April 20, 1971 R. L. WILCOX 3,575,778

PILE FABRIC FLOOR COVERING

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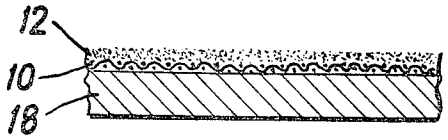


FIG. 1

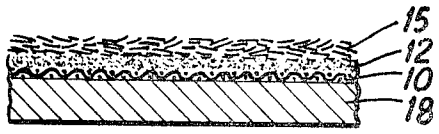


FIG. 2

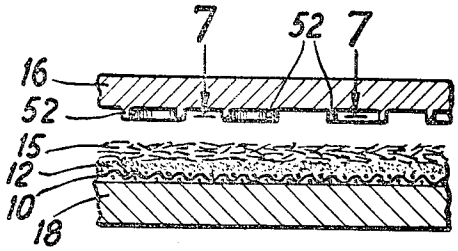


FIG. 3

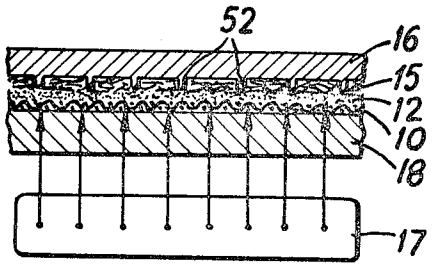


FIG. 4

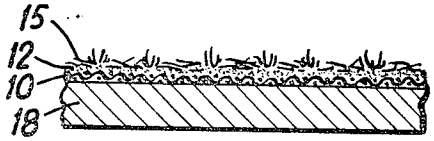


