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TEXTILE WORKING UNITS
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2,863,175

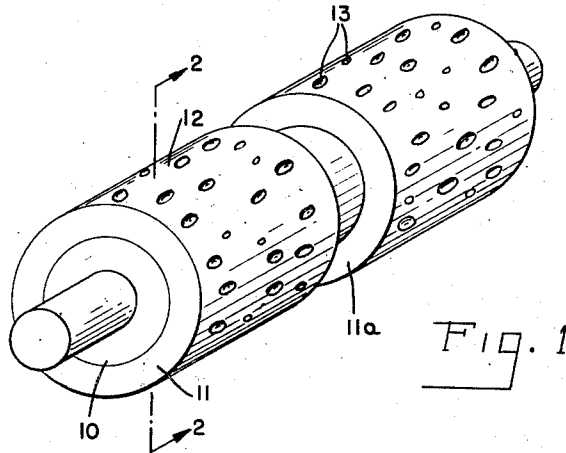


Fig. 1

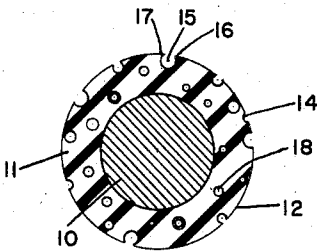


Fig. 2

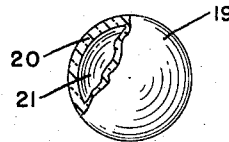


Fig. 3

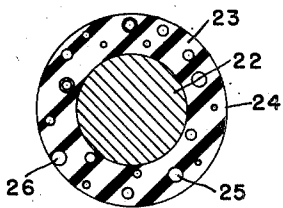


Fig. 4

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TEXTILE WORKING UNITS

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7 Claims. (Cl. 19—143)

The present invention relates to textile working units, and more particularly to cots or roll covers for spinning rolls.

This application is a continuation-in-part of copending application Serial No. 336,129, filed February 10, 1953, and is restricted to the product claims set forth therein, a requirement for such restriction having been made in the prosecution thereof.

A textile roller as used in present day drawing, roving and spinning machines, comprises a metal arbor having a sleeve-like roll cover known as a cot surrounding the arbor. This cover is customarily made of leather, cork composition, or certain types of rubber compounds.

In the past, most textile cots were made of leather. These cots proved to be not too satisfactory for use on modern machines which work at relatively high speeds, due to poor resistance to "lapping-up" and "eyebrowing" and due to their relatively short life. More recently, cots have been made of synthetic materials which show considerably longer life than leather and also possess better resistance to "lapping-up" and "eyebrowing."

Despite the improved characteristics which have been imparted to textile cots by the use of some of the known types of synthetic rubber, these cots still do not function perfectly under all conditions and for all types of fibers. Some of the newer types of cots, although considerably improved over leather, still exhibit a tendency toward "eyebrowing." This condition results from the failure of the cot to carry the short fibers or "clearer waste" to the top clearer in order to gather properly. Instead, these short fibers collect at the outside edge of the top clearer and hang down over the roll. This condition is called "eyebrowing" and the mass of fibers which hangs down is called an "eyebrow." As the size of the "eyebrow" increases, it will contact the yarn and bunches of short fiber will be pulled into the yarn, thus impairing its quality.

In connection with the use of the various types of synthetic rubber-like compositions for textile units and rollers of the type herein considered, the incorporation of many substances with the rubber-like material has been proposed to improve their fiber working properties and useful life. In Patent No. 2,373,876 to Cutler, the addition of graphite has been proposed. The incorporation of rubber particles of a hardness differing from the hardness of the main body of the roll has been proposed in Patent No. 2,386,583 to Bacon; and Patent No. 2,393,953 to Bacon discloses the use of fibrous materials such as cotton, rayon, glass, wool, bristles, hair, and the like. The inclusion of cork within the rubber-like composition of a roll cover is disclosed in Patents No. 2,450,409 and No. 2,450,410 to Baymiller.

In pending applications owned by applicant's assignee the combination of other substances with the rubber-like composition has been proposed to effect modification of the fiber drafting properties of textile units.

While the compositions proposed in these applications have represented substantial improvements over previ-

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ously known textile cot compositions and have been capable of operation for long periods of time without the occurrence of "eyebrowing" or "lapping-up," any improvement which will further increase the length of time which the textile unit may operate without these deleterious tendencies is still to be desired.

