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R. A. GARRETT
TEXTILE FIBER UNIT
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Fig. 1

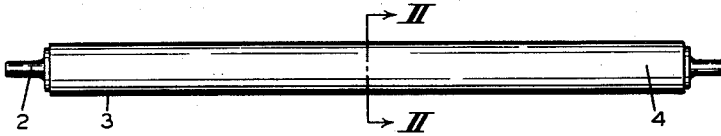


Fig. 2



Fig. 3

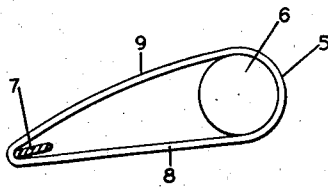


Fig. 4

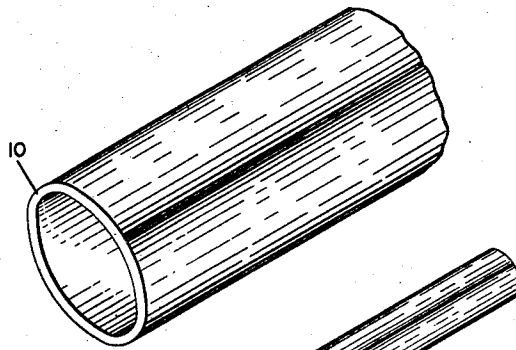


Fig. 5



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2,860,382

TEXTILE FIBER UNIT

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16 Claims. (Cl. 19—143)

This invention relates to textile fiber working units such as pencil roll covers, long draft aprons, comber detaching rolls, and the like. Pencil roll covers are used in the textile fiber working industry in Saco Lowell and similar type machines and serve the purpose of controlling fiber draft. In such operation the roll covers frictionally engage the fibers and static electricity on the roll surface causes the fibers to be disrupted, resulting in the creation of "waste" which floats about the mill and collects on the machines, creating a substantial nuisance and often resulting in the production of defective yarn. In long draft aprons, the textile fibers lie in engagement with the working surface of the apron or aprons, and these, too, must have a static-free working surface in order to form high quality yarn. In aprons, the working surface must be yielding and resilient, and the apron structure should be free of any tendency toward excessive growth or stretching during operation. It should also be resistant to attack by the oils encountered in use. Comber detaching rolls serve to disengage the fibers from the combers, and the presence of static electricity on the rolls would cause the fine web of fibers to be disrupted and an uneven web to be formed. Similar problems are encountered in other textile fiber working units such as twister rolls, self-weighted Washburn rolls, and the like.

It is an object of this invention to provide a textile fiber working unit having a static-free working surface formed of a plasticized resinous composition.

Another object of this invention is to provide a textile fiber working unit having a static-free working surface and possessing the desired physical characteristics of compressibility, resilience, proof against excessive growth or elongation, and requisite resistance to attack by oils and other substances encountered in the use of the textile fiber working unit.

According to the present invention, a textile fiber working unit is made having a working surface formed of a composition of a resin selected from the group consisting of polyvinyl chloride, the polymerization product of a mixture of vinyl chloride and vinyl acetate containing about 95% vinyl chloride and about 5% vinyl acetate, and mixtures thereof, each 100 parts by weight of the resin having incorporated therewith between about 50 parts by weight and 150 parts by weight of plasticizer for the resin which is compatible with the resin in such proportions at temperatures above 45° F. and renders the composition static-free, said plasticizer being selected from the group consisting of: (a) an ester, the acid component of which is selected from the group consisting of at least one aliphatic acid, phosphoric acid, and phosphonic acid, the molecular weight of the aliphatic portion of said ester representing more than 50% of the total molecular weight of said ester, (b) 2-ethylhexyl diester amide, (c) fatty acid nitrile of C₆-C₂₀ fatty acids, (d) C₄H₉OC₂H₄OC₂H₄OCH₂OC₂H₄OC₂H₄OC₄H₉, and (e) mixtures of two or more of the above plasticizers,

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and (e) mixtures of two or more of the above plasticizers. Such unit may be secured to a roll structure as in the case of the pencil or slip roll covers or may be formed into a tubular product and severed into products such as aprons, or the like. If required, a reinforcing cord may be provided within the body of the unit in the manner described in Billmeyer Patent 2,470,599 granted May 17, 1949. It has been found, however, that for some services the use of a reinforcing cord is not necessary.