FIG. 5

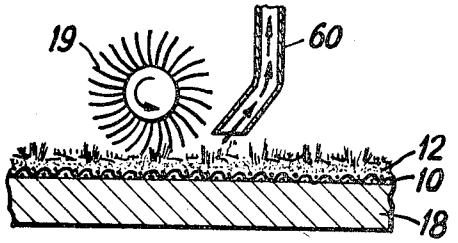


FIG. 6

INVENTOR
ROGER L. WILCOX

BY

ATTORNEY

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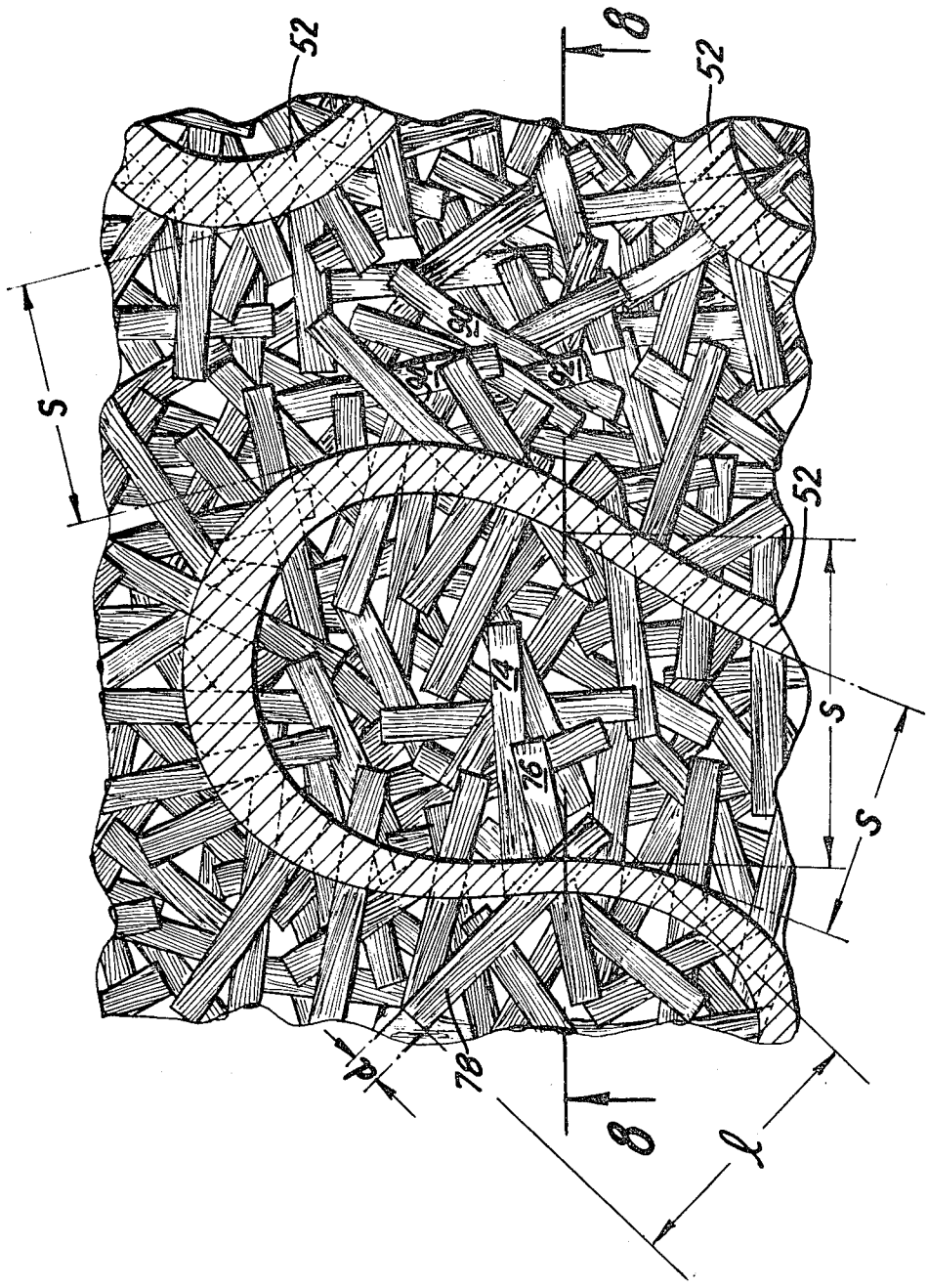


FIG. 7

INVENTOR
ROGER L. WILCOX

BY

ATTORNEY

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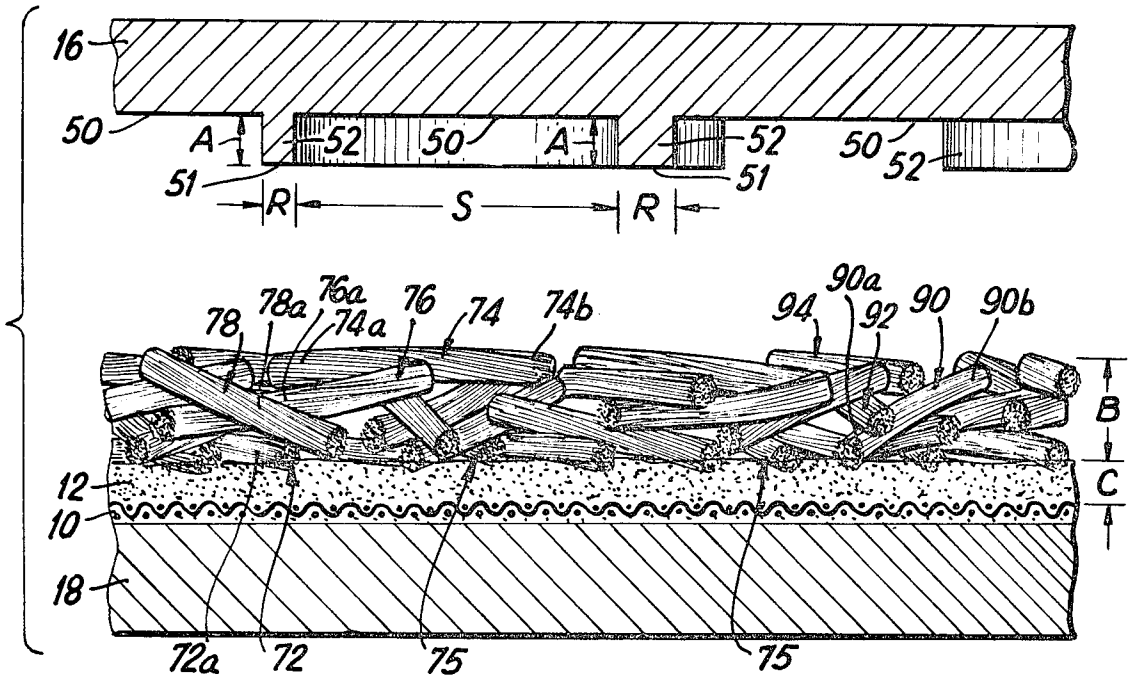


