July 22, 1958 J. ROCKOFF 2,843,883

TEXTILE COT

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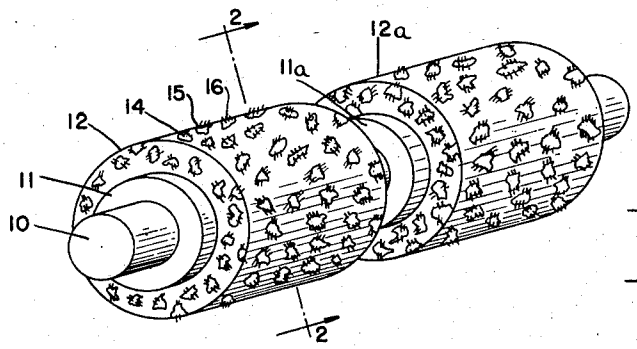


Fig. 1

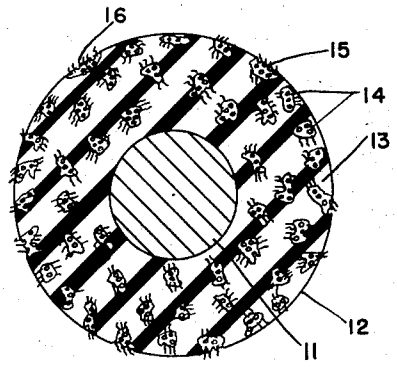


Fig. 2

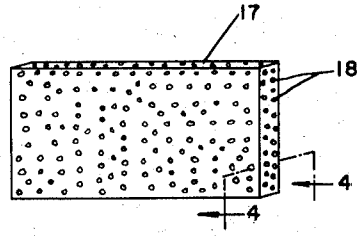


Fig. 3

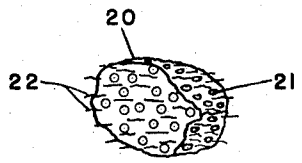


Fig. 5

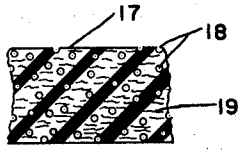


Fig. 4

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TEXTILE COT

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The present invention relates to compositions for rollers, roll covers and the like, particularly textile working units such as cots for spinning and drawing rollers.

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 or cot is made of leather, cork composition, or certain types of rubber-like material.

The function of these rollers, in the textile art, is to attenuate and to impart a twist to cotton, wool and other fibers including the well-known synthetic fibers. In carrying out these functions, such rollers are subjected to the abrasive action of the fiber and of their companion rollers which are usually of corrugated steel with which they are in substantially tangential contact. During their use in textile factories, these rollers are also subjected to undesirable atmospheric conditions, deleterious oils and the like present in the fibers, and in addition they tend to collect a static charge. Any one or all of these last enumerated factors may contribute to a condition known as "eyebrowing" which results from the failure of the cots to carry the very short fibers or "clearer waste" to the rear of the top clearer in order to gather properly. When this condition exists, these short fibers collect at the forward edge of the top clearer and hang down over the roll to form what is known as an "eyebrow." As the size of such an eyebrow increases, it will hang down and contact the sliver and will be pulled into the same thus impairing the quality of the yarn with what is known as a "slug."

In addition to this condition, there is the undesirable phenomenon known as "lapping up" which results when the cot becomes tacky or gummy and presents an adhesive surface to the fiber passing between the rollers, thereby causing the sliver to stick to the surface of the cot and to wrap around the same. It is apparent that when this condition exists, the textile working operation is completely disrupted and much time is consumed in its correction.