The attached drawing illustrates a number of embodiments of the invention as follows:

Figure 1 is a top plan view of a pencil or slip roll having applied thereto a cover made in accordance with the present invention;

Figure 2 is a sectional view taken along line II—II of Figure 1;

Figure 3 is an end view of a long draft apron made in accordance with the present invention mounted in a typical Casablanca type frame which has been diagrammatically shown;

Figure 4 is a perspective view of a section of tubing made in accordance with the present invention and adapted for severance into aprons; and

Figure 5 is a perspective view showing a pencil or slip roll cover suitable for mounting upon the roll structure of Figure 1.

In Figure 1, the roll body 2 is of conventional shape or configuration and may be formed of metal. It has a cover 3 mounted thereon made in accordance with the present invention, said cover having a working surface 4.

In Figure 3 an apron 5 is shown as encircling a driving roll 6 and a front bar 7. The apron 5 is shown as made from a tubular body 8 in accordance with the present invention, and the apron has a working surface 9. In this embodiment the apron is not reinforced; but, as previously mentioned, a reinforcing cord may be provided as taught by Billmeyer.

In Figure 4 a section of tubular stock 10 is shown which may be severed into appropriate pieces for use as aprons.

Figure 5 shows a pencil roll cover 11 which is formed without a reinforcement of any sort and may be adhesively secured to a metal pencil roll to form a structure such as that shown in Figures 1 and 2.

In the preparation of the composition of the present invention for use in the fabrication of a pencil roll cover, the following example is given:

Pencil roll cover composition

	Parts by weight
Resin	100
Plasticizer	50-150
White lead	1.5
Filler	20
Titanium dioxide	15
Carbon black	0.3

In the above example the resin will be selected from the group consisting of polyvinyl chloride, the polymerization product of a mixture of vinyl chloride and vinyl acetate containing about 95% vinyl chloride and about 5% vinyl acetate, and mixtures thereof. The polyvinyl chloride resin may be one sold under the trade designation "Koroseal." The polymerization product of the mixture vinyl chloride and vinyl acetate may be the resin sold under the trade designation "VYNW," and the mixture may be any proportions of the resins sold under the trade designations given above.

The plasticizer may be any one of the plasticizers for the resin listed below. The first three plasticizers are preferred. Of course, mixtures of the various plasticizers may be used.

Plasticizer Trade Name	Chemical Composition
1. Plasticizer SC	Triethylene glycol ester of C ₆ -C ₁₀ fatty acids.
2. Triacetin	Glycerol triacetate.
3. TBEP	Tributoxy ethyl phosphate.
4. Baker P-4	Methyl acetyl ricinoleate.
5. Flexol TOF	Trioctyl phosphate.
6. Paraplex G-25	Polyester (Linear)—poly (sebacate-glycol).
7. Plastolein 9715	Polyester (Linear)—poly (adipate glycol).
8. Flexol 3 GO	Triglycol dioctoate.
9.	Butyl benzl sebacate.
10.	Capryl benzyl sebacate.
11. Flexol 8NS	2-ethylhexyl di ester amide.
12.	Tributyl phosphate.
13. Arneel Plasticizer	Fatty acid nitrile of C ₆ -C ₂₀ fatty acids.
14. Flexol 4 GO	Polyethylene glycol di-2-ethylhexoate.
15. Flexol 3 GH	Triglycol dihexoate.
16. Flexol CS-24	Di (2-ethylbutyl Cellosolve) succinate.
17. Thiokol TP90B	High M. W. Polyether C ₄ H ₉ OC ₂ H ₄ OC ₂ H ₄ OCH ₂ OC ₂ H ₄ OC ₂ H ₄ OC ₄ H ₉
18. Thiokol TP95	High M. W. Polyether ester (Di-butoxyethoxyethyl adipate)
19.	Dioctyl styryl phosphonate.
20.	Dibutyl benzene phosphonate.
21.	Dioctyl benzene phosphonate.

Plasticizers 1-10, 12, 14-16, and 18-21 are in class (a) mentioned previously, i. e., an ester, the acid component of which is selected from the group consisting of at least one aliphatic acid, phosphoric acid, and phosphonic acid, the molecular weight of the aliphatic portion of said ester representing more than 50% of the total molecular weight of said ester; plasticizer 11 is in class (b), 2-ethylhexyl di-ester amide; plasticizer 13 is in class (c), fatty acid nitrile of C₆-C₂₀ fatty acids; and plasticizer 17 is in class (d),