FIG. 8

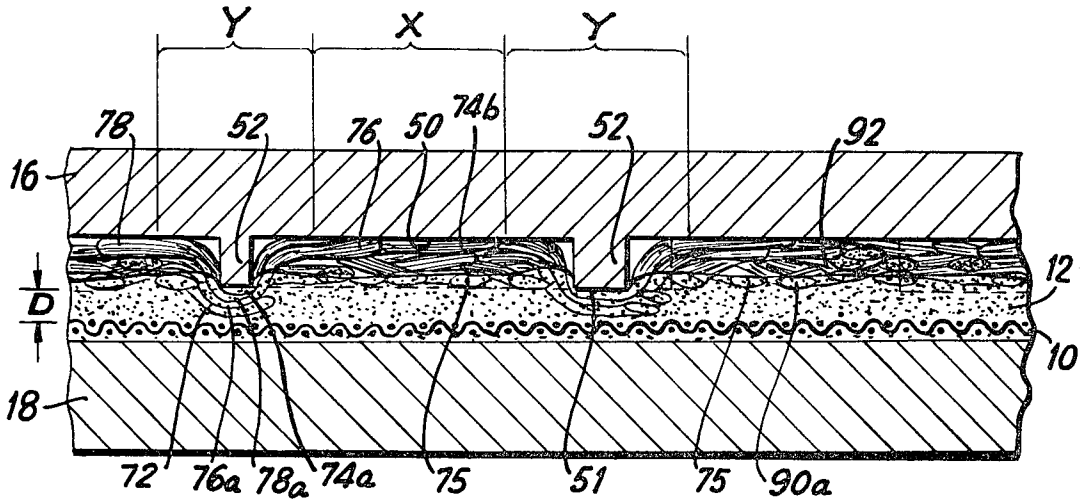


FIG. 9

INVENTOR
ROGER L. WILCOX

BY

ATTORNEY

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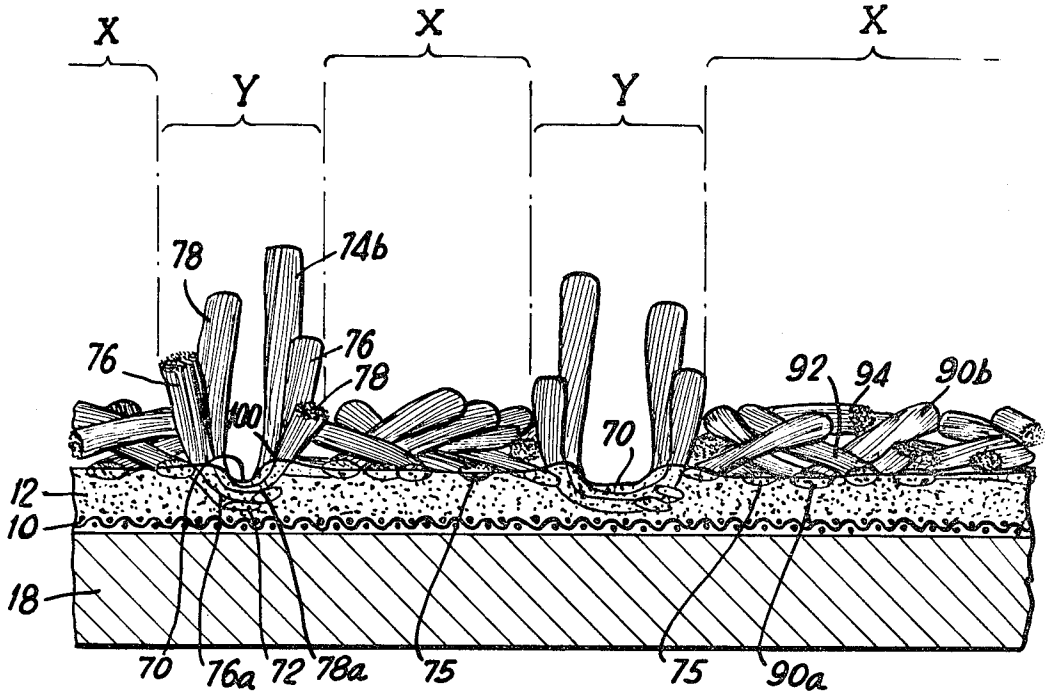


FIG. 10

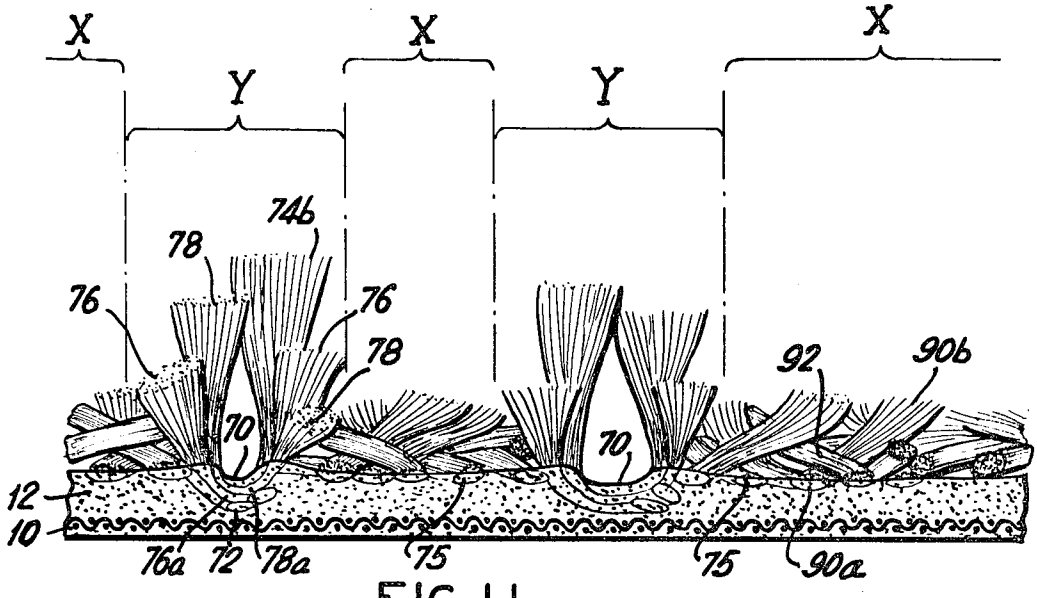


FIG. 11

INVENTOR
ROGER L. WILCOX

BY

ATTORNEY

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PILE FABRIC FLOOR COVERING

Roger L. Wilcox, P.O. Box 534,
Amagansett, N.Y. 11930

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Int. Cl. D04h 11/00
U.S. Cl. 161—63 4 Claims

ABSTRACT OF THE DISCLOSURE

As an article, and its method of manufacture, a floor covering or the like, having a non-woven pile surface, comprising a backing, a layer of flexible plastic secured to the backing and a multiplicity of yarn segments overlying the plastic ply and secured thereto as a pile tread surface cover by adhesion thereto and by embedment therein along spaced lanes of depression formed in the plastic ply, a plurality of yarn segments adjacent to said lanes of depression having ends deflected upwardly to present pile-like tufts.

