United States Patent

[11] 3,616,138

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[21] Appl. No. **871,757**
[22] Filed **Aug. 12, 1969**
[45] Patented **Oct. 26, 1971**

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[32] Priority **Nov. 23, 1964**
[33] **Great Britain**
[31] **47,533/64**
Continuation of application Ser. No. 506,400, Nov. 4, 1965, now abandoned.

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[54] CARPET STRUCTURE WITH FOAMED SECONDARY BACKING

5 Claims, No Drawings

[52] **U.S. Cl.** **161/67,** 161/112, 161/143, 161/159
[51] **Int. Cl.** **D05c 17/02**
[50] **Field of Search** 161/62–67, 109, 112, 113, 159–161; 156/72

[56] **References Cited**

UNITED STATES PATENTS

2,312,200	2/1943	Teague et al.	161/76
3,100,926	8/1963	Richmond	264/45
3,106,507	8/1963	Richmond	161/178
3,214,234	10/1965	Bottomley	161/178
3,227,664	1/1966	Blades et al.	161/142
918,331	4/1909	Koll	161/109 X
2,246,040	6/1941	Guild	161/66

FOREIGN PATENTS

971,958	10/1964	Great Britain

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ABSTRACT: Carpets, particularly tufted carpets having a primary backing of hessian or jute, having a secondary backing which comprises an extruded foamed aliphatic thermoplastic resin having a glass transition temperature below ordinary room temperature. Preferably, the resin is an olefin polymer or copolymer, e.g., polyethylene, and the foamed resin has a predominantly closed cell structure, the majority of the cells having a diameter of 0.002–0.1 inch. The foamed resin can be up to 0.5-inch thick; can be in the form of a continuous sheet, a woven fabric or net, or a plurality of adjacent sheets; and, if desired, can be perforated, corrugated, or embossed. It can be fastened to the back of the carpet in any convenient manner, e.g., by sewing it in place or by adhering it by means of a suitable adhesive such as a pressure-sensitive adhesive, a latex adhesive, or a heat-sensitive adhesive.

CARPET STRUCTURE WITH FOAMED SECONDARY BACKING

This application is a continuation of copending application Ser. No. 506,400, filed Nov. 4, 1965 and now abandoned.

This invention relates to carpets, and particularly to carpets having a secondary backing.

It has been proposed to apply to carpets, particularly those of the tufted type, a secondary backing consisting of hessian fabric in order to improve the appearance and provide additional stiffness for the carpet as a whole. A secondary backing of hessian has been found to have some disadvantages, however, including the serious one that it can make the carpet more likely to slip on polished floors.

It is therefore an object of this invention to provide an improved backing for carpets and the like.

It is a further object of this invention to provide an improved carpet having a secondary backing comprising an extruded foamed aliphatic thermoplastic resin having a glass-transition temperature below ordinary room temperature.

Each of the above objects has been realized through the development of a new type of secondary backing that not only improves the appearance and handle of the carpet, but also increases its resilience, resistance to wear and apparent depth and is moreover less likely than hessian to slip on floor surfaces.

The invention, which comprises a carpet having a secondary backing comprising an extruded foamed aliphatic thermoplastic resin that has a glass-transition temperature below ordinary room temperature, is particularly applicable to tufted carpets which are not woven in the traditional way but comprise individual tufts of pile yarn pulled through a primary backing fabric, normally of jute or hessian, and anchored in place by means of a binding composition. Binding compositions can for example be those described in British Patent specifications Nos. 903,009 and 969,368. However, more conventional carpets, for example Wilton or Axminster, can usefully have applied to them a secondary backing according to the invention.

The aliphatic thermoplastic resin is one derived by polymerization or copolymerization of an ethylenically unsaturated monomer. The monomer is preferably an ethylenically unsaturated hydrocarbon, and more specifically an olefin, but it may for instance be a nitrile, such as acrylonitrile; vinyl or vinylidene chloride, vinyl acetate, or an acrylate, such as ethyl acrylate or methyl methacrylate. The most suitable hydrocarbon monomers are ethylene, propylene, and the butylenes. For instance, the polymer may be polyethylene (low-density or high-density material) or polypropylene. Moreover, copolymers of at least 50 percent by weight of the ethylenically unsaturated monomers mentioned above, with up to 50 percent by weight of other ethylenically unsaturated monomers copolymerizable therewith, such as maleates, fumarates, divinyl benzene, divinyl phthalate, diallyl maleate, etc., may be employed in the practice of this invention. Preferably, a copolymer of one of the hydrocarbon monomers (such as ethylene) with another ethylenically unsaturated monomer, such as one of those given above is employed. Thus, the copolymer can, for example, be an ethylene-vinyl acetate copolymer.