Plasticizers 1, 2, 4, 8, 14, 15, 16, and 18 are esters of an aliphatic acid and an aliphatic alcohol in which the aliphatic acid component of the ester has 2 to 18 carbon atoms and in which the aliphatic alcohol component of the ester has from 1 to 8 carbon atoms. Plasticizers 6 and 7 are linear polymerized esters of glycol and polycarboxylic acid. Any other plasticizer or mixture of plasticizers selected from classes (a) to (d) mentioned previously and which are compatible in proportions of about 50 to 150 parts for each 100 parts of resin (all parts by weight) at temperatures above 45° F. may be employed so long as the plasticizer does not deleteriously affect the resin or so alter its physical characteristics as to render the working surface of the article unsatisfactory. The plasticizer or plasticizers selected will depend upon the particular type of fiber working unit being prepared, the service conditions which it will encounter, and other variable factors. The quantity of plasticizer used will likewise depend upon such variable factors. For pencil roll covers the amount of plasticizer used will generally be determined by the hardness desired in the finished product and the static resistance of the working surface. With the plasticizers listed above, 50 parts of plasticizer to 100 parts of resin will be adequate to secure static resistance in all instances except with linear polyester type plasticizer, No. 6, where about 85 parts by weight of plasticizer to 100 parts of resin are required to provide a static-free working surface. Where this quantity of plasticizer tends to produce a product which is too resilient and yielding for specific uses, one of the other plasticizers such as plasticizer No. 1 listed above will be chosen. Wide latitude is possible in the selection of plasticizers.

A preferred filler is the one sold under the trademark "Silene EF" which is a precipitated calcium silicate. In place of "Silene EF" other fillers may be substituted, such as clay, whiting, and carbon black. Titanium dioxide and carbon black, such as "Gastex," are used principally as color pigments, and in lieu thereof other pigments may be employed. The white lead serves as a heat stabilizer, and in place of it materials such as lead stearate, basic lead silicate, and the like may be substituted.

The quantities of the fillers, pigments, and stabilizers used may be varied and are not critical. These compounding ingredients are well known, and those skilled in the art will have no difficulty in compounding with various fillers, pigments, and stabilizers, as required.

In the preparation of the composition, the various ingredients are mixed in a suitable container or internal mixer. The blended ingredients are then fused on a heated two-roll mill, the temperature of which is in the order of 275° F. to 300° F. The fused compound is then extruded into tubular sections of the desired length. The extruded tubes are then permitted to cool and are subsequently cut into covers, aprons, or the like of the desired dimensions. Where roll covers are being fabricated, the covering may be mounted upon metal rolls, as shown in Figures 1 and 2 of the drawing, and the outer surface of the cover is ground to the desired diameter and surface smoothness.

A composition suitable for fabrication into aprons may be prepared as follows:

Apron composition

	Parts by weight
Resin	100
Plasticizer	50-150
White lead	1.5
Titanium dioxide	15
Carbon black	0.3

In this composition the resin may be the same as in the pencil roll cover composition. It will be observed that the filler used in the pencil roll cover composition has been omitted in the apron composition, but the other ingredients are incorporated in about the same proportions. The preferred plasticizers for the apron composition are those which are not extractable by oils which may be encountered in use, such as plasticizers 6, 7, 19, 20, and 21 listed above. Preferably where plasticizers Nos. 6 or 7 are used, for example, the quantity of plasticizer will be about 85 parts by weight for each 100 parts by weight of resin. Other plasticizers may be used in larger or smaller quantities within the range recited.

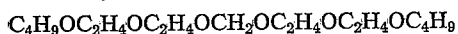
In the fabrication of the apron the mixing, fusing, and extruding steps will be the same as those mentioned above in connection with the pencil roll cover composition. The extruded tube will be as close as possible in dimensions to those required in the finished apron. The tube may then be mounted upon a mandrel having an outer diameter corresponding to the inner diameter of the apron being fabricated, and the assembly may then be heated in an oven at 250° F. for about one hour which will tend to "anneal" the composition. Thereafter, the tube will be severed into aprons of the desired dimensions; and if found necessary or desirable, the outer surface may be buffed or ground to provide a working surface having the requisite texture.

Other textile fiber working units may be formed from the compositions of this invention; and while the compounding may vary to some extent with the various units, they will in all events include a working surface formed of a composition of a resin selected from the group consisting of polyvinyl chloride, the polymerization product of a mixture of vinyl chloride and vinyl acetate containing about 95% vinyl chloride and about 5% vinyl acetate, and mixtures thereof; and they will have incorporated therewith a plasticizer for the resin which renders the composition static-free and which is selected from the classes (a), (b), (c), and (d) above or mixtures of two or more thereof. As mentioned above, fillers, pigments, and stabilizing agents and the like may be incorporated. The proportioning of resin and plasticizer may vary but will fall within the range of 50 to 150 parts by weight of plasticizer for each 100 parts by weight of resin; and the plasticizer will, of course, be compatible with the resin in such proportions at all temperatures above 45° F. encountered in the use of the product.

