This invention relates to the manufacture of decorated surface coverings and more particularly to the production of blended or similar striated, grained, veined or marbled effects in printed decorations. The invention contemplates a new and unique method of producing such effects as well as a new and useful apparatus effective for carrying out such method. The invention is particularly directed to those effects producible by mechanical blending or commingling of differently colored paint compositions while wet as distinguished from effects produced by printing directly in final form.

Mechanically blended or striated decorations have been used extensively in the hard surface floor covering art and my invention will be described in conjunction with such coverings as typifying a class of covering materials to which my invention and apparatus may be readily and advantageously applied.

Various methods have heretofore been proposed—and some carried into extensive commercial use—for the production of mechanically blended effects. These include the mash block method which is described and claimed in Humphreys and McCarthy Patent No. 1,824,433 and which comprises applying a base paint to a supporting web, applying variegating colors to the base paint while wet, engaging the base and variegating colors with a smooth flat surface to interperse the base and variegating colors and thereafter smoothing the surface with a sawn block. The decoration thus produced simulates natural marble but the fine, delicate graining characteristic of such material is lost due to the mass displacement effected by the smooth flat surface. Another method extensively used with much success is the brush and doctor method which is described and claimed in Rottmund Patent No. 2,048,971, and which method contemplates the application of a base color over previously applied variegating color and the interspersing and blending of the base and variegating colors by means of an oscillating brush, which brush is effective to initially interperse or commingle the wet color compositions, and the smoothing of the brushed surface with a doctor which may also effect a further blending of the compositions. By this method a striated effect is produced in which the decoration is undulatory in character and does not truly represent natural marble.

By the present method, decorations closely simulating natural marble and having the characteristics thereof, such as fine hair-line blending at the zone between stria in the natural material, may be produced in printed decorations, without the usual hard, mechanical appearance of the final product. By this method there is no mass displacement of the color compositions forming the decorations and the desired graining or blended effects may be carefully controlled to produce fine, delicate lines not heretofore producible by mechanical blending.

Generally stated, the method comprehended by this invention consists in applying base and variegating color compositions to a supporting web to be decorated, engaging the compositions while wet with a mass of relatively rigid, slender rods, causing relative movement between the color compositions and the rods to effect commingling of the base and variegating color compositions, and withdrawing the rods from the color compositions. The relative movement between the color compositions and the rods is effected in a direction parallel to the plane of the compositions and may be carried out by imparting movement to the rods unitarily, after being pressed into the color compositions, in a direction transverse to the length of the web to be decorated or both transversely and longitudinally thereof. Since the fine blending in natural marble between the main body and the veining stria is generally in the order of one-fourth to three-eighths of an inch, the magnitude of relative movement between the rods and the color compositions is preferably limited to such amount when producing effects in simulation of natural marble. The amount of movement will be determined by the effect to be produced and to some extent by the nature of the color compositions employed.

In some instances, it will be found useful to reengage the color compositions after the initial commingling to effect a further commingling and blending of the colors. This is conveniently effected by the use of two blending units or may be effected by bringing one unit into engagement with the color compositions twice during each successive step of the material through the machine.

The blending device comprises a mass of slender, relatively rigid rods which are preferably fixed to a flexible support and are unitarily or collectively moveable, the rods terminating in spaced relationship at the working surface. When used in conjunction with a flat block printing machine, the rods are secured to a block attached to the printing head frame so as to be intermittently brought into engagement with the color composition during successive steps in the printing operation. Suitable mechanism is provided for...
imparting relative movement between the rods and the color compositions in a direction parallel to the plane of the compositions.

In order that my invention may be readily understood, it will be described in connection with the attached drawings, in which,

Figure 1 is a diagrammatic view illustrating the steps in the process when carried out on a flat block printing machine;

Figures 2, 3, 4 and 5 are diagrammatic plan views of covering material showing various steps in the process;

Figure 6 is an isometric view broken away illustrating the blending device proper; and

Figure 7 is an isometric view, broken away, and illustrating the blending device of my invention applied to a printing head frame and including the moving mechanism covered by the Dorwart and Webster application.

Referring to Figure 1, a web 2 of material to be decorated is intermittently fed over a support 3 forming part of a conventional flat block printing machine so as to come to rest in sequential stations spaced along the bed. Printing blocks 5 are mounted above the bed and are brought into engagement with the web 2 while the same is at rest on the bed, each printing head applying color composition to the web. For purposes of illustration, the decoration illustrated in Figures 2 to 5 of the drawings has been reduced to simple form to aid in a clear understanding of the process.