To achieve this desired prolonged resistance to "eyebrowing" and "lapping-up" and thereby to increase the useful life of the textile working unit, it is proposed to provide the same with a roll cover which consists of a rubber-like composition interspersed with which are a plurality of small, smooth-surfaced, frangible particles. These particles are to be of such a nature that they may be milled with the rubber-like composition and remain embedded therein through the construction and vulcanization of the unit. At the same time, however, these particles will be sufficiently frangible so that, upon subsection of the surface in which they are embedded to a grinding or abrading action, they will be broken, and, upon removal of their fragments, will leave in the working surface of the unit a plurality of cavities or voids in the shape of substantially spheroidal segments. Since the particles will be in substantially uniform distribution throughout the composition of at least the outer layer of the roll cover, they will be exposed in varying degrees to the working surface and the grinding action thereon. Many of those particles which are only slightly exposed to the surface, however, will be broken and, upon the removal of the fragments thereof will leave spheroidal depressions the greatest circumference of which will lie beneath the actual working surface of the unit. The opening of such cavities upon the working surface will be of smaller dimensions than those within the cavity.

It is therefore an object of the present invention to provide a textile working unit which will be capable of prolonged continuous operation free from tendencies to "eyebrow."

It is a further object of the present invention to provide a rubber-like roll cover containing a plurality of small frangible particles, some of which are exposed about the surface of the roll and may be broken to leave a pattern of smooth-surfaced cavities thereon.

It is a still further object of the present invention to provide a textile drafting cot, the rubber-like surface composition of which contains a plurality of cavities in the shape of substantially spheroidal segments, the greatest circumference of which may lie on or beneath the working surface.

Other features, advantages and objects of the present invention will be apparent from a reading of the following disclosure for the clarification and particularization of which reference may be had to the appended drawings.

In the drawings:

Figure 1 is a view in perspective of a typical fiber drafting cot constituting a preferred embodiment of the present invention.

Figure 2 is a transverse section on the line 2—2 of Figure 1.

Figure 3 is a perspective, partially broken away, of a typical particle such as is proposed for inclusion within the rubber-like composition of the textile working unit of the present invention.

Figure 4 is a transverse section through a cot of this invention before the surface of the same has been prepared for operation.

In Figure 1 there is shown a roll or arbor 10 which is usually composed of steel or a similar material. About this arbor and adhesively connected thereto are shown the cots or roll covers 11 and 11a which, according to the present invention, are composed of a rubber-like composition and which, for purposes of illustration in the present description, may be considered in their preferred

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form to be composed of an oil-resistant copolymer of the butadiene-acrylic nitrile type also known as Buna-N, Perbunan, GR-A or by other well-known terms used in the trade. About the surface 12 of this cot are shown the small cavities 13 in the form of substantially spheroidal segments.

As best shown in Figure 2, these cavities extend to varying depths beneath the working surface of the cot. While the cavity at 14, for example, is very shallow and presents only a slightly dished contour to the working surface, that cavity at 15 extends considerably deeper into the rubber composition, and, because of its depth and its substantially spheroidal shape, the diameter of its opening 16 upon the surface 12 is smaller than the diameter of its interior 15. The re-entrant portion of rubber-like material formed by the reduction in diameter of the spheroidal cavity forms a resilient ring 17 about the opening of the cavity upon the periphery of the cot; and it is believed that this ring or re-entrant portion may be responsible for improved dissipation of electro-static charge or the creation of improved suction-like cups which greatly improve the "eyebrowing" and "lapping-up" resistance of the cot of the present invention.

As previously explained, the cavities such as at 13, 14, and 15 are formed by the inclusion within the rubber-like composition of a plurality of small, frangible, substantially spheroidal particles such as 19 of Figure 3. In one preferred case, such particles have a thin, ceramic shell 20 completely enclosing the hollow interior 21. If the material of which they are made is of a sufficiently frangible nature, however, the particles may be solid spheres.

Upon the metal arbor 22 of Figure 4 is mounted a roll cover 23 after it has been formed and vulcanized, but before its surface 24 has been ground to the necessary textile working regularity and smoothness. In even distribution throughout the rubber-like composition of the roll cover are shown the small particles 25 similar to the embedded particles 18 in Figure 2. Those particles 26 immediately underlying the surface 24 will be exposed to the surface and broken by the grinding of the roll, whereupon their broken particles may be removed to leave the previously described surface voids such as 13, 14 and 15.