This application is a continuation-in-part of my co-pending application, Serial No. 148,719, filed March 9, 1950, now abandoned.

I claim:

1. A textile fiber working unit having a static-free working surface formed of a composition of a resin selected from the group consisting of vinyl chloride, the polymerization product of a mixture of vinyl chloride and vinyl acetate containing about 95% vinyl chloride and about 5% vinyl acetate, and mixtures thereof, having incorporated therewith between about 50 parts by weight and about 150 parts by weight for each 100 parts by weight of resin of a plasticizer for the resin which is compatible with the resin in such proportions at temperatures above 45° F. and which renders the composition static-free, said plasticizer being selected from the group consisting of: (a) an ester, the acid component of which is selected from the group consisting of at least one aliphatic acid, phosphoric acid, and phosphonic acid, the molecular weight of the aliphatic portion of said ester representing more than 50% of the total molecular weight of said ester, (b) 2-ethylhexyl di ester amide, (c) fatty acid nitrile of C₆-C₂₀ fatty acids, (d)



and (e) mixtures of two or more of the above plasticizers.

2. A textile fiber working unit in accordance with claim 1 in which the principal plasticizer for the resin is an ester of an aliphatic acid and an aliphatic alcohol.

3. A textile fiber working unit in accordance with claim 2 in which the plasticizer consists principally of triethylene glycol ester of C₆-C₁₀ fatty acids.

4. A textile fiber working unit in accordance with claim 2 in which the plasticizer consists principally of polyester (linear).

5. A textile fiber working unit in accordance with claim 1 in which the principal plasticizer for the resin is an ester, the acid component of which is at least one aliphatic acid, the molecular weight of the aliphatic portion of said ester representing more than 50% of the total molecular weight of the ester.

6. A textile fiber working unit in accordance with claim 1 in which the principal plasticizer for the resin is an ester of phosphoric acid, the molecular weight of the

aliphatic portion of said ester representing more than 50% of the total molecular weight of said ester.

7. A textile fiber working unit in accordance with claim 6 in which the plasticizer consists principally of tributoxyl ethyl phosphate.

8. A textile fiber working unit in accordance with claim 1 in which the principal plasticizer for the resin is a phosphonate, the molecular weight of aliphatic portion of which represents more than 50% of the total molecular weight of said phosphonate.

9. A textile fiber working unit in accordance with claim 1 in which the resin consists principally of the resinous polymerization product of a mixture of vinyl chloride and vinyl acetate containing about 95% vinyl chloride and about 5% vinyl acetate.

10. A textile fiber working unit in accordance with claim 1 in which the resin consists principally of polyvinyl chloride.

11. A textile fiber working unit in accordance with claim 2 in which the resin consists principally of the resinous polymerization product of a mixture of vinyl chloride and vinyl acetate containing about 95% vinyl chloride and about 5% vinyl acetate and in which the plasticizer consists principally of triethylene glycol ester of C₆-C₁₀ fatty acids.

12. A textile fiber working unit in accordance with claim 1 in which the unit consists of a slip roll cover and in which the resin consists principally of the resinous polymerization product of a mixture of vinyl chloride and vinyl acetate containing about 95% vinyl chloride and about 5% vinyl acetate and in which the resin has incorporated therewith about 50 parts by weight of said plasticizer for each 100 parts by weight of resin.

13. A textile fiber working unit in accordance with claim 1 in which the unit consists of a draft apron in which the resin consists principally of the resinous polymerization product of a mixture of vinyl chloride and vinyl acetate containing about 95% vinyl chloride and about 5% vinyl acetate.

14. A textile fiber working unit in accordance with claim 1 in which the unit consists of a draft apron in which the resin consists principally of the resinous polymerization product of a mixture of vinyl chloride and vinyl acetate containing about 95% vinyl chloride and about 5% vinyl acetate and in which said plasticizer for the resin is resistant to oil extraction.

15. A textile fiber working unit in accordance with claim 2 in which the plasticizer consists principally of linear polymerized ester of glycol and polycarboxylic acid.

16. A textile fiber working unit in accordance with claim 2 in which the aliphatic acid component of the ester has 2 to 18 carbon atoms and in which the aliphatic alcohol component of the ester has from 1 to 8 carbon atoms.

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