Considering Figure 1 in conjunction with Figures 2 to 5, printing block 4 applies irregularly shaped portions of variegating color composition to spaced areas 6 of the web 2; block 6 applies a second variegating color composition to areas 7 intermediate the areas 6 previously covered, and block 8 applies base color composition to areas 9 intermediate areas 5 and 7 so that the base web in the particular design element is completely covered with color compositions.

In a following step, the base web with the applied color compositions is delivered to a blending station where the color compositions while still wet and commingling are mechanically blended by a device 10 reciprocally vertically in the same manner as the heads or blocks 4, 6 and 8.

A small section showing the working surface of the blending device is shown in Figure 6. The blending rods 11 are secured to a flexible backing 12 of rubber-cord fabric so as to permit slight flexure of the rods 11 about their point of support. The rods are preferably formed in joined pairs which are passed through the fabric 12 and the fabric is adhesively secured to a wooden block attached to the printing head frame.

The paint compositions commonly used in decorating floor coverings are relatively viscous and, accordingly, the rods must be of sufficient rigidity to overcome the viscous drag of the paints in order that proper displacement will be obtained. Although the rods 11 are disposed as a mass, collectively moveable, each individual rod is independently spaced at the working surface 13 as shown in Figure 6. In some cases the rods may become displaced and thus lie in mutual engagement at the working surface, but the mass when viewed as a whole exhibits a spaced structure.

This provides a working surface in which the individual rods engage in the discrete portions of the color compositions and displace the same, as contrasted with a soft bristle brush, sponge or felt which effect mass displacement. I have found that a device formed of steel wires of .008" to .012" diameter, about 1" long and spaced 22 per inch in each direction is suitable for use with print paints now commonly employed in the floor covering industry.

The blending device is pressed into engagement with the color compositions and the individual rods penetrate therethrough and may be brought closely adjacent to or in light engagement with the base. The frictional engagement of the rods with the base should not be sufficient to prevent their proper movement with respect to the color compositions. If they engage with too much pressure, there will be a tendency for the rods to pivot at their points of flexible support and remain stationary at their points of engagement with the web and thus cause no displacement of the compositions to effect blending.

After engagement of the rods with the color compositions, relative movement is effected between the compositions and the rods in a direction parallel to the plane of the compositions. I prefer that this movement be effected both substantially transversely of the web and substantially longitudinally of the web although a blending action is obtained if relative movement is effected in only one direction. A rotary motion may be imparted with satisfactory results on a mechanism which will impart transverse and longitudinal motion to a printing head frame when the head frame is in lowered position as shown in Figure 7.

Vertical reciprocatory motion is imparted to the head 10 through a head slide 14 carrying a cam follower 15 engageable with a head raising cam 16, the head being lowered when a section of the web 2 to be blended is delivered to the blending station by conveying pin band 17. After the working surface of the rods 12 engage the color compositions 5, 7 and 9 which lie thereunder, a shrouded cam 18 imparts a rocking motion to a rocker arm 19 which is pivoted to the head slide 14. Upon rocking the arm 19, movement is imparted to head 10 in a direction transversely of the web 2; the head being moveably secured to the head slide 14 by a pin 20 so that the desired movement of the rods 11 may be effected. The cam 18 is so shaped and set with respect to the cam 16 that the arm 19 is also rocked about a pivot pin 21 to impart movement to the rods in a direction longitudinally of the web 2. The transverse and longitudinal movements being accomplished while the head is in lowered position and before the cam 18 raises the same to withdraw the rods from the color compositions. A cam bar 22 fixed to the machine frame serves to return the head 10 to its normal position and ready for engagement with a fresh section of the web 2 upon the next movement of the pin band 17.

The blended effect is shown in Figure 5. It will be understood, of course, that this illustration is diagrammatic and does not do justice to the delicate graining obtainable. It will be noted that the variegating color compositions 5, 7 and 1 have been blended into the base color 9 at the juncture lines thereof and that fine line displacement has been effected.

In the embodiment chosen for illustration in Figures 2 to 5 and 7, the decoration covers substantially the entire web in an "all-over" effect. Tile and similar designs may be formed by printing outlining colors over the decorated web, or the blended decoration may be confined to limited areas and nonstriated elements applied in the intermediate uncovered areas.
As mentioned above, a second blending device may be used to produce "softer" blended effects and presenting patterns. In Figure 1, a second mass of blending rods is provided on head 22 and serves to further mechanically commingle the color compositions acted upon. In this view there is also provided a printing head 23 which may serve to apply nonstriated pattern elements such as interliner or printing to the web and to present a color composition to the web. While I have illustrated and described certain specific embodiments of my invention, it will be understood that the invention may be otherwise embodied and practiced within the scope of the following claims.

