EXHIBIT K

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FLOCK FINISHED FABRIC

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The present invention relates to improvements in a flock finished fabric.

An object of the invention is to provide an improved flock finished imitation suede suitable for use as a leather substitute.

A further object is to provide an improved flock finished fabric which has high resistance to wear and soiling and which is relatively insensitive to solvents and is readily cleaned.

Another object of the invention is to provide a process for making improved flock finished fabric.

A still further object relates to an improved flock finished fabric which can be given ornamental finishes not available in the case of the ordinary flock finished fabric.

Another object is to provide a process for ornamenting a flock finished fabric by souping and the product of such a process.

The above and other objects will be described more fully hereinafter.

It is well known in this art to produce a suede-like finish on a textile fabric or other flexible base material such as latex impregnated paper or felt by applying a coating of flock upon a foundation such as a layer of ethyl cellulose properly plasticized, or natural or synthetic rubber. Upon this foundation laid down in the desired thickness in any suitable manner, such as by calendering or spreading, an anchoring coat is spread and upon it, while still in a tacky condition, is sifted or blown a coating of fine flock of cotton, rayon, wool or the like. The anchoring material is generally of the same material as the foundation except that it is dissolved in a solvent sufficient to make it a sticky coating. After applying the flock, the goods are then heated to remove the volatile solvents and, in case rubber is used, a vulcanizing treatment is employed.

Imitation suede of the sort described above, which is used in shoes, garments, handbags, etc., has certain fundamental difficulties, among which are a tendency for the flock to wear off in use, sensitiveness to solvents, and especially in the case of white and light colors, easy soiling and difficulty in cleaning.

According to the present invention it has been discovered that a highly improved fabric (using the word "fabric" in its broad sense without limitation to textile fabrics) results when ordinary flock finished fabric is coated on its surface with a coating of lacquer or enamel containing a slip agent and preferably also a pigment. The quantity of material so applied is highly important in obtaining this improved finish. The quantity must be such that it will not obscure entirely the fibrous character of the surface so that the resulting fabric will still have the suede-like finish which is desired. On the other hand, the coating must be present in such quantity as to penetrate and partially saturate the flock layer to produce a definite bonding of the fibers, improving its resistance to abrasive wear, to impart a considerable degree of soil resistance and render the material cleanable with soap and water, cleaning fluids, or shoe cleaning preparations.

The previously known flock finished fabric has a loose, highly absorbent surface layer of flock. As a result of the nature of this layer the fabric tends to pick up a great deal of dirt and retain the same. The coating according to the present invention serves to saturate the flock layer at least partially with the lacquer or enamel whereby the flock is rendered relatively non-absorbent.

Because of the valuable properties of resistance to soiling and wearing and the ease with which the fabric is cleaned, the present invention is particularly useful in the case of white goods where the product resembles buckskin leather and can be used as a substitute for the same in the manufacture of shoes, handbags, etc.

Another objection to the flock finished fabric of the prior art is that by reason of its absorbent character it cannot be given some of the modern ornamental finishes which are desirable in this class of artificial fabric. An outstanding example of a process which is unavailable is what is known as "souping." In this process a colored composition is applied to an embossed fabric and then the fabric and composition, while still wet, are subjected to a scraping which removes the color from the high spots of the embossed fabric. The color then remains only in the depressions or valleys of the fabric and the contrast between the valleys and the high portions creates the ornamental effect. Obviously where a highly absorbent surface layer is present, such as in the flock finished fabric of the prior art, it is impossible to obtain this effect because the color

composition is absorbed rapidly and uniformly by the entire surface layer and scraping will not remove the color from the flock fibers into which it is absorbed. The present invention, however, provides a flock finish in which the flock fibers are coated so as to reduce their absorbency. This coated fabric can then be embossed and when a colored composition is applied to its surface it will not be absorbed into the flock fibers and the fabric can therefore be scraped in accordance with the usual souping operation.

