Dec. 7, 1948. J. R. JONES 2,455,777

FLOOR COVERING

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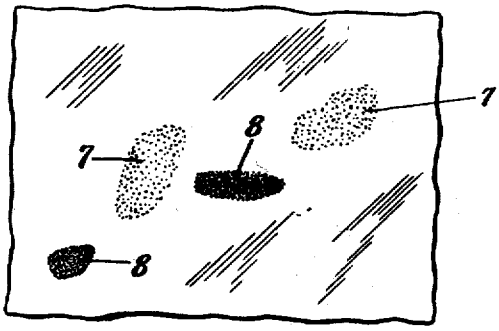


Fig:1.

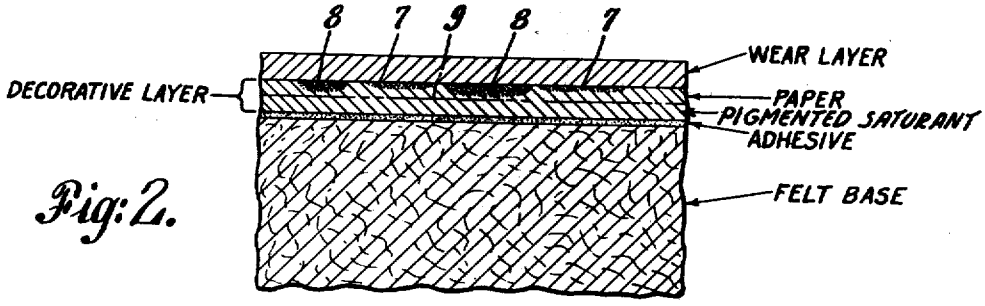


Fig:2.

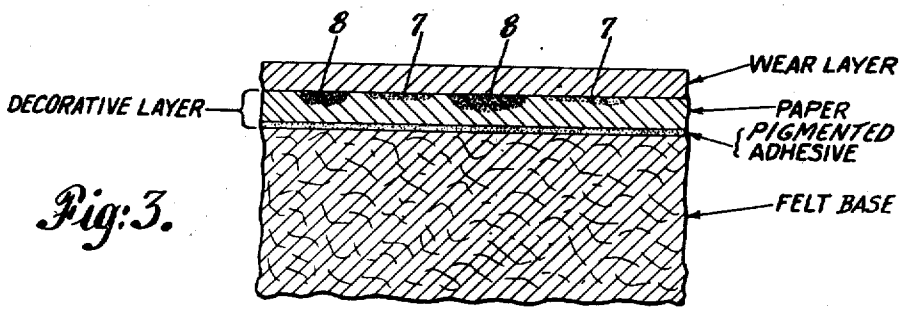


Fig:3.

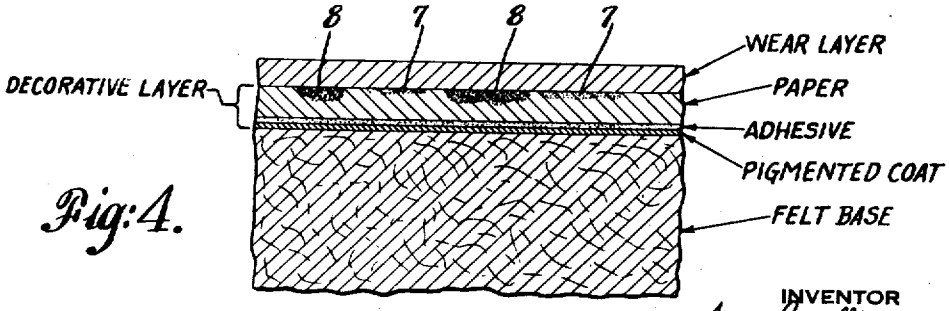


Fig:4.

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FLOOR COVERING

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5 Claims. (Cl. 41—22)

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This invention relates to floor coverings and similar products, and is concerned with an entirely new type of floor covering falling in that general class of floor coverings known in the art as "hard surface" floor coverings or "smooth surface" floor coverings.