This invention relates to floor coverings, or the like, in which pile and flat fibrous elements are adhesively secured to a backing.

The primary object of the invention is to provide a floor covering having, selectively, such desirable properties as liquid impermeability, durability, and dimensional stability, which are characteristic of conventional hard-surfaced floor coverings (e.g., linoleum, vinyl tile, etc.), coupled with the properties of tread softness, surface texture, style and flexibility associated with conventional pile fabrics and which can be manufactured at a cost substantially less than that of any such prior floor coverings.

In making a floor covering embodying the preferred construction of this invention, yarn segments preponderantly of approximately uniform length are disposed in random orientations in a layer of substantial depth on the upper surface of a thick ply of viscid plastic material (suitably supported on a base fabric backing) in which portions of the yarn segments which are to form pile tufts are then embedded in predetermined spaced areas or regions of depressed plastic and in which portions of other yarn segments forming flat fibrous elements are embedded or adhered, followed by solidification of the plastic ply.

Pile surface is formed of certain of the yarn segments, each of which has a substantial portion, including at least one extremity, disposed in an upper level of the yarn layer away from contact with the viscid ply, as by being supported on at least one underlying segment, and a remaining portion compressed into the adjacent depressed plastic region. The extremities of such pile elements are deflected upwardly and supported by contiguous uncompressed yarn segments to present pile-like tufts.

The thickness of the plastic ply above the base fabric is sufficient to accommodate the regions of depression, and the pile tufts, in the aggregate, have their extremities splayed outwardly with a bloom substantially to conceal the depressed plasttic regions beneath a pile tread surface.

In remaining regions of the composite surface, some yarn segments in the lowermost level of the yarn layer lie flat and have portions which are at least partially embedded in the plastic ply. Other segments, not in the lowermost layer, have portions adhered to the plastic and other portions disposed at upper levels, in instances presenting upwardly projecting extremities splayed to

form semi-pile tufts at a lower level than those previously referred to.

Further details and modifications of this preferred embodiment will appear from the ensuing description taken in connection with the accompanying drawings in which:

FIGS. 1 to 6 are schematic views indicating progressively the preferred steps in making the floor covering structure;

FIG. 7 is an enlarged diagrammatic view of a portion of the assembled constituents taken as a horizontal section on the line 7—7 of FIG. 3, indicating an exemplary configuration of protruding presser-plate elements, and relative thereto an exemplary dispositioning of elements in the yarn layer;

FIG. 8 is a diagrammatic vertical sectional representation on the line 8—8 of FIG. 7 wherein yarn segments are shown in elevation, the view corresponding to the stage illustrated by FIG. 3;

FIG. 9 is a diagrammatic view similar to FIG. 8, but showing the stage of FIG. 4, indicating the presser-plate in pressing engagement with elements of the yarn layer and forming depressed regions in the upper surface of the plastic ply in embedding portions of the elements therein;

FIG. 10 is a diagrammatic view showing the stage of FIG. 5 wherein the presser-plate is removed to leave the pile elements and other fibrous elements secured in the plastic ply; and

FIG. 11 is a diagrammatic view showing pile tufts and semi-pile tufts splayed following the operations represented in FIG. 6.

With reference to FIGS. 1–6, reference **10** designates a base fabric such as burlap or other coarse material which, during the various steps in the making of the floor covering, is supported on a suitable platform **18** of a width sufficient to accommodate the predetermined width of the fabric and also any auxiliary apparatus employed at the various stages of manufacture, and is of a suitable length. Base fabric **10** may, if desired, be advanced from stage to stage along the platform **18** by suitable feed mechanism as will be understood.