In accordance with the invention, the flock finished fabric is coated with an enamel having a base of suitable plastic or resin material such as ethyl cellulose, cellulose acetate, "Vinylite" resin or other natural or synthetic plastics or resins. The enamel preferably contains a slip agent and a suitable pigment. Particularly useful as a slip agent is talc, and a particularly good white pigment is titanium dioxide. It will be understood, however, that other and different slip agents and pigments can be used in carrying out the invention. For example, instead of talc, mica, zinc stearate, aluminum stearate and other metallic stearates can be used in whole or in part, or they can be mixed with one another. As a pigment instead of titanium dioxide other white pigments such as zinc sulphite and lithopones can be substituted in whole or in part or pigments of other colors can be used to obtain different color effects.

A particular function of the slip agent is to improve not only the feel of the fabric but also to prevent marking of the material by rubbing against other substances. As an example, a nickel coin (five-cent piece) rubbed edgewise upon an uncoated white flock finished fabric will leave a gray to black mark, whereas when the fabric is coated according to the present invention no mark is left when the coin is rubbed against it in the same way. This is one indication of the superior non-soiling properties of the fabric produced according to the present invention.

The binder or base, slip agent and pigment are incorporated into a solvent suitable for the binder employed. Such solvents are well known and a wide choice is available for the different binders. In addition to the aforesaid ingredients, the coating composition can contain plasticizers for the binder, for example, butyl phthalate, butyl glycollate, or other plasticizers well known in the art.

The invention is not restricted to white fabrics but can also be applied to fabrics of various colors. Colored pigments can be used in place of the white ones in the enamel or it can be colored partly or wholly with a suitable dye or other coloring agent. The color desired will of course determine the selection of the pigment or dye. On the other hand, a clear coating composition prepared without the use of any pigment can be used although the slip agent should be present to produce the soil resistance and improved feel above described.

In practice it is preferable to apply the coating to the surface of the fabric by means of a doctor knife in one or more coats on a finishing machine, but any other convenient method, such as application by a coating roller or by spraying, can be substituted. The fabric is then passed through a drying tunnel or the like to evaporate the solvent from the coating, after which it is preferably finished, as by sanding and brushing, to remove the surface harshness imparted by the coating.

If a vulcanizable foundation is used, the coating according to the invention can be applied to the fabric before or after vulcanizing the foundation but preferably for convenience the coating is generally applied after vulcanization.

An embossed imitation suede leather of the type described can be made by impressing a grain pattern on the fabric by any appropriate means. It is preferable first to apply the enamel coating and afterwards to emboss the desired grain pattern. However, it will be understood that the coating can be applied after the fabric is embossed, if desired, by spraying or other coating methods adapted for use on irregular surfaces. Where the foundation material is rubber, the embossing will preferably take place before vulcanization because embossing is more difficult after vulcanization. Where a rubber foundation fabric is to be embossed it is preferred to perform the coating before vulcanization while the fabric is still smooth. If vulcanizable, the fabric is then vulcanized in the usual way, preferably by dry-heating in a festooning oven.

A fabric either smooth or embossed produced according to the invention can be given a surface ornamentation by printing a desired pattern from engraved rolls. Another type of ornamentation is the "souping" previously described. The souping is done only after embossing since there must be a difference in the levels of portions of the surface.

The following are examples of specific coating compositions which can be used in carrying out the invention.

Example 1

	Per cent by weight
Ethyl cellulose	3.25
Titanium dioxide	4.56
Talc	13.7
Ethyl acetate	24.59
Ethyl alcohol	29.79
Petroleum naphtha	24.11
	100.00

This composition contains 18.26% total filler (pigment plus slip agent) which is 5.6 times the percentage of base (ethyl cellulose).

The ethyl cellulose used is Dow's 75–10 centipoise grade of 48% ethoxy content, although the invention is not limited to this particular type but may use ethyl cellulose of widely varying viscosity and ethoxy content. The formula may be varied in a number of ways without departing from the spirit of the invention.

Example 2

This example shows a coating composition in which a vinyl resin is used as the binder.