While the exact causes of these undesirable conditions are not clearly understood, it is generally believed that eyebrowing occurs when a cot becomes smooth surfaced or slick to the extent that it will part with the short clearer waste too readily, thereby depositing this clearer waste at the front of the clearer where it collects as an eyebrow rather than carrying it to the rear thereof where it builds up without adversely affecting the quality of the yarn. On the other hand, it is believed that lapping up results when the surface of the cot becomes sticky and tacky, thereby overly increasing the tendency of the sliver itself to cling to the cot. This sticky condition of the cot surface may result from the action of the atmosphere or of the oils within the fibers upon the cot composition or may be a matter of electrostatic attraction between the cot and the yarn resulting from a build-up of a static charge in the former. It thus appears that a satisfactory textile cot or similar roller composition must at once have

certain adhesive qualities which will enable it to carry the clearer waste to its proper point of deposit on the clearer and yet be sufficiently smooth and unadhesive so that the yarn contacting the roll will not stick to the same and wind around it. Most of the previously known cots composed of such material as leather, cork compositions and certain rubber compositions have failed to possess these qualities to the desired degree and have thus been found to be unsatisfactory from the standpoint of their operational life.

It is therefore an object of the present invention to provide a rubber composition suitable for roll covers and the like which has a certain affinity for small fibrous particles such as clearer waste but at the same time is not so adhesive as to cause the material such as yarn with which it is in contact to lap up or wind around it as it is rolling.

It is another object of the present invention to provide a textile working unit in the form of a roll cover or cot which will be capable of continued operation without becoming prematurely worn by abrasion or becoming otherwise unusable because of its tendency to eyebrow or cause lapping up.

It is a further object of the present invention to provide a textile cot having a working surface of unique properties which may be easily maintained in a satisfactory condition for use on spinning and drawing rollers and the like.

It is yet a further object of the present invention to provide a textile cot, the working surface of which has a degree of porosity which is easily controlled and maintained at a minimum consistent with the hardness that is required of such textile units.

It is yet another object of the present invention to provide a textile working unit the surface of which has heterogeneous arrangement of ciliate projections.

It is still a further object of the present invention to provide a method for the manufacture of roll covers and the like of the type herein considered.

To achieve these and other objects and advantages of present invention which will be apparent from a reading of the following disclosure, it is proposed to provide a base or matrix composition of a synthetic rubber material through which are interspersed a plurality of particles of a resinous composition, said particles having embedded therein a plurality of fibrous particles. The matrix composition employed where the present invention is applied to textile working units and the like is preferably of an oil-resistant synthetic rubber material such as the butadiene-acrylic nitrile copolymers known as Buna–N, GR–A, or Perbunan; the polychloroprenes such as chlor-2-butadiene-1,3 known as neoprene or GRM; and the ethylene dichloride, sodium polysulfide polymers known as Thiokol.

The discrete particles which are embedded in this matrix composition and which themselves carry the fibrous or filamentous material are of a resinous composition af material. By this is meant natural or synthetic resins or rubber in addition to natural rubber and the well known synthetic rubbers such as those enumerated above, these particles may be composed of the well-known resinous plastics such as the phenol-aldehydes, polyamides, coumarone, indenes, ureas, epoxy resins, furan, cellulose resins, high molecular weight plastics (such as polyesters) and the like. It is usually preferred that the particles, like the matrix, have a certain amount of oil-resistance.

In the preferred embodiment of the present invention to be hereinafter more fully described, it has been found that textile cots of extremely satisfactory qualities with regard to their resistance to eyebrowing and lapping up might include, as the resinous particles embedded

in the matrix composition, a chemically blown sponge rubber composition which may be made from any of the previously enumerated synthetic compositions to which is added the fibrous particles plus a blowing agent such as sodium bicarbonate or diazoaminobenzene prior to vulcanization. Upon the application of vulcanizing heat to such composition containing a blowing agent, gases will be evolved from the same which, if allowed to expand, will result in a highly porous structure having embedded fibers therein, from which the particles to be incorporated with the matrix composition according to this invention may be formed. In addition to the use of fillers, sulfur and other loadings to improve the hardness of the composition from which the chemically blown sponge is to be formed, the hardness of this composition may be further controlled by limiting the expansion of the same during its vulcanization and the attendant expansion of the blowing agent gases to the extent that the final sponge composition does not occupy more than one and one-half of the original volume of the unvulcanized, unexpanded material. While this maintenance of a minimum hardness of the sponge rubber particles is important from the standpoint of preventing a collapse of their cellular structure during fabrication and vulcanization of the finished products, this hardness of the particles in general must not be so great as to cause them to abrade and wear away the fibrous material extending from their surfaces. A Shore A durometer hardness range of from 65 to 85 is generally preferred for such particles. To achieve such apparent hardness in a chemically blown sponge rubber particle, however, it may be necessary to begin with a composition which, if vulcanized without blowing, would have a Shore A durometer hardness ranging from 85 to just below 100.