In the first stage (FIG. 1), a uniform layer **12** of a fluid mass of adhesive polymeric substance is deposited on the upper surface of base fabric **10** as by conventional means, e.g., roller-coating, not shown.

In the second stage (FIG. 2), while the layer **12** is still viscid, a layer **15** of pre-cut yarn segments is deposited thereon as by simple conventional means, e.g., blower apparatus, not shown, to provide random orientations of the segments, longitudinally of the web, to an approximately uniform depth.

In the third stage (FIG. 3), a presser-plate **16**, positioned above the base fabric with susperimposed plastic ply **12** and yarn layer **15**, approaches the assembled constituents for pressure engagement therewith. Presser plate **16** is cast or otherwise formed with a predetermined configuration of presser elements **52** integral with and protruding from its lower surface. Dimensions of the protruding elements and these spacings will be described below.

In the fourth stage (FIG. 4), while presser-plate **16** is pressed into engagement with the assembled constituents, a radiation generator-transmitter device **17** (for convenience shown schematically disposed beneath platform **18**) affords radiation of frequencies and power appropriately suited to the constitution of the substance of ply **12** so as to accelerate initial setting or polymerization thereof. The device **17** preferably is capable of generating microwave radiation which is so transmitted that it is focused or concentrated in the viscid ply **12**, thereby initiating or causing transformation of the substance of the ply from a fluid state to a solid state. Since

time-conserving means for inducing solidification of the viscid ply shall be suited to the chemical composition of the substance, device **17** may assume other forms for use with other than thermosetting polymers, or be omitted where the composition is subject to short-time solidification by catalysts as where a short pot-life polyurethane catalytic mixture is used.

Accordingly, in stage four, portions of yarn segments in layer **15** become partially or completely embedded in or otherwise adhered to the plastic ply **12**, as will be described in detail hereinafter, and at the same time the plastic ply becomes firmly bonded to the base fabric **10**, which desirably is pre-impregnated with the same or a similar plastic to close the pores of the fabric.

In the fifth stage (FIG. 5), presser-plate **16** is removed from engagement with the composite fabric to leave upwardly protruding pile segment ends.

In the sixth stage (FIG. 6), the exposed yarn surface is brushed by a wire or similar brush **19** sufficiently to splay the free ends of pile and fibrous elements for the desired bloom and also to brush out any non-adhered yarn portions which are conducted away by suitable suction apparatus **60**.

The construction of the presser will be apparent from FIGS. 7 and 8. The plate **16** itself is cast or otherwise formed with downwardly protruding rib elements **52**, which in the embodiment illustrated are of sinuous configuration (FIG. 7) to present a generally random disposition of the ribs which come to bear on a longitudinally random arrangement of fibrous elements. This is my preferred relationship to produce the fabric described below, although for certain special effects part or all of either the yarn segments or the presser ribs or both may be non-random.

The manufacturing in these several stages is subject to considerable variation in the specific dimensional relationship of the several elements involved, both of the fabric components and the presser mechanism, depending in part upon the structural characteristics sought in the finished product. As a typical example, I shall describe certain critical relationships which should be adhered to where it is desired to achieve a high incidence of pile tufts among randomly oriented yarn segments while allowing for reasonable freedom in the design of pattern configurations for presser-plate protrusions as lineaments and/or discrete elements, substantial concealment or depressed plastic regions by tufts of adjacently surrounding pile surface regions, and an average pile height substantially greater than the average height or surface level of remaining fibrous-elements regions.

Taking the normal yarn diameter *d* as a dimensional unit, shown full scale in FIG. 7, the approximate segment length *l* is **10***d*, the spacing S separating presser elements **52** ranges from **10***d* to **15***d*, the width R (FIG. 8) of protrusions **52** ranges from *d* to **3***d*, the uniform height A of the protrusions is about **2***d*, the nominal depth B of the yarn layer **15** is about **4***d* (i.e., equivalent to about four strata or levels of segments), and the thickness C of the viscid ply **12** is not less than *d* nor greater than **1.5***d*.

