June 5, 1945. B. R. BILLMEYER 2,377,316

LONG DRAFT APRON

Filed Feb. 22, 1944

FIG. 1

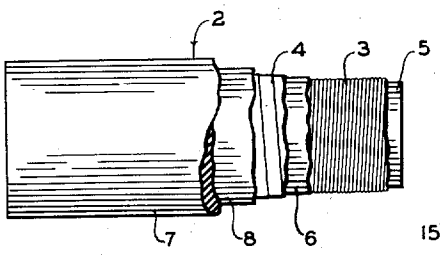


FIG. 2

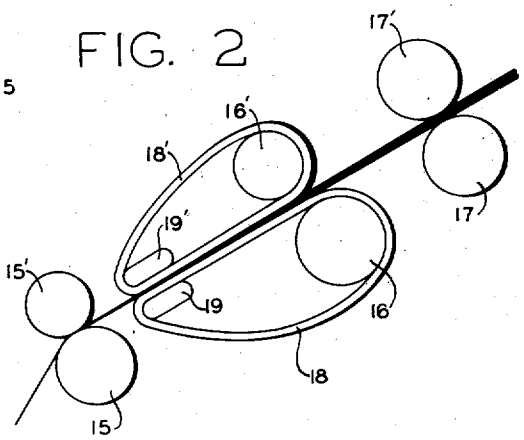


FIG. 3

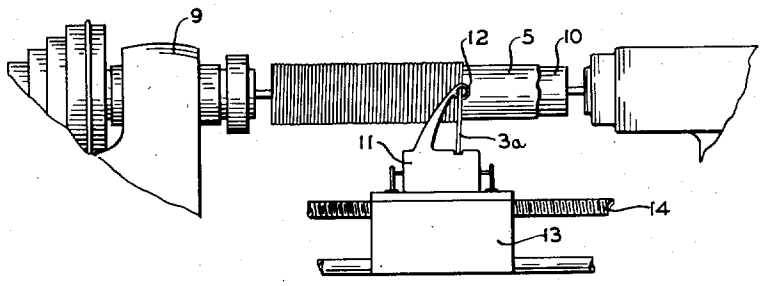


FIG. 4

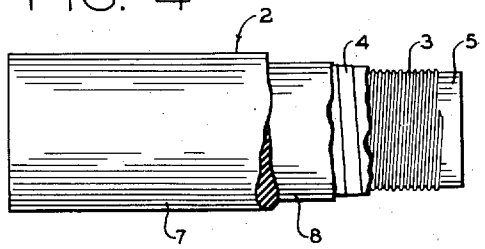
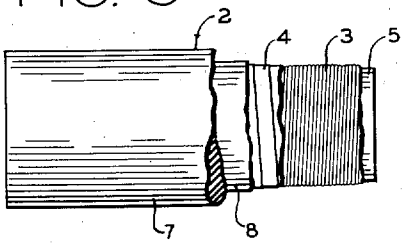


FIG. 5



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by

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UNITED STATES PATENT OFFICE

2,377,316

LONG DRAFT APRON

Bruce R. Billmeyer, Lancaster, Pa., assignor to Armstrong Cork Company, Lancaster, Pa., a corporation of Pennsylvania

Application February 22, 1944, Serial No. 523,408

7 Claims. (Cl. 19—131)

This application is a continuation in part of my copending application, Serial No. 404,781, filed July 31, 1941, and relates to a long draft apron including a layer formed of a plurality of convolutions of twine, a strengthening and reinforcing fabric layer disposed exteriorly of said twine layer and a wear-resistant facing of synthetic rubber. The term "twine" is used herein to denote strings, threads, cords, twists, small ropes, spun yarns, or the like of cotton, flax, silk, wool, nylon, glass fibers, rayon, or some other fibrous substance capable of being wound in tubular form.

The chief object of my invention is to produce a long draft apron which possesses the features of flexibility, frictional surface characteristics required for the purpose intended, which will not crack or check, which can be conveniently rendered of uniform thickness by grinding or buffing, and which will not stretch unevenly or to any substantial extent. An object of my invention is to produce a long draft apron including a strengthening and reinforcing layer of fabric. A further object is to provide a foundation for long draft aprons including a tubular body of twine disposed in the form of a helix and a strengthening and reinforcing layer of fabric. A still further object is to provide an inexpensive long draft apron whch is substantially inextensible radially and which possesses a seamless, oil-resistant wearing surface including synthetic rubber.