Although covering materials according to the present invention may be applied to surfaces other than floors, many features of the invention are especially adapted to floor coverings, for reasons which will further appear. However, it is mentioned that certain of the covering materials prepared according to the invention are also well suited to wall coverings, for example for bathrooms and kitchens. Because of the special applicability of the invention to floor coverings, most of the discussion and description of the invention herebelow is related to coverings prepared for that use.

One of the primary objects of the invention is to provide a floor covering having greatly improved pattern effects, as compared with prior floor coverings, even expensive prior floor coverings such as inlaid linoleums. At the same time the invention makes possible achieving the improved pattern effects at very much lower cost than is possible with inlaid linoleums. The improvements and refinements in color pattern effect contemplated by the invention include, among other things, improvement in the possible fineness and intricacy of pattern, improvement in gradation in depth of color, and making possible the attainment of very light, even true white background coloring, which last point is in distinct contrast with prior floor coverings in which a white or substantially white background has not been achieved, the closest approximation heretofore being a distinct ivory, cream or buff.

A further object of the invention is the provision of a floor covering having the foregoing characteristics and at the same time having relatively high resistance to yellowing upon aging.

According to another aspect of the invention provision is made for high speed production of the improved floor covering.

Other objects, both with respect to the product itself and also with respect to the process of manufacturing the improved product will appear as this disclosure proceeds.

Briefly described, a typical floor covering prepared according to the present invention comprises a laminated material consisting, in general, of three layers, i. e., a foundation or underlayer, a transparent wear-resistant top layer,

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and an interposed pattern or decorative layer visible through the top layer. The foundation layer suitably comprises a felt base. The wear-resistant top layer suitably comprises one or more coatings of appropriate transparent and substantially waterproof materials. The intermediate pattern layer includes a fibrous sheet, preferably paper with which contrasting color materials are associated in a novel manner as hereinafter described, in order to achieve the improved pattern effects hereinabove mentioned.

With respect to the decorative or pattern layer an important characteristic is the attainment of a contrasting color effect as between two or more colors, one of which is applied as a background color to the bottom surface of the paper sheet continuously throughout the area thereof, one or more contrasting colors being printed on the top surface of the paper in a discontinuous and/or multi-shaped pattern. For the purpose of rendering the background color applied to the bottom surface of the paper sheet clearly visible from the top in the unprinted areas and the lightly shaded areas of the pattern, at least the upper surface layer of the paper is saturated with a clear saturant capable of rendering the paper sheet transparent or at least translucent. In this way a visible color contrast is achieved as between color materials applied to the top and bottom surfaces of the paper sheet.

According to the invention the paper sheet employed is preferably relatively thin so as to ensure reasonably clear visibility of the background color applied at the bottom surface. While the fibers of the paper sheet may contribute more or less to the background color, depending somewhat upon the density of the particular paper employed, or the type of pulp from which it is made, or the type of fillers incorporated therein, it is contemplated that the paper sheet be thin enough to ensure that the color material applied at the bottom surface will provide at least a large part and preferably the predominating part of the background color effect.

Another important general characteristic of the product of the present invention is that the intermediate decorative layer is not relied upon to contribute wearing qualities to the floor covering and in view of this the decorative layer can be prepared in a manner best suited to realization of the improved pattern effects contemplated. Similarly, since the top or wear-resistant layer is not relied upon for pattern effect, but only for the purpose of contributing wearing qualities, the materials for the wear-resistant top

layer can be selected and formulated to best suit the needs of wear resistance. With the foregoing in mind, the invention contemplates employment of a transparent top layer of thickness at least about 25% of the thickness of the paper sheet, and preferably from about 40% to about 100% of the paper thickness.

Briefly described, a typical procedure according to the present invention comprises the steps mentioned just below, these steps being individually considered more fully hereinafter.

First, a discontinuous and/or multi-shaded pattern is printed in one or more colors, on the surface of a sheet of paper to be presented upwardly. The printed sheet is then top-saturated with a clear substantially waterproof saturant, and a background color is associated with the bottom surface of the printed and saturated sheet continuously throughout the area thereof, to provide the desired contrasting color pattern effect with the color material applied on the top surface. Thereafter, the transparent wear-resistant layer is applied to the top surface of the paper sheet. Finally, the sheet is laminated to the felt base or other suitable backing.