	Per cent by weight
Vinylite resin	5.13
Talc	12.51
Titanium dioxide	4.21
Methyl ethyl ketone	78.15
	100.00

This composition has a total of 16.72% filler (pigment plus slip agent) which is 3.25 times the percentage of base (Vinylite resin).

"Vinylite" is a copolymer of vinyl acetate and vinyl chloride produced by Carbide and Carbon Chemicals Company.

Example 3

The present example shows a white coating composition in which cellulose acetate is used as the binder.

	Per cent by weight
Cellulose acetate	4.13
Talc	14.15
Titanium dioxide	4.82
Acetone	37.55
Methyl alcohol	30.83
Ethyl acetate	8.52
	100.00

In this composition the filler constitutes 18.97% of all the ingredients and is 4.59 times the percentage of the base (cellulose acetate).

Example 4

A blue colored enamel containing no slip agent can be made up as follows:

	Per cent by weight
Ethyl cellulose	3.58
Ultramarine blue	10.04
Ethyl acetate	27.08
Ethyl alcohol	32.75
Petroleum naphtha	26.55
	100.00

In this composition the filler (pigment) is 10.04% which is 2.8 times the amount of base (ethyl cellulose).

It will be understood that these examples are merely indicative of the variations which can be made in the coating composition and the invention is not limited thereto. The proportion of solvent to solid matter, for instance, can be varied within wide limits to suit the method of application as well as to determine the effect desired. It will be obvious to those skilled in this art that numerous other solvents are available for the binders set out in the above examples. The coloring agent in Example 4 can be replaced by other suitable coloring agents to produce different colored compositions.

The bases or binders of the examples can be replaced by other plastics or resins and solvents suitable to the particular ones selected will then be employed.

Example 5

As a specific example of the production of a fabric according to the present invention there may be cited the following:

A piece of bleached 59-inch 2.25 Drill is coated by calendering with 16.4 oz. per linear yard of the following compound:

	Pounds	Ounces	Per cent
Milled pale crepe rubber	120		40.
Rotax (refined grade of mercapto-benzothiazole)	2	11½	0.90625
Zinc oxide	15		5.
Titanium dioxide	36		12.
Dixie clay (aluminum silicate)	36		12.
Magnesium carbonate	15		5.
Paris whiting	65	11½	21.90625
Laurex (zinc salt of lauric acid)	3		1.
Reogen (a mixture of sulphonated petroleum 15 parts, n-butyl alcohol 5 parts, and mineral oil 8 parts)	1	8	0.5
Heliozone (high melting solid paraffine)	2	4	0.75
Blue pigment 2% dissolved in crepe rubber 98%		3	0.0625
Retarder W (salicylic acid and a dispersing agent)		12	0.25
Zimate (oxidized zinc salt of dimethyldithio-carbamic acid)	1	8	0.125 0.5
Sulfur			
	300		100.

Next, a coating of rubber cement dissolved in a mixture of hydrocarbon solvents is spread onto the surface of the calendered coat. About 14.0 ounces of cement containing 14% solids is applied on each linear yard of material. This cement is made by dissolving the following composition in a mixture of 60 parts gasoline and 40 parts toluene by volume:

Cement composition

	Pounds	Ounces	Per cent
Milled pale crepe rubber	165		55.
Rotax	3	12	1.25
Zinc oxide	15		5.
Titanium dioxide	75		25
Lithopone	22	11	7.5625
Laurex	2	4	0.75
Heliozone	1	8	0.5
Petrolatum	3		1.
Light mineral oil	9		3.
Blue pigment 2% dissolved in crepe rubber 98%		3	0.0625
Zimate		9	0.1875
Sulfur	2	1	0.6875
	300		100.

While the surface of the cement coating is still liquid and while the cloth is in motion through the coating machine, an excess of bleached white cotton flocks is sifted upon the wet surface. During the application of the flock to the cloth the latter is agitated by the action of vibrating cords beating against its under side as it passes through the chamber which houses the sieves. About 3.4 ozs. of flock are consumed per linear yard of fabric being processed.

