherein the fibers 16 are arranged parallel and extend longitudinally of the sheet. This parallel arrangement of the fibers 16 in the sheet is an essential step in the method of making the improved draft apron of this invention, as in this way, a substantially inextensible composition apron is formed. The gauge thickness of the sheet 19 may be varied somewhat but as a typical example I form a sheet of from .013" to .015" thickness. The width of the sheet is a matter of choice and equipment available but for convenience in handling, the sheet may be approximately 28".

During calendering of the mass 15, the disarranged fibers 16 are swung around by the "flowing current" action created by the calendering rolls as the composition mass is drawn therebetween, so that the longitudinal axes of the fibers are arranged substantially parallel and at right angles to the axes of rotation of the calender rolls. This produces a sheet wherein the fibers extend parallel to the length of the composition sheet and are uniformly distributed.

The mass 15 may comprise any suitable material which, when formed into a belt has the following characteristics: considerable flexibility and a high coefficient of friction; favorable ageing properties such as maintenance of its thickness; resistant to cracking, therefore, having a long life; substantially free from static; resistant to oil and to abrasives; will now cold flow or stretch in service or become deformed or tacky when subjected to the temperature at high humidity conditions present during the drafting operation period. A number of materials will satisfy these requirements and good results are obtainable by using synthetic rubber and synthetic resin compositions containing vegetable fibers such as cotton or synthetic fibers such as rayon, nylon, etc. The presence of these fibers in the rubber material greatly enhances the tensile strength of the apron or belt formed and renders the completed apron substantially inextensible while the yieldability of the apron is not appreciably affected. The textile fibers materially reinforce the body of the apron and provide a long-wearing straight-running draft apron. The following are examples of the synthetic rubber and synthetic resin type of composition which may be used for the apron material, but it will be understood that the invention is not limited to these compositions or mixtures:

Composition #1—Using neoprene

	Parts by weight
Neoprene type G	100
Zince oxide	10
Light magnesium oxide	10
Cumar	2
Whiting	20
Cotton seed oil	5
Cotton fiber	30

Vulcanizing: 30 minutes at 300° F. steam cure.

Composition #2—Using perbunan

	Parts by weight
Perbunan (butadiene polymerization product)	100
Zinc oxide	5
Sulfur	2
Altax (benzothiazyl disulfide)	1
Whiting	30
Mineral oil	10
Cotton fiber	30

Vulcanizing: 30 minutes at 300° F. steam cure.

Composition #3—Using thiokol

	Parts by weight
Thiokol type F	100
Zinc oxide	2
Diphenyl guanidine	.10
Altax	.25
Whiting	20
Stearic acid	.50
Cotton fiber	30

Vulcanizing: 30 minutes at 300° F. steam cure.

Composition #4—Using flexible glyptal

	Parts by weight
Soft glyptal resin (General Electric 1353 U resin)	89
Neoprene binder[1]	10
Flexible Bakelite resin	1
Cotton fiber	30

Vulcanizing: 120 minutes at 300° F. dry heat.

[1] The neoprene binder mentioned in the immediately above formula is preferably composed of the following materials:

	Parts by weight
Neoprene type E	60.3
Litharge	10.07
Sulfur	.603
Wood rosin	3.15
Neozone "D" (phenyl-beta-naphthylamine)	1.207
Zinc oxide	6.03
Cumar	8.32
Medium oil	8.32

STEP II

After forming the thin plastic unvulcanized sheet 19 a mandrel or arbor 21 is selected having the desired inner diameter of the drafting apron to be formed and the sheet 19 is wound spirally around the mandrel 21, as shown in Figure 2, until an apron body of the desired thickness is built up. The sheet is wound on the mandrel so that the fibers 16 are parallel to the circumference of the mandrel whereupon the finished product will be substantially inextensible. In order to prevent wrinkles during the winding of the sheet onto the mandrel, the sheet stock is placed on a folded liner or similar material 22 and the mandrel rolled on this when the stock is wound around the mandrel.

One side of the sheet stock is thoroughly swabbed with solvent, such as benzol or the like cleaning substance. In order to start the sheet stock around the mandrel 21 the end of the sheet is skived, as shown at 24 in Figure 2, and is swabbed lightly with solvent and stuck to the mandrel by rolling the mandrel back on the skived end portion. The other side of the skived end is thoroughly swabbed with solvent and allowed to dry. After the desired thickness of the composition body is rolled up on the mandrel, the last turn, or layer, of the sheet stock is stitched or suitably secured down at the end and about ⅛" beyond the seam the excess sheet stock is trimmed off.

