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SOIL RESISTANT PILE FABRICS AND METHOD OF MAKING THEM

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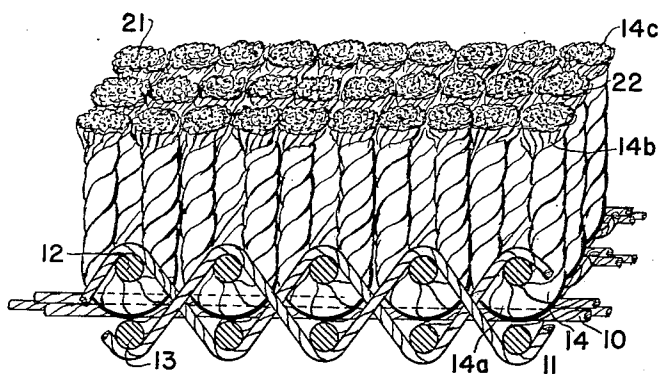


FIG. 1

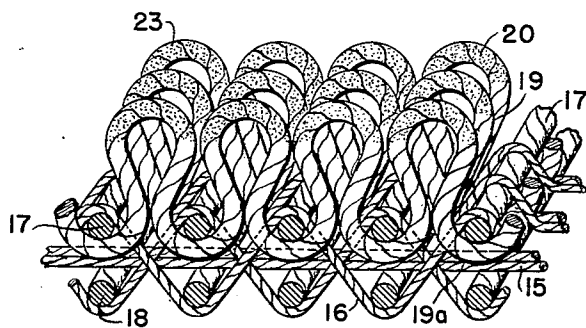


FIG. 2

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SOIL RESISTANT PILE FABRICS AND METHOD
OF MAKING THEM

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6 Claims. (Cl. 28—74)

This invention relates to the treatment of pile fabrics to cause their pile surfaces to resist permanent soiling and is concerned more particularly with a novel soil-resistant pile fabric and a method, by which pile fabrics may be treated to inhibit their tendency to become permanently soiled and discolored. The fabrics of the invention may be of various types, such as floor covering fabrics and drapery and upholstery materials, but, since utilization of the invention in connection with pile fabric carpets and rugs affords special advantages, the application of the invention to that field will be illustrated and described in detail for purposes of explanation.

In the manufacture of carpeting, it was the practice for many years to utilize pile yarns spun from a coarse grade of wool, since a pile made of such yarns is of good appearance and durability and does not crush readily in use. When a pile made of all-wool yarns becomes dirty, the dirt may ordinarily be removed without difficulty by the usual sweeping, beating, vacuum cleaning, etc. As a result, a carpet pile made of all-wool yarns is not liable to become permanently soiled in use, although long periods of service under heavy, dirty traffic conditions may result in such soiling. More recently, all-wool pile yarns have been displaced to a considerable extent in carpet manufacture by yarns containing vegetable fibers or synthetic fibers. The vegetable fibers, which have been used, include cotton and jute, while the synthetic fibers include those of viscose rayon, acetate rayon, nylon, and polyvinyl chloride and various other well known synthetic resins. The synthetic fibers have usually been employed in blends or mixtures, which frequently contain wool, while cotton fibers are used in the form of all-cotton yarns, which are commonly employed in sewn tufted fabrics made on sewing machines. Pile yarns spun from blends of wool and synthetic fibers, for example, or made entirely of synthetic fibers or vegetable fibers are satisfactory in many respects, but a carpet pile made of yarns containing 20% or more by weight of at least one vegetable fiber or synthetic fiber has been found to soil rapidly in use and cannot be readily restored to its original condition, so that the soiling and discoloration are likely to become permanent.

The present invention is accordingly directed to the provision of a novel pile fabric, in which the yarns forming the pile have been treated in such a way that the pile resists permanent soiling better than an untreated pile of the same yarns. The new fabric has the desirable resistance to soiling as a result of having been treated by the new method.

For a better understanding of the invention, reference may be made to the accompanying drawing, in which:

Fig. 1 is a view on an enlarged scale and in perspective of one form of the new fabric suitable for use as a floor covering; and

Fig. 2 is a view similar to Fig. 1 of another form of the fabric.