In general, the invention contemplates three ways of achieving the foregoing improvements, each of which has certain distinctive advantages, as is described herebelow. The three general types of product are illustrated in the accompanying drawings, to which attention is now directed and in which—

Figure 1 is a face view of a floor covering prepared according to the invention, illustrating certain of the improvements in pattern effect which may be achieved according to the invention; and

Figures 2, 3, and 4 are greatly enlarged sectional views of three forms of the floor covering prepared according to the invention. These views are somewhat diagrammatic in the sense that they are not necessarily intended to accurately indicate relative thickness of the layers employed.

Illustrative Process and Product According to Figure 2

For purposes of illustration, reference is first made to Figure 2. As there shown, the foundation or under-layer comprises a felt base of known type to which is laminated the printed and saturated paper sheet, as by an adhesive. The color materials providing the desired contrasting color pattern effect are associated with the paper sheet at the top and bottom surfaces thereof, and superimposed on the sheet is a transparent wear-resistant layer. In producing this illustrative product according to the invention, the following matters of process and materials are of importance.

The paper

It is characteristic of the present invention that a relatively thin paper sheet may be employed. This is not only of advantage from the standpoint of reduction of cost of materials, but also because the employment of a thin sheet has certain advantages both in the process and product. The paper should be of light color, preferably white, and should not have a tendency to discolor when heated for drying purposes and when saturated with various saturants employed, such as those discussed herebelow.

The paper preferably has substantial tensile strength and sufficient absorbency to readily take ink when printed and to readily accept the saturating solutions. A porous paper made of sulphite paper pulp effectively meets these requirements and I have found that advantageously the thickness of the paper is not greater than about 0.01". Even down to about 0.003" is usable. For most purposes a paper of about 0.005 to 0.007" thickness is preferred.

Paper of greater density than that mentioned above may also be used, in which event the fibers of the paper may contribute appreciably to the background color.

Printing

Instead of completely covering the top surface of the paper with solid or unshaded color materials, as has been customary in certain prior floor coverings, the present invention employs a type of color printing capable of achieving gradation in depth of shading of one or more colors applied. Such shading is attained by applying more or less of any given color to various different areas, those areas to which a relatively small amount of color is applied appearing as lightly shaded areas because of the light, contrasting background color showing through, when the printed sheet is subsequently rendered more or less transparent by saturation and when the said background color is applied to the bottom surface of the printed and saturated sheet.

For the above purposes printing is preferably effected by a roll type printing press incorporating intaglio printing rolls, such as photo-engaved rolls. Such rolls are not only capable of fine gradation in color shading but are also capable of printing discontinuous patterns, so that it is possible to print fine and intricate patterns, such as floral and marble designs, and many others of fineness and intricacy never heretofore attainable in floor coverings prepared according to prior methods. Where a discontinuous pattern is employed, as is preferred for most purposes, the background color subsequently applied shows through the sheet in the areas between the printed pattern, as well as in printed areas of light shading.

From the above it will be seen that the subsequently applied background color provides a contrasting color effect with the colors printed on the top surface of the sheet both in the unprinted areas (if any) and also in areas of light shading. Most usually a broken or discontinuous printed pattern is used, since this gives the pleasing effect of a design, such as a floral design, standing out sharply against a light background. It is noted, however, that either with or without unprinted areas in the pattern, the background color shows through, at least in areas of light shading. Thus either with or without unprinted areas the printing may be termed "discontinuous," in the sense that there are always some areas in which the background color will either contribute to the color pattern or to the color shading or both. Unless otherwise specifically indicated in the appended claims, the term "discontinuous" is used in this broad sense.