The resin has a glass-transition temperature below ordinary room temperature. The glass-transition temperature of a resin, sometimes known as its second-order transition temperature, is defined as the temperature below which the resin is hard and rigid but above which it possesses elastic properties. The glass-transition temperature is thus normally below about 20° C., and preferably below 0° C. Many of the resins derived by polymerization or copolymerization of the monomers mentioned above, for example polyethylene, intrinsically possess glass-transition temperatures below room temperature, but others, for example, polyvinyl chloride, may require the addition of a plasticizer in order to achieve a sufficiently low glass-transition temperature. Suitable plasticizers include, for example, dioctyl phthalate and chlorinated diphenyl.

The resin is in the form of an extruded foam, which can be made by extruding a foamable resin composition containing a blowing agent. The blowing agent is preferably a normally gaseous substance but it can be a volatile liquid. In many cases the blowing agent is one that is normally gaseous but which while under pressure before extrusion is present in the liquid state. Examples of volatile substances that can be used include lower aliphatic hydrocarbons, such as ethane, propane, a butane or butene, or a pentane or pentene; lower alkyd halides, such as methyl chloride, trichloromethane or 1,2-dichlorotetrafluoroethane; and inorganic gases such as carbon dioxide or nitrogen. The lower aliphatic hydrocarbons, especially a butane, or mixture of butanes, are preferred. The blowing agent can also be a chemical blowing agent, which can for example be a bicarbonate such as for example sodium bicarbonate or ammonium bicarbonate, or an organic nitrogen compound that yields nitrogen on heating, such as for example dinitrosopentamethylenediamine or barium azodicarboxylate. From 3 to 30 percent, especially 7 to 20 percent, by weight based on the weight of the resin is generally a suitable proportion of blowing agent. For example, the use of from 7to 15percent by weight of butane in conjunction with polyethylene has given excellent results.

Preferably the foamable resin contains a nucleating agent, which assists in the formation of a large number of small cells. A wide range of nucleating agents can be employed, including finely divided inert solids such as for example silica or alumina, preferably in conjunction with zinc stearate, or small quantities of a substance that decomposes at the extrusion temperature to give a gas. An example of the latter class of nucleating agents is sodium bicarbonate, used if desired in conjunction with a weak acid such as tartaric acid or citric acid. A small proportion of the nucleating agent, for example up to 5 percent by weight of the resin, is usually effective.

Extrusion of the resin takes place through a die, which is normally of the slit type so that a sheet of resin is produced. Slit dies that have modified so as to produce a more uniform product, as described in British Patent specifications 1,034,120 and 1,089,561 can often be advantageously used.

The density of the foamed resin may vary between fairly wide limits. Foamed resins having a density between 1 pound per cubic foot or slightly less and 10 pound per cubic foot or more are suitable. Resins having a density between 1 and 7 pounds per cubic foot, and preferably between 2 and 4 pounds per cubic foot, are generally most useful, particularly in the case of a foamed polyethylene.

Preferably the foamed resin has a predominantly closed cell structure, the majority of the cells may for example have a diameter of from 0.002 to 0.1 inch. Preferably the majority of the cells have a diameter of from 0.003 to 0.01 inch.

The foamed resin may be in the form of a continuous sheet, perforated by a number of holes about 0.1 inch in diameter and spaced about 0.25 inch apart, or it can be a woven fabric or net comprising strands of the extruded foamed resin. Alternatively, a number of strips of foamed resin can be used side by side, and the resin can be corrugated or embossed.

A very suitable form of foamed resin is that described in British Patent specification No. 1,089,561.

The foamed resin may be up to 0.5-inch thick. Usually however, it will be in the range of about 0.05 inch to 0.3-inch thick. Preferably, the thickness is from 0.1 inch to 0.25 inch.