The fiber to be interspersed through the composition from which the resinous particles such as the sponge rubber particles above described may be formed might include a wide variety of material. For roll covers generally, such fibers might be of cotton, wool, hair, bristles, comminuted peanut shells and other fibrous materials. The various synthetic fibers such as the polyamide polymers known as nylon, the polyacrylonitriles such as Orlon, the polyesters such as Dacron, the vinylidene chloride and vinyl chloride polymers such as Saran, and glass fibers are also adaptable to the present invention. For textile cots such as top spinning roll covers and the like, it is preferred that the fibrous material be cut to lengths of from 1/16 to 1/4 of an inch and have a denier per filament of from 1½ to 20.

As previously stated, these fibers are first mixed with a resinous composition, an example of which is the sponge rubber material above described, after which such resinous composition may be calendered or otherwise formed into sheets, preferably of a limited thickness ranging from 1/16" to 3/16", after which the sheet, having the fibers interspersed therein, is vulcanized or allowed to take a set and is thereafter broken into small particulate fragments. In addition to providing an accurately controlled surface with regard to hardness and porosity in those cases in which a porous resinous composition is used for these particles, this provision of resinous particles, which themselves carry the fibrous material, as opposed to the direct incorporation of such fibrous material with the matrix composition, results in a composite material wherein the fibrous particles extend from the surface thereof. Such a resulting ciliated surface is difficult to achieve where the fibrous material is incorporated directly with the matrix composition which is, in turn, extruded or calendered or otherwise formed, in that, during the forming operation, the particles will tend to align themselves parallel to the surfaces of the article and will accordingly not project or extend therefrom. On the other hand, where, according to the present invention, the particles are first embedded and fixed in position within the resinous carrier particles which are then mixed with the matrix composition, the resinous particles, being three dimensional and irregular in shape, will not tend to align in any uniform fashion upon the working, extruding or molding of the article so that the fibers in their fixed position within these particles will similarly not be aligned parallel with the article surface. Since no uniform alignment of these fibers thus takes place, they will be arranged in a non-uniform manner completely throughout the matrix composition including the surface portion thereof; and this surface portion will accordingly be characterized by projecting ciliate particles, their projection being at a variety of angles to the surface.

A cot made according to the above described method may thus be formed of a basic material which is sufficiently hard as to maintain a smooth, non-tacky surface to which the yarn or other material upon which it is working will not adhere and lapping up will be prevented. At the same time, the surface roughness provided by the resinous particles, particularly where the same comprise a chemically blown sponge composition, and that degree of roughness provided by the fibrous particles projecting therefrom will cause the short clearer waste to cling to the cot until it is carried to the rear of the clearer where it may be deposited without danger of formation of an eyebrow and resultant damage to the finished goods.

Referring now to the particular description of a preferred embodiment of the present invention generally set foth above, reference may be had to the appended drawings.

In the drawings:

Figure 1 is a perspective of a typical textile spinning or drawing roller according to the present invention.

Figure 2 is a cross-section on line **2—2** of the roller of Figure 1.

Figure 3 is a perspective of a sheet of chemically blown resinous composition from which the particles incorporated in the matrix of the cot according to the present invention may be formed.

Figure 4 is an enlarged cross-section of the sheet of Figure 3 taken on line **4—4** thereof.