After application of the flock the goods passes over a steam chest where the greater part of the solvent is evaporated. It is then rolled up and run into a heating chamber where it is hung in festoons for vulcanizing. Vulcanization is accomplished by application of heat, the goods remaining in the oven for one hour at 260° F. after being brought to that temperature in 1½ hours.

At the end of the vulcanization period the suede is brushed by a series of rotating bristle brushes to remove loose or excess flock, after which it is ready for application of the protective enamel coating.

The flock coated fabric prepared as described above is then coated with 8 ozs. per linear yard of the enamel having the formula of Example 1. The enamel is applied under a doctor knife on a coating machine. The coating after drying leaves approximately 1.7 ozs. of solids per linear yard.

The goods, after coating, is pased through a drying tunnel to remove solvent and is thereafter sanded and brushed to remove the surface harshness left by the coating enamel.

The fabric so produced is white and can be used in place of white buckskin leather or the like. It has excellent wearing qualities, is soil-resistant and can be readily cleaned when necessary with soap and water, cleaning fluids or shoe cleaning preparations.

Example 6

In preparing a fabric which is ornamented by souping, the following procedure can be followed:

A piece of Drill coated as in Example 5 with flock is given a coating of white protective lacquer of the formula of Example 1 before vulcanization. The coated fabric is then sanded and brushed to remove surface harshness. Thereafter, and still before vulcanization, the fabric is embossed in any desired pattern by means of an embossing press or by passing between embossing rolls. The

coated and embossed goods is then vulcanized in a festooning chamber as in Example 5.

After vulcanizing, the soup coat of contrasting color is applied. In this operation an enamel containing a relatively high proportion of pigment of which a specific example is shown below is applied to the surface of the embossed fabric. While the enamel is still wet the fabric is passed under a doctor knife which scrapes the colored enamel from the high spots of the embossing pattern, leaving it untouched in the valleys. The weight of coating applied in the souping operation will vary greatly according to the character of the grain and the effect desired, but in general will run from 1 to 2 ozs. wet or ¼ to ½ ozs. dry per square yard.

The souping enamel employed in this example has the following composition:

	Weight per cent
Nitrocellulose (300 sec.)	3.7
Pigment (Bone Black)	13.6
Ethyl Acetate	28.4
Ethyl Alcohol	30.0
Petroleum Naphtha	24.3
	100.0

It is to be understood that the above examples are merely illustrative of the invention and not limiting. According to the invention the quantity of coating lacquer or enamel is regulated so that the resulting product retains the desirable surface common to suede and buckskin. The coating must therefore be limited in amount as before explained. At the same time the coating must be of sufficient quantity to partially penetrate the flock particles in order to render them less absorbent and more strongly united. In general it has been found that the coating should be applied in such proportion that it will deposit from ½ to 3 ounces of solids per square yard of fabric.

In the coating compositions hereinbefore described a lacquer or enamel is prepared consisting of a base, such as a lacquer base, and a filler which may be a pigment or a slip agent and in the preferred form both a pigment and a slip agent constitute the filler.

Where the fabric is to be used in imitation of soft materials like suede or buckskin it is generally desirable to sand or otherwise abrade the coated flock to break down the harshness imparted by the enamel. This abrasive treatment should be controlled so as to produce the softening desired but should be stopped before injury can be done to the flock or the fabric. Only a minor amount of the coating composition is removed by this abrasion, the major part remaining upon and in the flock particles where it produces the above-described advantages.

Numerous modifications in the composition of the coating lacquers or enamels as well as in the nature of the flock coated fabric are possible within the scope of this invention and the invention is to be taken as limited only by the following claims.

We claim:

1. The method for improving the resistance to wear and soiling of a suede-like flock finished fabric which comprises the steps of applying to the flock finished surface of the fabric an enamel having a base selected from the group consisting of ethyl cellulose, cellulose acetate, and copolymer of vinyl acetate and vinyl chloride, solvent for said base, and filler consisting of at least one of the class of pigments and slip agents, said filler being present in said enamel in the proportion of at least 2.8 times the weight of said base, said enamel being applied in an amount to deposit from about ½ to about 3 ounces of solids per square yard of fabric whereby to penetrate and at least partially saturate the flock but not to form a continuous coating and destroy the flock finished character of the surface, drying said enamel on the flock, and abrading the enameled flock to remove the surface harshness imparted by the enamel and to restore a soft suede-like feel to the fabric.