STEP III

The tightly wound plastic unvulcanized sheet stock on the mandrel of Step II is provided with a wrapper or jacket 25 of relatively coarse fabric or similar woven material so as to leave an imprint on the outer surface of the wound stock. The wrapper is started around the laminated layers on the mandrel with a light tension and after two or three rounds the maximum tension is applied to the wrapper for the remainder of the operation. Preferably two layers of butted frictional bead tape are wound around the material to be vulcanized. The second layer is positioned so as to cover the butted portions of the first layer.

STEP IV

After the built-up apron body has been wrapped, the mandrel and overlaid composition material are placed in a steam vulcanizer and vulcanized under heat to a unitary belt or apron structure. Preferable the curing or vulcanizing step comprises subjecting the material to a temperature of approximately 300 degrees F. for from 15 to 40 minutes, depending on the kind of composition. When using a flexible glyptal composition as in the case of Composition #4 given above, the vulcanizing time is extended to approximately 120 minutes. Steam or dry heat may be utilized for effecting the vulcanization.

STEP V

After vulcanization, the composition material wrapper is removed leaving the imprint of the fabric or texture of the wrapper on the outer surface of the molded apron body, as illustrated in Figure 5.

STEP VI

In order to provide a smooth uniform outside diameter apron body, the overlap portion 27, formed where the end layer portion is united to the under layer of vulcanized material, is placed on a lathe or suitable mechanism and the overlap abraded off by applying an abrading means 29, as illustrated in Figure 6. For abrading the overlap there may be used sandpaper or metal cloth wrapped around a small block and the overlap at the seam ground off to produce a curvature at the point of the seam which is the same as the rest of the outside cover portion of the apron body.

STEP VII

In this step, the outer surface of the apron body is scuffed off to remove any burr-like projections and to produce an apron having a uniform outside diameter that is slightly rough, as illustrated at 30 in Figure 10. The texture of the outer surface comes from the imprint of the jacket wrapper wound around the material before vulcanization and which imprint is modified by grinding in Step VI, as illustrated at 34 in Figure 9, to provide a draft apron having the proper coefficient of friction at its surface so as to avoid any slippage of the draft apron during use.

STEP VIII

After the surface has been properly ground, the apron is cut at the desired width by mounting the mandrel on a lathe and applying the cutting knife or knives 32. Preferably, the vulcanized apron material is removed from the mandrel by directing a light blast of air underneath the cover at one end and progressively stripping the vulcanized sleeve-like body off from the mandrel. The material is then slipped over a wooden core, placed on a lathe, and cut to the desired width of draft apron, as illustrated in Figure 8. During the manufacture of the draft aprons the material is carefully gauged so as to produce a belt or apron having uniform thickness throughout and of the desired inside diameter or circumference.

In Figure 11 the use of the finished draft apron 35 is illustrated in a three-roll drafting unit. In this type of unit only one apron is used which is fairly thin in thickness and is guided and held in place by an idler roller 36. This idler roller maintains the tension uniform and guides the apron through the operating cycle. A driven roll 38 runs the draft apron and a weighted covered idler roll 40 cooperates with the driven roll 38 over which the draft apron is moved. The apron passes forward over the nose or pinch bar member 42 and continues around the idler tension roller 36. A slip or pencil roll 44 engages the apron as it passes over the pinch bar 42 during the drafting operation. The purpose of this pencil

roll is to keep the fibers down onto the apron and to deliver them in a uniform layer to the final drafting roll which is not shown but which is positioned immediately to the left of the pencil roll 44. The driven roll 38 may be suitably knurled or fluted in order to contact the inside surface of the apron and drive the same.

The making of the draft aprons by the process described provides an improved method whereby each succeeding apron can be made of the same gauge thickness, length and width throughout a large number of aprons. This is an important improvement in the making of draft aprons since any substantial variation in gauges in the different aprons results in inefficient and troublesome operations during the drafting process.

The surface texture of the aprons may be provided with a sufficient coefficient of friction by grinding, pickling or any other means to drive the top roll 40 and also to prevent slippage of the pencil roll 44 when the aprons are used in a three-roll drafting unit.

When using the aprons of this invention in "Whitin" frames, the cloth markings provide proper coefficient of friction on the surface of the aprons to effect proper driving of the drafting apron and associated upper apron without slippage.