Figure 5 is a perspective of a particle formed from such sheet as shown in Figures 3 and 4.

In Figure 1 the typical cot is shown to comprise the metal arbor **10** having raised shoulder boss portions **11** and **11*a*** upon which are mounted sleeve-like roll covers or cots **12** and **12*a***. As best shown in Figure 2, such a roll cover comprises a base or matrix composition of synthetic rubber material **13** interspersed through which are the fiber carrying resinous particles **14**. It is to be observed that these particles, being in substantially uniform distribution throughout the matrix composition, will be exposed to the surface of the cot in a similar uniform manner and will impart a degree of porosity and roughness thereto as shown at **15**. The fibers at **16** extend from the working surface of the cot to provide the above described desirable ciliated surface.

In the manufacture of cots according to the present invention, the fibrous material, one preferred form of which is a condensation polymer of dimethyl terephthalate and ethylene glycol which is manufactured by the E. I. du Pont de Nemours and Company, Inc., under the tradename, "Dacron," is first prepared by shredding or cutting to lengths of from 1/16 to 3/16 of an inch after which it is thoroughly mixed with the resinous composition. One preferred form of such resinous composition is an elastomeric material, for example an oil-resistant synthetic rubber, to which has been added a blowing

agent. Such synthetic rubber material may comprise the following parts by weight:

	Parts by weight
Butadiene-acrylic nitrile copolymer	100
Plasticizer	10–20
Stearic acid	.625
Sulfur	9
Antioxidant	1
Accelerator	1
Coumarone-indene resin	7.5
Filler (clay)	80–150
Diazoaminobenzene (blowing agent)	4

Admixed with this composition may be from 1 to 20 parts by weight, based upon the butadiene-acrylic nitrile copolymer, of the previously described Dacron fibers, after which the mixture is calendered or otherwise formed into thin sheets having a thickness of from 1/16 to 1/4 inch. As previously explained, it is preferred that this synthetic rubber composition have a high filler and sulfur loading so that it will have a hardness without blowing, of from 85 to just below 100. Where the blowing agent is incorporated, the expansion of the same should be limited to 1½ the original volume of the unblown composition so that a fine porous structure will result and the original hardness of the composition will not be lost due to excessive porosity. It is important that the porosity of this sheet be extremely uniform and accordingly it is important that the blowing agent be thoroughly mixed and distributed throughout the composition before the same is vulcanized and blown. Such sheet is shown in Figures 3 and 4 wherein the sheet **17** has a surface characterized by its plurality of uniformly spaced pores **18**. The uniform arrangement of the fibrous filaments parallel with this surface resulting from the calendering or sheeting thereof is shown at **19**.

In the formation of particles from this sheet after it has been cured, the same may be ground or otherwise broken and, where, as in the case of this preferred sample, the sheet comprises a synthetic rubber composition, the same may be frozen by contact with Dry Ice which contact and frozen condition is maintained through the grinding operation. Upon this grinding there is formed a porous particle such as that shown in Figure 5, wherein the particle **22** has the uniformly distributed pores **23** and aligned filaments **24** extending from its surface.

In Figures 4 and 5, it is to be noted that the fibrous particles **19** and **22** are in parallel alignment corresponding to the direction in which the resinous composition containing them was passed through calender rolls or extruding dies. It is apparent that if these fibers were mixed directly with the matrix composition, they would take the same parallel position in a roll cover as it was formed in an extruder. It is further apparent that in such alignment, they would not extend from the surface of the roll cover to provide the desired fibrous surface.

It has been found, however, that the three dimensional particles such as shown in Figure 5 may overturn in the matrix composition as it is passed through rolls or extruding dies, but that their final position within the finished roller or the like will be entirely independent of the direction in which the fibrous material within them has become aligned. As a result, even though the fibrous filaments have been previously aligned in the sheeting of the resinous composition in which they are embedded, the formation of particles from this fiber carrying resinous composition and the mixture of these particles in a matrix composition results in a working surface which is characterized by a plurality of fibers extending therefrom in a random arrangement at angles of varying acuteness and in various directions with regard to the surface.