While the quantity of the small particles per given weight will vary considerably as between those having a hollow interior and those which are solid, it has appeared that the hollow particles, although lighter in weight and more abundant relative to an equal weight of the solid particles, break up more easily and thus compensate for their original larger numbers, so that, in the final product, the number of surface cavities will be approximately the same whether a given weight of hollow or solid particles is employed. Since it is the cavity formed by these particles which is of primary importance in the present invention, the size of the particle employed does not depend upon whether the particle is hollow or solid; and a broad range of particle sizes from 0.001 in. to 0.090 in. in diameter have been successfully employed.

One form of smooth, frangible particle satisfactory for incorporation within the rubber composition of a textile working unit according to the present invention is obtained by the fusion of argillaceous materials such as clays and shale, under such conditions that finely divided, hollow, spheroidal or substantially spherical particles are obtained. These particles are manufactured by feeding a ground and screened clay into the top of a vertical furnace through which it falls and, while so doing, passes through a gas-air flame whereupon it becomes heated to a temperature above 2700° F. causing it to become fused and expanded into a hollow ceramic particle and whereafter it cools during the remainder of its fall. It is to be noted that these particles and the cavities formed by them have been enlarged in the drawings for the sake of clarity.

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These hollow, frangible particles 19 in the form of spheres or spheroids are particularly desirable for purposes of the present invention in that, because they are hollow, the particles may be easily broken into small fragments which, in turn, may be easily removed from the rubber composition leaving the desired cavities. On the other hand, the inherent structural strength of the particles resulting from their spherical shape will resist ordinary internal forces within the cot during its manufacture and operation so that they will remain integral and have no deteriorating effect upon the rubber composition until they are exposed to the working surface at which time they may be broken and the would-be deleterious fragments effectively removed.

The rubber composition to be used in the roll covers may be similar to any of the known synthetic rubber-like compounds previously employed for such applications and may be prepared according to well-known procedures from the various well-known compounding ingredients, the proper selection of which may be readily made by those skilled in the art. A preferred example of such a composition is as follows:

	Parts by weight
Butadiene-acrylic nitrile copolymer.....	100
Plasticizers (tricresyl phosphate).....	10-15
Stearic acid	.625
Sulfur	6.5
Antioxidant (di-beta-naphthyl-para-phenylenediamine)	1
Accelerator (benzothiazyl disulfide).....	1.25
Coumarone indene resin.....	7.5
Soft clay filler.....	20
Hollow fused argillaceous particles (0.007 in. to 0.023 in. diameter).....	100

The preferred amount of particles to be incorporated with such a rubber-like polymer will vary in direct proportion to the degree of fiber spinning and/or twisting to be accomplished by the textile machine unit and will also vary according to the chemical and structural nature of the particles. While satisfactory cots have included from 30 to 150 parts by weight of the particles to 100 parts by weight of the rubber-like polymer, there is no indication that the utility of this invention is limited to such a range of proportions, especially where varying particle sizes are employed.

Small spheres or beads of glass, which is a siliceous material usually formed from silica and an alkali such as sodium hydroxide or potassium hydroxide, have also been found satisfactory for inclusion in cots according to the present invention. Where these beads are in solid spherical form, the significance of their frangibility is enhanced since the problems involved in breaking and removing the broken fragments of a solid body are greater than in the case of a hollow one. These problems notwithstanding, the glass beads may be satisfactorily broken by grinding and their fragments removed by blowing or buffing to provide the desired spheroidal voids and cavities as described above. To aid in this process, the glass from which the beads are formed may be compounded so as to be more frangible as for example, by the addition of lead oxide according to common practices in the manufacture of crystal or flint glass. One preferred compound incorporating the glass beads is as follows:

	Parts by weight
Butadiene-acrylic nitrile copolymer	100
Plasticizer (tricresyl phosphate)	12.5
Stearic acid	.625
Sulfur	6.5
Antioxidant (di - beta - naphthyl - para - phenylenediamine)	1
Accelerator (benzothiazyl disulfide)	1.25
Coumarone indene resin	7.5
Soft clay filler	30
Solid glass beads (0.006 in. to 0.017 in. diameter)...	60