It will be understood that this invention is not limited to the specified method steps and structure of the apron as described by me but modified to suit different conditions and uses as required.

Having thus fully described my invention, what I claim as new and desired to secure by Letters Patent, is:

1. A draft apron for textile machine consisting of a vulcanized resilient composition including a vulcanizing agent such as sulfur comprising as an essential constituent a synthetic rubber composed of acrylic nitrile and butadiene copolymer reinforced with fine textile fibers lying substantially parallel to each other and longitudinally of the apron.

2. A draft apron for textile machine consisting of a resilient composition including a vulcanizing agent such as sulfur comprising as an essential constituent a vulcanized synthetic rubber composed of butadiene-acrylic nitrile copolymer admixed with filler and reinforced with fine textile fibers lying substantially parallel to each other and longitudinally of the apron.

3. A draft apron for textile machine comprising a body member vulcanized with a vulcanizing agent and formed of a composition which has been polymerized containing butadiene-acrylic nitrile copolymer as an essential constituent, with zinc oxide, benzothiazyl disulfide, whiting, mineral oil and cotton fiber incorporated in sufficient amounts to give a substantially static free friction resistant wearing surface, the individual strands of said cotton fiber lying substantially parallel to each other along the longitudinal axis of the apron.

4. A draft apron for textile machine consisting of synthetic rubber composition composed of butadiene-acrylic nitrile copolymer, filler and sulfur, which has been vulcanized with a vulcanizing agent such as sulfur to produce a product having an oil resistant substantially static free fiber working surface, said composition being reinforced with fine textile fibers lying substantially parallel to each other and longitudinally of the apron.

5. A draft apron for textile machine comprising butadiene-acrylic nitrile copolymer compounded with substances serving to provide the required hardness and wearing qualities which has been vulcanized with sulfur, said apron being substantially static free under ordinary working conditions and being reinforced with fine textile fibers lying substantially parallel to each other and longitudinally of the apron.

6. A draft apron for textile machine composed of a vulcanized elastic composition comprising butadiene-acrylic nitrile copolymer compounded with constituents including a vulcanizing agent, said composition being polymerized to produce a relatively tough apron of uniform density which is substantially static free under ordinary working conditions, said apron being reinforced with fine textile fibers lying substantially parallel to each other and longitudinally of the apron.

7. A draft apron for textile machine composed of a polymerized elastic composition comprising butadiene-acrylic nitrile copolymer, zinc oxide, sulfur, benzothiazyl disulfide, whiting, mineral oil and cotton fiber, the individual fibers lying substantially parallel to each other along the longitudinal axis of the apron, said apron being vulcanized to a relatively tough resilient body of uniform density which is wear resistant and is substantially free from a tendency to cause the fiber on which it is used to adhere to it under the usual working conditions.

8. A draft apron for textile machine formed of an elastic composition comprising as a principal ingredient synthetic rubber selected from the group consisting of the copolymers of butadiene-acrylic acid esters and acrylic nitrile, said synthetic rubber being compounded with addition agents and vulcanized with sulfur to provide a relatively hard resilient body of uniform density and having no tendency to build up a static charge to cause adherence of the fiber under normal working conditions and being reinforced with fine textile fibers lying substantially parallel to each other along the longitudinal axis of the apron.

9. A draft apron for textile machine composed of an elastic vulcanized composition which has been first polymerized, comprising as a principal constituent a copolymer of butadiene and acrylic nitrile plus a vulcanizing agent, said copolymer being compounded with fillers and other ingredients to increase its hardness and wearing properties and provide a fiber working surface substantially equal to calfskin and having no tendency to develop a static charge, said composition being reinforced with fine textile fibers lying substantially parallel to each other along the longitudinal axis of the apron.

10. As an article of manufacture for use in textile machines, a draft apron formed of a resilient body which has been polymerized, comprising as an essential constituent butadiene-acrylic nitrile copolymer which has been vulcanized with a vulcanizing agent such as sulfur, said resilient body being reinforced with fine textile fibers lying substantially parallel to each other along the longitudinal axis of the apron.

11. As an article of manufacture for use in textile machines, a draft apron formed of butadiene-acrylic nitrile copolymer and sulfur and vulcanized therewith, said apron being reinforced with fine textile fibers lying substantially parallel to each other and along the longitudinal axis thereof.

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