Certain of the foregoing characteristics are illustrated in Figures 1 and 2, showing portions of a printed pattern at 7 and 8. In connection with the showing of printed color (7, 8) in the drawings, it should be kept in mind that the illustration is only diagrammatic, particularly with respect to the depth of penetration of color. Actually, the pattern effects contemplated can only be achieved when penetration of the ink is limited or shallow, i. e., when the printing approximates

what might be termed "surface printing." However, according to the shading, more or less ink is applied and this results in some slight variation in the depth of ink penetration as is diagrammatically indicated by portions of the pattern marked 7 and 8 in Figure 2. The gradation in color is also indicated in Figure 1, the area marked 7 having relatively light stippling to illustrate a light shade and the area 8 having heavy stippling to illustrate a dark shade.

Saturation

Because of the differences in the quantity of ink applied to the top surface of the paper in different areas of the pattern and further because of the fact that, as contemplated by the invention, the printed pattern is preferably discontinuous, leaving unprinted areas, special techniques are required in saturation of the paper sheet.

First, with regard to saturation, it should be kept in mind that, according to the invention, a contrasting color effect is achieved at least in large part by application of a background color at the bottom of the printed sheet, for instance white or some light pastel shade, which background color is associated with the paper sheet continuously over the entire area thereof, so as to provide the contrasting background color both in the unprinted areas and also within the printed areas where the shading is light. With this in mind, according to the form of product illustrated in Figure 2, the paper sheet is top-saturated with a clear or transparent, waterproof or insoluble saturant, the quantity of this clear saturant applied, and the penetration thereof, being insufficient to saturate the sheet all the way through to the bottom surface, but sufficient to penetrate to a depth approximating the depth of penetration of the ink applied in the printing. The sheet is also subjected to bottom-saturation with a pigmented saturant, preferably white. This color material applied in the bottom-saturant constitutes the background color with which the discontinuously printed color material on the top surface cooperates in achieving the contrasting color effect. In Figure 2 the dot-and-dash line 9 indicates the approximate meeting line of the clear and pigmented saturants applied respectively to the top and bottom surfaces of the paper sheet.

Wear surfacing

Following printing and saturation of the paper sheet according to the above, one or more transparent wear-resistant coatings or layers are applied to the top surface of the sheet, it being the intention that these layers shall be built up to such an extent and formed of such materials as to impart substantial wear resistance to the completed product, since the saturated paper sheet is not being relied upon for wear.

Lamination

The paper sheet, printed and saturated, and carrying the transparent wear-resistant layer is finally laminated to the felt base or other foundation layer, an adhesive being used for this purpose as is indicated in Figure 2. The adhesive may be either clear or pigmented. Hot asphalt may be used for this purpose, although in the event of employment of hot asphalt, or any dark pigment in the adhesive, care should be taken to adequately bottom-saturate the paper sheet so as to block out the underlying dark color and thus avoid impairment of the desired contrasting color effect of the color materials associated with the

paper sheet. With effective back-saturation of the paper sheet with an appropriately pigmented solution the color of the adhesive will not show through, nor will the color of the felt base, in the event of employment of a clear adhesive. It may be mentioned that felt base materials suitable for the present purpose are commonly asphalt saturated and therefore are black or very dark brown.

If additional shielding of the color of the felt base is required, the adhesive employed may also be pigmented to have the same or a similar light color as that employed in the back-saturant for the paper sheet.

Still further, if desired, a coating, such as a coating of light colored paint may be applied to the top surface of the felt or to the bottom surface of the paper sheet before lamination to further aid in shielding undesired dark color of the felt base or of the adhesive.

The product of Figure 2 has certain distinctive advantages, notably the fact that by application of a pigmented saturant to the bottom surface, the contrasting color penetrates upwardly through the paper sheet to a level in close proximity with that of the color material printed on the top surface, thereby realizing exceptional sharpness in the color contrast, shading and pattern effect.

The product of Figure 2 is capable of manufacture by relatively few processing steps In this connection it may be mentioned that, if desired, the top saturation of the paper sheet (with the clear saturant) may be accomplished by the application of a suitably formulated coating serving both as saturant and as the base layer of the transparent wear surfacing. Preferably, however, at least the upper coatings of the wear-resistant layer are of composition somewhat different from those which are best suited for saturation, various differences between preferred types of saturants and wear compositions being brought out hereinafter.