With reference to FIG. 9, an additional dimension D represents the separation between the lowermost surface **51** of protrusions **52** and the upper surface of the base fabric **10** as supported on the pressure resisting platform **18** and is less than the thickness C of the viscid ply as a result of just sufficient downward travel of the plate **16**, under the pressure applied in stage four (FIG. 4), to force compressive embodiment of yarn portions in the depressed plastic regions.

The mode of operation and functions of the parts so relatively dimensioned may be understood by considering the disposition of the pile and other elements in FIGS. 7 and 8 and in the areas designated X and Y in FIGS. 9, 10, and 11.

Considering, first, the dispositions in FIG. 8, I have designated certain significant yarn elements as follows: element **72** and its portion **72***a*, element **74** with its extremities **74***a* and **74***b*, element **75**, element **76** and its portion **76***a*, and element **78** and its portion **78***a*; also element **90** with extremities **90***a* and **90***b* and elements **92** and **94**. Referring to FIGS. 9, 10, and 11, there are included in and enclosed by the areas Y, depressed regions **70** (FIG. 10) formed in the plastic ply **12**, in which regions, typically yarn portions **72***a*, are embedded and compresed beneath other yarn portions **76***a* and **78***a* overlying them also in the depressed regions **70**. This complete embedment results from the dimensional relationship above discussed wherein the dimension C (FIG. 8) is greater than the dimension D (FIG. 9).

In the areas X the yarns are compacted and the lower stratum of the yarn layer is impressed into the viscid ply **12** at least partially embedding the lowermost yarn portions therein, such as indicated by element **75**. Other yarn segments in the areas X having portions superimposed over those embedded as at **75** may still have portions adhered to the viscid ply **12** or, in instances, may be free, in which event they will later be brushed away and removed in stage **6**. Still other segments may be entangled with those adhered to the plastic ply and by such entanglement be locked in place against pulling out when subjected to the operations of stage **6**.

This disposition of yarn elements in the areas X results from randomly oriented depositions thereof in conjunction with the dimensional relationship above discussed in which dimension A is less than the dimension B.

At the margins where areas Y meet or merge with areas X (FIG. 9), those segments which extend into the two areas, such as the segment **74** (also identified in FIG. 8) will be embedded at one portion **74***a*, will be free of protrusion element pressure at and adjacent the extremity **74***b*, and will be supported by the solidified upright edge **100** of the depressed plastic region **70** (FIGS. 10 and 11) and usually by an underlying segment adjacently disposed, and this support acts to cause the extremity **74***b* to be deflected upwardly from its substantially horizontal position shown at **74***b* in FIG. 8 to its more upstanding position shown at **74***b* in FIG. 10. When the parts are in their positions of FIG. 9, certain of otherwise upstanding portions such as **74***b* are depressed under the imposed surface **50** of the presser-plate base and remain thus deflected until the presser-plate is retracted when the extremities spring upwardly for engagement by the brush **19** (FIG. 6) to form the splayed tufts, e.g. **74***b*, as shown in areas Y of FIG. 11.

It may be observed that substantial portions of yarn segments forming components of areas Y may, in preliminary stages (FIGS. 8 and 9), extend into areas X, and also that areas Y are more extensive in the final stage as shown in FIG. 11 than in the previous stage as shown in FIG. 10 as a consequence of tuft blooming functions induced in stage **6**.

The typical different aspects and positions assumed by yarn segments and portions thereof in forming upright splayed pile tufts may be observed by comparing the relative positioning and orientation of segments **74**, **76**, and **78** in FIG. 7, the generally horizontal postures of same in FIG. 8, the upstanding but deflected postures in FIG. 9, erect positions of FIG. 10, and the splayed bloom configurations of FIG. 11.

