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FLOOR COVERING AND METHOD OF PRODUCING THE SAME

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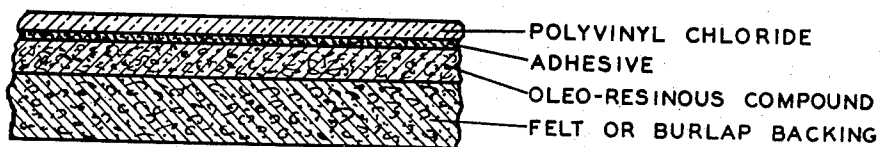


Fig. 1.

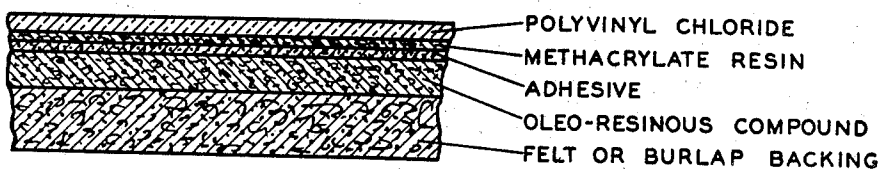


Fig. 2.

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FLOOR COVERING AND METHOD OF
PRODUCING THE SAME

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7 Claims. (Cl. 154—49)

1

This invention relates to floor coverings and to materials for use on walls, the tops of desks, tables, counters and for other purposes, and to methods of producing such materials.

The invention relates particularly to products having remarkable wearing qualities, improved appearance and resistance to cracking of the material when rolled or unrolled or when bent around corners.

In accordance with the present invention floor coverings and similar products are provided with a wearing surface formed of or containing polyvinyl chloride. While sheeted polyvinyl chloride is known to be tough, flexible and resistant to acids and alkalies, we have discovered that such sheets also possess remarkable wear resisting qualities. Comparative abrasion tests on products having wearing surfaces formed of sheeted polyvinyl chloride and products in which the wearing surfaces are formed of numerous other materials, including other resinous compositions such as the copolymer of vinyl chloride and vinyl acetate (Vinylite) have indicated that products having a wear receiving surface of polyvinyl chloride have from two to forty times the life of other products tested.

It has also been discovered that the application of sheeted polyvinyl chloride to conventional floor coverings serves to increase the resistance of the product to cracking when bent or flexed. Apparently the strains incident to bending of the material are taken up by the resinous sheet or are so distributed over the backing material by the sheet that cracking or tearing of the backing does not occur. This is of particular value when the backing is formed of felt base products or other materials which crack or tear readily when unrolled while cold or when bent about a corner.

Moreover, such sheeted resinous materials serve to protect pigments used in decorating the product so that inexpensive pigments and coloring agents which are sensitive to alkalies may be used in the sheeted resinous material or in or on the base material. In this way improved color effects and combinations are obtained and yet the colors of the pigments are substantially unaffected and retain their original intensity after long periods of wear and after repeated scrubbing or cleaning with strong alkaline agents.

One of the objects of the present invention is to

2

provide a new type of floor covering or the like which is characterized by improved wear resisting properties.

Another object of the invention is to provide floor coverings and the like with a surface layer of material which serves to increase the resistance of the product to cracking on bending thereof.

A particular object of the invention is to provide floor coverings and similar products having a wear receiving layer formed of or containing polyvinyl chloride.

These and other objects and features of the present invention will appear from the following description thereof in which typical examples and products are referred to for the purpose of illustrating the nature of the invention but without intending to limit the scope thereof.

In the drawing:

Fig. 1 is a vertical sectional view of one form of a product embodying the present invention, and

Fig. 2 is a similar view of another embodiment thereof.

Products embodying the present invention consist essentially of a layer of backing material and a surface layer of sheeted polyvinyl chloride. The surface layer is secured to the backing by suitable means such as an adhesive as shown in Fig. 1.

The polyvinyl chloride is generally obtained from the manufacturer in the form of a powder and before being sheeted or applied to a backing it is mixed with one or more suitable plasticizers and stabilizers. If the surface layer is to be transparent no filler is used but oil soluble dyes or a limited amount of a pigment may be added to impart color to the surface layer while leaving it transparent or translucent. Sometimes the pigment or a small amount of a filler is added to the mix to produce a striated, marbelized or semi-transparent sheet through which the base material and its color or design may be seen.