The fabric shown in Fig. 1 is of conventional velvet carpet construction and it includes a backing made up

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of stuffer warps 10, binder warps or fine chains 11 in two sets, and weft yarns 12, 13 lying, respectively, above and below the stuffer warps and bound in place by the binder warps. The pile of the fabric is made up of heavy pile yarns 14, each of which has a portion 14a bound beneath a weft yarn 12 and another portion 14b projecting upwardly in the form of a pair of tuft legs. In the weaving of the fabric, the pile yarns are raised as loops over pile wires provided with knives and, upon withdrawal of each wire, the loops of pile yarn thereover are cut. This permits the yarns forming the tuft legs to untwist and expand somewhat and the cut ends 14c of the yarns are sheared in finishing operations, so that these ends lie substantially in a plane and together form the pile surface.

The fabric shown in Fig. 2 is of conventional tapestry carpet weave and it includes stuffer warps 15, binder warps or fine chains 16 in two sets, and weft yarns 17, 18 lying, respectively, above and below the stuffer warps and bound in place by the binder warps. The pile of the fabric is formed by heavy pile yarns 19, which have portions 19a anchored in the backing by being passed beneath weft yarns 17. During the weaving, each pile yarn is raised over a non-cutting pile wire to form a loop 20 between each two adjacent weft yarns 17 and, upon removal of the wires, the tuft yarns remain as loops. The tops and the sides of the loops adjacent the tops then form the visible part of the surface of the pile.

The fabric of the invention includes a pile, which has been treated to increase its resistance to permanent soiling and discoloration and the treated pile possesses such resistance because of the presence on the visible portions of the yarns forming the pile elements of discrete extremely fine particles of a non-film-forming synthetic resin of the class consisting of polyvinyl chloride, polyvinyl acetate, vinyl chloride-vinylidene chloride copolymers, polystyrene, and styrene-butadiene copolymers. Resins which are non-film-forming, as that term is here used, do not form continuous films when colloidal solutions thereof are dried at room temperature, although such resins may be fused by drying at elevated temperatures. Since the resin is to be present on the pile yarns in discrete particles and carpets are exposed to elevated temperatures in finishing operations, the resin employed should have a softening point such that the particles of resin will not become tacky at ordinary drier temperatures. The temperatures in driers vary considerably, but, if the softening point of the resin is at least about 175° F., the passage through a drier of a carpet with a pile carrying the resin particles is not likely to cause the particles to soften and stick together.

The formation of a coating of discrete particles of resin confined substantially to the outer exposed portions of the yarns forming the elements of a pile may advantageously be effected by applying a dilute aqueous colloidal solution of the resin to the pile surface by means of a roller applicator, although spraying and other well known methods may be employed. In the formation of the colloidal solution, emulsifying agents may be employed, but many emulsifying agents hold particles of soil, so that such agents may not be used in the practice of the process. The emulsifying agents found satisfactory are of the anionic type and a typical example of such an agent is sodium lauryl sulfate.

In the application of the colloidal solution, it is employed in dilute form, so that the solids present have a dry weight equal to 5% or less of the weight of the solution with 3% a satisfactory concentration. The roller applicator includes a driven roll dipping into a bath of the solution and the carpet is passed with its pile surface down over the top of the roller with the tips of the pile elements lightly contacting the roller. The fabric

is then passed immediately into a drier. By the application of the colloidal solution in the manner described, the solution is kept from penetrating the pile to any considerable extent and, when the coating is dried, the resin particles are found substantially only on the outer visible portions of the pile.

The resins found to be most advantageous in the practice of the invention are unplasticized but some plasticized resins may also be employed and are thus the equivalents of unplasticized resins for the purpose of the invention. The factor, which determines whether a plasticized resin may be satisfactorily employed in the practice of the invention, is the nature of the plasticizer employed. Plasticizers of the non-solvent type, which have a tendency to exude after a period of time from the surface of the resins with which they are used, are objectionable, since such plasticizers exposed at the surface of the resin hold soil particles. The plasticizers, which are acceptable, are those of the solvent type, which combine chemically with the resin at relatively low temperatures, such as 212° F., instead of the normal high temperatures of plastic curing ranging from about 300° F. to 400° F. Acceptable plasticizers also do not migrate and are not lost by volatilization. The plasticizers, which can be employed, vary with the resin and examples of plasticizers suitable for use with polyvinyl chloride resin are glycerin and dibutyl phthalate. Tricresyl phosphate is a typical plasticizer unsatisfactory for use with polyvinyl chloride in the practice of the method, since it is of the non-solvent type and exudes from the resin to be exposed in a position to hold soil particles.