Similarly, different typical aspects assumed by segment extremities in forming semi-pile tufts in areas X may be observed by comparing the relative position of segment **90** in FIGS. 7 and 8, the embedment of its lower portion **90***a* in the plastic ply by virtue of the overlying portion of segment **92** as compacted and forced downwardly by the presser-plate surface as shown in FIG. 9, the position of its extremity **90***b* uppermost in the yarn layer as shown in FIG. 10, and the semi-upright splayed tuft configuration **90***b* of FIG. 11. It may also be observed that certain yarn segments lying in an upper stratum of the

yarn layer, and positioned so as to be free of engagement with protruding elements **52** of the presser-plate, such as the segment **94** shown in FIG. 8, remain free of adhesion to the ply **12** or entanglement with other adhered segments and are subsequently removed by the operations in stage **6**.

Experiments have shown that random orientation of yarn segments allows a great variety of presser-plate protrusion configurations (including parallel ribs or other geometric arrangements) to be equivalently effective, yet other orientations of yarn segments may be suitable for special effects in the forming of a composite surface structure according to the principles herein elucidated. In all such modifications, the dimensional relationships above described are to be adhered to if the function described is to be achieved.

It will be found that the novel floor covering herein described may present a predominance of pile tufts in a surface comparable to that of conventional pile fabrics but without apparent rows or courses as is common to prior yarn-pile structures, and that it is inexpensive to manufacture yet affords a combination of the desirable properties of both the soft and hard-surfaced floor coverings heretofore known. Indeed, the floor covering, in construction is comparable to the two in that the solidified plastic ply **12** may be comparable to hard-surfaced materials while the tufts and other yarn surfaces are comparable to softer pile surfaces. If made of appropriate materials, the floor covering, of course, is waterproof and may readily be used out of doors.

Modifications in the construction of the floor covering will readily occur once the principle of the invention is understood. Thus, various color effects can be achieved, not only through selection of various yarn colors, but, if desired, by utilizing the depressed regions for special decorative pattern effects, for which purpose they may be broadened so they are not concealed by overlying tufts and that part of the plastic ply which is visible may be transparent or specially colored by pigment or by embedded yarns or fibers of selected colors.

I claim:

1. As an article of manufacture, a floor covering, or the like, having a non-woven pile surface, comprising a backing, a layer of flexible plastic secured to the backing, and a multiplicity of yarn segments overlying the plastic ply and secured thereto as a pile tread surface by adhesion thereto and by embedment therein along spaced lanes of depression formed in the plastic ply, a plurality of yarn segments adjacent to said lanes of depression having ends deflected upwardly to present pile-like tufts.

2. The article defined in claim **1** in which the yarn segments are preponderantly of approximately uniform predetermined length and are extended in random directions over the tread surface.

3. The article defined in claim **1** in which the yarn segments are preponderantly of approximately uniform predetermined length and in which the lanes of depression are substantially narrower than the said approximately uniform length of said yarn segments, adjacent lanes being spaced apart in a direction normal to the axis of each lane a distance substantially greater than said length.

4. The article as defined in claim **1** in which the ends of yarn segments adjacent said lanes are supported in upwardly deflected posture by contiguous portions of plastic and plastic-embedded yarn and are flared outwardly with a bloom substantially in the aggregate to conceal said lanes of depression.

References Cited

UNITED STATES PATENTS

1,810,328	6/1931	Slater	117—33X
2,231,995	2/1941	Glidden et al.	161—64
2,723,937	11/1965	Rice	161—63X
2,784,630	3/1957	Koprow et al.	117—33X
3,275,487	9/1966	Lemelson	161—64X

FOREIGN PATENTS

1,136,088	9/1962	Germany	156—72

ROBERT F. BURNETT, Primary Examiner

R. H. CRISS, Assistant Examiner

U.S. Cl. X.R.

156—72; 161—64, 67