A typical colorless transparent polyvinyl chloride sheet may contain 66 parts by weight of the powdered polyvinyl chloride mixed with 33 parts of a plasticizer such as tricresyl phosphate and a small amount, say 1 or 2 parts, of a stabilizer such as litharge. These ingredients are mixed and kneaded together on a conventional rubber mill or in a Banbury mixer at temperatures in the neighborhood of 250° F.

The proportions of the polyvinyl chloride and plasticizer used will differ in various products but the amount of the plasticizers employed is generally within the range of about 1 part plasticizer to from 1 to 3 parts of the resin powder. If the sheet contains more than about 4 parts of the resin to one part of plasticizer it is generally too hard and brittle at low temperatures to effectively prevent cracking of the product on flexing thereof.

Typical plasticizers other than tricresyl phosphate are: di-butyl phthalate, tri-butyl phosphate, butyl phthalyl, butyl glycolate, di-tetrahydro furfural adipate, di-tetrahydro furfural phthalate, di-methoxy ethyl phthalate and others. The stabilizers used are those generally known as "chloride accepting substances" and include the monoglyceride of cottonseed fatty acids, and butyl-acetyl ricinolate. When the surface layer is to be opaque lead silicate or calcium silicate may be used as a stabilizer.

Typical fillers adapted for use when forming an opaque surface layer, are Whiting, wood flour, cork, barytes, clay and diatomaceous earth. Any of the conventional pigments used in coloring floor coverings, paints or lacquers may be used but in addition thereto many alkali sensitive pigments may be employed, such as iron blue. In general any filler or pigment may be employed provided it does not accelerate the decomposition of the polyvinyl chloride or other resin used in forming the surface layer. Thus, the use of zinc oxide should be avoided because it is known to accelerate the decomposition of polyvinyl chloride.

The amounts of filler and pigment used may be varied considerably and may constitute as much as 50% by weight of the sheeted surface layer. Similarly, the ratio of the filler to the pigment may vary depending upon the nature of the pigment and the color desired. The range of filler and pigment is indicated roughly by one example in which the filler equaled 47% and the pigment 3% of the weight of the surface layer, and an alternative example in which the pigment constituted 6% of the weight of the surface layer and no filler at all was employed. The amount of plasticizer used is generally higher in those sheets containing pigment or filler than it is in transparent sheets.

When the materials have been thoroughly mixed or incorporated the product is sheeted to form a continuous layer for application to a backing. The material may be sheeted on a calender roll or a flat press under pressure of from 100 to 200 pounds per square inch and at temperatures up to 300° F. and preferably at about 250° F. It is found in general that clearer and more transparent sheets are obtained at higher temperatures and higher pressures, but the best conditions to use in any particular case will depend somewhat upon the nature and amount of plasticizer and filler used and the qualities desired in the finished sheet.

In some instances the pigment is not added until the material is sheeted, in which case a marbelized or striated effect is obtained. In other cases differently colored mixes are broken down into pieces or granules and either compressed to form a granite effect or they are calendered to produce a marbelized appearance in the sheet. In this way sheets of material having very pleasing and unusual effects and which are semi-transparent may be produced.

The backing to which the polyvinyl chloride

sheet is applied may be of any desired type. In the simplest form of my invention a clear transparent sheet of the resinous material is secured to a layer of preformed decorated floor covering such as linoleum or printed felt base material. However, the surface layer may be tinted, streaked or marbelized to present areas which are opaque or translucent while other areas are transparent. In this way the product is given an impression of depth and very attractive overlay designs and color effects are produced. When the surface layer is opaque the base may be formed of any suitable material such as burlap (either coated or uncoated), saturated felt, linoleum, paper or other material.