In the application of the colloidal solution of resin, the solid material deposited ranges from about 0.10 oz. to about 1.0 oz. per square yard of pile surface treated. When the coated fabric issues from the drier, it is desirable as part of the finishing operations to brush the pile surface to improve its appearance and separate yarns, which may have become matted together. In the brushing operation, a part of the coating of resin particles on the pile elements is removed. The extent of the removal of particles depends on the weight of the original coating in that, with a heavier coating, a proportion of the particles may not be firmly adherent to the pile elements. With a coating of an initial weight of about 1.0 oz. per square yard, the brushing is likely to reduce the weight of the coating to about 0.5 oz. per square yard, whereas, if the initial coating has a weight of about 0.1 oz. per square yard, the weight of the brushed coating may be about 0.075 oz. per square yard. A coating having a weight of about 0.075 oz. per square yard exhibits soil resistance and the resistance increases with an increase in the weight of the coating. Above about 1.0 oz. per square yard, an increase in the weight of the coating does not appear to add anything to soil resistance and the particles of the coating are likely to dust off. It may be said that, for general purposes, a coating having a final weight after brushing of about 0.5 per square yard of pile surface is satisfactory.

As an example of the treatment of a standard carpet in accordance with the method of the invention, the following may be given.

Example I

The carpet treated was of standard Wilton weave with the pile yarn spun from a blend of equal amounts of wool and viscose rayon. The colloidal solution or latex employed was an aqueous solution of a styrene-butadiene copolymer having a ratio of 90% styrene and 10% buta-

diene. This resin is non-film-forming and is sold commercially by Koppers Company, Inc., Pittsburgh, Pa., under the trade-name Dylex K-900-D. The particles in the latex have a size varying from 0.01 to 0.1 microns and the commercial product contains 50%–52% solids. In the use of the latex, it was diluted to contain 3% solids on a dry basis and was applied by a roller coater applicator to the pile surface of the carpet. The treated carpet passed directly from the applicator through a drier, the interior temperature of which was 175° F. The latex was so applied that the dried coating had a weight of about 1.0 oz. per square yard and, after the carpet had issued from the drier, it was brushed and the weight of the coating was reduced to about 0.5 oz. per square yard. The carpet was subjected to a standard soil test and was found to possess excellent soil resistance. At the same time, the presence of the resin particles on the pile elements did not impair the feel of the pile, which was considered to be substantially as soft as in its original uncoated condition.

We claim:

1. A fabric having a pile resistant to soiling, which comprises a backing and pile yarns having portions anchored in the backing and other portions projecting above the backing and forming the pile elements, and a coating confined substantially to the outer, exposed portions of the pile elements and formed of discrete particles of a non-film-forming synthetic resin of the class consisting of polyvinyl chloride, polyvinyl acetate, vinyl chloride-vinylidene chloride copolymers, polystyrene, and styrene-butadiene copolymers, the resin having a softening point of at least about 175° F. and the coating ranging in weight from about 0.075 oz. to about 1.0 oz. per square yard of pile surface.

2. The fabric of claim 1, in which the resin is unplasticized.

3. The fabric of claim 1, in which the pile yarns contain at least 20% by weight of at least one fiber of the class consisting of vegetable fibers and synthetic fibers.

4. The fabric of claim 1, in which the pile yarns include a substantial amount of wool forming at least 20% by weight of the yarns.

5. A method imparting soil resistance to the pile of a fabric, which comprises applying to the surface of the pile a dilute colloidal water solution of a non-film-forming synthetic resin to form a coating confined substantially to the outer, exposed portions of the pile yarns forming the pile elements and drying the treated pile at an elevated temperature, the resin being a member of the class consisting of polyvinyl chloride, polyvinyl acetate, vinyl chloride-vinylidene chloride copolymers, polystyrene, and styrene-butadiene copolymers and having a softening point of at least about 175° F., the resin remaining on the fibers of the yarns in the form of discrete particles after drying of the coating and ranging in weight from about 0.1 oz. to about 1.0 oz. per square yard of pile surface and the drying exposing the resin to a temperature below the softening point of the resin.

6. The method of claim 5, in which a part of the resin is removed from the pile elements by brushing.

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