This invention relates to a long draft apron for use in fiber drawing which comprises an inner, tubular, wear resistant body, a tubular body of twine placed thereon, a strengthening and reinforcing fabric layer disposed exteriorly of said twine body, and a wear-resistant facing, said members being securely attached to one another.

The attached drawing illustrates a preferred embodiment of my invention, in which

Figure 1 is a view in elevation of my long draft apron, partially broken away to disclose the foundation;

Figure 2 is a diagrammatic view of the Casablancas system of long drafting including the long draft apron of my invention;

Figure 3 is a diagrammatic view illustrating a method of forming the tubular twine foundation; and

Figures 4 and 5 are views in elevation similar to Figure 1, illustrating modified forms of my invention.

Referring to the drawing, there is shown in Figure 1 a long draft apron designated generally at 2. The apron 2 comprises a base foundation 3 of tubular form, a strengthening and reinforcing layer 4 of fabrc thereover, a wear-resistant layer or coating 5 disposed interiorly of the foundation 3, a coating 6 disposed exteriorly thereof and attaching the fabric layer 4 thereto, and a wear-resistant, seamless tubular facing 7 disposed over and integrally united with the other members of the apron. Preferably, a joining coating 8 is disposed exteriorly of the fabric 4 to secure the facing thereto, although, if desired, the inner surface of the facing may be rendered tacky or adhesive by the application of solvent to secure the facing to the fabric.

The foundation 3, preferably, is composed of a single length of twine 3a wound helically to form a tube. If desired, a plurality of pieces of twine may be wound in one layer to form a multiple threaded tube; in such case, the true pitch or distance between consecutive convolutions of the same piece of twine is greater than the distance between corresponding points in any two successive convolutions. The convolutions may be placed in abutting relationship although, if desired, they may be spaced apart a distance not greater than the thickness of the twine; such abutting or slightly spaced apart relationship of the convolutions is designated herein by the term "substantially abutting." The twine may be composed of any natural or synthetic fiber of suitable strength for the purpose intended and cotton, silk, wool, rayon, flax, nylon, or glass fibers are examples of satisfactory materials for my purpose. A typical example of satisfactory twine for this purpose is a cotton cord, size #16, four-ply, ten twists to the inch.

In Figure 3, I have illustrated diagrammatically a method of making the foundation. There is shown a lathe 9 of usual type adapted to receive a mandrel 10 about which the twine 3a is wound or wrapped. A twine holder 11 contains a roll of twine which passes therefrom through an eyelet 12 to the mandrel 10. The holder 11 is mounted on a carriage 13 actuated by a lead screw 14 connected by suitable gearing (not shown) with the lathe actuating mechanism. The twine holder 11 is movable longitudinally of the mandrel 10 and, preferably, is moved forward a distance equal to the thickness or diameter of the twine being wound as each convolution is wound so that the adjacent convolutions abut or are under some degree of tension. Even slight tension embeds the twine 3a to some extent in the inner layer 5.

In the manufacture of the foundation, the mandrel 10 is coated with a layer of any suitable mold lubricant such as "Aquarex D" or a suitable soap solution to facilitate removal of the finished tube or apron. The wear-resistant layer or coating 5 is then applied to the mandrel 10. An end of the twine 3a is then secured to the mandrel and the lathe 9 and holder 11 actuated to wind the twine helically about the mandrel 10. Only slight tension need be placed on the twine to ensure satisfactory winding about the mandrel. The convolutions are wound in abutting or, preferably, slightly spaced relationship to form the helical tube. The maximum space between con-

volutions should be no greater than the thickness of the twine for best results and the convolutions are embedded to some extent in layer 5. The convolutions are wound with a slight inclination in either direction, toward the right as shown in Figure 3, so that the angles formed by the convolutions with a line drawn axially through the tube fall within the range of 80°–90°, and preferably, the inclination is as close to 90° as possible. It is desirable that such angles be kept at a maximum to ensure that the foundation of the apron is substantially inextensible radially.