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The spherical materials are preferably thoroughly mixed in the rubber-like matrix composition during the regular mixing involved in the compounding thereof, such mixing taking place on a mill or in a Banbury as is the common custom in compounding rubber-like material. The matrix material thus compounded and carrying the spheroidal particles is then preferably extruded in tubular form upon a building mandrel or directly upon the arbor of the roll of which the cot is to form the covering. The material thus formed and mounted is then subjected to vulcanizing conditions according to the common and well-known practice, usually by rag wrapping and placing the assembly in an open steam vulcanizer. During this vulcanization the rubber-like matrix composition will assume its elastomeric properties and the spherical particles will become permanently set therein. The plastic flow of the matrix composition attending this vulcanization is such that the particles near the surface of the roll cover will be covered with a thin film of the rubber-like material. Accordingly, to uncover the surface particles and to remove the impression of the rag wrapper, the roll covers are removed from the vulcanizer and subjected to a grinding and buffing action until they are brought to proper working dimensions. It is during this grinding operation that the surface particles become broken into small fragments which may be easily removed to leave the desired voids and cavities as above described.

The working surface of the cot, once abraded and blown so as to remove the broken fragments of the ceramic-like particles, will be non-regenerating; that is, the cot or similar textile working unit will not wear away to the extent that the cavities formed by the broken particles will be worn away and new unbroken particles appear on the surface. When the cot begins to lose its desirable properties with regard to resistance to "eyebrowing" and "lapping-up" it may be subjected to a new grinding or abrading action as is the established custom in the textile art. In order that the broken fragments of the frangible particle will not remain on the cot to the damage of the goods being worked and the bearings and other parts of the textile working machine, each grinding operation will be followed by blowing or similar means to remove the broken particle fragments from the rubber-like composition.

The superiority of a textile cot made according to the present invention with regard to its non-eyebrowing characteristics and its increased operational life between working surface renewal has been clearly demonstrated in the hereinafter described tests wherein the cot of this invention was compared with previously known cots. In the table below, cot A represents a cot of a typical butadiene-acrylic nitrile composition without the addition of any particles. Cot B was of a similar compound containing granulated cork particles evenly distributed therethrough. Cot C included the small, frangible particles according to the present invention. All of these cots were run on a typical drawing frame at high speeds approximating those normally used for the roving operation in which eyebrowing has been found most difficult to control. The hours which each cot, operating under the same test conditions, ran before "eyebrowing" began to appear were as follows:

	Hours to eyebrow	
Cot A -----	1/2 to 3/4	65
Cot B -----	60 to 95	
Cot C -----	over 400	

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It is obvious from these results that the cot according to the present invention constitutes an important step forward in the art insofar as cot C containing the small, hollow, frangible particles performed from four to five times as long as the previously known types without eyebrowing. In practice this means that replacement, resurfacing of the cots and the labor cost, and loss of time involved therein will be substantially reduced.

Although, in the foregoing description, particular reference has been made to preferred singular embodiments of the present invention, it is to be understood that the terms and examples employed therein are for purposes of description only and are in no way intended to limit the scope of the principles of this invention as defined in the following claims.

I claim:

1. A roll of synthetic oil-resistant rubber-like composition containing a plurality of small, smooth-surfaced, hollow, frangible particles interspersed therein.
2. A roll of synthetic oil-resistant rubber-like composition, the outer portion of which comprises a plurality of small, substantially spherical, hollow, frangible particles of a fused siliceous material and the working surface of which comprises a plurality of cavities in the shape of substantially spherical segments formed by the breakage and removal of the frangible particles therefrom.
3. A textile fiber drafting cot comprising a synthetic rubber-like butadiene-acrylic nitrile copolymer composition interspersed with which are a plurality of small, smooth-surfaced, substantially spherical, hollow, frangible particles of a fused and expanded argillaceous material wherein the surface portion of said cot comprises a plurality of voids in the form of spheroidal segments formed by the breakage and removal of the frangible particles therefrom.
4. A textile cot according to claim 3 wherein the openings of a substantial proportion of said voids upon said working surface are substantially circular and are of a smaller diameter than the interior of said voids.
5. A textile cot according to claim 3 wherein the siliceous material is clay.
6. A textile fiber working unit of a rubber-like composition interspersed with which are a plurality of small, frangible, substantially spheroidal particles wherein the working surface of said unit comprises a plurality of depressions in the form of substantially spheroidal segments left upon the removal of said particles therefrom and a substantial proportion of said depressions have an internal diameter which is greater than the diameter of their opening upon said surface.
7. The article of claim 6 in which said unit is a drafting cot.

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