Sheeted polyvinyl chloride, while slightly thermoplastic, cannot be heated to a high enough temperature to bond it to most other materials by the action of heat alone, since it begins to decompose at temperatures above about 350° F. Furthermore, very few materials are known which will adhere to sheeted polyvinyl chloride with sufficient tenacity to permit it to be secured firmly to a backing. In our copending application Serial No. 421,697, filed December 4, 1941, we have described and claimed certain adhesives and combinations of adhesives containing methacrylate resins and methods of using these adhesives in securing polyvinyl chloride sheets to other materials. However, it is found that most methacrylate resin containing adhesives which adhere firmly to sheeted polyvinyl chloride do not form a satisfactory bond with many of the backing materials adapted for use in floor coverings. Thus, for example, methacrylate resins which will adhere to sheeted polyvinyl chloride do not form a satisfactory bond with oleoresinous surfaces, such as those presented by linoleum and the paint usually used in printing felt base floor coverings.

For this reason, when securing sheeted polyvinyl chloride to conventional hard surface floor coverings having an oleoresinous surface it is preferable to use a combination of adhesives which not only have an affinity for the polyvinyl chloride but also have an affinity for oleoresinous surfaces. Satisfactory types of adhesives having an affinity for oleoresinous surfaces are solutions of varnish type resins, such as ester gum, hydrogenated rosin, coumarone resins and asphalt. These may be applied to the backing most readily by dissolving them in a solvent such as toluol or petroleum solvents, and thereafter allowing the solvent to evaporate before bonding a methacrylate resin coated polyvinyl chloride sheet thereto. For best results it is desirable to employ several layers of adhesive between an oleoresinous backing and the polyvinyl chloride sheet, progressing from the oleoresinous surface, where the adhesive may consist mainly of ester gum, through one or more layers containing both ester gum and a methacrylate resin, to the layer of adhesive directly adjacent the polyvinyl chloride surface layer which may consist entirely of a methacrylate resin. Excellent results have been obtained in this way using several successive layers of adhesive material between the surface layer and the backing as shown in Fig. 2.

Instead of using a solution of ester gum for the adhesive having affinity for the base material an emulsion of a high melting point asphalt or a solution of asphalt in toluol may be used. When securing the sheeted polyvinyl chloride to backings which do not have an oleoresinous surface other suitable adhesives may be used and in some

instances only the methacrylate resin adhesive need be employed.

The resinous sheet is preferably secured to the backing material by the use of thermo-plastic adhesives, and under the action of heat and pressure. The temperature at which the sheet is pressed onto the backing should be as high as possible with the type of backing employed while avoiding decomposition of the wear resisting sheet. The bonding of the resinous sheet to the backing may be effected by any suitable means such as a press roll or a flat press. In some cases the resinous sheet and backing are passed together between press rolls to secure the sheets together and force air from between the sheets to eliminate blisters and thereafter the laminated material is subjected to heat and pressure in a flat press to increase the activation of the adhesive and prolong the pressing operation. This second pressing operation also aids in clarifying the resinous sheet and forms a smooth polished surface thereon. It is sometimes found that the adhesion of the polyvinyl chloride to the backing is improved by a tempering treatment in which the laminated product is maintained at a temperature of about 140° F. to 150° F. for a period of 8 to 12 hours without pressure. Much the same improvement is obtained when the material is held in the press at, say 250° F., for a period of from 1 to 5 minutes. When methacrylate resin adhesive and polyvinyl chloride have been subjected to such a tempering treatment to increase the bond between the resin and the sheet the resin may be said to be "activated" and this term is used in the claims to refer to such a tempered product. However, this tempering treatment is not necessary when the adhesives used form a firm bond with both the polyvinyl chloride sheet and the backing.

The durability or length of life of floor coverings having a wearing surface formed of or containing polyvinyl chloride depends in part at least upon the amount and nature of the filler and pigments, if any, which are incorporated therein. However, wear tests on typical samples of material embodying the present invention indicate that the durability is generally reduced as the amount of filler and pigment is increased.

In a typical instance wear tests by means of abrasion upon a product consisting of a backing of felt base material having a sheet of polyvinyl chloride .015 inch thick and containing 50% of pigment and filler with the resinous sheet adhesively secured to the backing, showed wear resistance equal to twice the life of products in which the same backing material was provided with a wearing surface of the usual printed paint type. When the resinous sheet contained no filler the life indicated was six times that of the printed felt base material.