The foamed resin may be fastened to the carpet in any convenient way. For example, it may be sewn in place or stuck to the back of the carpet by means of a suitable adhesive, for instance an "impact" or pressure-sensitive adhesive, or one that comprises a polymer latex, especially a latex of a natural or synthetic rubber such as a styrene/butadiene rubber or a nitrile rubber. A mineral filler such as barytes, china clay, whiting or titanium dioxide may also be present. Excellent results can often be obtained using as adhesive a composition comprising a latex and a filler of the kind that are commonly applied as a binding composition to a primary backing of tufted carpets. Where the carpet is tufted, the foamed resin

secondary backing can conveniently be applied to the partially dried binding composition on the primary backing, thus eliminating the need for additional adhesive. After the foamed resin is applied to the carpet the adhesive or binding composition is dried out. Drying is facilitated if the foamed resin is perforated as mentioned above. Good results are obtainable by applying a heat-sensitive adhesive such as polyvinyl acetate to the foamed resin and then placing the treated resin against the back of the carpet while the latter is hot, for example from a drying operation.

The invention is illustrated by the following Examples.

EXAMPLE I

This example describes the production of carpets having a secondary backing according to the invention.

The first carpet was a tufted one comprising tufts of rayon pulled through a hessian primary backing fabric and anchored in place by a binding composition comprising a styrenebutadiene copolymer containing 60 percent by weight of combined styrene together with whiting as a filler.

The secondary backing consisted of strips of foamed polyethylene having a density of 2 pounds per cubic foot, containing predominantly closed cells of diameter about 0.040 inch. The strips were 0.125 inch thick and 8 inches wide and were made by extruding a foamable polyethylene composition containing 3 percent by weight of finely divided silica, 1 percent by weight of zinc stearate and 10 percent by weight of butane through a slit orifice of length 2 inches, a width 0.040 inches and a land 0.75 inch.

The secondary backing was stuck to the back of the carpet by means of a commercial adhesive of the "impact" type, a thin layer of adhesive being spread on the back of the carpet and on the secondary backing and allowed to dry for 15 minutes, and the two surfaces then being pressed firmly together.

A good bond was obtained and the carpet as a whole had an excellent handle and resilience. When laid on a floor the apparent depth and the resistance to wear and slipping were improved compared with those of a similar carpet having a secondary backing of hessian.

EXAMPLE II

The same foamed resin secondary backing was applied in the same way to an Axminster woven carpet, and the same advantages were obtained.

EXAMPLE III

Example I was repeated using strips of foamed ethylene vinyl acetate copolymer wherein the copolymer had a vinyl acetate content of 35 percent.

EXAMPLE IV

Example I was repeated using foamed polyvinyl chloride resin having incorporated therein 50 parts of dioctyl phthalate.

EXAMPLE V

Example I was repeated using foamed polyisobutylene in place of foamed polyethylene.

EXAMPLE VI

Example I was repeated using a foamed ethyl acrylate copolymer.

EXAMPLE VII

Examples I and II were repeated except that the polyethylene was applied to the primary backing in the form of a perforated continuous sheet.

The above description and particularly the examples are set forth for purposes of illustration only. Many modifications and variations will be apparent to those skilled in the art and can be made without departing from the scope of the invention herein described.

What is claimed is:

1. In combination with a carpet having a primary backing, the improvement which comprises a secondary backing sheet adhered thereto; said secondary backing sheet comprising an extruded foamed aliphatic thermoplastic resin; said resin having a glass-transition temperature below ordinary room temperature; said secondary backing sheet having a multiplicity of voids extending therethrough from one face of the sheet to the other and being a woven fabric comprising strands of the extruded foamed aliphatic thermoplastic resin, said voids being formed by the interstices of the weave.

2. The improved carpet of claim 1 wherein the carpet is a tufted carpet comprising individual tufts of pile yarn pulled through a primary backing fabric.

3. The improved carpet of claim 1 wherein the extruded foamed aliphatic thermoplastic resin is polyethylene.

4. The improved carpet of claim 1 wherein adhesion of the secondary backing sheet to the primary carpet backing is accomplished by means of a pressure-sensitive adhesive.

5. The improved carpet of claim 1 wherein adhesion of the secondary backing sheet to the primary carpet backing is accomplished by means of a heat-sensitive polyvinyl acetate adhesive.

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