If desired, the wear-resistant top layer may be completely built up, as by applying several coatings, before the sheet is back-saturated with the pigmented saturant.

ALTERNATIVE EMBODIMENT OF FIGURE 3

As with the product of Figure 2, the product of Figure 3 also comprises, in general, three layers, the foundation layer, the top transparent wear-resistant layer, and the interposed decorative layer. Whereas, in Figure 2 the decorative layer essentially comprises only the paper sheet and the color materials applied thereto, in Figure 3 the decorative layer comprises both the paper sheet (with printed pattern on the top surface), together with a pigmented layer immediately below the sheet. This layer may comprise a coating such as paint, applied to the bottom of the sheet or may comprise a pigmented adhesive employed for lamination to the base, as is illustrated in Figure 3.

According to this embodiment the same type of paper is employed as in Figure 2, although in this instance, for reasons which will appear, the thickness of the paper may be somewhat less than in Figure 2. The paper is printed in the same manner as described above and then is saturated with a clear or transparent saturant throughout its depth, this being accomplished either by saturating both sides of the sheet or by complete penetration of the saturant through the depth of the sheet from either side. Saturation of the paper sheet with a clear or transparent

saturant renders the paper translucent, or semi-transparent, the degree of transparency depending on the nature of the paper, its thickness and the type of saturant employed, but in any event the pigment in the adhesive or other under-coating shows through the saturated paper sheet and thus achieves the desired contrasting background color effect for the color material printed on the top surface of the sheet. If the paper sheet is relatively thin, as is contemplated, the contrasting color effect can be made to show up with satisfactory sharpness.

If desired, additional shielding of the dark color of the felt base can be achieved in this form by applying a pigmented coating to the top surface of the felt base before laminating.

ALTERNATIVE EMBODIMENT OF FIGURE 4

In contrast with the embodiments of Figures 2 and 3, the decorative layer of Figure 4 is made up in still another way. Here the paper sheet is again printed in the manner above described and is then through-saturated with a clear saturant as in the form of Figure 3. The background color is incorporated in a coating applied to the top surface of the felt base before laminating. The lamination is then effected with a clear or transparent adhesive. The desired contrasting color effect is thus secured in the arrangement of Figure 4 by coloring matter printed on the top surface of the paper sheet and coloring matter incorporated in a coating on the top surface of the felt base, the latter showing through the intermediate transparent or translucent layers of adhesive and saturated paper.

It is of especial importance in both of Figures 3 and 4 that the paper employed be relatively thin and capable of being rendered relatively transparent when saturated with clear saturants.

From the foregoing it will be seen that the three general types of product above described are primarily distinguished from each other in the manner of associating the contrasting background color with the paper sheet. The form of Figure 2 relies primarily upon bottom saturation of the paper sheet with a pigmented saturant. The form of Figure 3 relies primarily upon employment of a pigmented coating, preferably the adhesive, at the bottom surface of the paper sheet. The form of Figure 4 relies primarily upon a special pigmented coating introduced between the top surface of the foundation layer and a transparent adhesive. All three forms have in common the important characteristic that the desired contrasting color pattern effect is achieved by association of two contrasting color materials with the paper sheet, one being discontinuously printed on the top surface and the other being associated with the bottom of the sheet continuously throughout its area and being visible through the sheet in the lightly shaded and unprinted areas of the printed pattern on the top surface.

It is of advantage in the present invention that top coatings are relied upon for purposes of wear and abrasion resistance, it being pointed out that in the product of this invention it is not contemplated that the decorative layer or the paper sheet be capable of withstanding any appreciable wear. The paper saturants need not be formulated in a manner to contribute wear resistance and because of this they can more readily be formulated to meet the requirements of effective and complete saturation, i. e., thorough filling of the voids of the paper, protection of the printed color material, waterproofing of the sheet, and, in the case of a pigmented back saturant, provision of the desired contrasting background color, thereby blocking out any dark color in an under-layer, such as the laminating adhesive or the felt base.