2. A method for improving the resistance to wear and soiling of a suede-like flock finished fabric which comprises the steps of applying to the flock finished surface of the fabric an enamel having a base selected from the group consisting of ethyl cellulose, cellulose acetate, and copolymer of vinyl acetate and vinyl chloride, solvent for said base, a pigment and a slip agent, the total amount of said pigment and slip agent being at least 3.25 times the amount of said base, said enamel being applied in an amount to deposit from ½ to 3 ounces of solids per square yard of fabric whereby to penetrate and at least partially saturate the flock but not to form a continuous coating and destroy the flock finished character of the surface, drying said enamel on the flock, and abrading the enameled flock to remove the surface harshness imparted by the enamel and to restore a soft suede-like feel to the fabric.

3. A method for improving the resistance to wear and soiling of a white suede-like flock finished fabric which comprises the steps of applying to the flock finished surface of the fabric an enamel having a base of the group consisting of ethyl cellulose, cellulose acetate, and copolymer of vinyl acetate and vinyl chloride, solvent for said base, a white pigment, and a slip agent, the total amount of said slip agent and pigment in the enamel being at least 3.25 times the amount of said base, said enamel being applied in an amount to deposit from ½ to 3 ounces of solids per square yard of fabric whereby to penetrate and at least partially saturate the flock but not to form a continuous coating and destroy the flock finished character of the surface, drying said enamel on the flock, and abrading the enameled flock to remove the surface harshness imparted by the enamel and to restore a soft suede-like feel to the fabric.

4. A method for improving the resistance to wear and soiling of a white suede-like flock finished fabric comprises the steps of applying to the flock finished surface of the fabric an enamel having a base of the group consisting of ethyl cellulose, cellulose acetate, and copolymer of vinyl acetate and vinyl chloride, solvent for said base, titanium dioxide, and talc, the amount of said titanium dioxide plus the talc being at least 3.25 times the amount of said base, said enamel being applied in an amount to deposit from ½ to 3 ounces of solids per square yard of fabric whereby to penetrate and at least partially saturate the flock but not to form a continuous coating and destroy the flock finished character of the surface, drying said enamel on the flock, and abrading the enameled flock to remove the surface harshness imparted by the enamel and to restore a soft suede-like feel to the fabric.

5. The method for treating a suede-like flock finished fabric which comprises the steps of applying to the flock finished surface of the fabric

an enamel having a base selected from the group consisting of ethyl cellulose, cellulose acetate, and copolymer of vinyl acetate and vinyl chloride, solvent for said base, and filler consisting of at least one of the class of pigments and slip agents, said filler being present in said enamel in the proportion of at least 2.8 times the weight of said base, said enamel being applied in an amount to deposit from ½ to 3 ounces of solids per square yard of fabric whereby to penetrate and at least partially saturate the flock but not to form a continuous coating and destroy the flock finished character of the surface, drying said enamel on the flock, abrading the enameled flock to remove the surface harshness imparted by the enamel and to restore a soft suede-like feel to the fabric, embossing said enameled fabric, applying a colored enamel composition of contrasting color to the flock finished surface of the fabric, and scraping the fabric while said composition is wet to remove the said composition from the high spots so as to leave the colored composition only in the valleys of the embossed fabric.

6. A wear-resistant and soiling-resistant enameled suede-like flock finished fabric produced by the method of claim 1.

7. A wear-resistant and soiling-resistant enameled suede-like flock finished fabric produced by the method of claim 2.

8. A wear-resistant and soiling-resistant enameled suede-like flock finished fabric produced by the method of claim 3.

9. A wear-resistant and soiling-resistant enameled suede-like flock finished fabric produced by the method of claim 4.

10. A wear-resistant and soiling-resistant enameled suede-like flock finished fabric produced by the method of claim 5.

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