1. In the method of decorating a web of covering material, the steps of applying base and variegating color compositions to a web with the base and variegating compositions in contiguous relationship, pressing a mass of independently spaced, relatively rigid, slender rods into substantially the entire area of the color compositions in the design area to be blended while wet, moving the mass of rods in a direction parallel to the plane of the surface of the color compositions located in the contiguous base and transverse to the web to effect blending of the color compositions one into the other at the zone of juncture between contiguous base and variegating color compositions, and withdrawing the rods from the color compositions in a direction normal to said plane.

2. The method of decorating as defined in claim 1, in which the longitudinal and transverse relative movement between the rods and color compositions is effected in separate steps.

3. The method of decorating as defined in claim 1, in which the longitudinal and transverse relative movement between the rods and color compositions is limited by the movement of the rods in a direction parallel to the plane of the surface of the color composition to a magnitude in the order of one-fourth of an inch.

4. In the method of decorating a web of covering material, the steps of applying a plurality of interspersible color compositions to a web in contiguous relationship, engaging the color compositions in a direction parallel to the plane of the surface of the color compositions to effect blending of the color compositions, withdrawing the rods from the color compositions in a direction normal to said plane, and reengaging the color compositions while still wet with a mass of independently spaced, relatively rigid slender rods in substantially the entire area of the previously engaged color compositions, effecting relative movement between the color compositions and the rods in a direction parallel to the plane of the surface of the color compositions, and withdrawing the rods from the color compositions in a direction normal to said plane.

5. In the method of printing a web of covering material, the steps of moving a web intermittently past color applying stations, applying base and variegating color compositions to the web at the stations while the web is at rest thereat, moving the web with the applied base and variegating color compositions to a blending station, engaging the color compositions while wet and at rest in said station with a plurality of closely but independently spaced, relatively rigid, slender rods in substantially the entire area of the color compositions in the design area to be blended, moving the rods with respect to the surface of the color compositions such lateral movement being in directions longitudinally of the web and transversely of the web to effect commingling of the base and variegating compositions in the desired elements, withdrawing the rods from the color compositions in a direction normal to the plane of the surface of said compositions, moving the base to a color applying station and applying nonstriated elements to portions of the web to form a decoration including striated and nonstriated elements.

6. In an apparatus for decorating surface covering, means for applying base and variegating color compositions to a web in contiguous relationship, a mass of spaced, slender and relatively rigid rods engageable with the color compositions in substantially the entire area of the color compositions in the design area to be blended to commingle the same and a second similar mass adapted to engage the commingled compositions to further commingle the same.

7. In a flat block printing machine, printing blocks for applying base and variegating color compositions to a web in contiguous relationship, and a blending device engageable with the color compositions to commingle the same comprising a mass of independently spaced, slender rods mechanically fastened to a flexible backing and of such rigidity as to overcome the viscous drag of block applied paint when moved thereon in a direction normal to the length thereof.

8. In an apparatus for decorating surface coverings, means for applying base and variegating color compositions to a web, a mass of independently spaced collectively movable, relatively rigid slender rods for engagement with substantially the entire area of the color compositions to be blended, such rods being of sufficient rigidity to overcome the viscous drag of the color compositions and being spaced a distance sufficient that the rods effect movement of discrete portions only of the color compositions, means for effecting relative movement between the rods and the color compositions in a direction longitudinal and transverse of the web and parallel to the plane of the surface of the compositions to commingle the compositions, and means for withdrawing said rods from said compositions in a direction normal to their plane.

9. In a flat block printing machine having a plurality of printing blocks for applying base and variegating paints to the surface of a web to be decorated, a support for the web to be decorated, a brush block movable in a vertical plane, said brush block having a working surface formed of a mass of closely spaced, slender metal rods, said rods being spaced from one another at their working surface and mechanically fastened to a flexible backing, the rods being of such rigidity as to overcome the viscous drag of the paints applied to the web, means for imparting movement to said block in a horizontal plane with the working surface of said rods in spaced engagement with the paint applied by said printing blocks, said means being effective for moving said block in a direction substantially longitudinal of the web and in a direction substantially transversely thereof, and means for
elevating said block in a vertical direction to withdraw the rods from the paint.

10. In a flat block printing machine, printing blocks for applying base and variegating color compositions to a web in contiguous relationship, a blending device engageable with the color compositions to commingie the same comprising a mass of independently spaced, slender, flexible wire rods of such rigidity as to overcome the vis-

ous drag of the block applied paint when moved therethrough in a direction normal to the length thereof, means for moving said rods in a direction normal to their length while in engagement with said base and variegating color compositions, and means for withdrawing the rods from the color compositions.

CHARLES F. HUMPHREYS.