For top saturation the saturant should be as near colorless and transparent as possible, and all of the paper saturants, whether for top or bottom saturation and whether pigmented or otherwise, should be of types which are not subject to yellowing upon drying or aging. Materials which dry by oxidation, and tend to yellow, are therefore preferably avoided. The saturants should also have good flexibility over a fairly broad range of atmospheric and house temperatures, and should not have tendency to cause curling of the paper either before or after lamination upon thermal change.

For the purpose of effective saturation the solids content of the saturant is preferably relatively high.

Various types and formulations of materials, many of which are known in the art, may be employed to provide a saturant having the above characteristics. For instance, cellulose-type materials such as ethyl cellulose or nitrocellulose may be used in appropriate formulations, or if desired resin-type materials can be used, such materials preferably being applied in solution in volatile solvents.

Clarity and transparency are outstandingly important characteristics of the wear coating or layer contemplated according to this invention, since in this way the fineness of pattern effect of the color materials associated with the paper sheet is not impaired. The coating materials must also have good wear and abrasion resistance, at least some resistance to mild alkalies, such as soaps and must be water insoluble.

Materials of the general classes referred to above for saturation may also be used for wear coatings, although the specific formulation thereof for these two purposes would preferably be somewhat different, in order to best suit the needs of saturation or wear surfacing, as the case may be.

The wear-resistant layer is desirably built up to substantial thickness and since, in accordance with the present invention, the decorative layer incorporating the paper sheet is not relied upon for wear qualities, it is contemplated that the thickness of the coatings applied to the top surface should be at least 0.003'' when dry.

As above mentioned, the hot asphalt type of adhesive is effective and economical and may be used in any of those forms of floor covering not requiring transparency in the adhesive and not requiring that the adhesive be pigmented so as to contribute background color.

Other types of adhesives may also be used, such for example as resin and/or cellulose derivative adhesives. As a specific example it may be mentioned that where a transparent adhesive is desired, either for use as such or for use pigmented with a light color material, an ethyl cellulose base adhesive may be used.

In addition to employment of products as above described for the purpose of floor coverings, it will also be understood that these same products can, if desired, be applied to other surfaces such as walls, table or desk tops, luggage, etc. When the products are used as wall coverings it would ordinarily not be necessary to build up the wear layer to the same thickness as for floor coverings.

Further for the purpose of wall coverings, some other foundation layer can be substituted for the felt or other base employed in floor coverings, for instance a second underlying paper sheet, or, if desired, a relatively thin felt base or a textile fabric can be used as the foundation layer.

I claim:

1. A floor covering comprising a foundation or under-layer and a decorative sheet laminated therewith, the decorative sheet being translucent and having contrasting color materials associated, respectively, with the lower and upper sides thereof, the color material associated with the lower side of the sheet being continuous and of uniform color and shade throughout at least a substantial portion of the total area of the sheet to provide a background color visible through the sheet, and the color material associated with the upper side of the sheet being printed in designs having lighter and darker areas through which the background color is visible to different degrees to provide a multi-shaded pattern effect.

2. A laminated floor covering comprising a felt sheet as a foundation layer, a transparent wear resistant top layer, and a decorative layer interposed between the top layer and the foundation layer and adhesively laminated with the latter, the decorative layer comprising a translucent sheet of paper having contrasting color materials associated, respectively, with the lower and upper sides thereof, the color material associated with the lower side of the paper sheet being continuous and of uniform color and shade throughout at least a substantial portion of the total area of the paper sheet to provide a background color visible through the paper sheet and the transparent top layer, and the color material associated with the upper side of the paper sheet being printed in designs having lighter and darker areas through which the background color is visible to different degrees to provide a multi-shaded pattern effect.

3. A floor covering according to claim 2 in which the paper sheet is bottom-saturated with a pigmented saturant to provide said background color.

4. A floor covering according to claim 2 in which the adhesive for laminating the paper sheet with the foundation layer is pigmented to provide said background color.

5. A floor covering according to claim 2 in which the adhesive for laminating the paper sheet with the foundation layer is transparent and in which a pigmented layer is interposed between said transparent adhesive and the foundation layer to provide said background color.

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