The joining coating 6 is then formed from the inner layer 5 by the application of solvent thereto and brushed over the twine, or a separate coating is applied to the wound tube dependent upon whether the convolutions are spaced apart or are abutting. The strengthening and reinforcing fabric layer 4 is then disposed about the tube. Preferably, such fabric layer 4 is composed of a fabric strip helically wound of opposite hand to the convolutions of twine forming the helical tube although it will be understood it may be a single sheet disposed about the foundation 3 or a fabric tube drawn thereover. Preferably, an adhesive coating or layer 8 is then brushed on the fabric and the assembly is in condition to receive the facing 7. It will be understood instead of a coating brushed on the fabric, the inner surface of the facing 7 may be softened by the application of solvent to render it tacky and this in effect forms an adhesive coating disposed between the facing and the fabric reinforcement.

Preferably, facing 7 is composed of an extruded, seamless tube of tough, oil and wear-resistant synthetic rubber. It will be understood, of course, any of layers or coatings 5, 6, and 8 may be dispensed with or, if desired, may be omitted. The tubular facing 7 is inflated and disposed over the assembly formed as described above and the combination is wrapped with wet fabric tape in order to obtain proper engagement of the wearing surface with the base. It is then vulcanized by placing the article in an open steam vulcanizer and applying steam for a period sufficient to cure the mass and to integrally unite the facing, tubular foundation, fabric reinforcement, and coatings; for example, 30 minutes at 300° F. will be generally satisfactory to obtain the required degree of vulcanization when synthetic rubbers, such as "Hycar O. R.," "Neoprene," or "Thiokol" are employed. The article is then removed from the mandrel and the surface is ground or buffed to a desired diameter. The tubing is then severed to desired length for use as long draft aprons.

The wear-resistant tubular facing 6 may be formed of a suitable synthetic rubber composition as shown in the following formula:

	Parts by weight
Hycar O. R.	100.0
Anti-oxidant	1.5
Softeners	21.5
Stearic acid	1.5
Accelerator	1.5
Reinforcing pigment	80.0
Zinc oxide	5.0
Sulfur	1.5

This mixture is suitably milled. Thereafter, it is fed to an extrusion machine of the screw type well known to those in the art and a hollow tubular body of desired size is produced adapted to serve as the wearing surface of the long draft apron. If desired, this composition may be calendered to form a thin sheet which is disposed about the wound tube and vulcanized to form a satisfactory seamless wearing surface.

The layers or coatings 5, 6, and 8 may be formed of the above composition in sheet or tubular form or dissolved in a suitable solvent, such as methyl ethyl ketone, cyclohexanone, chlorobenzene, chlorotoluene, butyl acetate, or amyl acetate. I have found a coating including 0.8 pound of "Hycar" to each gallon of solvent is of satisfactory consistency to be brushed in application.

In the above composition "Hycar" is a synthetic rubber of the type known as a polymerized butadiene acrylic nitrile copolymer. Other synthetic rubbers may, of course, be employed in forming the wearing surface and layers or coatings, such as Thiokol (olefine polysulfide), Neoprene (polymerized chloroprene), Koroseal (plasticized polyvinyl chloride), or similar copolymers containing a high content of chloride, such as polyvinyl chloride-acetate copolymers or the like. Any of the materials of this character which possesses high resistance to oil, extreme flexibility and the characteristics of being extremely resistant to cracking upon continued flexing over long periods of time may be substituted. Rubber may be used in some instances where the service does not require a high degree of oil resistance. The method employed in forming the aprons may be varied depending upon the type of synthetic rubber employed; for example, Koroseal does not require vulcanization and aprons having wearing surfaces thereof need not be vulcanized.

In the above described composition, any suitable anti-oxidants may be used and "Neozone A," "Agerite Resin D," "Aminox," are examples of satisfactory materials. As softeners, I may use tricresyl phosphate, paraffin, dibutyl phthalate, pine tar, cumar, triacetin or the like. Accelerators are well known in the art and mercaptobenzothiazole, tetramethylthiuramdisulfide, diphenylguanidine, zinc butylxanthate, or combinations thereof, for example, may be used. The reinforcing pigments and fillers included in this composition may include any of various grades of carbon black, whitings, clays or the like such as "Thermax," "P–33," "Gastex," "Kalite," "Kalvan," etc. Zinc oxide is used in the composition primarily as an activator for the accelerators. Stearic acid is used as a plasticizer and aids in vulcanization. Sulfur, of course, is the vulcanizing agent. The ingredients and the amounts used may be varied as desired depending upon the properties required in the completed apron.