In comparing products having a wearing surface formed of sheeted polyvinyl chloride with those having a linoleum wearing surface the life indicated for the polyvinyl chloride surfaced product was much greater in every case and in some instances was 46 times the life of the linoleum product. Comparisons with products surfaced with sheets formed of various copolymers of vinyl chloride and vinyl acetate (Vinylite) indicate that the latter resins are not always hard enough to be suitable for use in floor coverings. The softer sheets picked up dirt and retained it to such an extent that abrasion tests were not significant. When sheets of the copolymer comparable with polyvinyl chloride in hardness, as determined by

penetration and recovery tests, were subjected to abrasion tests the polyvinyl chloride had an indicated life of from 2 to 16 times that of the copolymer.

These remarkable wearing characteristics of products embodying the present invention are attainable while at the same time novel and pleasing color effects and appearances may be produced and the flexibility of the product without injury is increased. Moreover, these properties can be obtained in a great variety of products other than floor coverings. It should therefore be understood that the products, compositions, proportions, and methods of procedure cited above and particularly described are intended for the purpose of indicating the nature and typical applications of the invention and are not intended to limit the scope of the following claims.

We claim:

1. Floor covering material comprising a backing having an oleoresinous surface and sheeted polyvinyl chloride secured to said oleoresinous surface by a plurality of layers of adhesives which are compatible with each other the layer of adhesive adjacent the polyvinyl chloride containing a methacrylate resin and the layer of adhesive adjacent the oleoresinous surface having the property of adhering firmly to said surface and containing a material selected from the group consisting of ester gum, hydrogenated rosin and coumarone resin.

2. Floor covering material comprising a backing presenting a surface formed of a linoleum composition and having transparent sheeted polyvinyl chloride adhesively secured to the surface of the linoleum composition by a film of material selected from the group consisting of ester gum, hydrogenated rosin and coumarone resins, the concentration of the methacrylate resin in said film being greater in that portion of the film adjacent the sheeted polyvinyl chloride than in that portion of the film adjacent the linoleum.

3. The method of producing floor coverings and the like which comprises the steps of applying oleoresinous decorative material to the surface of a backing, applying to the decorated surface a layer of an adhesive containing material selected from the group consisting of ester gum, hydrogenated rosin and coumarone resin sheeting polyvinyl chloride, applying an adhesive containing a methacrylate resin to the sheeted polyvinyl chloride, placing said sheet on the backing with the adhesives in contact and subjecting the product to heat and pressure.

4. Floor covering material comprising a backing of felt base material having oleoresinous material applied to one surface of the backing, sheeted polyvinyl chloride overlying the oleoresinous material and secured thereto by a film of adhesive material containing methacrylate resin and a material selected from the group consisting of ester gum, hydrogenated rosin and coumarone resin, the concentration of the methacrylate resin in said film being greater in that portion of the film adjacent the sheeted polyvinyl chloride than in that portion of the film adjacent the oleoresinous material.

5. Laminated floor covering comprising a layer of material having an oleoresinous surface, a layer of sheeted polyvinyl chloride overlying said surface and a film of adhesive material bonding said layers together, that portion of said film which is adjacent the sheeted polyvinyl chloride

7

consisting substantially entirely of methacrylate resin and that portion of said film which is adjacent said oleoresinous surface consisting substantially entirely of a material selected from the group consisting of ester gum, hydrogenated rosin and coumarone resin.

6. Laminated floor covering comprising a layer of material having an oleoresinous surface, a layer of sheeted polyvinyl chloride overlying said surface and a film of adhesive material bonding said layers together, that portion of said film which is adjacent the sheeted polyvinyl chloride consisting substantially entirely of methacrylate resin and that portion of said film which is adjacent said oleoresinous surface consisting substantially entirely of ester gum.

7. Laminated floor covering comprising a layer of material having an oleoresinous surface, a layer of sheeted polyvinyl chloride overlying said surface and a film of adhesive material bonding said layers together, that portion of said film

8

which is adjacent the sheeted polyvinyl chloride consisting substantially entirely of methacrylate resin and that portion of said film which is adjacent said oleoresinous surface consisting substantially entirely of coumarone resin.

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10 The following references are of record in the file of this patent:

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