A suitable oil-resistant matrix composition to which

the fiber carrying resinous particles above described may be added might be as follows:

	Parts by weight
Butadiene-acrylic nitrile copolymer	100
Plasticizer	10–20
Stearic acid	.625
Sulfur	6.5
Antioxidant	1
Accelerator	1
Coumarone-indene resin	7.5
Filler (clay)	50–100

A preferred range of from 50 to 200 parts by weight of the fiber carrying resinous particles based upon the synthetic rubber polymer (butadiene acrylonitrile in the above example) may be added to the above described matrix composition. A most satisfactory spinning cot composed of the above described matrix and fiber carrying compositions has included 140 parts of the sponge rubber particles to 100 parts of the synthetic rubber polymer of the matrix, said particles being screened through an 8 mesh screen. These particles are thoroughly mixed with the matrix composition on a mill or internal blender and the mixture is extruded in the form of a sleeve. This sleeve is then compacted upon a mandrel, for example by rag wrapping, and vulcanized. In accordance with the customary procedure, the sleeve thus formed may be ground after being fitted upon an arbor.

The superiority of such a cot has been demonstrated on a drawing machine where the same operated for over 500 hours before eyebrowing as opposed to 60 hours of operation before eyebrowing of a cot containing cork particles and less than 1 hour of such operation for a cot of the matrix composition alone.

The present invention having been described and illustrated by reference to particular embodiments and examples above, may be precisely defined according to the following claims.

I claim:

1. A textile working unit having a ciliated working surface comprising a synthetic rubber matrix composition, discrete particles of a resinous composition embedded therein and a fibrous material embedded in and carried by said discrete particles, said fibrous material projecting from said surface to impart ciliate properties thereto.

2. A roll cover comprising a deformable base composition, comminuted particles of porous resinous composition interspersed through said base composition and filamentous material embedded in said particles and providing a ciliate working surface upon said cover.

3. In a textile cot having a matrix of oil-resistant synthetic rubber composition that improvement which comprises a plurality of particles of resinous composition and a plurality of fibrous particles embedded therein, said fibrous particles being in substantially parallel alignment within said particles of resinous composition and said particles of resinous composition being so embedded in said matrix that the fibrous particles project at random angles from the surface thereof.

4. A textile cot according to claim 3 wherein said matrix is composed of a butadiene-acrylic nitrile copolymer.

5. A textile cot according to claim 3 wherein said particles of resinous composition are porous.

6. A textile cot according to claim 5 wherein said resinous particles are of a chemically blown sponge oil-resistant synthetic rubber composition.

7. A textile cot according to claim 6 wherein said matrix composition and said chemically blown sponge particles are compounded of the same basic synthetic rubber material.

8. A textile cot according to claim 7 wherein said synthetic rubber material is a butadiene-acrylic nitrile copolymer.

9. A method for manufacturing roll covers comprising admixing a plurality of fibers with a resinous material, forming this composition into a thin sheet, vulcanizing the sheet thus formed, comminuting said sheet into small particles, admixing said small particles with an oil-resistant synthetic rubber matrix compoistion, forming a sleeve from the mixture thus formed vulcanizing the same, and thereafter grinding the exterior surface of said sleeve to cause the fibers to extend at random angles therefrom.

10. A method for the manufacture of roll covers comprising admixing a plurality of ciliated particles with an oil-resistant synthetic rubber composition containing a blowing agent, sheeting this mixture of fibers and synthetic rubber composition, vulcanizing this mixture while allowing the gases formed by the blowing agent to expand to form minute pores in said sheet, breaking the vulcanized sheet material into small fragments, mixing these fragments with an oil-resistant synthetic rubber material, extruding the composition thus formed into sleeves, and vulcanizing the sleeves.

11. A method according to claim 10 wherein said sheets

are broken by grinding while they are in a frozen condition.

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