In Figure 2, I have illustrated diagrammatically the so-called Casablancas system of long drafting including my apron; it will be understood, of course, my aprons may be used satisfactorily in other long drafting systems such as that known as the Saco-Lowell Roth system. The Casablancas system comprises a series of positively driven bottom rolls 15, 16, and 17 and a plurality of top rolls 15', 16', and 17'; rolls 15' and 17' are rotated by frictional contact with the bottom rolls 15 and 17. The top rolls are weighted to apply pressure to the fibers. Aprons 18 and 18' are provided, apron 18 extending around bottom roll 16 and a guide bar 19 while apron 18' encircles idler roll 16' and a guide bar 19', being rotated by friction developed between the contacting surfaces of the aprons 18 and 18'. In this system, there is generally a short draft between the rolls 17, 17', and the rolls 16, 16' while rolls 15, 15' are usually rotated with a surface speed 6 to 30 times that of the rolls 17, 17'.

In Figure 4, I have illustrated a modified form

of my invention in which the convolutions of twine forming the helical tube are spaced. In Figure 5, I have illustrated a modified form generally similar to that shown in Figure 1 except that coating 6 disposed between the twine tube 3 and the fabric reinforcement 4 is omitted.

My invention comprises a long draft apron including a wearing surface which is seamless, tough, flexible, oil resistant and which may be ground to a smooth, true surface of uniform dimensions. The foundation is substantially inextensible radially so that the apron cannot stretch thus materially increasing its life in service. The apron is economical, simply made, and does not require large capital expenditure or investment in stocks necessary for manufacture.

While I have described and illustrated a preferred embodiment of my invention, it will be understood my invention is not so limited since it may be otherwise embodied within the scope of the following claims.

I claim:

1. A long draft apron for use in fiber drawing comprising a tubular body of twine disposed in the form of a helix, a strengthening and reinforcing fabric layer disposed exteriorly of said body, and a wear-resistant facing secured thereto.

2. A long draft apron according to claim 1 in which said facing includes as an essential ingredient a synthetic rubber chosen from the group consisting of a polymerized butadiene acrylic nitrile copolymer, a plasticized polyvinyl chloride, a plasticized polyvinyl chloride-acetate copolymer, an olefin polysulfide, and a polymerized chloroprene.

3. A long draft apron for use in fiber drawing comprising a tubular body composed of a plurality of convolutions of twine disposed in substantially abutting relationship and extending in the same direction, a strengthening and reinforcing fabric layer disposed exteriorly of said body composed of a helically wound fabric strip of opposite hand to said convolutions, and a wear-resistant, seamless facing of synthetic rubber secured to said body.

4. A long draft apron for use in fiber drawing which comprises an inner, tubular, wear-resistant layer, a tubular body of twine thereover, a strengthening and reinforcing fabric layer disposed exteriorly of said twine body, and a wear-resistant facing, said elements being securely attached to one another.

5. A long draft apron according to claim 4 in which the tubular body of twine comprises spaced convolutions disposed on the form of a helix.

6. A long draft apron for use in fiber drawing which comprises an inner, tubular, wear-resistant layer, a tubular body of twine comprising spaced convolutions disposed in the form of a helix placed over said inner layer, a strengthening and reinforcing fabric layer disposed exteriorly of said twine body and secured to the twine convolutions and the inner, wear-resistant body where it appears between the spaced convolutions by an adhesive layer, and a wear-resistant facing, said elements being securely attached to one another.

7. A long draft apron according to claim 6 in which an adhesive layer is disposed over said strengthening and reinforcing fabric layer and secures the wear-resistant facing thereto.

BRUCE R. BILLMEYER.

CERTIFICATE OF CORRECTION.

Patent No. 2,377,316. June 5, 1945.

BRUCE R. BILLMEYER.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, second column, line 19, claim 5, for "on" read --in--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 11th day of September, A. D. 1945.

Leslie Frazer

(Seal) First Assistant Commissioner of Patents.

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6. A long draft apron for use in fiber drawing which comprises an inner, tubular, wear-resistant layer, a tubular body of twine comprising spaced convolutions disposed in the form of a helix placed over said inner layer, a strengthening and reinforcing fabric layer disposed exteriorly of said twine body and secured to the twine convolutions and the inner, wear-resistant body where it appears between the spaced convolutions by an adhesive layer, and a wear-resistant facing, said elements being securely attached to one another.

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